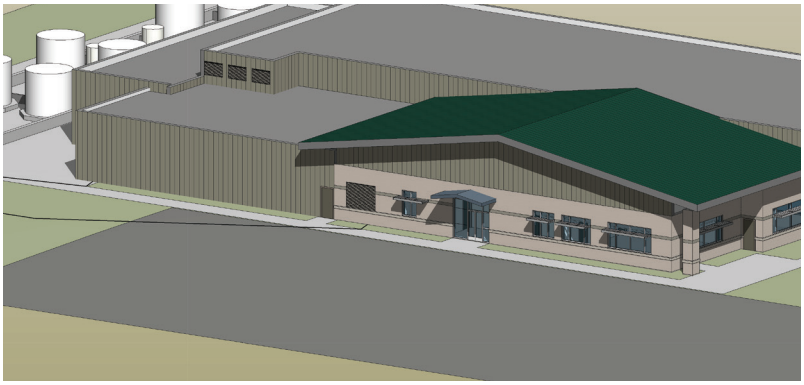
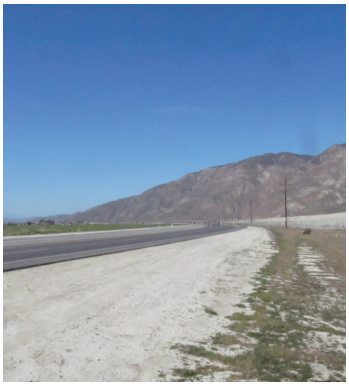

Purified Water Replenishment Project

SCH No. 2020049002

Draft Environmental Impact Report

February 2021

Prepared for:

Eastern Municipal Water District

2270 Trumble Road

Perris, CA 92570

Prepared by:

HELIX Environmental Planning, Inc.

7578 El Cajon Boulevard

La Mesa, CA 91942

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ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
ACBCI	Agua Caliente Band of Cahuilla Indians
ADA	Americans with Disabilities Act
AFY	acre-feet per year
AMSL	above mean sea level
APCD	air pollution control district
AQMP	Air Quality Management Plan
AWTF	Advanced Water Treatment Facility
BACM	Best Available Control Measures
BCC	Bird of Conservation Concern
bcf	billion cubic feet
BMPs	best management practices
BOR	Bureau of Reclamation
BTU	British thermal unit
CAA	Federal Clean Air Act
CAAQS	California Ambient Air Quality Standards
CAFE	Corporate Average Fuel Economy
CAL FIRE	California Department of Forestry and Fire Protection
CalEEMod	California Emissions Estimator Model
CalEPA	California Environmental Protection Agency
CalRecycle	California Department of Resources Recycling and Recovery
Caltrans	California Department of Transportation
CAP	Climate Action Plan
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CASGEM	California Statewide Groundwater Elevation Monitoring
CBC	California Building Code
CCR	California Code of Regulations
CDC	California Department of Conservation
CDFW	California Department of Fish and Wildlife
CEC	California Energy Commission
CED	California Energy Demand
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFG Code	California Fish and Game Code
CFR	Code of Federal Regulations
CGS	California Geological Survey
CH_4	methane
CHRIS	California Historical Resources Information System
CMP	Congestion Management Program
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society

CNRP	Comprehensive Nutrient Reduction Plan
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CRHR	California Register of Historical Resources
CRPR	California Rare Plant Rank
CSMP	Construction Site Monitoring Program
CWA	Clean Water Act
CY	cubic yard
dB	decibel
dBA	A-weighted decibel
DDW	Division of Drinking Water
DEH	Department of Environmental Health
District	Eastern Municipal Water District
DOI	Department of the Interior
DPM	diesel particulate matter
DSOD	Division of Safety of Dams
DTSC	California Department of Toxic Substances Control
DWR	Department of Water Resources
EIC	Eastern Information Center
EIR	Environmental Impact Report
EO	Executive Order
ERRP	Enhanced Recharge and Recovery Program
ESA	federal Endangered Species Act
FEMA	Federal Emergency Management Administration
FMMP	Farmland Mapping and Monitoring Program
GHG	greenhouse gas emissions
GRP	Groundwater Reliability Plus
GSF	gross square foot/feet
GWh	gigawatt hour
GWP	global warming potential
H_2S	hydrogen sulfide
HA	hydrologic area
HAPs	hazardous air pollutants
HCP	Habitat Conservation Plan
HDPE	high density polyethylene
HFCs	hydrofluorocarbons
HMBP	Hazardous Materials Business Plan
HRA	health risk assessment
HSA	hydrologic subarea
HSC	Health and Safety Code
HU	hydrologic unit
HVAC	heating, ventilation, and air conditioning

Hz	hertz
I-	Interstate
IBC	International Building Code
in/sec	inches per second
IPCC	Intergovernmental Panel on Climate Change
IRP	Integrated Resources Plan
kV	kilovolt
kW	kilowatt
kWh	kilowatt hour
LCC	Land Capability Classification
LCFS	Low Carbon Fuel Standard
LCRS	Leachate Collection and Removal System
L_{DN}	Day-Night Sound Level
L_{EQ}	Equivalent Sound Level
LESA	Land Evaluation and Site Assessment
LHMP	Local Hazard Mitigation Plan
L_{MAX}	Maximum Sound Level
LOS	level of service
LST	localized significance threshold
LUP	linear underground project
MBTA	Migratory Bird Treaty Act
MCLs	maximum contaminant levels
MCV	Manual of California Vegetation
MEI	maximally exposed individual
MF	membrane filtration
mg/L	milligrams/liter
MGD	million gallons per day
MLD	Most Likely Descendant
MMT	million metric tons
mph	miles per hour
MPO	Metropolitan Planning Organization
MS4	Municipal Separate Storm Sewer
MSHCP	Multiple Species Habitat Conservation Plan
MT	metric ton
MW	megawatt
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NHTSA	National Highway Traffic Safety Administration

NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOP	Notice of Preparation
NO_X	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPPA	Native Plant Protection Act
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSLU	noise-sensitive land use
NVCS	National Vegetation Classification System
O_3	ozone
OHP	Office of Historic Preservation
OHWM	ordinary high water mark
OPR	Office of Planning and Research
PCBs	polychlorinated biphenyls
PCE	Primary Constituent Element
PFCs	perfluorocarbons
PGA	peak ground acceleration
PM	particulate matter
PM_{10}	respirable PM equal to or less than 10 microns in diameter
$PM_{2.5}$	fine PM equal to or less than 2.5 microns in diameter
ppm	parts per million
PPV	peak particle velocity
PRC	Public Resources Code
PSMZ	Perris South Management Zone
PVRWRF	Perris Valley Regional Water Reclamation Facility
PWR	Purified Water Replenishment
RCP	Regional Comprehensive Plan
RCTC	Riverside County Transportation Commission
REAP	Rain Event Action Plan
RMP	Risk Management Plan
RMS	root mean square
RO	reverse osmosis
ROGs	reactive organic gasses
RTA	Riverside Transit Agency
RTP	Regional Transportation Plan
RWQCB	Regional Water Quality Control Board
SAA	Streambed Alteration Agreement
SAFE	Safer Affordable Fuel-Efficient
SB	Senate Bill
SCAB	South Coast Air Basin
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCC	Species of Special Concern

SCE	Southern California Edison
SCEDC	Southern California Earthquake Data Center
SCH	State Clearinghouse
SCS	Soil Conservation Service
SCS	Sustainable Communities Strategy
SDC	seismic design category
SF_6	sulfur hexafluoride
SGMA	Sustainable Groundwater Management Act
SIP	State Implementation Plan
SJP	San Jacinto Power
SJUPMZ	San Jacinto Upper Pressure Management Zone
SJV	San Jacinto Valley
SJVRWRF	San Jacinto Valley Regional Water Reclamation Facility
SLC	State Lands Commission
SLR	San Luis Rey
SO_2	sulfur dioxide
SOC	Statement of Overriding Considerations
SoCalGas	Southern California Gas Company
SR	State Route
SRA	source receptor area
SSC	Species of Special Concern
SUV	sports utility vehicle
SWAMP	Surface Water Ambient Monitoring Program
SWP	State Water Project
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TACs	toxic air contaminants
TCP	Traffic Control Plan
TCR	Tribal Cultural Resource
TDS	total dissolved solids
TMDL	total maximum daily load
TOC	total organic carbon
U.S.	United States
UBC	Uniform Building Code
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UWMP	Urban Water Management Plan
VMT	vehicle miles traveled
VOCs	volatile organic compounds
VZMS	Vadose Zone Monitoring System

WLA	waste load allocation
WMA	Watershed Management Area
WQCP	Water Quality Control Plan
WQIP	Water Quality Improvement Plan
WRCC	Western Regional Climate Center
WRCOG	Western Riverside Council of Governments
ZEV	zero emissions vehicle
ZOI	zone of influence

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EXECUTIVE SUMMARY

This chapter presents an executive summary of the Environmental Impact Report (EIR) for implementation of Eastern Municipal Water District's (District's) Purified Water Replenishment (PWR) Project (proposed project), prepared in compliance with the California Environmental Quality Act (CEQA). The project proposes to construct and operate facilities that would replenish the San Jacinto Upper Pressure Groundwater Management Zone (SJUPMZ) aquifer with a combination of recycled water and advanced treated water to reduce reliance on imported water sources, provide improved drought resiliency, and potentially improve the quality of the groundwater basin utilized by the District. This summary provides a brief description of the project, including the project's background and objectives, outlines the alternatives to the project, and identifies areas of known controversy. In addition, this chapter provides tables that summarize: (1) the direct and indirect impacts that would occur from implementation of the project; (2) the level of impact significance before mitigation; (3) the recommended mitigation measures that would avoid or reduce significant environmental impacts; (4) the level of impact significance after mitigation measures are implemented; and (5) cumulative impacts.

ES.1 OVERVIEW

As required by CEQA, this EIR: (1) assesses the potentially significant direct, indirect, and cumulative environmental effects of the project; (2) identifies potential feasible means of avoiding or substantially lessening significant adverse impacts; (3) identifies significant and unavoidable adverse impacts that cannot be mitigated to below a less than significant level; and (4) evaluates a range of reasonable alternatives to the project, including the required No Project Alternative. The District is the "Lead Agency" for this EIR for the implementation of the project. The District has the principal responsibility for certifying the EIR and approving the project.

ES.2 PROJECT BACKGROUND

In 2011, the District completed the Integrated Resources Plan (IRP) to address future water supply challenges and develop an overall strategy for future water supply. The IRP is a flexible long-term strategy for the development of water supplies, implementation of key facilities, and execution of inter-agency agreements needed to expand and operate the District's water, recycled water, and wastewater system. The IRP recommended strategies for both expanded local water supplies and imported water supplies. The proposed PWR project, which would use recycled water to recharge groundwater basins, was recommended as a key local water supply strategy for the District's future water supply portfolio.

The PWR project began with the preparation of the SJUPMZ Indirect Potable Reuse Phase I Study (CDM Smith 2014). The Phase I Study included an evaluation of five PWR project alternatives for recharge into the SJUPMZ and provided recommendations related to recycle water treatments, recharge method and locations, conveyance, and brine management for each alternative. Two alternatives were recommended in the Phase I Study: (1) a blend of recycled water and reverse osmosis (RO) permeate and (2) a phased approach with Phase I including only recharge of recycled water and Phase II including recharge of a blend of recycled water and RO permeate.

Following the Phase I Study, a PWR Program Definition Study (Phase II Study) was prepared and included a comparison of projects for both the SJUPMZ and the Perris South Management Zone (PSMZ;

CDM Smith 2016). The Phase II study evaluated five alternatives with varying recharge into the SJUPMZ and/or the PSMZ. Recharge into the SJUPMZ with a blend of recycled water and RO permeate was recommended.

The District subsequently established the goal of a two-phase implementation program with a Phase I recharge capacity of 4,000 acre-feet per year (AFY) and a Phase II expansion of 11,000 AFY for a 15,000-AFY total recharge PWR project. The recharge flow would consist of RO permeate and tertiary media filtered recycled water (tertiary recycled water).

ES.3 PROJECT OBJECTIVES

Specific key objectives of the proposed project are to:

- Produce advanced treated water and combine it with tertiary recycled water for recharge into, and replenishment of, the SJUPMZ;
- Contribute to establishing a local, long-term sustainable water supply for the District's service area;
- Provide increased water supply reliability during droughts and emergencies;
- Increase the amount of groundwater that can be pumped seasonally through recharge and storage of a combination of advanced treated water and tertiary recycled water; and
- Utilize recycled water in an environmentally responsible manner (i.e., no recycled water is discharged outside of the District's service area).

ES.4 PROJECT DESCRIPTION

The proposed project would occur as part of the District's Groundwater Reliability Plus (GRP) initiative. GRP encompasses the District's actions and investments aimed at improving the quality and quantity of water in local groundwater basins, also called aquifers. The benefits of GRP include improved groundwater quality and reduced water salinity, higher groundwater levels resulting in lower pumping costs, increased groundwater availability, and drought-resilient supply reliability. The District previously initiated the San Jacinto Valley Water Banking – ERRP as part of the GRP initiative. The purpose of the San Jacinto Valley Water Banking – ERRP is to aid in enhancing current and future water supplies by recharging imported water into the local groundwater basin. Groundwater produced (extracted) by the San Jacinto Valley Water Banking – ERRP would be used within the District's service area. The groundwater could also be made available to the District's sub-agencies or other regional water agencies through an exchange, with no physical export of local supplies.

The proposed project would replenish the SJUPMZ aquifer with a combination of recycled water and advanced treated water to reduce reliance on imported water sources, provide improved drought resiliency, and potentially improve the quality of the groundwater basin utilized by the District. The project would work in conjunction with the San Jacinto Valley Water Banking – ERRP by utilizing the existing Mountain Avenue West Recharge Basin, which was developed as part of the San Jacinto Valley Water Banking – ERRP, for recharge of the proposed project's combined tertiary recycled water and advanced treated water.

The proposed project would include the following components:

- Construction of an Advanced Water Treatment Facility (AWTF) near the District's existing San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF);
- Construction of a brine management system north of the AWTF site that would include five interconnected evaporation ponds with a total evaporation surface area of approximately 20 acres;
- Construction of Alessandro Blending Station facilities that would blend advanced treated water and tertiary recycled water;
- Relining of an existing 18-inch-diameter pipeline that would convey advanced treated water from the AWTF site to the proposed Alessandro Blending Station; and
- Construction of a new 36-inch-diameter pipeline that would convey blended water from the Alessandro Blending Station to the existing Mountain Avenue West Recharge Basin.

ES.5 IMPACT SUMMARY

The EIR examines the potential environmental effects from implementation of the proposed project, including information related to existing site conditions, analyses of the types and magnitude of individual and cumulative environmental impacts, and feasible mitigation measures that could reduce or avoid environmental impacts. In accordance with Appendix G of the *CEQA Guidelines*, the potential environmental effects of the proposed project were analyzed for the following areas:

- Agricultural and Forestry Resources
- Air Quality
- Biological Resources
- Cultural Resources and Tribal Cultural Resources
- Energy
- Geology and Soils
- Greenhouse Gas Emissions
- Hydrology and Water Quality
- Noise
- Transportation

Table S-1, *Summary of Environmental Impacts and Mitigation Measures,* presented at the end of this chapter provides a summary of the environmental impacts that could result from implementation of the project and feasible mitigation measures that could reduce or avoid environmental impacts. Table S-2, *Summary of Cumulative Impacts,* summarizes cumulate impacts and whether the project would result in a cumulatively considerable contribution to a cumulative impact.

Impacts to aesthetics, hazards and hazardous materials, land use and planning, mineral resources, population and housing, public services, recreation, utilities and service systems, and wildfire are considered to be "Effects Found Not to be Significant," according to Section 15128 of the *CEQA Guidelines*. These issues are discussed further in Chapter 5, *Environmental Effects Found Not to be Significant*, of this EIR.

ES.6 ALTERNATIVES TO THE PROJECT

The following two alternatives are analyzed in detail in Chapter 8, *Alternatives*, of this EIR. The objective of the alternatives analysis is to consider a reasonable range of potentially feasible alternatives to foster informed decision-making and public participation. The alternatives include:

- **No Project.** Under the "No Project" alternative, the District would not implement the proposed project.

- **Brine Discharge Pipeline.** This alternative would include the installation of a force main for the disposal of project-generated brine waste instead of the brine ponds that are included as part of the proposed project. Other facilities included under the proposed project would remain the same.

CEQA Guidelines Section 15126.6(e)(2) requires that an EIR identify the environmentally superior alternative among the alternatives that are evaluated. Under the No Project Alternative, the proposed project would not be implemented, and the alternative would therefore avoid potentially significant environmental impacts to biological resources, cultural resources and tribal cultural resources, geology and soils (paleontological resources), noise, and transportation identified for the proposed project. In the short term, the No Project Alternative would result in reduced impacts related to construction with respect to air quality, energy, GHG emissions (despite impacts related to air quality, energy, and GHG emissions being less than significant under the proposed project), and hydrology and water quality. However, in the long term, regional benefits related to energy use and reduction in indirect GHG emissions from lowering the amount of water needed to be transported from Northern California would not be realized. Further, long term benefits from improving groundwater quality would also not be achieved. In addition, the No Project Alternative would not meet any of the project objectives.

CEQA Guidelines Section 15126.6(e)(2) also requires that an EIR identify another alternative as environmentally superior, besides the No Project Alternative. In this case, the next environmentally superior alternative is the Brine Discharge Pipeline Alternative. The Brine Discharge Pipeline Alternative would still incur impacts related to construction and operation; however, impacts related to air quality, GHG emissions, and noise would be substantially reduced due to less grading, which would result in reduced use of off-road heavy equipment, haul truck trips, and dust generation. While some impacts would occur closer to residences, such impacts are anticipated to be less than significant.

ES.7 AREAS OF KNOWN CONTROVERSY

To initiate the public scoping process for this EIR in accordance with CEQA, the District circulated a Notice of Preparation (NOP) on April 2, 2020. The 60-day[1] public review period for the NOP ended on June 1, 2020. Commenters on the NOP expressed concerns related to potential impacts to Native American human remains and tribal cultural resources; dam safety (if dams are to be included in the project, which they are not); conflict with San Jacinto Valley Master Drainage Plan facilities, easements and encroachment permits, and Multiple Species Habitat Conservation Plan (MSHCP) consistency for encroachment permits; and potential impacts to biological resources. These concerns have been

[1] State law mandates that responses to the NOP must be sent at the earliest possible date but postmarked within 30 days from distribution of the NOP; however, in light of the COVID-19 pandemic, which may have limited ability for NOP review and comment and which resulted in the District not being able to hold a scoping meeting, responses postmarked within 60 days from distribution of the NOP, or through June 1, 2020, were accepted.

identified as areas of known controversy and are addressed throughout this EIR. Comment letters received in response to the NOP are included in Appendix A of this EIR.

Table S-1
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
4.1 Agricultural and Forestry Resources				
Conversion of Prime Farmland, Unique Farmland, of Farmland of Statewide Importance	Although the proposed project would convert Unique Farmland and Farmland of Statewide Importance to non-agricultural use, the impact would be less than significant.	Less than Significant	No mitigation is necessary.	Less than Significant
Williamson Act Contract	The proposed project would not conflict with existing zoning for agricultural use or a Williamson Act contract.	No Impact	No mitigation is necessary.	No Impact
Zoning for Forest Land	The proposed project would not conflict with land zoned as forest land, timberland, or timberland zoned Timberland Production.	No Impact	No mitigation is necessary.	No Impact
Loss or Conversion of Forest Land	The proposed project would not result in the loss of forest land or the conversion of forest land to non-forest use.	No Impact	No mitigation is necessary.	No Impact
Conversion of Farmland to Non-agricultural Use or Forest Land to Non-forest Use	Although the proposed project would convert agricultural land to non-agricultural use, the impact would be less than significant.	Less than Significant	No mitigation is necessary.	Less than Significant
4.2 Air Quality				
Conflicts with Air Quality Plans	The proposed project would not conflict with obstruct implementation of the applicable air quality plan.	Less than Significant	No mitigation is necessary.	Less than Significant
Air Quality Standards	The proposed project would not result in a cumulatively considerable net increase of	Less than Significant	No mitigation is necessary.	Less than Significant

Table S-1 (cont.)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
	any criteria for which the project region in non-attainment.			
Sensitive Receptors	The proposed project would not expose sensitive receptors to substantial pollutant concentrations.	Less than Significant	No mitigation is necessary.	Less than Significant
Odors	The proposed project would not result in other emissions, such as those leading to odors, affecting a substantial number of people.	Less than Significant	No mitigation is necessary.	Less than Significant
4.3 Biological Resources				
Special Status Species	During construction, the proposed project has the potential to directly and/or indirectly affect special status plant and animal species including smooth tarplant, chaparral sand-verbena, nesting birds and raptors, least Bell's vireo, and burrowing owl.	Potentially Significant	**MM-BIO-1 Temporary Construction Fencing.** Prior to construction, to help ensure inadvertent impacts to environmentally sensitive areas outside of the approved impact footprint are avoided, temporary construction fencing, including silt fencing, as appropriate and where determined necessary by the SWPPP, shall be installed at the edges of the approved impact limits for the project. Temporary fencing shall be installed at locations where the project components occur adjacent to resources depicted on Figure 4.3-1, *Vegetation and Sensitive Resources/Land Use Impacts,* and Figure 4.3-2, *Aquatic Resources Avoidance,* in addition to locations at the proposed Alessandro Blending Facility and the proposed 36-inch pipeline trenching along Ramona Expressway, from Vernon Avenue to Old Mountain Avenue. A qualified biologist shall be retained to monitor the installation of the temporary construction fencing wherever it would abut environmentally sensitive areas. Construction activities	Less than Significant

Table S-1 (cont.)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
			shall be restricted to areas within the approved impact limits at all times during construction.	
			MM-BIO-2 Biological Monitoring. A qualified biologist will conduct a pre-construction environmental training session for construction personnel to inform them of the sensitive biological resources in the local area and the avoidance measures in place to remain in compliance. The biologist will periodically monitor construction activities where temporary construction fencing has been installed in accordance with mitigation measure MM-BIO-1.	
			MM-BIO-3 Nesting Bird and Raptor Avoidance. Trimming, grubbing, and clearing of vegetation shall be avoided during the general avian breeding season (January 15 to July 15 for raptors; February 15 to August 31 for other avian species) to the extent feasible. If trimming, grubbing, or clearing of vegetation is proposed to occur during the general avian breeding season, a pre-construction survey shall be conducted by a qualified biologist no more than 7 days prior to vegetation clearing to determine if active bird nests are present in the affected areas. If there are no nesting birds (includes nest building or other breeding/nesting behavior) within this area, trimming, grubbing, and clearing of vegetation shall be allowed to proceed. If active bird nests are confirmed to be present during the pre-construction survey, a buffer zone will be established by the biologist. Construction activities shall avoid any active nests until a qualified biologist has verified that the young have fledged, or the nest has otherwise become inactive.	

Table S-1 (cont.)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
			MM-BIO-4 Burrowing Owl Pre-Construction Take Avoidance Survey. Prior to construction, the District shall retain a qualified biologist to conduct required pre-construction take avoidance surveys for the burrowing owl in accordance with the protocol described in the CDFW Staff Report on Burrowing Owl Mitigation (CDFW 2012). The initial take avoidance survey shall occur no less than 14 days prior to initiating ground-disturbing activities, with a final survey conducted within 24 hours prior to initiating ground disturbing activities. If, after the initial take avoidance survey, no suitable burrowing owl habitat, including burrows, is present, then the second survey 24 hours prior to ground disturbance would not be required. If no active burrowing owl burrows (nesting sites) are identified within the potential impact area of the project during the take avoidance surveys, then no additional action would be required. If active burrowing owl burrows are identified within the potential impact area, the project shall avoid disturbing active burrowing owl burrows (nesting sites) and burrowing owl individuals. Buffers shall be established around occupied burrows in accordance with guidance provided in the CDFW Staff Report on Burrowing Owl Mitigation (CDFW 2012) based on the proposed level of disturbance. For low disturbance projects, initial setback distances for avoidance of active burrows shall be 200 meters (approximately 656 feet) from April 1 to October 15 and 50 meters (approximately 164 feet) from October 16 to March 31. Exceptions can be made to the avoidance distance for areas with natural (hills, trees) or artificial (buildings, walls) barriers in place. The final avoidance buffer shall be at the discretion of the	

Table S-1 (cont.)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
			biologist. If, after consideration of a reduced buffer, an adequate avoidance buffer cannot be provided between an occupied burrow and required ground-disturbing activities, then passive relocation activities during the non-breeding season (September 1 through January 31) may be authorized in consultation with CDFW, which would include preparation, approval, and implementation of a Burrowing Owl Exclusion Plan in accordance with protocol described in the CDFW Staff Report on Burrowing Owl Mitigation.	
Sensitive Habitats	The proposed project would not have a substantial adverse effect on riparian or other sensitive habitats.	No Impact	No mitigation is necessary.	No Impact
Wetlands	During construction, the proposed project could inadvertently result in indirect impacts to jurisdictional drainage features.	Potentially Significant	MM-BIO-1 and MM-BIO-2	Less than Significant
Wildlife Movement	The proposed project would not interfere with wildlife movement.	Less than Significant	No mitigation is necessary.	Less than Significant
Local Policies	The proposed project would not conflict with local policies protecting biological resources.	No Impact	No mitigation is necessary.	No Impact
Conservation Planning	The District is not a signatory to the Western Riverside Multiple Species Habitat Conservation Plan; regardless, through implementation of mitigation measures, the project would be consistent.	No Impact	No mitigation is required; however, mitigation measures MM-BIO-1 through MM-BIO-4 would ensure consistency with the Western Riverside Multiple Species Habitat Conservation Plan.	No Impact

Table S-1 (cont.)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
4.4 Cultural and Tribal Cultural Resources				
Historical Resources	The proposed project would not cause a substantial adverse change in the significance of a historical resource.	No Impact	No mitigation is necessary.	No Impact
Archaeological Resources	Based on the cultural sensitivity of the area, the proposed project could affect unidentified archaeological resources during ground-disturbing activities.	Potentially Significant	**MM-CUL-1 Cultural Resources Treatment and Monitoring Agreement**. At least 30 days prior to the start of ground-disturbing activities, the District shall contact the Consulting Tribe(s) to develop Cultural Resource Treatment Monitoring Agreement(s) ("Agreement"). The Agreement(s) shall address the treatment of archaeological resources inadvertently discovered on the project site; project grading; ground disturbance and development scheduling; the designation, responsibilities, and participation of tribal monitor(s) during grading, excavation, and ground-disturbing activities; and compensation for the tribal monitors, including overtime, weekend rates, and mileage reimbursements.	Less than Significant
			MM-CUL-2 Develop a Cultural Resources Monitoring Plan. Prior to grading activities, a Cultural Resources Monitoring Plan shall be prepared by a qualified archaeologist in consultation with the Consulting Tribe(s). The plan shall also identify the location and timing of cultural resources monitoring. The plan shall contain an allowance that the qualified archaeologist, based on observations of subsurface soil stratigraphy or other factors during initial grading, and in consultation with the Native American monitor and the lead agency, may reduce or discontinue monitoring as warranted if the archaeologist determines that the possibility of encountering archaeological deposits is low. The plan shall outline the appropriate measures to be followed	

Table S-1 (cont.)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
			in the event of unanticipated discovery of cultural resources during project implementation (including during the survey to occur following vegetation removal and monitoring during ground-disturbing activities). The plan shall identify avoidance as the preferred manner of mitigating impacts to cultural resources. The plan shall establish the criteria utilized to evaluate the historic significance (per CEQA) of the discoveries, methods of avoidance consistent with *CEQA Guidelines* Section 15126.4(b)(3), as well as identify the appropriate data recovery methods and procedures to mitigate the effect of the project if avoidance of significant historical or unique archaeological resources is determined to be infeasible. The plan shall also include reporting of monitoring results within a timely manner, disposition of artifacts, curation of data, and dissemination of reports to local and state repositories, libraries, and interested professionals. A qualified archaeologist and Consulting Tribe(s) tribal monitor shall attend a pre-grade meeting with District staff, the contractor, and appropriate subcontractors to discuss the monitoring program, including protocols to be followed in the event that cultural material is encountered.	
			MM-CUL-3 Tribal Monitoring Agreements. A qualified archaeological monitor and a Consulting Tribe(s) monitor shall be present for ground-disturbing activities associated with the Project, and both the project archaeologist and Tribal Monitor(s) will make a determination as to the areas with a potential for encountering cultural material. At least seven business days prior to project grading, the District shall contact the tribal monitors to notify the Tribe of grading/	

Table S-1 (cont.)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
			excavation and the monitoring program/schedule, and to coordinate with the Tribe on the monitoring work schedule. Both the archaeologist and the tribal monitor shall have the authority to stop and redirect grading activities in order to evaluate the nature and significance of any archaeological resources discovered within the project limits. Such evaluation shall include culturally appropriate temporary and permanent treatment pursuant to the Cultural Resources Treatment and Monitoring Agreement, which may include avoidance of cultural resources, in-place preservation, data recovery, and/or reburial so the resources are not subject to further disturbance in perpetuity. Any reburial shall occur at a location predetermined between the District and the Consulting Tribe(s), details of which shall be addressed in the Cultural Resources Treatment and Monitoring Agreement in MM-CUL-1. Treatment may also include curation of the cultural resources at a tribal curation facility, as determined in discussion among the District, the project archaeologist, and the tribal representatives and addressed in the Cultural Resources Treatment and Monitoring Agreement referenced in MM-CUL-1.	
			MM-CUL-4 Evaluation of Discovered Artifacts. All artifacts discovered at the development site shall be inventoried and analyzed by the project archaeologist and tribal monitor(s). A monitoring report will be prepared, detailing the methods and results of the monitoring program, as well as the disposition of any cultural material encountered. If no cultural material is encountered, a brief letter report will be sufficient to document monitoring activities.	

Table S-1 (cont.)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
			MM-CUL-5 Disposition of Inadvertent Discoveries. In the event that Native American cultural resources are recovered during the course of grading (inadvertent discoveries), the following procedures shall be carried out for final disposition of the discoveries with the tribe. The District shall relinquish ownership of all cultural resources, including sacred items, burial goods, and all archaeological artifacts and non-human remains as part of the required mitigation for impacts to cultural resources, and adhere to the following: 1. Preservation-in-place is the preferred option; preservation-in-place means avoiding the resources and leaving them in the place where they were found with no development affecting the integrity of the resource. 2. If preservation-in-place is not feasible, on-site reburial of the discovered items as detailed in the Monitoring Plan required pursuant to MM-CUL-2 is the next preferable treatment measure. This shall include measures and provisions to protect the future reburial area from future impacts in perpetuity. Reburial shall not occur until all legally required cataloging and basic recordation have been completed. No recordation of sacred items is permitted without the written consent of all Consulting Native American Tribal Governments. 3. In the event that on-site reburial is not feasible, the District shall enter into a curation agreement with an appropriate qualified repository within Riverside County that meets	

Table S-1 (cont.)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
			federal standards per 36 Code of Federal Regulations 800 Part 79 and therefore would be curated and made available to other archaeologists/ researchers for further study. The collections and associated records shall be transferred, including title, to an appropriate curation facility within Riverside County, to be accompanied by payment of the fees necessary for permanent curation.	
			MM-CUL-6 Non-Disclosure of Reburial Locations. It is understood by all parties that unless otherwise required by law, the site of any reburial of culturally sensitive resources shall not be disclosed and shall not be governed by public disclosure requirements of the California Public Records Act. The Coroner, pursuant to the specific exemption set forth in California Government Code 6254(r), parties, and Lead Agencies will be asked to withhold public disclosure information related to such reburial.	
Human Remains	The proposed project could inadvertently disturb unidentified human remains during ground-disturbing activities.	Potentially Significant	**MM-CUL-7 Procedure to Address Inadvertent Disturbance of Human Remains.** If Native American human remains are encountered, PRC Section 5097.98 and California Health and Safety Code Section 7050.5 will be followed. If human remains are encountered no further disturbance shall occur until the Riverside County Coroner has made the necessary findings as to origin. Further, pursuant to California PRC Section 5097.98(b), remains shall be left in place and free from disturbance until a final decision as to the treatment and disposition has been made. If the Riverside County Coroner determines the remains to be Native American, the coroner shall contact the NAHC within 24 hours. Subsequently, the NAHC shall identify	Less than Significant

Table S-1 (cont.)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
			the person or persons it believes to be the "most likely descendant." The most likely descendant shall then make recommendations and engage in consultations concerning the treatment of the remains as provided in PRC Section 5097.98.	
Tribal Cultural Resources	Based on the cultural sensitivity of the area, the proposed project could affect unidentified tribal cultural resources during ground-disturbing activities.	Potentially Significant	MM-CUL-1 through MM-CUL-7	Less than Significant
4.5 Energy				
Wasteful, Inefficient, or Unnecessary Energy Consumption	The proposed project would not use energy in a wasteful, inefficient, or unnecessary manner.	Less than Significant	No mitigation is necessary.	Less than Significant
Conflict with Energy Plans	The proposed project would not conflict with state or local plan for renewable energy or energy efficiency.	Less than Significant	No mitigation is necessary.	Less than Significant
4.6 Geology and Soils				
Seismic Hazards	With incorporation of site-specific design measures, the proposed project would not cause potential adverse effects related to seismic hazards.	Less than Significant	No mitigation is necessary.	Less than Significant
Erosion and Sedimentation	The proposed project would not result in substantial erosion or the loss of topsoil.	Less than Significant	No mitigation is necessary.	Less than Significant
Geologic Instability	The proposed project would not result in substantial effects associated with geologic instability.	Less than Significant	No mitigation is necessary.	Less than Significant

Table S-1 (cont.)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
Expansive Soil	The proposed project would not cause substantial risks related to expansive soils.	Less than Significant	No mitigation is necessary.	Less than Significant
Septic Tanks	The proposed project would not require the use of septic tanks.	No Impact	No mitigation is necessary.	Less than Significant
Paleontological Resources	The project is located in an area of high paleontological sensitivity; therefore, the proposed project could affect buried paleontological resources during excavation activities.	Potentially Significant	**MM-GEO-1 Paleontological Resources Mitigation and Monitoring Plan.** A Paleontological Resources Mitigation and Monitoring Plan shall be prepared prior to commencing construction activities that would exceed four feet in depth that could directly affect geologic formations with high paleontological resource sensitivity. A qualified paleontologist shall be retained to carry out and manage the plan. Fieldwork may be carried out by a qualified paleontological monitor working under the direction of the paleontologist. Components of the Paleontological Resources Mitigation and Monitoring Plan shall include, but not be limited to: • The paleontologist shall attend all pre-grading meetings to inform the grading and excavation contractors of the paleontological resource mitigation program and shall consult with them with respect to its implementation. • The paleontological monitor shall be on site at all times during the original cutting of previously undisturbed sediments of high resource sensitivity formation at a subsurface depth of four feet or greater to inspect cuts for contained fossils.	Less than Significant

Table S-1 (cont.)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
			• If fossils are discovered, the paleontologist or monitor shall recover them. In instances where recovery requires an extended salvage time, the paleontologist or monitor shall be allowed to temporarily direct, divert, or halt ground-disturbing activities to allow recovery of fossil remains in a timely manner. Where deemed appropriate by the paleontologist or monitor, a screen-washing operation for small fossil remains shall be set up. • Recovered fossils, along with copies of pertinent field notes, photographs, and maps, shall be deposited in a scientific institution with paleontological collections. A final summary report that outlines the results of the mitigation program shall be completed. This report shall include discussion of the methods used, stratigraphy exposed, fossils collected, and significance of recovered fossils.	
4.7 Greenhouse Gas Emissions				
Greenhouse Gas Emissions	The proposed project would not generate greenhouse gas emissions that would have a significant impact on the environment.	Less than Significant	No mitigation is necessary.	Less than Significant
Conflict with Plans or Policies	The proposed project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing greenhouse gas emissions.	Less than Significant	No mitigation is necessary.	Less than Significant

Table S-1 (cont.)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
4.8 Hydrology and Water Quality				
Water Quality	The proposed project would not violate water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality.	Less than Significant	No mitigation is necessary.	Less than Significant
Groundwater Supply	The proposed project would not substantially decrease groundwater supplies or interfere with groundwater recharge.	Less than Significant	No mitigation is necessary.	Less than Significant
Drainage	The proposed project could result in impacts associated with increased impervious surfaces, runoff generation, hydromodification, and erosion/sedimentation.	Less than Significant	No mitigation is necessary.	Less than Significant
Flood Hazard Areas	The proposed project would not risk release of pollutants due to project inundation.	Less than Significant	No mitigation is necessary.	Less than Significant
Water Quality Plan	The proposed project would not conflict with or obstruct implementation of a water quality plan or sustainable groundwater management plan.	Less than Significant	No mitigation is necessary.	Less than Significant
4.9 Noise				
Increase in Ambient Noise	Proposed project construction could occur outside of allowable construction hours per the City of San Jacinto's Municipal Code, which would	Potentially Significant	**MM-NOI-1 Construction Noise Hours.** Construction activities in the City of San Jacinto within the construction noise time restriction areas depicted on Figure 4.9-1, *Construction Noise Time Restriction Areas,*	Less than Significant

Table S-1 (cont.)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
	result in the generation of a substantial temporary increase in ambient noise levels in excess of standards.		shall occur only on weekdays and Saturdays between the hours of 7:00 a.m. and 7:00 p.m.	
Vibration	The proposed project would not generate excessive groundborne vibration or groundborne noise levels.	Less than Significant	No mitigation is necessary.	Less than Significant
Aircraft Noise	The proposed project would not expose people to excessive aircraft noise.	Less than Significant	No mitigation is necessary.	Less than Significant
4.10 Transportation				
Traffic Circulation	Proposed project construction would occur within the public right-of-way, temporarily requiring vehicle lane, bicycle lane and sidewalk closures, thus affecting the circulation system.	Potentially Significant	**MM-TRA-1 Traffic Control Plan.** Prior to the start of construction of the portions of the conveyance facilities that would be located within roadway rights-of-way, the District shall require the construction contractor to prepare a Traffic Control Plan (TCP) and coordinate with the agency of jurisdiction (City of San Jacinto or County of Riverside), as applicable, to address vehicular traffic during construction of the project within the public rights-of-way of the affected jurisdiction(s), including bicycle, pedestrian, and transit facilities. The TCP shall show all signage, striping, delineated detours, flagging operations, and any other devices that will be used during construction to guide motorists, bicyclists, and pedestrians safely through the construction area and allow for adequate access and circulation. The TCP shall also ensure that congestion and traffic delay are not substantially increased as a result of the construction activities. Further, the TCP shall include detours and/or alternative routes for bicyclists using on-street bicycle lanes as well as for pedestrians using adjacent sidewalks. The District shall provide written notice at	Less than Significant

Table S-1 (cont.)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
			least two weeks prior to the start of construction to owners/occupants along roadways to be affected during construction. During construction, the District shall maintain continuous vehicular and pedestrian access to affected residential driveways from the public right-of-way to the private property line, except where necessary construction precludes such continuous access for reasonable periods of time. Access shall be reestablished at the end of the workday. If a driveway needs to be closed or interfered with as described above, the District shall notify the owner or occupant of the closure of the driveway at least five working days prior to the closure. The TCP shall include provisions to ensure that the construction of the conveyance pipelines do not interfere unnecessarily with the work of other agencies such as mail delivery, school buses, and municipal waste services. The District shall also notify local emergency responders of planned partial or full lane closures or blocked access to roadways or driveways required for project construction. Emergency responders include fire departments, police departments, and ambulances that have jurisdiction within the project area. Written notification and disclosure of lane closure location must be provided at least 30 days prior to the planned closure to allow for emergency response providers adequate time to prepare for lane closures.	
Vehicle Miles Traveled	The proposed project would not generate substantial vehicle miles traveled.	Less than Significant	No mitigation is necessary.	Less than Significant

Table S-1 (cont.)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue	Impact	Significance Before Mitigation	Mitigation Measure(s)	Significance After Mitigation
Hazardous Design Features	Proposed project construction would occur within the public right-of-way, which could result in hazardous roadway conditions.	Potentially Significant	MM-TRA-1	Less than Significant
Emergency Access	Proposed project construction would occur within the public right-of-way, which could result in inadequate emergency access.	Potentially Significant	MM-TRA-1	Less than Significant

Table S-2
SUMMARY OF CUMULATIVE IMPACTS

Issue	Geographic Scope of the Cumulative Analysis	Potentially Significant Cumulative Impact?	Project Contribution
4.1 Agricultural and Forestry Resources			
Conversion of Prime Farmland, Unique Farmland, of Farmland of Statewide Importance	Agricultural land adjacent to and nearby the proposed project.	No	No cumulative impact.
Williamson Act Contract	Agricultural land adjacent to and nearby the proposed project.	No	No cumulative impact.
Zoning for Forest Land	There is no forest land in the project vicinity that could be cumulatively affected.	No	No cumulative impact.
Loss or Conversion of Forest Land	There is no forest land in the project vicinity that could be cumulatively affected.	No	No cumulative impact.
Conversion of Farmland to Non-agricultural Use or Forest Land to Non-forest Use	Agricultural land adjacent to and nearby the proposed project.	No	No cumulative impact.
4.2 Air Quality			
Conflicts with Air Quality Plans	The South Coast Air Basin (SCAB).	Yes	Not cumulatively considerable.
Air Quality Standards	The SCAB.	Yes	Not cumulatively considerable.
Sensitive Receptors	The area in the immediate vicinity of the proposed project components.	No	No cumulative impact.
Odors	The area immediately surrounding potential odor sources.	No	No cumulative impact.
4.3 Biological Resources			
Special Status Species	The cities of San Jacinto and Hemet, nearby portions of unincorporated Riverside County, and surrounding lands that support native plant and animal species.	Yes	Not cumulatively considerable with implementation of MM-BIO-1 through MM-BIO-3.
Sensitive Habitats	The cities of San Jacinto and Hemet, nearby portions of unincorporated Riverside County, and surrounding lands that support native habitats.	No	No cumulative impact.
Wetlands	The cities of San Jacinto and Hemet, nearby portions of unincorporated Riverside County, and surrounding lands that support potentially jurisdictional waters.	Yes	Not cumulatively considerable with implementation of MM-BIO-1 and MM-BIO-2.

Table S-2 (cont.)
SUMMARY OF CUMULATIVE IMPACTS

Issue	Geographic Scope of the Cumulative Analysis	Potentially Significant Cumulative Impact?	Project Contribution
Wildlife Movement	The cities of San Jacinto and Hemet, nearby portions of unincorporated Riverside County, and surrounding lands that support native habitats and native plant and animal species.	Yes	Not cumulatively considerable.
Local Policies	The cities of San Jacinto and Hemet, nearby portions of unincorporated Riverside County, and surrounding lands that support native habitats, native plant and animal species, and potentially jurisdictional waters.	No	No cumulative impact.
Conservation Planning	Land within the Western Riverside Multiple Species Habitat Conservation Plan area.	No	No cumulative impact.
4.4 Cultural and Tribal Cultural Resources			
Historical Resources	The cities of San Jacinto and Hemet, nearby portions of unincorporated Riverside County.	Yes	Not cumulatively considerable.
Archaeological Resources	The cities of San Jacinto and Hemet, nearby portions of unincorporated Riverside County, and the traditional use areas of local tribes.	Yes	Not cumulatively considerable with implementation of MM-CUL-1 through MM-CUL-6.
Human Remains	The cities of San Jacinto and Hemet, nearby portions of unincorporated Riverside County, and the traditional use areas of local tribes.	Yes	Not cumulatively considerable with implementation of MM-CUL-7.
Tribal Cultural Resources	The cities of San Jacinto and Hemet, nearby portions of unincorporated Riverside County, and the traditional use areas of local tribes.	Yes	Not cumulatively considerable with implementation of MM-CUL-1 through MM-CUL-6.
4.5 Energy			
Wasteful, Inefficient, or Unnecessary Energy Consumption	The service areas of the energy (electricity and natural gas) providers in the project area.	No	No cumulative impact.
Conflict with Energy Plans	The service areas of the energy (electricity and natural gas) providers in the project area.	No	No cumulative impact.

Table S-2 (cont.)
SUMMARY OF CUMULATIVE IMPACTS

Issue	Geographic Scope of the Cumulative Analysis	Potentially Significant Cumulative Impact?	Project Contribution
4.6 Geology and Soils			
Seismic Hazards	Impacts are generally site-specific and not cumulative in nature.	No	No cumulative impact.
Erosion and Sedimentation	The watersheds downstream from the project's construction sites.	No	No cumulative impact.
Geologic Instability	Impacts are generally site-specific and not cumulative in nature.	No	No cumulative impact.
Expansive Soil	Impacts are generally site-specific and not cumulative in nature.	No	No cumulative impact.
Septic Tanks	Impacts are generally site-specific and not cumulative in nature.	No	No cumulative impact.
Paleontological Resources	The cities of San Jacinto and Hemet, nearby portions of unincorporated Riverside County.	Yes	Not cumulatively considerable with implementation of MM-GEO-1.
4.7 Greenhouse Gas Emissions			
Greenhouse Gas Emissions	The global atmosphere.	Yes	Not cumulatively considerable.
Conflict with Plans or Policies	The global atmosphere.	Yes	Not cumulatively considerable.
4.8 Hydrology and Water Quality			
Water Quality	The receiving waters downstream of the project alignment and the entire San Jacinto Groundwater Basin.	No	No cumulative impact.
Groundwater Supply	The San Jacinto Groundwater Basin.	Yes	Not cumulatively considerable
Drainage	The receiving waters downstream of the project alignment.	No	No cumulative impact.
Flood Hazard Areas	The floodplains within the cities of San Jacinto and Hemet, nearby portions of unincorporated Riverside County.	No	No cumulative impact.
Water Quality Plan	The receiving waters downstream of the project alignment and the entire San Jacinto Groundwater Basin.	No	No cumulative impact.

Table S-2 (cont.)
SUMMARY OF CUMULATIVE IMPACTS

Issue	Geographic Scope of the Cumulative Analysis	Potentially Significant Cumulative Impact?	Project Contribution
4.9 Noise			
Increase in Ambient Noise	The immediate vicinity of the proposed project locations and any adjacent noise sensitive land uses.	Yes	Not cumulatively considerable with implementation of MM-NOI-1.
Vibration	The immediate vicinity of the proposed project locations and any adjacent noise sensitive land uses.	No	No cumulative impact.
Aircraft Noise	Projects located within the mapped aircraft noise contours of the Hemet-Ryan Airport.	No	No cumulative impact.
4.10 Transportation			
Traffic Circulation	The circulation network within and adjacent to the city of San Jacinto.	Yes	Not cumulatively considerable with implementation of MM-TRA-1.
Vehicle Miles Traveled	The circulation network within and adjacent to the city of San Jacinto.	Yes	Not cumulatively considerable.
Hazardous Design Features	The circulation network within and adjacent to the city of San Jacinto.	Yes	Not cumulatively considerable with implementation of MM-TRA-1.
Emergency Access	The circulation network within and adjacent to the city of San Jacinto.	Yes	Not cumulatively considerable with implementation of MM-TRA-1.

1.0 INTRODUCTION

This Environmental Impact Report (EIR) analyzes the environmental effects associated with the Eastern Municipal Water District (District) Purified Water Replenishment (PWR) Project, referred to herein as "proposed project" or "project." The project proposes to construct and operate facilities that would replenish the San Jacinto Upper Pressure Groundwater Management Zone (SJUPMZ) aquifer with a combination of recycled water and advanced treated water to reduce reliance on imported water sources, provide improved drought resiliency, and potentially improve the quality of the groundwater basin utilized by the District.

As described in the California Environmental Quality Act (CEQA) Statutes and Guidelines, public agencies are charged with the duty to avoid or substantially lessen significant environmental effects, with consideration of other conditions, including economic, social, technological, legal, and other benefits. This EIR is an informational document. As required by CEQA, this EIR:

- Assesses the potentially significant direct and indirect environmental effects of the proposed project as well as the potentially significant cumulative impacts that could occur from implementation of the project;
- Describes potential feasible means of avoiding or substantially lessening significant adverse impacts;
- Identifies any significant and unavoidable adverse impacts that cannot be mitigated to below a less than significant level; and
- Evaluates a range of reasonable and feasible alternatives to the project that would avoid or substantially lessen any significant adverse environmental effects.

1.1 PURPOSE AND INTENDED USE OF THE DRAFT EIR

The District, as the Lead Agency, has prepared this Draft EIR in accordance with CEQA, as codified in California Public Resources Code (PRC) Section 21000 et. seq., and the State *CEQA Guidelines* in the Code of Regulations, Title 14, Division 6, Chapter 3. The EIR process and the information it generates are used for the following purposes:

- To give responsible and trustee agencies, other governmental bodies, and the public the opportunity to provide input to the decision-making process;
- To provide public agencies with the information necessary for them to determine if they have jurisdiction over some aspect of implementation of the project, and, if so, to identify any requirements they may have for project permits, approvals, licenses, or other entitlements;
- To inform the public as well as the decision makers of the potential consequences of the implementation of the project, and alternatives, and to assist the District in making decisions and taking actions to avoid or reduce environmental effect to a less-than-significant level; and
- To assist the public in understanding the expected environmental effects and how decision-makers plan to respond and mitigate such effects.

1.2 PRIOR ENVIRONMENTAL REVIEW

The proposed project would utilize the Mountain Avenue West Recharge Basin, which is currently under construction, where treated water would be stored, percolate into the belowground aquifer, and eventually be recovered for use as potable water. The Mountain Avenue West Recharge Basin is part of the District's San Jacinto Valley Water Banking – Enhanced Recharge and Recovery Program (ERRP) which has been previously analyzed in compliance with CEQA in an EIR that was certified by the District Board of Directors on June 20, 2018 (State Clearinghouse [SCH] # 2015071002). Because the potentially significant impacts (and mitigation measures where necessary) of the San Jacinto Valley Water Banking ERRP, including the Mountain Avenue West Recharge Basin, have been identified in a prior CEQA document, this component of the proposed project is not included in the analysis in this EIR.

1.3 ENVIRONMENTAL REVIEW PROCESS

1.3.1 Lead, Responsible, and Trustee Agencies

The District has the principal responsibility of carrying out or approving the project and is therefore considered to be the Lead Agency for this EIR. CEQA requires the Lead Agency to consider the information in the EIR prior to project approval and make findings regarding each significant impact identified in the EIR. Public agencies, other than the lead agency, that have discretionary authority over a project, are considered responsible agencies. For example, the State Water Resources Control Board (SWRCB) is considered a responsible agency. Federal agencies are not responsible agencies under CEQA; however, federal agencies may also have discretionary authority over a project. A trustee agency is a state agency that has jurisdiction by law over natural resources affected by a project that are held in trust for the people of the state of California. As listed in *CEQA Guidelines* Section 15386, trustee agencies include the California Department of Fish and Wildlife (CDFW), the State Lands Commission (SLC), the State Department of Parks and Recreation, and the University of California. For the proposed project, the applicable trustee agency would be CDFW. For a list of agency permits and approvals for the project, please see Table 1-2, *Anticipated Regulatory Permits and Approvals.*

1.3.2 Notice of Preparation/Scoping Process of the Draft EIR

In accordance with Section 15082 of the *CEQA Guidelines,* the District circulated a Notice of Preparation (NOP) of a Draft EIR on April 2, 2020 for review by applicable local, state, and federal agencies and the public. The NOP was published in The Press-Enterprise newspaper and on the District's website and submitted to the State Clearinghouse for distribution to relevant state agencies.

The NOP provided a general description of the facilities associated with the project, a summary of the probable environmental effects of the project to be addressed in the Draft EIR, and figures showing the project location. The NOP provided the public and interested public agencies with the opportunity to review the facilities to be constructed as part of the project and to provide comments or concerns on the scope and content of the Draft EIR.

State law mandates that responses to the NOP must be sent at the earliest possible date but postmarked within 30 days from distribution of the NOP; however, in light of the COVID-19 pandemic, which may have limited ability for NOP review and comments and which resulted in the District not being able to hold a scoping meeting, responses postmarked within 60 days from distribution of the NOP, or through June 1, 2020, were accepted. During the scoping period, four comment letters were

received from CDFW, the California Department of Water Resources (DWR) Division of Safety of Dams (DSOD), the Native American Heritage Commission (NAHC), and the Riverside County Flood Control and Water Conservation District. The comment letters are included in Appendix A along with the NOP. The main issues raised in the comment letters, and where they are discussed in the EIR, are shown in Table 1-1, *NOP Comment Letter Issue Areas*.

Table 1-1
NOP COMMENT LETTER ISSUE AREAS

Agency of Letter Received	Issue Area(s)	Where Addressed in EIR
Native American Heritage Commission (NAHC)	1. The project could impact tribal cultural resources; in which case it would be considered to have a significant effect on the environment.	1. Section 4.4.4.2, *Issue 2: Archaeological Resources,* and Section 4.4.4.4, *Issue 4: Tribal Cultural Resources*
	2. The proposed project may be subject to Assembly Bill (AB) 52 and Senate Bill (SB) 18. Consultation per AB 52 and SB 18 with California Native American tribes that are traditionally and culturally affiliated with the geographic area of the project is recommended to occur as early as possible to avoid inadvertent discoveries of human remains and best protect tribal cultural resources.	2. Section 4.4.4.4, *Issue 4: Tribal Cultural Resources*
	3. The project should perform a cultural resources assessment that includes an archaeological record search at the California Historical Research Information System (CHRIS); a report detailing the findings and recommendations of the records search and field survey; a Sacred Lands File Search; and a mitigation and monitoring reporting program plan.	3. Section 4.4, *Cultural Resources and Tribal Cultural Resources,* and Appendix D
Department of Water Resources (DWR) Division of Safety and Dams (DSOD)	1. The project includes bioretention basins and evaporation ponds that may be subject to state jurisdiction for dam safety.	1. The project does not include construction of dams (see Chapter 2.0, *Project Description*).
Riverside County Flood Control and Water Conservation District	1. The project is located within the Riverside County Flood Control and Water Conservation District's San Jacinto Valley Master Drainage Plan area. Portions of the project which may conflict with the Master Drainage Plan include Ramona Expressway, State Street, Olmstead Street, the Casa Loma Canal at San Jacinto Reservoir, and the proposed brine ponds.	1. Section 4.8.4.3, *Issue 3: Drainage*
	2. The project may impact existing Riverside County Flood Control and Water Conservation District easement, which would require encroachment permits.	2. Section 1.4, *Required Public Action and Approvals*

Table 1-1 (cont.)
NOP COMMENT LETTER ISSUE AREAS

Agency of Letter Received	Issue Area(s)	Where Addressed in EIR
	3. The Riverside County Flood Control and Water Conservation District is a permittee under the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP). The project will need to demonstrate consistency with the MSHCP for work activities within Riverside County Flood Control and Water Conservation District right-of-way/easements.	3. Section 4.3.4.6, *Issue 6: Conservation Planning*
California Department of Fish and Wildlife (CDFW)	1. The project may impact environmental resources that are rare or unique to the region. A complete assessment of flora and fauna within the project footprint should be included with particular emphasis on identifying rare, threatened, endangered, or other sensitive species and their associated habitats.	1. Section 4.3, *Biological Resources*
	2. The project may result in direct, indirect, and cumulative impacts to biological resources.	2. Section 4.3, *Biological Resources,* and Section 6.3.3, *Biological Resources*
	3. The project should identify mitigation measures that are appropriate and adequate to avoid or minimize potential impacts to biological resources, including fully protected species, sensitive plant communities, California Species of Special Concern, and nesting birds protected under the Migratory Bird Treaty Act (MBTA). Mitigation should empathize avoidance and impact reduction. For unavoidable impacts, habitat restoration, enhancement, and/or preservation should be evaluated.	3. Section 4.3.4.1, *Issue 1: Special Status Species*
	4. If the project has the potential to result in "take" of state-listed California Endangered Species Act (CESA) species, a CESA Incidental Take Permit should be obtained.	4. Section 4.3.4.1, *Issue 1: Special Status Species*
	5. The project may result in impacts to San Bernardino kangaroo rat, which has been documented in the project area and is a candidate species for listing under CESA.	5. Section 4.3.4.1, *Issue 1: Special Status Species*
	6. The project area is within the MSHCP but the District is not a signatory to the MSHCP. Policies and procedures of the MSHCP may apply to the project if the District chooses to participate in the MSHCP as a Participating Special Entity.	6. Section 4.3.4.6, *Issue 6: Conservation Planning*

Table 1-1 (cont.)
NOP COMMENT LETTER ISSUE AREAS

Agency of Letter Received	Issue Area(s)	Where Addressed in EIR
	7. The project may be subject to notification to CDFW pursuant to Fish and Game Code section 1602. The project may require a Lake and Streambed Alteration Agreement for substantial adverse effects to fish and wildlife resources.	7. Section 4.3.4.3, *Issue 3: Wetlands*

1.3.3 Public Review of the Draft EIR

When a Draft EIR is submitted to the State Clearinghouse for review by state agencies, the public review period shall not be less than 45 days, unless the SCH approves a shorter period. During public review, the Draft EIR is circulated to responsible agencies and trustee agencies with resources affected by the project, state agencies with jurisdiction by law, federal agencies, and interested parties and individuals. The purpose of public and agency review of the Draft EIR includes sharing expertise, disclosing agency analysis, checking for accuracy, detecting omissions, discovering public concerns, and soliciting comments. In reviewing the Draft EIR, reviewers should focus on the sufficiency of the document in identifying and analyzing potentially significant effects on the environment and avoiding or mitigating the significant effects on the proposed project.

1.3.4 Final EIR and the Public Hearing Process

Following completion of the public review period for the Draft EIR, a Final EIR will be prepared to address the written comments received on the Draft EIR during the public review period. Responses to comments made by public agencies on the Draft EIR will be provided by the District at least 10 days prior to the scheduled District Board of Directors hearing to consider certification of the Final EIR and approval or denial of the proposed project.

As the decision-making body of the lead agency the District Board of Director's will consider the Final EIR for certification per *CEQA Guidelines* Section 15090. The District Board of Director's will certify that it has reviewed and considered the information contained in the Final EIR, that the Final EIR reflects the lead agency's independent judgement and analysis, and that the Final EIR has been completed in compliance with CEQA. Once the Final EIR has been certified, the lead agency may proceed to consider approval of the proposed project. Prior to approval, the lead agency must make written findings regarding each significant environmental effect identified in the Draft EIR in accordance with *CEQA Guidelines* Section 15091.

CEQA requires that the lead agency neither approve nor implement a project unless the project's significant environmental effects have been reduced to a less-than-significant level, essentially "eliminating, avoiding, or substantially lessening" the expected impacts. If the lead agency approves the project despite residual significant impacts that cannot be mitigated to a less-than-significant level, the agency must state the reasons for its action in writing in a Statement of Overriding Considerations (SOC). As defined in *CEQA Guidelines* Section 15093, a SOC balances the benefits of a project against its unavoidable environmental consequences. The SOC must be included in the record of the proposed project approval.

After the District Board of Directors has approved the proposed project, the lead agency will file a Notice of Determination with the Riverside County Clerk and the State Clearinghouse per *CEQA Guidelines* Section 15094.

1.4 REQUIRED PUBLIC ACTIONS AND APPROVALS

The adoption of the proposed project requires the affirmative vote from the District's Board of Directors; however, implementation of the proposed project may require that the District obtain approval, permits, licenses, certifications, or other entitlements from various state and local agencies, as shown in Table 1-2, *Anticipated Regulatory Permits and Approvals*.

Table 1-2
ANTICIPATED REGULATORY PERMITS AND APPROVALS

Responsible Agency	Permit/Approval
State	
California Department of Transportation (Caltrans)	Encroachment Permit*
State Water Resources Control Board Division of Drinking Water	Title 22 Engineering Report, Summary of Public Hearing, Conditional Approval
State Water Resources Control Board/Regional Water Quality Control Board	NPDES – Industrial General Permit,[1] Storm Water Pollution Prevention Plan (SWPPP)
	NPDES – Construction General Permit, SWPPP
Regional Water Quality Control Board	Producer/User Water Recycling Requirements
	Order No. R8-2020-0006, NPDES No. CAG998001, General Waste Discharge Requirements for Insignificant Threat Discharges to Surface Waters
	Title 27 – Environmental Protection – Division 2, Solid Waste – Waste Management Units, Facilities and Disposal Sites
Regional	
South Coast Air Quality Management District	Permits to Construct and Operate
Local	
County of Riverside and/or Division of Drinking Water	Cross-connection and Backflow Prevention
County of Riverside	Encroachment Permit(s)
Riverside County Flood Control and Water Conservation District	Encroachment Permit*
City of San Jacinto	Building Permits*
	Encroachment Permits
Private Property Owner(s)	Temporary Easements*

[1] This would not be a new permit. The project's Advanced Water Treatment Facility (AWTF), which requires the permit, would be added to the existing permit for the San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF).

* if necessary

Additionally, an application for a Title XVI Water Reclamation and Reuse Grant has been submitted to the U.S. Department of the Interior (DOI) Bureau of Reclamation (BOR) for the project in order to pursue funding through the WaterSMART Program. Therefore, documentation would be required to identify project impacts subject to federal regulations compliant with the National Environmental Policy Act (NEPA).

1.5 ORGANIZATION OF THE EIR

The content and format of this EIR are designed to meet the requirements of CEQA. The EIR includes the following chapters:

- **Executive Summary.** Summarizes the proposed project, environmental impacts that would result from implementation of the project, recommended mitigation measures that would avoid or reduce impacts, and the levels of significance of impacts both before and after mitigation. Also identifies areas of controversy known to the lead agency and issues to be resolved including the choice among alternatives and whether or how to mitigate the significant effects.

- **Chapter 1, Introduction.** Provides an introduction and overview describing the purpose and intended use of the EIR, prior environmental review related to the project, the EIR's compliance with CEQA, and the scope and organizational format of the EIR. This section also includes a list of public actions and approvals that would be required to approve the proposed project by the lead agency and other responsible and trustee agencies.

- **Chapter 2, Project Description.** Provides a detailed description of the proposed project, including the project's background, location, major objectives, purpose and need, components, and phasing.

- **Chapter 3, Environmental Setting.** Provides a description of the physical environmental conditions in the vicinity of the project as they exist at the time the NOP was published. This setting establishes baseline physical conditions by which the significance of potential impacts is evaluated.

- **Chapter 4, Environmental Analysis.** Contains project-level analysis for the various environmental resource topics. The subsection for each environmental resource topic contains a description of the existing conditions, regulatory framework, impacts, and mitigation measures.

- **Chapter 5, Environmental Effects Found Not to be Significant.** Contains discussion of environmental resource topics for which no significant impacts would occur.

- **Chapter 6, Cumulative Impact Analysis.** Contains a discussion of cumulative impacts for each environmental resource topic covered in Chapter 4.

- **Chapter 7, Other CEQA-Related Sections.** Provides discussions required by *CEQA Guidelines* Sections 15126 and 15128, including growth-inducing impacts, significant environmental effects, and significant irreversible environmental changes that would result from implementation of the proposed project.

- **Chapter 8, Alternatives.** Describes alternatives to the proposed project that could avoid or substantially lessen significant effects and evaluates their environmental effects in comparison to the proposed project.

- **Chapter 9, References.** Provides a list of the references used in preparation of this EIR.

- **Chapter 10, List of Preparers.** Provides a list of the EIR preparers and persons consulted during EIR preparation.

Supporting materials and technical appendices include the following:

- **Appendix A** Notice of Preparation and Comments
- **Appendix B** Air Quality and GHG Emissions Technical Report
- **Appendix C** Biological Technical Report
- **Appendix D** Cultural Resources Survey
- **Appendix E** Preliminary Design Report

The Final EIR will contain the Mitigation Monitoring and Reporting Program (MMRP) for the Project, the comments received on the Draft EIR and responses, and any changes or clarifications to the Draft EIR that were made in response to public comments.

2.0 PROJECT DESCRIPTION

This section provides a description of the project, including discussion of the project background and context, location, objectives, purpose and need, components, and construction methods.

2.1 PROJECT BACKGROUND AND CONTEXT

The District was organized as a municipal water district in 1950 for the primary purpose of importing Colorado River water to its service area to augment local water supplies. Today, the District is California's sixth-largest water retail agency, providing water, wastewater, and recycled water services to 825,000 people in a 555-square mile service area located in western Riverside County (Figure 2-1, *District Service Area*). Approximately 49 percent of the District's water supply is provided by the Metropolitan Water District of Southern California through the Colorado River Aqueduct and State Water Project. The remaining 51 percent of the District's potable water demand is supplied by District-owned groundwater wells located mostly in the Hemet and San Jacinto areas. The District's water supply is a critical issue as there are limited local surface and groundwater resources.

In 2011, the District completed the Integrated Resources Plan (IRP) to address future water supply challenges and develop an overall strategy for future water supply. The IRP is a flexible long-term strategy for the development of water supplies, implementation of key facilities, and execution of inter-agency agreements needed to expand and operate the District's water, recycled water, and wastewater system. The IRP recommended strategies for both expanded local water supplies and imported water supplies. The proposed PWR project, which would use recycled water to recharge groundwater basins, was recommended as a key local water supply strategy for the District's future water supply portfolio.

The PWR project began with the preparation of the SJUPMZ Indirect Potable Reuse Phase I Study (CDM Smith 2014). The Phase I Study included an evaluation of five PWR project alternatives for recharge into the SJUPMZ and provided recommendations related to recycle water treatments, recharge method and locations, conveyance, and brine management for each alternative. Two alternatives were recommended in the Phase I Study: (1) a blend of recycled water and reverse osmosis (RO) permeate and (2) a phased approach with Phase I including only recharge of recycled water and Phase II including recharge of a blend of recycled water and RO permeate.

Following the Phase I Study, a PWR Program Definition Study (Phase II Study) was prepared and included a comparison of projects for both the SJUPMZ and the Perris South Management Zone (PSMZ; CDM Smith 2016). The Phase II study evaluated five alternatives with varying recharge into the SJUPMZ and/or the PSMZ. Recharge into the SJUPMZ with a blend of recycled water and RO permeate was recommended.

The District subsequently established the goal of a two-phase implementation program with a Phase I recharge capacity of 4,000 acre-feet per year (AFY) and a Phase II expansion of 11,000 AFY for a 15,000-AFY total recharge PWR project. The recharge flow would consist of RO permeate and tertiary media filtered recycled water (tertiary recycled water).

2.2 PROJECT LOCATION

The proposed project would be located at multiple sites predominantly within the city of San Jacinto, with one location just outside the eastern city limits in unincorporated Riverside County (Figure 2-2, *Regional Location*, and Figure 2-3, *Project Components*). The project's proposed aboveground facilities would be located adjacent to the northern boundary of the District's existing San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) at 770 North Sanderson Avenue and at the District's existing Alessandro Ponds site near the intersection of West Ramona Parkway and North Vernon Avenue. The project has two belowground pipeline segments. One of the project's belowground pipelines, the advanced treated water pipeline, would slipline an existing 18-inch pipeline with a new 16-inch pipeline following a route northeast from the SJVRWRF in an unpaved roadway, northeast along North Lyon Avenue, and southeast along Ramona Expressway, where it would turn off northeast to near the District's existing Alessandro Ponds site. The project's second pipeline would convey blended advanced treated water and tertiary recycled water and run from near the Alessandro Ponds site southeast along Ramona Expressway to the District's existing Mountain Avenue West Recharge Basin at the intersection of Ramona Expressway and East Esplanade Court (see Figure 2-3).

2.3 PROJECT OBJECTIVES

Specific key objectives of the proposed project are to:

- Produce advanced treated water and combine it with tertiary recycled water for recharge into, and replenishment of, the SJUPMZ;
- Contribute to establishing a local, long-term sustainable water supply for the District's service area;
- Provide increased water supply reliability during droughts and emergencies;
- Increase the amount of groundwater that can be pumped seasonally through recharge and storage of a combination of advanced treated water and tertiary recycled water; and
- Utilize recycled water in an environmentally responsible manner (i.e., no recycled water is discharged outside of the District's service area).

2.4 PURPOSE AND NEED OF THE PROPOSED PROJECT

The proposed project would occur as part of the District's Groundwater Reliability Plus (GRP) initiative. GRP encompasses the District's actions and investments aimed at improving the quality and quantity of water in local groundwater basins, also called aquifers. The benefits of GRP include improved groundwater quality and reduced water salinity, higher groundwater levels resulting in lower pumping costs, increased groundwater availability, and drought-resilient supply reliability. The District previously initiated the San Jacinto Valley Water Banking ERRP as part of the GRP initiative. The purpose of the San Jacinto Valley Water Banking – ERRP is to aid in enhancing current and future water supplies by recharging imported water into the local groundwater basin. Groundwater produced (extracted) by the San Jacinto Valley Water Banking – ERRP would be used within the District's service area. The groundwater could also be made available to the District's sub-agencies or other regional water agencies through an exchange, with no physical export of local supplies.

The proposed project would replenish the SJUPMZ aquifer with a combination of recycled water and advanced treated water to reduce reliance on imported water sources, provide improved drought resiliency, and potentially improve the quality of the groundwater basin utilized by the District. The project would work in conjunction with the San Jacinto Valley Water Banking – ERRP by utilizing the existing Mountain Avenue West Recharge Basin, which was developed as part of the San Jacinto Valley Water Banking – ERRP, for recharge of the proposed project's combined tertiary recycled water and advanced treated water.

2.5 DESCRIPTION OF PROPOSED PROJECT COMPONENTS

The proposed project would include the following components:

- Construction of an Advanced Water Treatment Facility (AWTF) near the District's existing SJVRWRF;
- Construction of a brine management system north of the AWTF site that would include five interconnected evaporation ponds with a total evaporation surface area of approximately 20 acres;
- Construction of Alessandro Blending Station facilities that would blend advanced treated water and tertiary recycled water;
- Relining of an existing 18-inch-diameter pipeline that would convey advanced treated water from the AWTF site to the proposed Alessandro Blending Station; and
- Construction of a new 36-inch-diameter pipeline that would convey blended water from the Alessandro Blending Station to the existing Mountain Avenue West Recharge Basin.

Project components are shown on Figure 2-3 and are described in detail below.

2.5.1 Advanced Water Treatment Facility

The proposed AWTF would be constructed on a portion of an approximately five-acre site located adjacent to the northern boundary of the existing SJVRWRF (see Figure 2-4, *Advanced Water Treatment Facility Conceptual Site Plan*). The AWTF site would initially (during Phase I) include an approximately 20,800-gross-square-foot (GSF) Process and Control Building (see Figure 2-5, *Process and Control Building Conceptual Elevations*) that would be divided into two main areas: a control area and a process area. A breakdown of the anticipated space requirements of the Process and Control Building are shown in Table 2-1, *Process and Control Building Space Requirements.*

Table 2-1
PROCESS AND CONTROL BUILDING SPACE REQUIREMENTS

Component	Area (GSF)
Control Area	
Public Area	3,050
Administrative Staff Area	1,850
Control Area Subtotal	*4,900*
Process Area	
Major Process Area	10,200
Ancillary Facilities Area	3,700
Chemical Pump Area	2,000
Process Area Subtotal	*15,900*
Process and Control Building Total	***20,800***

GSF = gross square feet

The control area would contain a public area and a District administrative staff area. The public area would include an entry lobby, an education/exhibit area, a conference and public meeting room, restrooms, and a private District outreach staff person's office. The administrative staff area would contain an operations supervisor's office, control room, break room, server room, storage room, and mechanical/rise room. Within the process area, the major process area would house a membrane filtration (MF) system and a high-recovery RO facility that would be used for the advanced treatment of recycled water. The ancillary facilities area would contain the electrical, MF compressor, and building mechanical rooms. The chemical pump area would include the AWTF's chemical pumps. Upon implementation of Phase II of the project, the process area would accommodate a 10,400-GSF expansion. Other proposed facilities at the AWTF site outside of the Process and Control Building would include a chemical storage facility, emergency generator, standby generator, transformer, four new pump stations, paved access with parking, and two stormwater bioretention basins.

During operation of the AWTF, the tertiary recycled water produced at the SJVRWRF would be further treated through the new MF/RO process, which would reduce total organic carbon (TOC), totaled dissolved solids (TDS), and nitrogen concentrations creating advanced treated water, or what is referred to as "RO permeate." The tertiary recycled water would first be pumped from the existing SJVRWRF site via an influent pump station to automatic strainers at the AWTF. Before reaching the strainers, the water would undergo pretreatment chemical injections to remove free chlorine and control biological fouling[1] of the MF system. The automatic strainers would further protect the downstream MF system by removing large particles from the water. Once at the MF system, water would be treated utilizing microfiltration or ultrafiltration membrane systems and stored in a MF break tank. Water from the tank would then be transferred to the RO system where dissolved organic material would be removed via the RO process.

2.5.2 Brine Management System

Concentrated brine generated during the RO process would be managed and stored using a system of five interconnected evaporation ponds that would have a total surface area of approximately 20 acres and be located north of the proposed AWTF site (see Figure 2-6, *Brine Management System Conceptual*

[1] As related to the proposed project, biological fouling, also known as biofouling, is the accumulation of microorganisms on a membrane surface, which reduces membrane permeability and function.

Site Plan). The surfaces areas, depths, and volumes of the five ponds are shown in Table 2-2, *Brine Ponds Characteristics.*

Table 2-2
BRINE PONDS CHARACTERISTICS

Pond	Surface Area[1] Acres	Surface Area[1] Square Feet	Maximum Operating Depth[2] (ft)	Total Depth[3]	Maximum Operating Volume (MG)	Total Volume (MG)
A	2.94	128,100	8.3	11	7.95	10.54
B	4.80	208,900	8.3	11	12.97	17.19
C	2.28	99,300	8.3	11	6.17	8.17
D	4.42	192,700	8.3	11	11.97	15.86
E	5.61	244,100	8.3	11	15.16	20.09
Total	20.05	873,100	8.3	11	54.22	71.85

[1] Area at mid height of the pond.
[2] Does not account for sloping of the pond floor.
[3] As measured from the top of the embankment. Includes maximum operating depth, 1,000-year, 24-hour storm of 8.3 inches, and 2-foot freeboard.
ft = feet; MG = million gallons

The brine solution would be pumped from the AWTF to the brine management system where it would be managed by evaporating the water and leaving the concentrated brine for storage in the ponds. Floating mechanical spray evaporators would be used within Ponds B, D, and E to enhance natural evaporation. Spray evaporators work by pumping water from a pond through a series of nozzles into an air flow stream that generates and discharges a fine mist plume into the air. The fine composition of the mist increases the surface area of the water stream, which substantially accelerates the evaporation rate of the water droplets. Drift from the mechanical spray evaporators would be contained within the ponds and access roads that would be constructed between the individual ponds. Additional access roads would be provided on the perimeter of the ponds and would be elevated higher than the inner access roads to capture drift, retain on-site stormwater runoff within the brine evaporation pond facility, and prevent off-site stormwater runoff from inundating the ponds.

The three semi-enhanced evaporation ponds (Ponds B, D, and E) would be the primary ponds receiving brine concentrate from the AWTF. The water level in each pond would be monitored and the selection of the ponds to be filled would be based on the water level in each of the ponds. Because Ponds B, D, and E would be the primary ponds receiving brine concentrate and would evaporate pond water faster than Ponds A and C, they would accumulate salts more rapidly than Ponds A and C. When the salt concentration in the pond water of Ponds B, D, and E reaches a desired level, inter-pond transfer pumps would be used to transfer highly concentrated salt water from Ponds B, D, and E to Ponds A and C, where the highly concentrated salt water would continue evaporating to achieve a slurry-like brine solution.

Each of the five ponds would include a leak detection monitoring system with a Leachate Collection and Removal System (LCRS), a Vadose Zone Monitoring System (VZMS), and a groundwater detection monitoring program. The LCRS would consist of an upper layer primary liner, a bottom layer drain liner, and a sump to collect any liquid that leaks through the upper primary liner. The VZMS would consist of a gravel layer and lined sump directly below the LCRS sump and along the centerline of each pond where leaks are most likely to occur. The VZMS would be designed for moisture detection and monitoring,

collection, and removal. Additional monitoring would occur for groundwater at various nearby monitoring stations.

2.5.3 Alessandro Blending Station

Advanced treated water from the AWTF and tertiary recycled water from the SJVRWRF would be conveyed, via two separate existing pipelines (one of which would be sliplined as part of the project), to the Alessandro Blending Station where they would be blended in-pipe before the combined flow is conveyed to the Mountain Avenue West Recharge Basin, via a new pipeline to be constructed as part of the project. The blending facility pipes, including the two inflow pipes, connection pipes, and one outflow pipe, would be located on an approximately 48-foot by 34-foot concrete equipment pad southeast of the existing pressure regulating station downstream of the Alessandro Pump Station (see Figure 2-7, *Alessandro Blending Station Conceptual Site Plan*). A pressure regulating valve would be provided at the blending facility for the option to discharge advanced treated water into the adjacent existing Alessandro Ponds forebay for operational storage.

2.5.4 Conveyance Pipelines

The project would require pipelines to convey advanced treated water from the AWTF to the Alessandro Blending Station as well as blended water from the Alessandro Blending Station to the Mountain Avenue West Recharge Basin (see Figure 2-3). Advanced treated water would be conveyed from the AWTF to the Alessandro Blending Station via an existing 4.1-mile (21,700-linear foot) 18-inch diameter recycled water pipeline that extends east from the southern side of the SJVRWRF to approximately the intersection of Alessandro Avenue North and Ramona Expressway (see to Figure 2-8, *Conceptual Conveyance Pipeline Alignments*). The existing cement-mortar-lined steel pipeline would be sliplined with new 16-inch diameter high density polyethylene (HDPE) pipe. The space between the existing 18-inch diameter pipe and the new 16-inch-diameter HDPE pipe would be grouted. The advanced treated water would be conveyed from the AWTF to the start of the 18-inch-diameter pipeline to be sliplined (located on the southern side of the SJVRWRF) via a pipeline that would be installed within the SJVRWRF.

Blended water from the Alessandro Blending Station would be conveyed to the Mountain Avenue West Recharge Basin via a new approximately 2.7-mile (14,200-linear-foot) 36-inch-diameter HDPE pipeline that would be constructed within the eastern shoulder of Ramona Expressway (see Figure 2-8). The new pipeline would be located under four feet of cover. Isolation valves, air valves, and blow-offs would be included along the new pipeline per District standards.

2.5.5 Mountain Avenue West Recharge Basin

Combined flows from the Alessandro Blending Facility would be conveyed, via the above-mentioned proposed 36-inch-diameter pipeline, to the District's existing Mountain Avenue West Recharge Basin, where the water would be stored, percolate into the aquifer, and eventually be recovered for use as potable water. The Mountain Avenue West Recharge Basin is part of the San Jacinto Valley Water Banking – ERRP, which was previously evaluated in a separate EIR (refer to Section 1.2).

2.6 DRAINAGE PLAN

The Preliminary Design Report for the project, attached to this EIR as Appendix E, notes that rainwater from the Process and Control Building would be collected in gutters and discharged at ground level. This rainwater, along with other miscellaneous site drainage, would be collected in a site drainage system and discharged to two on-site stormwater bioretention basins. The drainage system may consist of a combination of pipes, catch basins, manholes, dry conveyance/storage swales, overflow structures and wet retention/detention basins. Capture runoff would be routed to the stormwater bioretention basins. One basin may be located south of the Process and Control Building while the second basin may be located between the AWTF and the brine evaporation ponds. Final design of the stormwater management system would be coordinated with the stormwater management system from the future solar site. In addition, the brine evaporation basins would be designed to withstand a potential 1,000-year storm.

All applicable results and recommendations from the Preliminary Design Report would be incorporated into the associated final design documents to address identified potential hydrologic concerns, including, but not necessarily limited to drainage alteration, runoff rates/amounts, stormwater management and hydromodification. The final project design documents would also encompass applicable standard design and construction practices from sources including NPDES (with related requirements to be included in applicable engineering/design drawings and/or construction contract specifications). Remedial measures typically associated with identified potential hydrologic concerns, pursuant to applicable regulatory and industry standards, includes: (1) minimize the installation of new impervious surfaces (e.g., by surfacing with pervious pavement, gravel or decomposed granite); (2) use flow regulation facilities (e.g., detention/retention basins) and velocity control structures (e.g., riprap dissipation aprons at drainage outlets), to maintain pre-development runoff rates and amounts for design storm events, if applicable; and (3) utilize additional and/or enlarged drainage facilities to ensure adequate on- and off-site storm drain system capacity, if applicable.

2.7 GEOTECHNICAL DESIGN CONSIDERATIONS

The project would incorporate the recommendations provided in the Geotechnical Engineering Services Report prepared for the project by Kleinfelder (2017). This report confirmed that the site is geotechnically suitable for the proposed project provided the recommendations in the report are incorporated into project design and construction. The AWTF site is located in a seismically active region subject to ground shaking and is underlain by undocumented fill, which is highly compressible and susceptible to excessive differential settlement. The report therefore recommends the overexcavation and recompaction of upper soils to support shallow spread foundations for the structures associated with the AWTF.

2.8 PROJECT PHASING

As mentioned above in Section 2.1, the District established a goal of a two-phase implementation program with a Phase I recharge capacity of 4,000 AFY and a Phase II expansion of 11,000 AFY for a 15,000-AFY total recharge project. With design flows of a 50 percent advanced treated water and 50 percent tertiary recycled water blend, Phase I would involve 2,000 AFY for both advanced treated water and tertiary recycled water, and Phase II would involve 7,500 AFY for both. Table 2-3, *PWR Project Capacity Goals,* summarizes the PWR project's recharge capacity goals.

Table 2-3
PWR PROJECT CAPACITY GOALS

	Phase I	Phase II
Total Recharge Capacity (AFY)	4,000	15,000
Tertiary Recycled Water Contribution (AFY)	2,000	7,500
Advanced Treated Water Contribution (AFY)	2,000	7,500

AFY = acre-feet per year

Accordingly, the AWTF would be sized to accommodate 2.0 million gallons per day (MGD) for Phase I and 7.5 MGD for Phase II. Phase I of the project is anticipated to be operational in 2023 and Phase II of the project is anticipated to be operational in 2035.

2.9 CONSTRUCTION METHODS

Construction of Phase I of the project would involve three general components: (1) construction of the AWTF; (2) construction of the brine management system; and (3) construction and modification of the conveyance pipelines and Alessandro Blending Station. Construction of Phase II of the project would involve expansion of the AWTF. Construction equipment would be used at the various sites and along the pipeline alignments. Excavators, loaders, forklifts, pavers, generators, rollers, air compressors, backhoes, dozers, graders, dump trucks, compactors, welders, pumps, and cranes would be the primary equipment used for project construction.

Phase I construction of the AWTF would generally consist of site preparation, grading, installing underground utilities, constructing the Process and Control Building and associated facilities, paving the roadway and parking lot, and applying architectural coatings. Phase II construction at the AWTF site would involve the 10,400-GSF expansion of the process area of the Process and Control Building.

The primary construction activity for the brine management system would be excavation and grading to construct the ponds, berms, and access roads. The ponds would be excavated to a depth of approximately five feet, resulting in 170,500 cubic yards (CY) of cut. The excavated material would be temporarily stockpiled on District-owned land northwest of the brine management system site. This material would then be used to construct the berms and access roads in between and around the ponds, resulting in balanced site cut/fill with no export of material required. During the temporary stockpile period, best management practices (BMPs) for dust control and erosion prevention would be implemented, such as covering the stockpile with erosion control blankets, installing fiber rolls, and/or applying soil binders.

Construction at both the AWTF site and brine management system would require the installation of connection pipes to adjacent facilities.

Modification of the existing 18-inch-diameter pipeline would involve sliplining the existing pipeline with the new 16-inch-diameter pipeline. The sliplining process would require access pits at various locations along the pipeline alignment, including within the right-of-way of Ramona Expressway, for inserting and receiving the sliplining pipe. Depending on location, the insertion pits would range from 25 to 55 feet in length and 10 feet in width. The receiving pits are anticipated to be approximately 15 feet in length and 10 feet in width. The depth of the insertion and receiving pits would vary based on the existing pipeline, the majority of which is located at a depth of approximately 5.5 feet.

The new 36-inch pipeline would be constructed via open trench methods, with an approximate trench width of five feet. The majority of the trench would be located within the dirt shoulder along the east side of Ramona Expressway. In general, open-cut trenches with laid back walls would be used. In areas that are confined due to existing utilities, roadway intersections, easements, or right-of-way where there is insufficient lateral space to allow for laid back trench walls, trench-box excavation would be used to keep the trench as narrow as feasible. Approximately 80 feet of the 36-inch pipeline would be constructed per day on average.

The total duration for construction of Phase I is anticipated to be approximately one and a half years (April 2022 through August 2023), with the individual construction component durations anticipated to be 15 months for the AWTF, 12 months for the brine management system, and 12 months for the conveyance pipelines and Alessandro Blending Station. Construction of the three Phase I components would overlap. Construction of Phase II is anticipated to last approximately one year (January through December 2034). For the purposes of analysis, an anticipated construction schedule, duration, and equipment list for each project component is provided in Table 2-4, *Construction Schedule and Equipment*.

Table 2-4
CONSTRUCTION SCHEDULE AND EQUIPMENT

Project Component	Activity	Equipment	Construction Period Start	Construction Period End
PHASE I				
AWTF	Site Preparation	2 Tractor/Loader/Backhoe	June 2022	June 2022
	Grading	1 Dozer; 1 Grader; 1 Excavator; 1 Dump Truck	June 2022	July 2022
	Underground Utilities	2 Excavator; 2 Tractor/ Loader/Backhoe	July 2022	August 2022
	Construction	1 Crane; 2 Excavator; 2 Tractor/ Loader/Backhoe; 1 Boom Forklift; 1 Roller; 1 Dump Truck; 1 Plate Compactor	August 2022	July 2023
	Paving	2 Roller; 2 Paver	August 2023	August 2023
	Architectural Coatings	2 Air Compressor	August 2023	August 2023
Brine Management System	Site Preparation	2 Tractor/Loader/Backhoe	June 2022	July 2022
	Grading	2 Dozer; 2 Grader; 2 Excavator; 2 Tractor/Loader/Backhoe; 3 Dump Truck	July 2022	December 2022
	Underground utilities/ infrastructure (lining system)	1 Crane; 2 Excavator; 2 Tractor/ Loader/Backhoe	January 2023	May 2023
Conveyance Pipelines*	Insertion/Receiving Pits Excavation	1 Excavator; 1 Tractor/Loader/Backhoe	April 2022	March 2023
	Pipeline Sliplining	1 Excavator; 1 Generator; 1 Welder	April 2022	March 2023
	Trenching	1 Excavator; 1 Tractor/Loader/Backhoe	April 2022	March 2023
	Pipeline Installation	1 Excavator; 1 Tractor/Loader/Backhoe; 1 Generator; 1 Welder	April 2022	March 2023

Table 2-4 (cont.)
CONSTRUCTION SCHEDULE AND EQUIPMENT

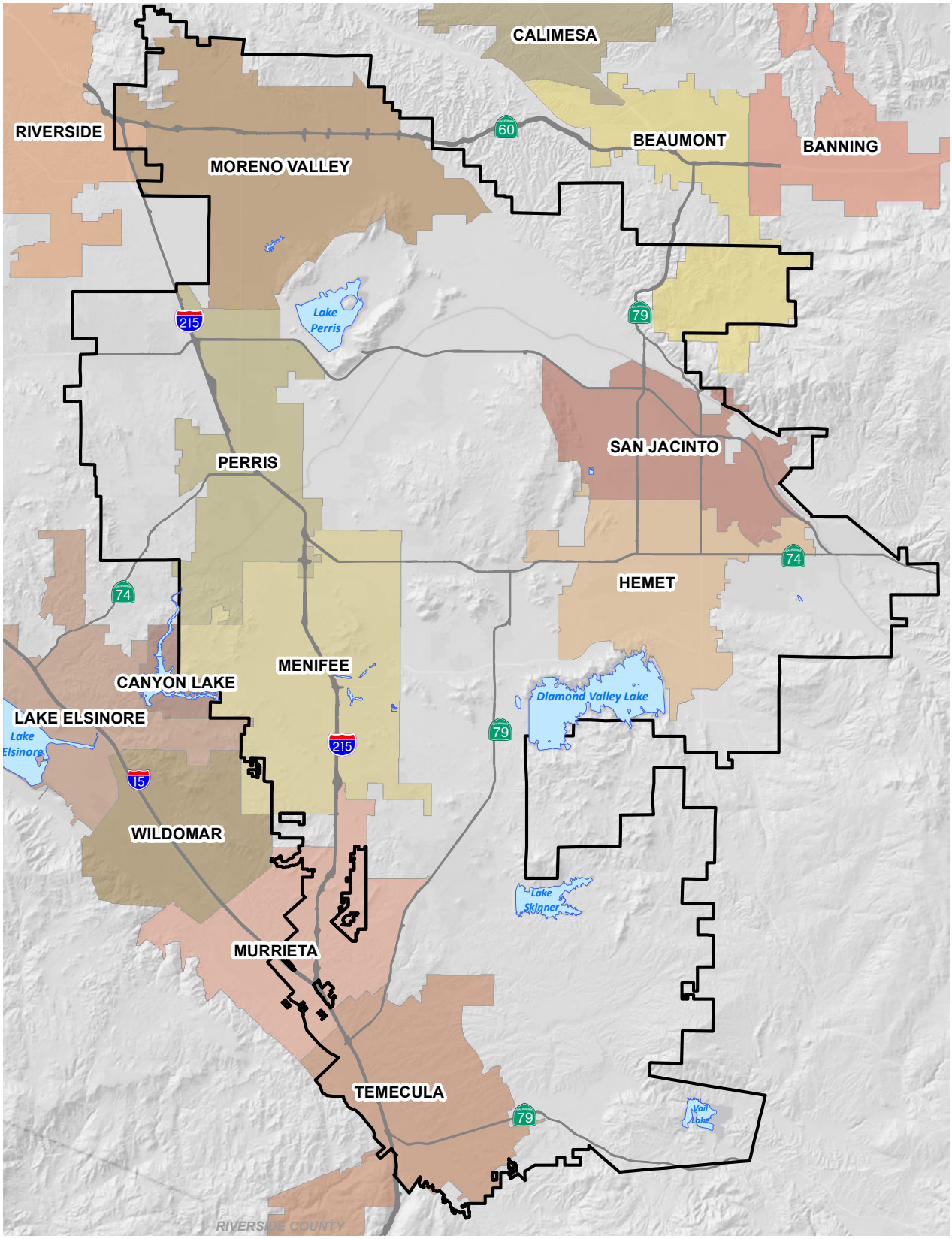
Project Component	Activity	Equipment	Construction Period Start	Construction Period End
PHASE II				
AWTF Expansion	Underground Utilities	1 Excavator; 1 Tractor/ Loader/Backhoe	January 2034	February 2034
	Construction	1 Crane; 2 Excavator; 2 Tractor/ Loader/Backhoe; 1 Boom Forklift; 1 Roller; 1 Dump Truck; 1 Plate Compactor	February 2034	November 2034
	Architectural Coatings	2 Air Compressor	December 2034	December 2034

*Based on the linear alignment, it is assumed that these activities are not phased, but rather occur simultaneously.

2.9.1 Project Construction Features/Practices

Project construction would include the following features/practices:

- Implement standard dust control measures in accordance with South Coast Air Quality Management District (SCAQMD) Rule 403, such as watering two times daily during excavation.
- Implement measures included within the project's Geotechnical Engineering Services Report (Kleinfelder 2017), including, but not limited to, the following:
    - Strip existing vegetation, compressible topsoil, debris, and oversized materials;
    - Over-excavate at the AWTF site to remove undocumented fill that is not suitable to support the proper foundations; and
    - Scarify (break up), moisture-condition, and compact engineered fill.
- Implement a Storm Water Pollution Prevention Plan (SWPPP) and associated BMPs during construction.



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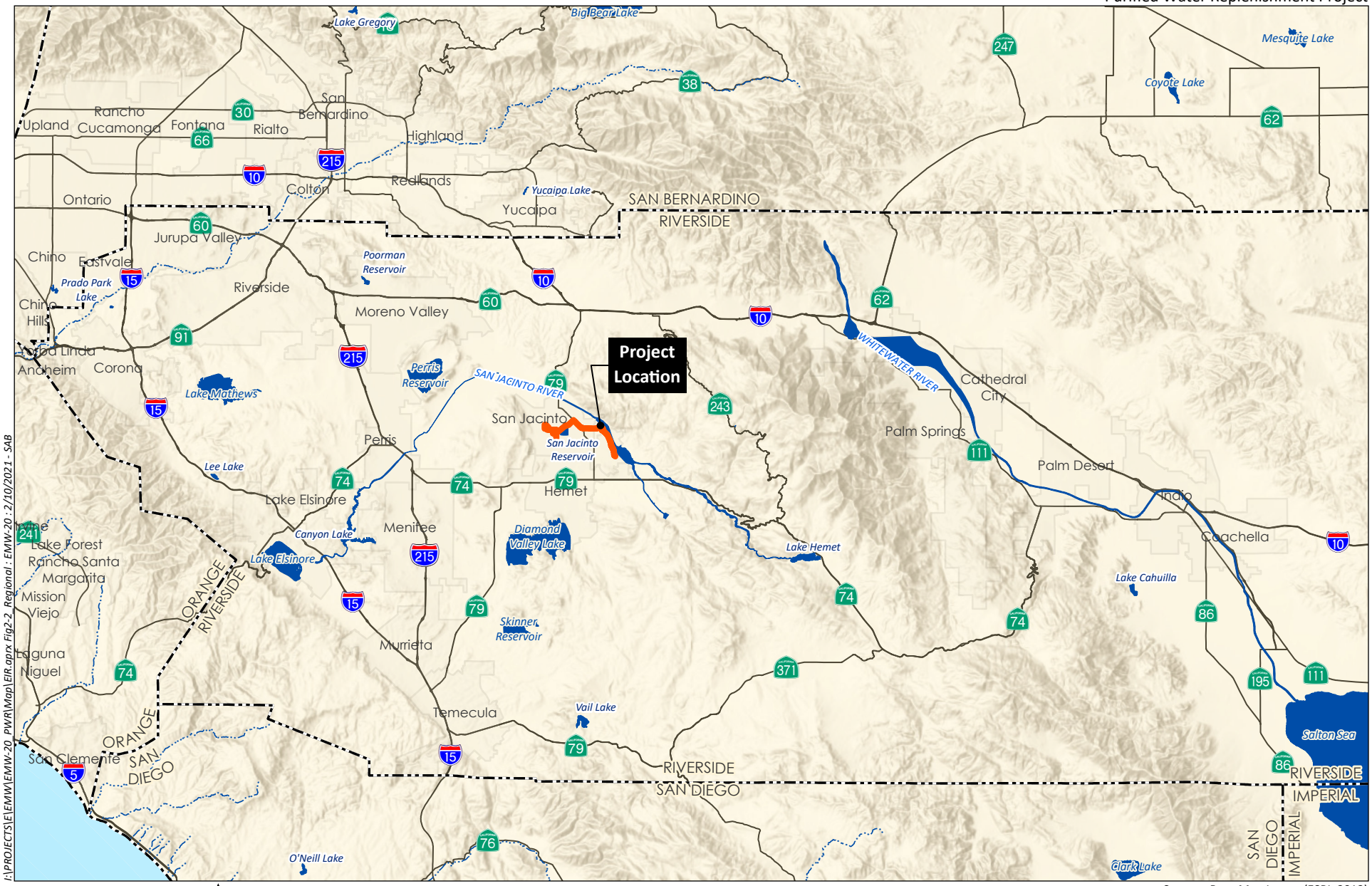
Source: CDMSmith (2020)

HELIX Environmental Planning

District Service Area

Figure 2-1



I:\PROJECTS\E\EMW\EMW-20_PWR\Map\EIR.aprx Fig2-2_Regional : EMW-20 : 2/10/2021 - SAB

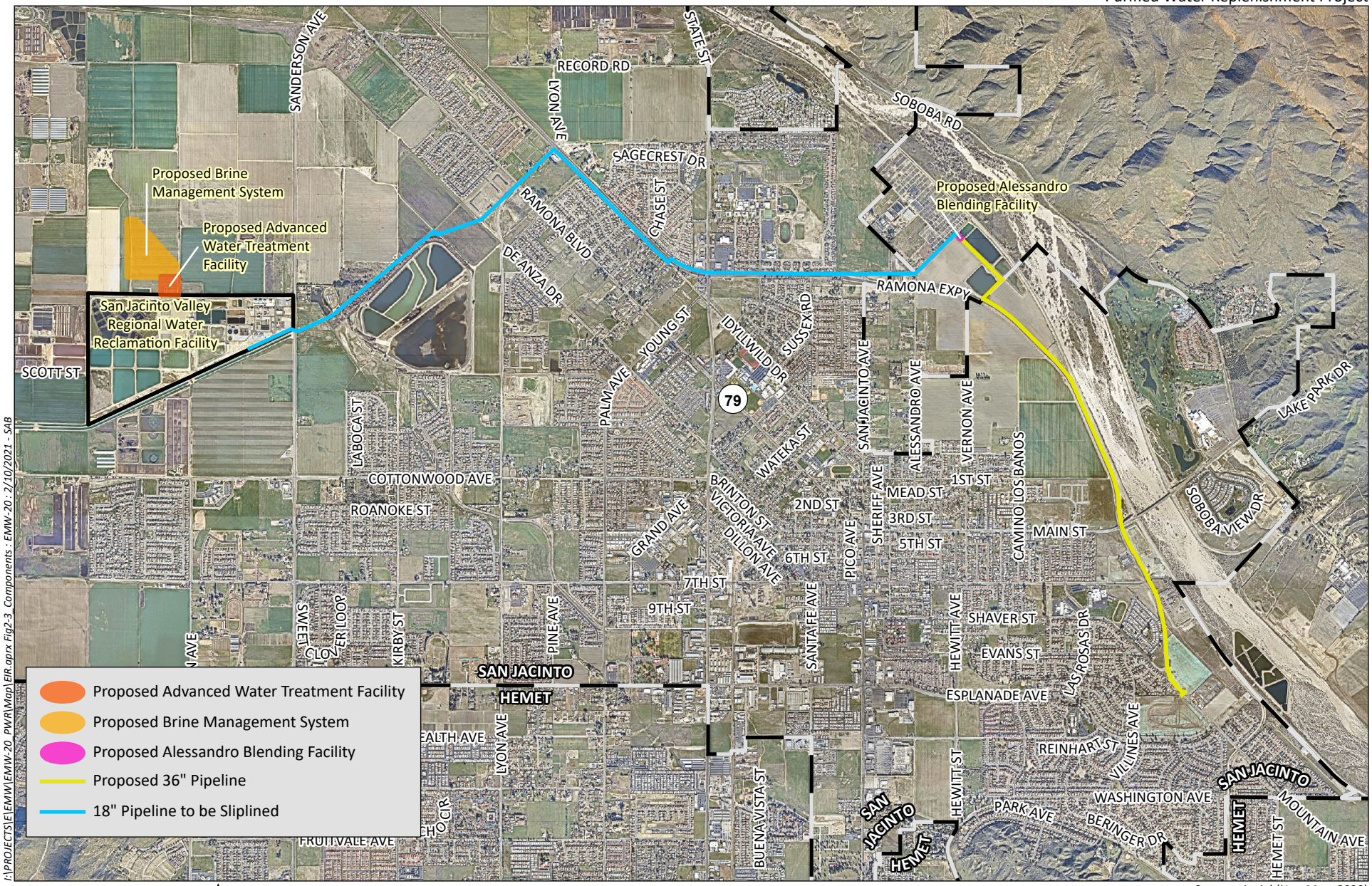
0 10 Miles

Source: Base Map Layers (ESRI, 2013)

HELIX Environmental Planning

Regional Location

Figure 2-2



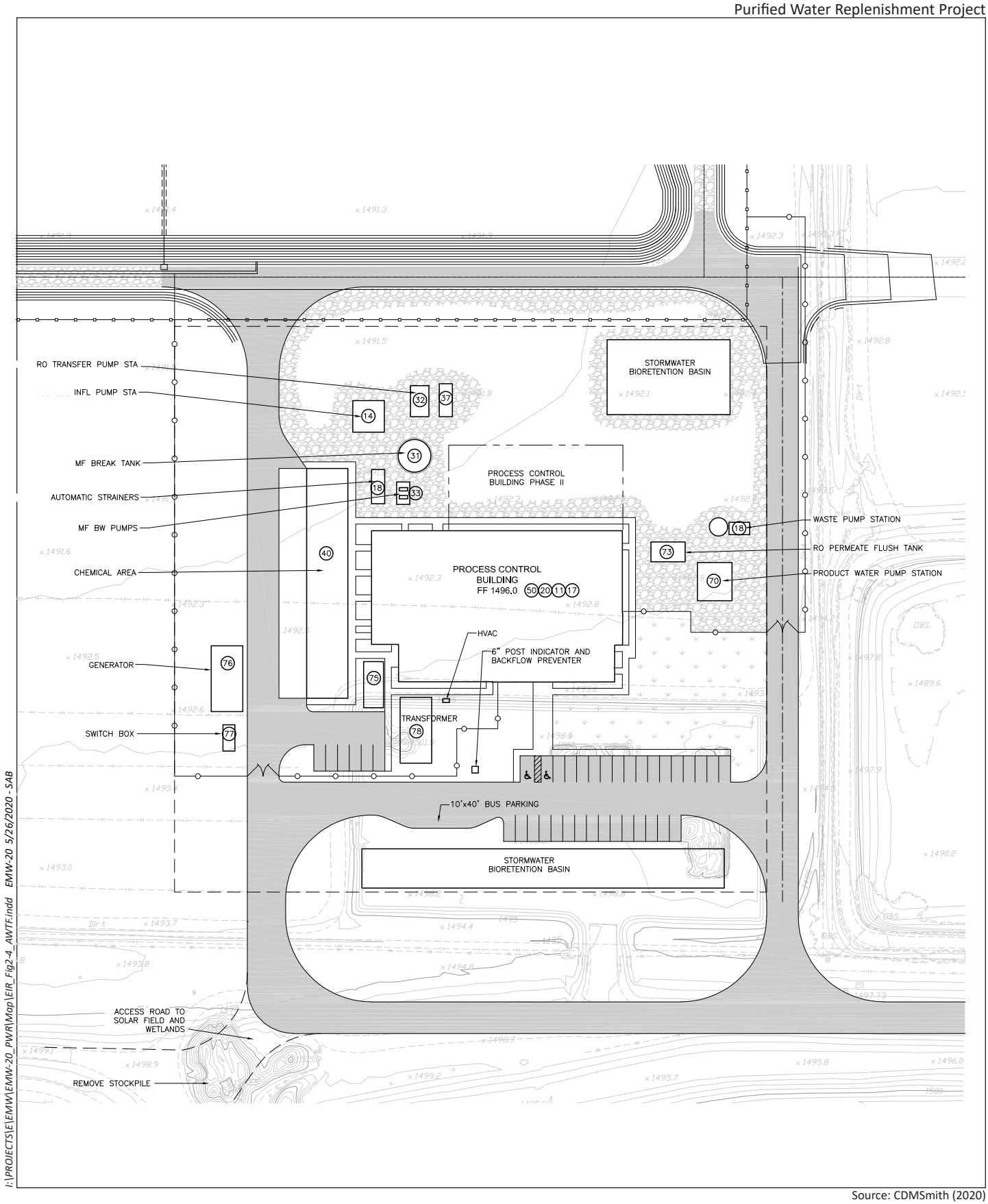
I:\PROJECTS\E\EMW\EMW-20_PWR\Map\EIR.aprx Fig2-3_Components : EMW-20 : 2/10/2021 - SAB

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Project Components

Figure 2-3



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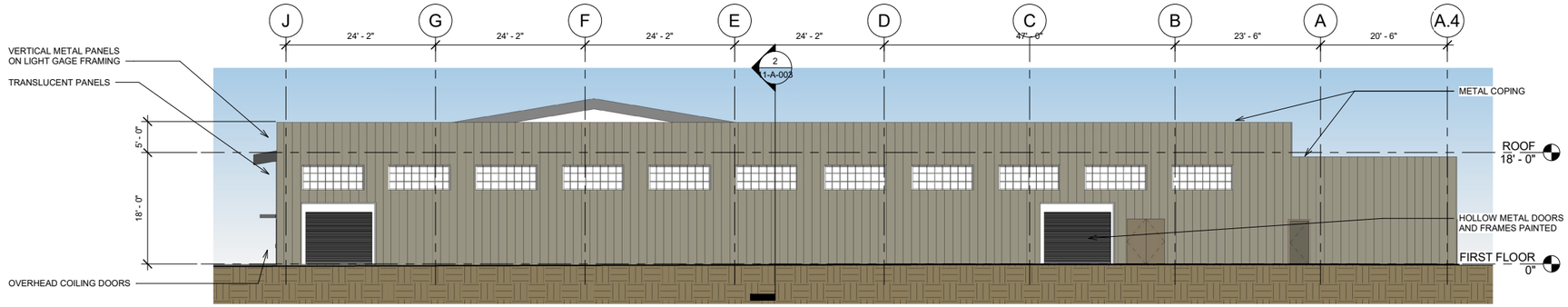
Source: CDMSmith (2020)

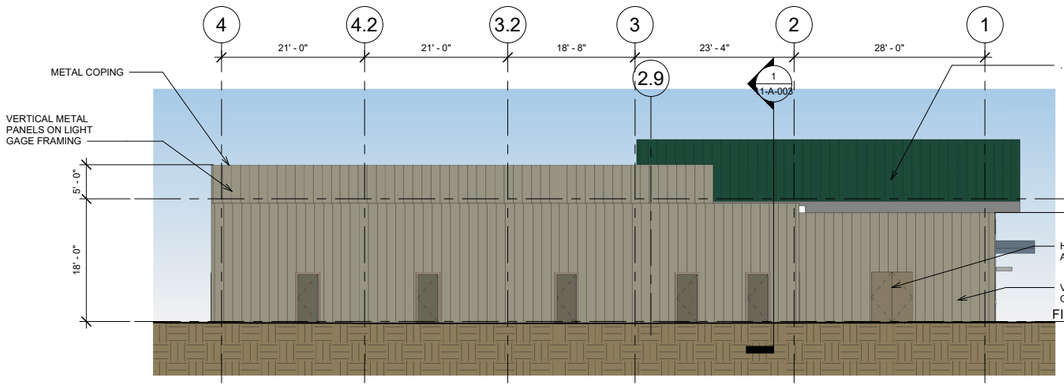
HELIX Environmental Planning

Advanced Water Treatment Facility Conceptual Site Plan

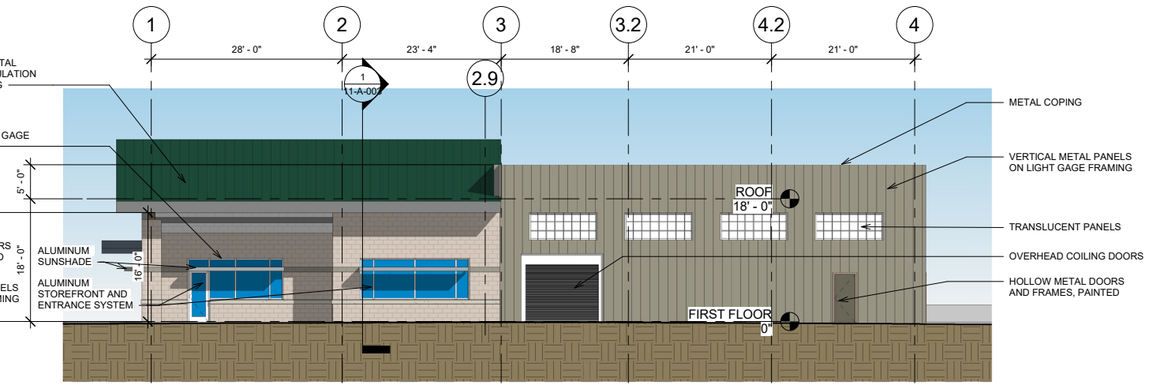
Figure 2-4



1 EAST ELEVATION
3/32" = 1'-0"



2 NORTH ELEVATION
3/32" = 1'-0"



3 SOUTH ELEVATION
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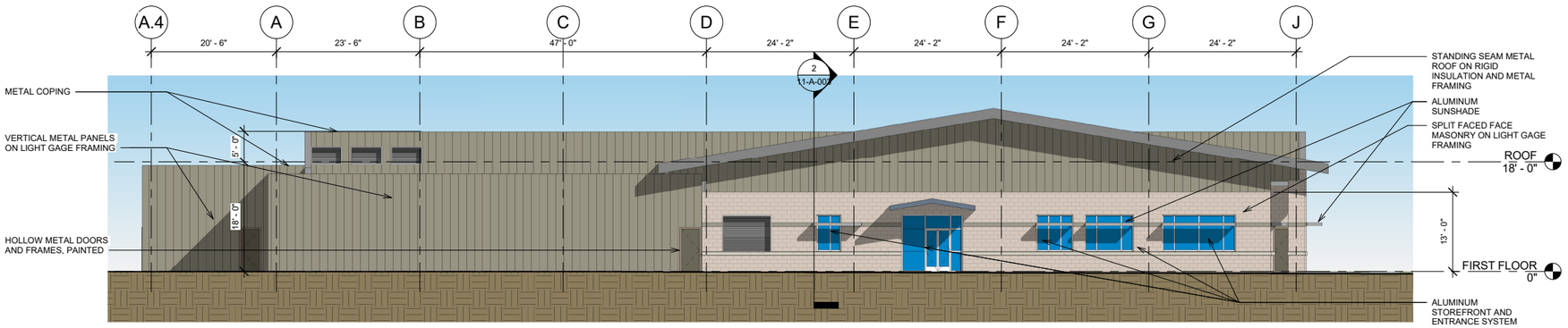

4 WEST ELEVATION
3/32" = 1'-0"

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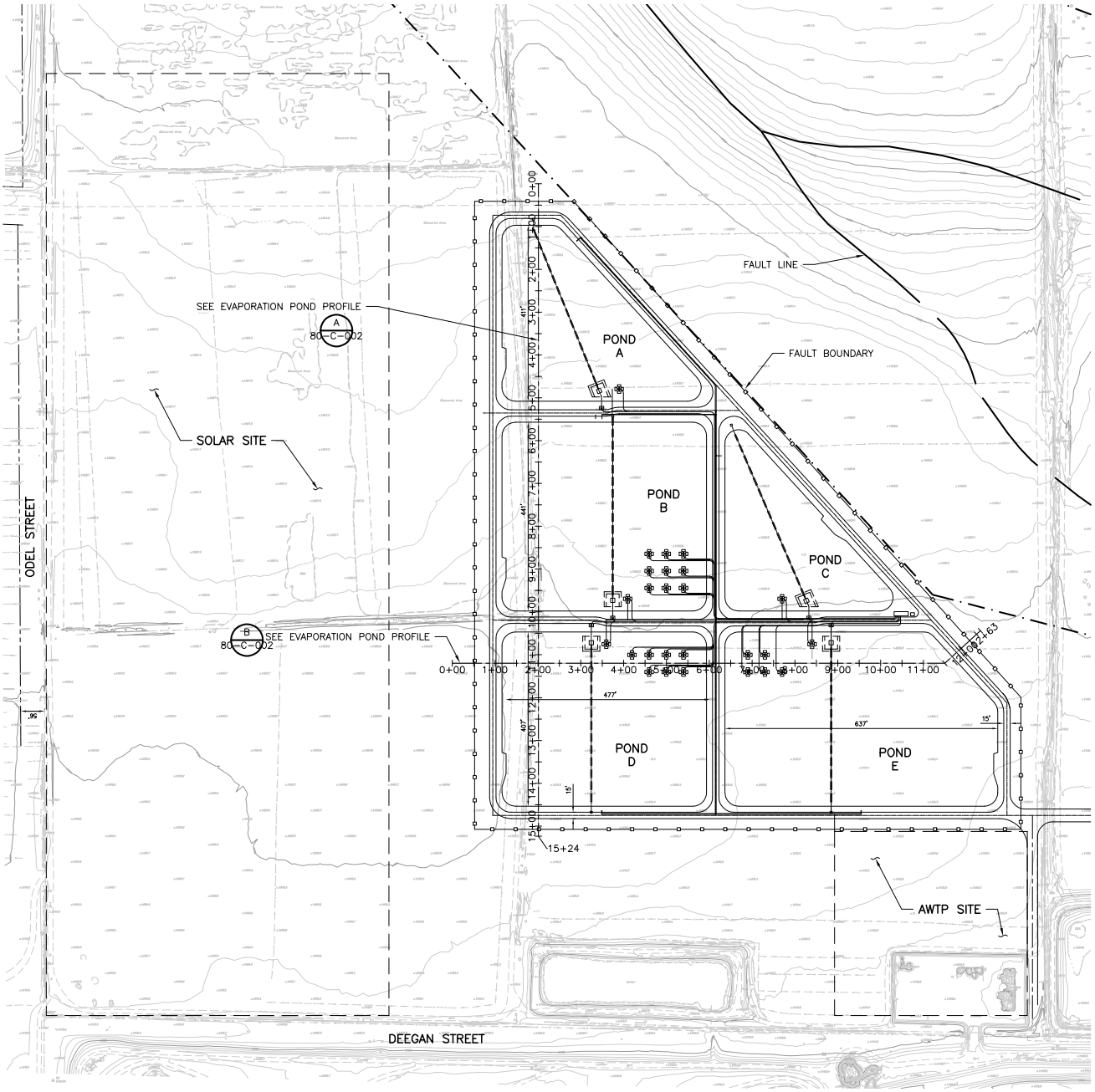
Source: CDMSmith (2020)



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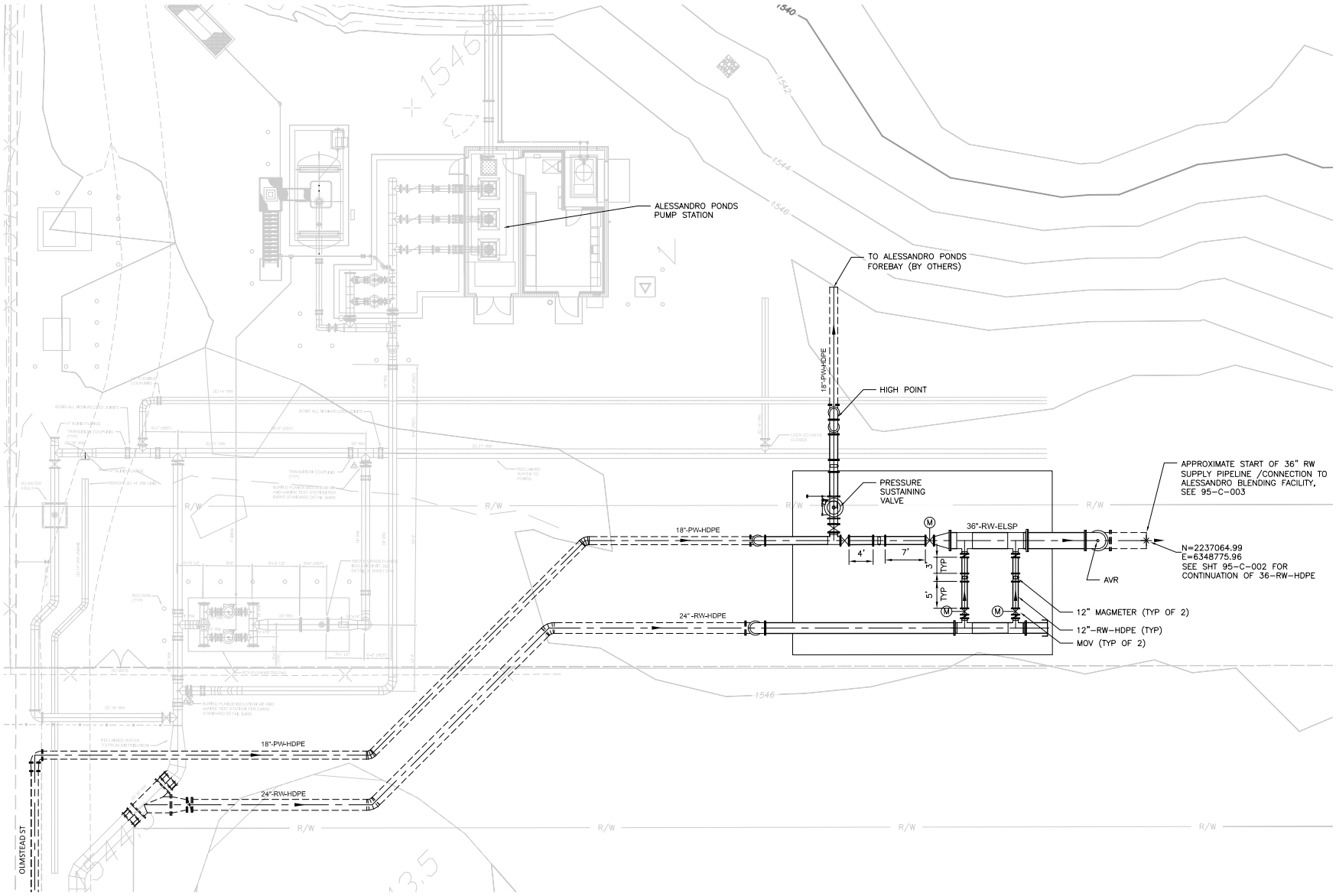
Source: CDMSmith (2020)

HELIX Environmental Planning

Brine Management System Conceptual Site Plan

Figure 2-6



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Source: CDMSmith (2020)

HELIX Environmental Planning

Alessandro Blending Station Conceptual Site Plan

Figure 2-7

Slipline Pit and Excavation Area
18" Pipeline to be Sliplined

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0 300 Feet

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Conceptual Conveyance Pipeline Alignments

Figure 2-8a

Purified Water Replenishment Project



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0 300 Feet

Source: Aerial (NearMap, 2020)

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Conceptual Conveyance Pipeline Alignments

Figure 2-8b



Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Conceptual Conveyance Pipeline Alignments

Figure 2-8c

Slipline Pit and Excavation Area
18" Pipeline to be Sliplined

I:\PROJECTS\EMW\EMW-20_PWR\Map\EIR.aprx Fig2-8_ConveyancePipelines : EMW-20 : 2/10/2021 - SAB

0 300 Feet

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Source: Aerial (NearMap, 2020)

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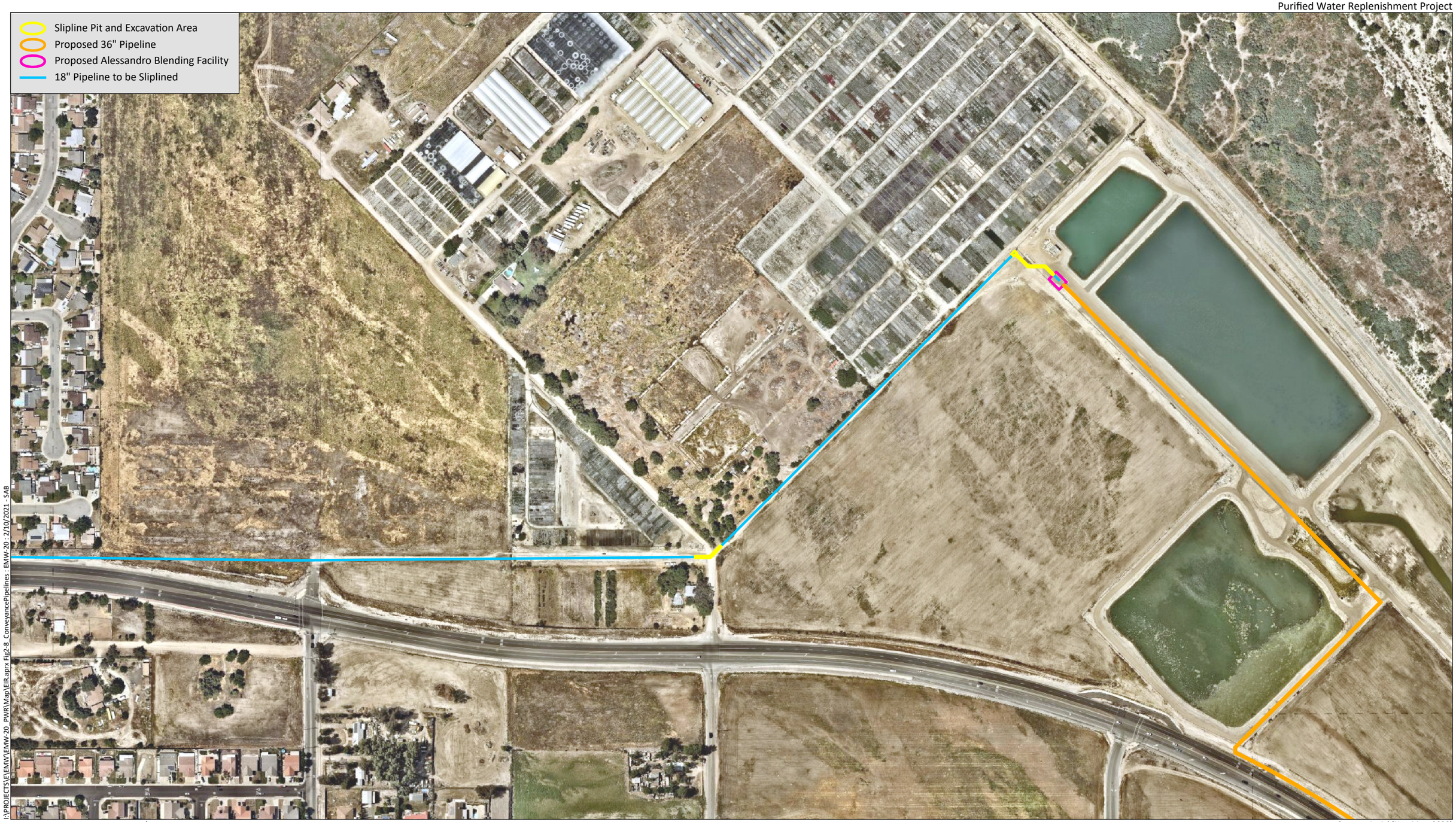
Environmental Planning

Conceptual Conveyance Pipeline Alignments

Figure 2-8d



Source: Aerial (NearMap, 2020)

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Conceptual Conveyance Pipeline Alignments

Figure 2-8e



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0 300 Feet

Source: Aerial (NearMap, 2020)

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Conceptual Conveyance Pipeline Alignments

Figure 2-8f



I:\PROJECTS\E\EMW\EMW-20_PWR\Map\EIR_aprx Fig2-8_ConveyancePipelines : EMW-20 : 2/10/2021 - SAB

0 300 Feet

Source: Aerial (NearMap, 2020)

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Conceptual Conveyance Pipeline Alignments

Figure 2-8g



Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Conceptual Conveyance Pipeline Alignments

Figure 2-8h

3.0 ENVIRONMENTAL SETTING

3.1 DISTRICT SETTING

The District provides water, wastewater, and recycled water services to 825,000 people in a 555-square mile service area located in western Riverside County, approximately 75 miles east of the City of Los Angeles (refer to Figure 2-1). The District's service area includes retail customers located within the cities of Canyon Lake, Hemet, San Jacinto, Menifee, Moreno Valley, Murrieta, Perris, and Temecula, as well as the unincorporated communities of French Valley, Good Hope, Homeland, Lakeview, Mead Valley, Murrieta Hot Springs, Nuevo, Romoland, Valle Vista, and Winchester. The District also supplies water on a wholesale basis to the cities of Hemet, San Jacinto, and Perris; Lake Hemet Municipal Water District; Nuevo Water Company; Rancho California Water District; and Western Municipal Water District.

Water demands within the District's service area are primarily associated with residential, industrial, and agricultural uses. The majority of the demand is from residential uses, and this demand is anticipated to increase as development continues in Riverside County. Approximately 49 percent of the District's potable water demand is supplied by imported water from the Metropolitan Water District of Southern California through its Colorado River Aqueduct and its connections to the State Water Project. The remaining 51 percent is supplied by District-owned groundwater wells, the majority of which are located in the Hemet and San Jacinto area. The District also has wells in the Moreno Valley, Perris Valley, and Murrieta areas.

Groundwater production is a primary reliable water supply located with the District's service area. The northern portion of the District's service area lies within the San Jacinto Groundwater Basin, which is a portion of the greater Santa Ana River Basin. The San Jacinto Groundwater Basin includes eight groundwater management zones, as defined by the Santa Ana Regional Water Quality Control Board. The eight groundwater management zones that are located in the District's service area include the Perris North Management Zone, PSMZ, Lakeview/Hemet North Management Zone, Menifee Management Zone, Hemet South Management Zone, San Jacinto Lower Pressure Management Zone, SJUPMZ, and Canyon Management Zone. As discussed in Chapter 2.0, the proposed project would produce advanced treated water and combine it with tertiary recycled water for recharge into, and replenishment of, the SJUMPZ.

3.2 PROJECT AREA CHARACTERISTICS

The proposed project would be located within the eastern portion of the District's service area, predominantly within the city of San Jacinto, with one portion of the project alignment within unincorporated Riverside County (refer to Figure 2-2 and Figure 2-3).

The project area is located within the San Jacinto Valley (SJV), which is a flat inland area situated at the western base of the San Jacinto Mountains. The SJV includes the cities of San Jacinto and Hemet, as well as several unincorporated communities. Diamond Valley Lake lies approximately six miles to the south and Perris Reservoir is approximately nine miles to the northwest. Elevations in the project area range from approximately 1,615 feet above mean sea level (AMSL) near the eastern project extent to approximately 1,480 feet AMSL in the western portions of the project area. The project area is characterized by agriculture, single-family residential development, and undeveloped lands, with

additional land uses adjacent to or nearby the project alignment including small areas of commercial development, parks, Mt. San Jacinto College, and the Soboba Springs Golf Course. State Route (SR) 79 runs north-south through the San Jacinto Valley, connecting SR 74 in the south to Interstate (I-) 10 in the north.

The project area is within the South Coast Air Basin (SCAB), which consists of all of Orange County and the non-desert regions of Los Angeles County, Riverside County, and San Bernardino County. The SCAB is a coastal plain with connecting broad valleys and low hills that is bound by the Pacific Ocean to the southwest and high mountains around the rest of its perimeter. The general region lies in the semi-permanent high-pressure zone of the eastern Pacific, resulting in a mild climate tempered by cool sea breezes with light, average wind speeds.

The usually mild climatological pattern of the SCAB is interrupted occasionally by periods of extremely hot weather, winter storms, or Santa Ana winds. Winds in the project area are usually driven by the dominant land/sea breeze circulation system. Regional wind patterns are dominated by daytime onshore sea breezes. At night, the wind generally slows and reverses direction traveling toward the sea. Local canyons can also alter wind direction, with wind tending to flow parallel to the canyons. The vertical dispersion of air pollutants in the SCAB is hampered by the presence of persistent temperature inversions. High pressure systems, such as the semi-permanent high-pressure zone in which the SCAB is located, are characterized by an upper layer of dry air that warms as it descends, restricting the mobility of cooler marine-influenced air near the ground surface, and resulting in the formation of subsidence inversions. Such inversions restrict the vertical dispersion of air pollutants released into the marine layer and, together with strong sunlight, can produce worst-case conditions for the formation of photochemical smog.

The highest monthly average maximum temperature (98.9°F) in the project area, as measured at the Hemet climatic station, occurs in August, and the lowest monthly average minimum temperature (37.3°F) occurs in January (Western Regional Climate Center [WRCC] 2016). The average annual precipitation is approximately 11 inches, most of which occurs in the winter months (WRCC 2016).

Vegetation communities and/or land uses that occur within the project alignment include Southern willow scrub, open water, Riversidian sage scrub, field/pasture, disturbed habitat, and urban/developed uses. The project is located within the boundaries of the adopted Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP).

The project area has an extensive cultural history characterized by early Native American occupation associated with the San Dieguito Tradition, then the Encinitas Tradition, and later the San Luis Rey complex; Spanish exploration and mission development; Mexican independence from Spain and the subsequent dominance of a civilian population and cattle ranching; and the cession of California to the United States, which resulted in high population growth and a predominantly agricultural society. Prominent historic-age resources in the project area include the Colorado River Aqueduct and San Diego Aqueduct.

Geologically, the project alignment and surrounding areas are situated within the Peninsular Ranges geomorphic province, which is a region characterized by northwest-trending mountain ranges and intervening, generally parallel, long valleys, formed from faults branching from the San Andreas Fault. The province spans from the Transverse Ranges in the north to the southern tip of Baja California. The

province varies in width from approximately 30 to 100 miles and is bounded by the Colorado Desert to the east.

Hydrologically, the project is located in the San Jacinto River Watershed, which is a tributary to the Santa Ana River and encompasses 780 square miles on the western flanks of the San Jacinto Mountains. Lakes and reservoirs within the San Jacinto River Watershed include Lake Elsinore, Canyon Lake, Lake Perris, and Mystic Lake. Major tributaries include Bautista Creek, Poppet Creek, Potrero Creek, Perris Valley Drain, and Salt Creek. The 293-square mile San Jacinto Groundwater Basin underlies the project alignment and surrounding areas of the San Jacinto, Perris, Moreno, and Menifee Valleys in western Riverside County.

3.3 LOCAL AND REGIONAL PLANNING CONTEXT

The project alignment consists of lands within the jurisdictions of the County of Riverside and the City of San Jacinto. The land use planning documents that pertain to the project include the City of San Jacinto General Plan, County of Riverside General Plan, the San Jacinto Valley Area Plan, and the Western Riverside Multi-Species Habitat Conservation Plan.

3.3.1 City of San Jacinto General Plan

The City of San Jacinto General Plan was adopted on May 4, 2006, with the land use element being updated in October 2012 and the housing element being updated in September 2013. In addition to the land use and housing elements, the City General Plan includes economic development, community design, transportation, open space, parks and recreation, infrastructure, natural resources, safety, and noise elements. The General Plan is the primary long-range planning document that guides growth and development within the city. It also establishes the community's vision for the future and includes goals, policies, and programs to achieve that vision.

3.3.2 County of Riverside General Plan

The current County of Riverside General Plan was adopted on December 3, 2015 and contains nine elements, including land use, circulation, multipurpose open space, safety, noise, housing, air quality, healthy communities, and administration. Five of the nine elements, including land use, circulation, safety, housing, air quality, and administration, have been revised since the December 2015 adoption. The County General Plan covers the entire unincorporated portion of the County and is augmented by 19 detailed area plans that cover the County territory except for the undeveloped desert areas and March Air Joint Reserve Base. The purpose of the County General Plan is to manage the overall pattern of development while the area plans provide a focused framework aimed at enhancing individual community identity and stimulating quality of life at the community level.

3.3.3 San Jacinto Valley Area Plan

The entirety of the project alignment is within the boundaries of the SJV Area Plan of the County of Riverside General Plan. The SJV Area Plan, last revised in December 2016, covers the cities of San Jacinto and Hemet and nearby unincorporated County land. The SJV Area Plan includes a land use plan and sets forth policies related to land use, circulation, multipurpose open space, and hazards, while emphasizing the importance of the area's natural setting.

3.3.4 Western Riverside Multiple Species Habitat Conservation Plan

The MSHCP is a comprehensive, multi-jurisdictional Habitat Conservation Plan (HCP) focusing on the conservation of species and their associated habitats in Western Riverside County. The MSHCP allows the County and its incorporated cities to better control local land use decisions and maintain strong economic function in the region while addressing the requirements of the state and federal Endangered Species Acts. Rather than addressing sensitive species on an individual basis, the MSHCP focuses on the conservation of 146 species, proposing a reserve system of approximately 500,000 acres and a mechanism to fund and implement the reserve system. Most importantly, the MSHCP allows participating entities to issue take permits for listed species so that individual applicants need not seek their own permits from the USFWS and/or CDFW. The MSHCP was adopted on June 17, 2003 by the Riverside County Board of Supervisors. The Incidental Take Permit was issued by both the USFWS and CDFW on June 22, 2004.

The District is not a signatory to the MSHCP, and as such is not subject to the requirements of the MSHCP, though a discussion regarding project consistency with the MSHCP is provided in this EIR for informational purposes.

3.4 STANDARD REGULATORY REQUIREMENTS

Standard regulatory requirements are in place for numerous environmental issues that would minimize the proposed project's impacts. Construction and operation of the project would be conducted in compliance with applicable federal, state, and local laws and regulations, including environmental laws and regulations pertaining to various environmental topics that are described below.

Under Section 53091(d) and (e) of the California Government Code, building ordinances of a county or city shall not apply to the location or construction of facilities for the production, generation, storage, treatment, or transmission of water or wastewater. Zoning ordinances of a county or city shall not apply to the location of construction of facilities for the production, generation, storage, treatment, or transmission of water.

3.4.1 Aesthetics

The project would implement lighting in a manner that complies with Riverside County Ordinance No. 655 to minimize nighttime lighting interference with operations of the Mount Palomar Observatory.

3.4.2 Air Quality

To control fugitive dust during construction, the project would implement standard dust control measures in accordance with SCAQMD Rule 403, Fugitive Dust, including watering two times daily during excavation/grading, limiting vehicle speeds to 15 miles per hour (mph) on unpaved surfaces and maintaining a 12 percent moisture content on unpaved roads.

3.4.3 Cultural Resources

During project construction, the District would comply with PRC Section 5097.98 and California State Health and Safety Code (HSC) 7050.5, upon unintentional discovery or disturbance of human remains. California State HSC Section 7050.5 dictates that no further disturbance will occur until the County

Coroner has made the necessary findings as to origin and disposition pursuant to PRC Section 5097.98. If the remains are determined by the County Coroner to be Native American, the NAHC will be notified within 24 hours, and the guidelines of the NAHC will be met in the treatment and disposition of the remains. A professional archaeologist with Native American burial experience will conduct a field investigation of the specific site and consult with the Most Likely Descendant (MLD), if any, identified by the NAHC. As necessary and appropriate, a professional archaeologist will be retained by the District to provide technical assistance to the MLD, including but not limited to the excavation and removal of the human remains.

3.4.4 Geology

The District would implement relevant regulatory requirements and industry standards into the design and construction of the project, including current versions of the following, as appropriate: (1) International Building Code (IBC; which replaced the Uniform Building Code [UBC]); (2) California Building Code (CBC); (3) Standards and Specifications for Public Works Construction (Greenbook); (4) California Seismic Hazards Mapping Act and related guidelines; (5) Alquist-Priolo Earthquake Fault Zoning Act; and (6) associated local standards, as applicable. Specifically, the IBC provides standard specifications for engineering and construction activities, including measures related to seismic standards. The CBC, which is derived from the IBC, includes criteria specific to California such as geologic and seismic characteristics. The Greenbook provides standard specifications for public works projects, including measures related to geologic issues. The Seismic Hazards Mapping and Alquist-Priolo Earthquake Fault Zoning acts (along with related guidelines) provide guidance for the evaluation and mitigation of earthquake-related hazards in California. In addition, construction activities are also subject to federal and state occupational safety standards for excavation, shoring, and trenching, as specified in Title 29 of the Code of Federal Regulations (CFR), Title 8 of the California Code of Regulations (CCR), and Chapter 33 of the CBC. Additional descriptions of these and other applicable regulatory and industry standards related to geotechnical concerns are provided in Section 4.6, *Geology and Soils*.

3.4.5 Hydrology and Water Quality

Construction and operational activities related to the proposed project would require conformance with applicable requirements of the federal Clean Water Act (CWA), National Pollutant Discharge Elimination System (NPDES), California Porter-Cologne Water Quality Control Act, CCR, associated implementing regulations of the State Water Resources Control Board (SWRCB) and RWQCB, and related local standards, as applicable. These requirements are primarily intended to protect water resources and address potential concerns related to drainage systems/watersheds (e.g., drainage alteration), water quality, flood-related hazards, and groundwater.

3.4.6 Hazards and Hazardous Materials

Construction and operation of the proposed project would be conducted in compliance with all applicable federal, state, and local laws and regulations governing the use, management, handling, storage, release reporting and response actions, transportation, treatment, and disposal of hazardous materials, hazardous substances, and hazardous waste. During construction, these laws govern the manner in which hazardous materials may be transported, used, stored, and disposed of as well as the handling and disposal of demolition debris containing hazardous waste. During operations, these laws

govern the use, management, storage, and transportation of hazardous materials and the management, handling, storage, transportation, and disposal of hazardous wastes.

These laws include:

- U.S. Resource Conservation and Recovery Act (42 U.S.C. Section 6901 et seq.), which provides the 'cradle to grave' regulation of hazardous wastes; the Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. Section 9601 et seq.), commonly known as the "superfund" law addressing remediation of contaminated sites.

- U.S. Emergency Planning and Community Right-to-Know Act (42 U.S.C. Section 11001 et seq.), which establishes reporting requirements for facilities storing hazardous materials and is designed to help local communities protect public health, safety, and the environment from chemical hazards.

- U.S. Hazardous Materials Transportation Act (49 U.S.C. Section 5101 et seq.), which governs hazardous materials transportation on U.S. roadways.

- California Hazardous Waste Control Law (Health and Safety Code Section 25100 et seq.) and Hazardous Substances Account Act (Health and Safety Code Sections 25300 et seq.), which impose regulatory systems for handling hazardous waste in a manner that protects human health and the environment.

- California Proposition 65, formally known as "The Safe Drinking Water and Toxic Enforcement Act of 1986" (Health and Safety Code, Chapter 6.6, Sections 25249.5 through 25249.13), requiring persons and entities doing business in California using specific listed chemicals known to the state to cause cancer or reproductive harm or birth defects to provide a clear and reasonable warning to individuals entering the site regarding the presence of such chemicals, and the implementing regulations for such laws.

4.0 ENVIRONMENTAL ANALYSIS

Sections 4.1 through 4.10 of this EIR contain information related to existing environmental conditions, regulatory framework, analyses of the potential impacts that would result from implementation of the proposed project, and feasible mitigation measures that could avoid or reduce environmental impacts to a less-than-significant level.

The environmental factors listed below would be potentially affected by implementation of the project:

- Agricultural and Forestry Resources
- Air Quality
- Biological Resources
- Cultural Resources and Tribal Cultural Resources
- Energy
- Geology and Soils
- Greenhouse Gas Emissions
- Hydrology and Water Quality
- Noise
- Transportation

The project would not result in one or more potentially significant impacts on the following environmental factors: aesthetics, hazards and hazardous materials, land use and planning, mineral resources, population and housing, public services, recreation, utilities and service systems, and wildfire. The rationale for this determination is described in Chapter 5 of this EIR.

The potentially significant environmental effects are analyzed by considering applicable conditions, principles, and standards, and by using the methodology set forth below.

Existing Conditions

As provided in Section 15125 of the *CEQA Guidelines*, the analysis includes a description of the existing physical environmental conditions in the vicinity of the proposed project, as of the date that the NOP of this EIR was published (April 2, 2020). The environmental baseline is the starting point for the analysis of the project's environmental effects, and it enables a meaningful assessment of the significance of such effects.

Regulatory Framework

The analysis also provides a summary of applicable federal, state, and local laws, regulations, plans, and policies that are relevant to each environmental factor affected by the project.

Project Impacts and Mitigation

Thresholds of Significance

As the Lead Agency, the District is responsible for determining whether an adverse environmental effect identified in the EIR is potentially significant or less than significant. Significance standards may vary depending on the nature of the area affected and, as a result, the definition of what is a significant

environmental effect must be flexible. In determining standards of significance, Lead Agencies can obtain assistance from experts, a Lead Agency's policies, performance standards adopted by regulatory agencies, significance standards recommended by regulatory agencies, and the Lead Agency's own judgment, among other things. In addition, Lead Agencies may use the standards set forth in Appendix G to the *CEQA Guidelines* as a basis for defining significance thresholds in an EIR.

The thresholds of significance used in this analysis are primarily based upon the recommendations provided in Appendix G of the *CEQA Guidelines*. The threshold of significance defines the type, amount, and/or extent of impact that would be considered a significant adverse change in the environment. The thresholds of significance for some environmental factors, such as air quality and noise, are quantitative, while those for other topics, such as aesthetics, are qualitative. The thresholds of significance are intended to assist the reader in understanding how and why an EIR determines whether an impact is potentially significant or less than significant.

Impact Analysis

As required by *CEQA Guidelines* Section 15126.2, this EIR identifies and focuses on the potentially significant direct and indirect effects of the proposed project. In assessing the impact of the project on the environment, the District limits its examination to changes in the physical environment in the affected area from the environmental baseline discussed within the Existing Conditions section. Both direct and reasonably foreseeable indirect significant effects of the project on the environment are identified and described, giving due consideration to both long-term and short-term effects.

In drawing conclusions concerning an environmental analysis, such as whether a particular environmental effect is significant, CEQA depends upon the accumulation of substantial evidence in the record to support the conclusions, findings, and determinations made by the reviewing agency. In effect, substantial evidence is defined as "enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though another conclusion might also be reached" (*CEQA Guidelines* Section 15384(a)). Substantial evidence includes facts, reasonable assumptions predicated upon fact, and expert opinion supported by facts; it does not include argument, speculation, conjecture, or unsubstantiated opinion (California PRC Sections 21080(e) and 21082.2(c)).

This EIR utilizes the following terms to describe the level of significance of impacts identified during the course of the environmental analysis:

- ***Less than Significant:*** This term is used when an environmental effect would not exceed the defined thresholds of significance, namely (1) when the effect is not a substantial or potentially substantial adverse change to the environment, and (2) when potentially significant impacts are reduced to a level that is less than significant after implementation of mitigation measures.

- ***Potentially Significant:*** This term is used to refer to impacts on the environment resulting from implementation of the project that exceed the defined thresholds of significance before identification of mitigation measures. A "significant effect" is defined by Section 15382 of the *CEQA Guidelines* as "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance. An economic or social change by itself shall not be considered a significant effect on the environment [but] may be considered in determining whether the physical change is significant." For impacts that

exceed a threshold of significance, feasible mitigation measures that avoid or reduce the potential impact are identified.

- ***Significant and Unavoidable:*** This term is used to refer to significant impacts resulting from implementation of the proposed project that cannot be eliminated or reduced to below thresholds of significance through implementation of feasible mitigation measures.

Mitigation Measures

Section 15126.4 of the *CEQA Guidelines* requires an EIR to "describe feasible measures which could minimize significant adverse impacts." The *CEQA Guidelines* define "feasible" as a quality attributable to an action capable of being accomplished in a successful manner within a reasonable period of time taking into account economic, legal, social, technological, or other considerations. The EIR identifies and describes mitigation measures that could reduce the severity of potentially significant impacts identified as part of the Impact Analysis.

Significance After Mitigation

For impacts where mitigation has been identified, the EIR determines the level of significance of the impact following implementation of the identified mitigation measure.

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4.1 AGRICULTURAL AND FORESTRY RESOURCES

This section describes the potential impacts of the proposed project to agricultural and forestry resources. The following discussion includes a description of existing conditions as related to agricultural and forestry resources, a summary of applicable regulations, and an evaluation of the proposed project's potential environmental effects associated with agricultural and forestry resources.

4.1.1 Existing Conditions

4.1.1.1 Regional Agricultural Setting

The County General Plan identifies widespread and diverse agricultural lands as one of the County's most important land uses in terms of historic character and economic strength. The gross value of all agricultural crops produced during 2018 in the County was approximately $1.3 billion, with the leading commodity groups by value including vegetable, melons, miscellaneous; livestock and poultry; and tree and vine (County of Riverside Agricultural Commissioner's Office 2019). The lower SJV, which is characterized by agricultural uses and mountainous terrain, is recognized as an area within Western Riverside County, where agricultural land is limited, that could sustain agricultural uses for a considerable period of time (County of Riverside 2016).

Similarly, the city of San Jacinto has historically been an agricultural community, with its rich valley soils providing a wide variety of crops. Primary agricultural uses within San Jacinto include groves and orchards, field and truck crops, and dairy and livestock feed yards (City of San Jacinto 2006).

4.1.1.2 Project Area Conditions and Agricultural Resources

Current Agricultural Use

The California Department of Conservation (CDC) Farmland Mapping and Monitoring Program (FMMP) produces Important Farmland maps and statistical data used for categorizing agricultural land and analyzing impacts. Agricultural lands are rated based on soil quality and irrigation status, with Important Farmland maps scheduled for update every two years based on aerial photograph review, computer mapping analysis, public input, and field reconnaissance. The eight use categories identified on the Important Farmland maps are defined below in Section 4.1.1.3. Portions of land in the vicinity of the project alignment are mapped as Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, Urban and Built-up Land, and Other Land. Within the project's proposed AWTF site and brine management system footprints, portions of land are designated as Unique Farmland and Farmland of Statewide Importance (CDC 2016). This area is currently utilized as irrigated agricultural land, planted with alfalfa. Because the AWTF and brine management system are components of the proposed project that would permanently convert land from its existing use and would occur on land currently mapped as and utilized for agriculture, the analysis in this section focuses on the combined footprint of the AWTF site and brine management system, referred to herein as the "subject site." Table 4.1-1, *Important Farmland within the Subject Site,* shows the acres and proportions of the subject site mapped as each FMMP land use category. Figure 4.1-1, *Farmland Designations and Soils*, shows the FMMP designations within the subject site.

Table 4.1-1
IMPORTANT FARMLAND WITHIN THE SUBJECT SITE

FMMP Land Use Category	Acres	Proportion of the Subject Site
Unique Farmland	30.99	92.0%
Farmland of Statewide Importance	2.50	7.4%
Subtotal	*33.49*	*99.4%*
Urban and Built-Up Land	0.19	0.5%
Subtotal	*0.19*	*0.5%*
Total	**33.67**	**100%**

Source: CDC 2016
Note: Totals may not add due to rounding.
FMMP=Farmland Mapping and Monitoring Program

Historical Agricultural Use

Historical imagery from Google Earth dating back to 1996 shows the area included ponds/basins from 1996 to 2003 that at times held water and at other times were left empty. The ponds/basins were surrounded by vacant and/or agricultural lands. In 2003, the site began to be used for agricultural crop farming and has been continuously used until the present for agricultural purposes, at times planted and at other times vacant/fallow.

4.1.1.3 Soil and Agricultural Land Designations

Federal

U.S. Natural Resources Conservation Service

The U.S. Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service [SCS]) maps soils according to distinct soil series and individual soil types. The SCS soil classification system also includes assessments of Land Capability Classification (LCC) and Storie Index ratings; summary definitions are provided below.

Storie Index

The Storie Index designation "[e]xpresses numerically the relative degree of suitability, or value, of a soil for general intensive agriculture. The rating is based on soil characteristics only. It does not take into account other factors such as the availability of water for irrigation, climate, and distance from markets, which might determine the desirability of growing specific crops in a given locality" (SCS 1971). The four factors that represent the inherent characteristics and qualities of the soil (i.e., profile characteristics, texture of surface soil, slope, and other conditions that limit use of the soil) are considered in the index rating.

Land Capability Classification

The LCC concept is defined as follows in the Western Riverside Area Soil Survey (SCS 1971):

> Capability classifications show, in a general way, the suitability of soils for most kinds of field crops. Soils are classified according to the limitations when used for field crops, the risk of

damage when they are used, and the way they respond to treatment. The LCC system does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management. In the LCC system, all kinds of soils are grouped at three levels: the capability class (Roman numeral designation), the subclass (letter designation), and the unit (Arabic numeral designation).

Soils are divided into Capability Classes I through VIII, with these designations representing a range in quality from Class I soils that have few limitations for agricultural use, to Class VIII soils that have no commercial crop production capability. Capability Classes are further divided into subclasses and capability units which define limitations for agricultural use. Subclasses indicate soil limitations based on erodibility (e), water regime (w), depth and/or texture (s), and climate area (c). Capability units further reveal the main limitation for the placement of a soil into the given class and subclass. Numerals used to designate units within the classes and subclasses include: (0) sand and gravel in the substratum; (1) erosion hazard; (2) wetness caused by poor drainage or flooding; (3) slow or very slow permeability; (4) coarse texture or excessive gravel; (5) fine or very fine textured soil; (6) salts or alkali; (7) cobblestones, stones, or rocks; (8) nearly impervious bedrock or hardpan; and (9) toxicity or low fertility (SCS 1971).

State

California Department of Conservation

Farmland Mapping and Monitoring Program

As described above in Section 4.1.1.2, the CDC FMMP produces Important Farmland maps based on eight land use categories: Prime Farmland, Farmland of Statewide Importance, Unique Farmland, Farmland of Local Importance, Grazing Land, Urban and Built up Land, Other Land, and Water. The Important Farmland designations are defined below.

Prime Farmland

Prime Farmland includes areas that have the best combination of physical and chemical characteristics for the production of crops, including (but not limited to) moisture regime, soil temperature, pH, groundwater depth, sodium content, flooding, erodibility, permeability, rock fragment content, and rooting depth. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when treated and managed, including water management, according to current farming methods. Prime Farmland must have been used for the production of irrigated crops at some time during the two update cycles (i.e., four years) prior to the mapping date.

Farmland of Statewide Importance

Farmland of Statewide Importance includes areas other than Prime Farmland that have a good combination of physical and chemical characteristics for the production of crops, but also have constraints to crop production such as greater slopes or less ability to store soil moisture. Areas mapped as Farmland of Statewide Importance must have been used for the production of irrigated crops at some time during the four years prior to the mapping date.

Unique Farmland

Unique Farmland includes areas that do not meet the criteria for Prime Farmland (areas that have the best combination of physical and chemical characteristics for the production of crops) or Farmland of Statewide Importance (areas other than Prime Farmland that have a good combination of physical and chemical characteristics for the production of crops), but that have been used for the production of specific high economic value crops during the two update cycles prior to the mapping date. It has the special combination of soil quality, location, growing season, and moisture supply needed to produce sustained high quality and/or high yields of a specific crop when treated and managed according to current farming methods. Examples of such crops may include oranges, olives, avocados, rice, grapes, and cut flowers.

Farmland of Local Importance

Farmland of Local Importance includes areas other than Prime Farmland, Farmland of Statewide Importance, or Unique Farmland that are currently producing crops, have the capability of such production, or are used for the production of confined livestock. Farmland of Local Importance may be important to local economies due to its productivity or value and is defined by each county's local advisory committee and adopted by its Board of Supervisors. For Riverside County, the definition of Farmland of Local Importance is provided by the CDC (2017) as:

- Soils that would be classified as Prime and Statewide but lack available irrigation water. Lands planted to dryland crops of barley, oats, and wheat.

- Lands producing major crops for Riverside County but that are not listed as Unique crops. These crops are identified as returning one million or more dollars on the 1980 Riverside County Agriculture Crop Report. Crops identified as permanent pasture (irrigated), summer squash, okra, eggplant, radishes, and watermelons.

- Dairylands, including corrals, pasture, milking facilities, hay and manure storage areas if accompanied with permanent pasture or hayland of 10 acres or more.

- Lands identified by city of county ordinance as Agricultural Zones or Contracts, which includes Riverside City "Proposition R" lands. Lands planted to jojoba which are under cultivation and are of producing age.

Grazing Land

Grazing Land includes areas on which the existing vegetation is suited to the grazing of livestock. Grazing Land does not include areas designated as any other Important Farmland categories or lands with restrictions to livestock movements (e.g., steep slopes), and is defined to include areas on which the existing vegetation, whether grown naturally or through management, is suitable for grazing or browsing of livestock. The minimum mapping unit for Grazing Land is 40 acres.

Urban and Built-up Land

Urban and Built-up Land includes areas with a building density of at least one unit per 1.5 acres. This designation is used for residential, industrial, commercial, institutional, and other developed purposes. Transportation facilities (e.g., highways and railroads) and vacant (non-agricultural) areas surrounded by

urban development and less than 40 acres in size are mapped as part of associated Urban and Built-up Land, while uses such as farmsteads, commercial feedlots, and poultry facilities are not included within this designation.

Other Land

Land areas not included in any other Important Farmland mapping category are designated as Other Land. Common examples include low-density rural developments; brush, timber, wetland, and riparian areas not suitable for livestock grazing; confined livestock, poultry, or aquaculture facilities; and vacant and non-agricultural areas larger than 40 acres and surrounded by urban development.

Water

This category is defined as perennial water bodies with an extent of at least 40 acres.

Criteria for Listing as Prime Farmland and Farmland of Statewide Importance

To be shown on FMMP's Important Farmland Maps as Prime Farmland or Farmland of Statewide Importance, land must meet both land use and soil criteria. To meet the land use criteria, the land must have been used for irrigated agricultural production at some time during the four years prior to the Important Farmland Map date. Irrigated land use is determined by FMMP staff by analyzing current aerial photos, local comment letters, and related GIS data, supplemented with field verification. To meet the soil criteria, the soil must meet the physical and chemical criteria for Prime Farmland or Farmland of Statewide Importance as determined by the NRCS, which compiles lists of soil types in each survey area that meet the quality criteria. Factors considered in qualification of a soil by NRCS include:

- Water moisture regimes, available water capacity, and developed irrigation water supply
- Soil temperature range
- Acid-alkali balance
- Water table
- Soil sodium content
- Flooding (uncontrolled runoff from natural precipitation)
- Erodibility
- Permeability rate
- Rock fragment content
- Soil rooting depth

California Land Evaluation and Site Assessment Model

The Land Evaluation and Site Assessment (LESA) is a point-based approach for rating the relative importance of agricultural land resources based upon specific measurable features. The California LESA Model was developed to provide lead agencies with an optional methodology to ensure that potentially significant effects on the environment of agricultural land conversions are quantitatively and consistently considered in the environmental review process (PRC Section 21095), including in CEQA reviews.

The California Agricultural LESA Model evaluates measures of soil resource quality, a given project's size, water resource availability, surrounding agricultural lands, and surrounding protected resource lands. For a given project, the factors are rated, weighted, and combined, resulting in a single numeric score. The project score becomes the basis for making a determination of a project's potential significance.

4.1.2 Regulatory Framework

4.1.2.1 State

California Land Conservation Act of 1965 (Williamson Act)

The California Land Conservation Act of 1965, commonly referred to as the Williamson Act (California Administrative Code §51200 et. seq.), enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use. The issuance of such a contract precludes non-agricultural development of the subject property for a period of 10 years. In return, the landowner receives property tax assessments that are lower than normal because the assessments are based on farming and/or open space uses rather than full market value. Local governments receive an annual subvention of forgone property tax revenues from the state via the Open Space Subvention Act of 1971. Contracts issued under the Williamson Act automatically renew each year for a new 10-year period unless the landowner files a Notice of Non-renewal to terminate the contract at the end of the current 10-year period. During the 10-year cancellation period, property taxes are gradually raised to the appropriate level for developable land.

The Williamson Act also authorizes cities and counties to establish agricultural preserves, with these areas intended to identify locations wherein the issuing city or county is willing to enter into Williamson Act contracts. Agricultural preserves are generally intended to avoid areas where public utility improvements and related land acquisitions may be required. The Williamson Act does not specifically address the issue of compatible land uses in sites adjacent to agricultural preserves or contract lands, other than to require that "[c]ities and counties shall determine the types of uses to be deemed 'compatible uses' in a manner which recognizes that a permanent or temporary population increase often hinders or impairs agricultural operations." (California Administrative Code §51220.5).

The Williamson Act allows the County of Riverside to designate agricultural preserves wherein agricultural properties are assessed on the basis of agricultural production rather than the current market value. There are no County-designated agricultural preserves within or adjacent to the impact footprint of the proposed project (County of Riverside 2020).

Farmland Security Zone Act

The Farmland Security Zone Act is similar to the Williamson Act and was passed by the California State Legislature in 1999 to ensure that long-term farmland preservation is part of public policy. Farmland Security Zone Act contracts are sometimes referred to as "Super Williamson Act Contracts." Under the provisions of this act, a landowner already under a Williamson Act contract can apply for Farmland Security Zone status by entering into a contract with the county. Farmland Security Zone classification automatically renews each year for an additional 20 years. In return for a further 35 percent reduction in the taxable value of land and growing improvements (in addition to Williamson Act tax benefits), the owner of the property promises not to develop the property into nonagricultural uses. Because Farmland Security Zones are created within an agricultural preserve through agreement with the County and, as stated above, there are no County-designated agricultural preserves within or adjacent to the

impact footprint of the proposed project (County of Riverside 2020), there are therefore no Farmland Security Zones adjacent to the impact footprint of the proposed project.

4.1.3 Thresholds of Significance

The following criteria from Appendix G of the *CEQA Guidelines* are used as thresholds of significance to determine the impacts of the proposed project as related to agricultural and forestry resources. The proposed project would have a significant impact if it would:

1. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use;[1]

2. Conflict with existing zoning for agricultural use, or a Williamson Act contract;

3. Conflict with existing zoning for, or cause rezoning of, forest land (as defined in PRC section 1220[g]), timberland (as defined by PRC section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104[g]);

4. Result in the loss of forest land or conversion of forest land to non-forest use; or

5. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use.

The significance level of impacts to agricultural resources were determined from the results of the California LESA model, which is based on the Federal LESA model released in 1981 by the NRCS (known then as the SCS). The LESA model is a procedural tool that is designed to provide a quantitative method for rating the agricultural suitability of land compared to demands for non-agricultural uses of lands. The formation of a California LESA model is the result of legislation that added Section 21095 to CEQA, which directed the Resources Agency, in consultation with the California Office of Planning and Research, to amend Appendix G of the *CEQA Guidelines* to "provide lead agencies an optional methodology to ensure that significant effects on the environment of agricultural land conversions are quantitatively and consistently considered in the environment review process." Section 21095 also required the California Department of Conservation to develop a state model land evaluation and site assessment system, which in turn could be adopted by the Resources Agency as its amendment to Appendix G.

In 1997, the CDC published the California LESA model. Appendix G of the *CEQA Guidelines*, as revised in October 1998 (and carried forward in subsequent updates), includes the provision that "In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department Conservation as an optional model to use in assessing impacts on agriculture and farmland."

The LESA model utilizes several basic factors which can capture much of the variability associated with the determination of the relative value of agriculture lands. A point-based approach is used to rate

[1] The significance level of impacts related to the conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance is dependent on the LESA model scoring.

various factors related to agricultural characteristics that ultimately result with an overall score for the project. This final LESA model score is a tool used by lead agencies to determine whether the conversion of farmland on a project site could be considered a significant impact using the scoring thresholds listed below in Table 4.1-2, *California LESA Model Scoring Thresholds*.

Table 4.1-2
CALIFORNIA LESA MODEL SCORING THRESHOLDS

Total LESA Score	Scoring Decision
0 - 39	Not Considered Significant
40 - 59	Considered Significant only if the Land Evaluation Score and the Site Assessment Score are each greater than or equal to 20
60 - 79	Considered Significant unless either the Land Evaluation Score or the Site Assessment Score are less than 20 points
80 - 100	Considered Significant

Source: Table 9 of CDC 1997
LESA = Land Evaluation and Site Assessment

4.1.4 Project Impacts and Mitigation

4.1.4.1 LESA Model Methodology

The LESA model breaks project site factors into two categories: land evaluation factors and site assessment factors. Two land evaluation factors measure inherent soil-based qualities of the subject site as they relate to agricultural suitability. Four site assessment factors measure the social, economic, and geographic attributes as the relate or contribute to the overall agricultural value of the subject site. A separate score is determined for each factor. The six factor scores generated from the land evaluation and site assessment are recorded on a final score sheet where they are weighted and summed. The final sum is the LESA score for the project.

According to the CDC, the LESA model is designed to be used as part of the CEQA process to make a determination of the potential significance of a project's conversion of agricultural lands to non-agricultural uses. The scoring thresholds are based upon the total LESA score as well as the component land calculation and site assessment sub scores. The scoring thresholds depend upon the attainment of a minimum score for the land evaluation and site assessment sub scores so that a single threshold is not the result of heavily skewed sub scores (e.g., a site with a very high Land Evaluation Score, but a very low Site Assessment Score).

Step 1: Land Evaluation Score

After the soil types on a project site are identified, the LCC and Storie Index scores are calculated to compile the Land Evaluation Score of the LESA model. Table 4.1-3, *Numeric Conversion of Land Capability Classification Units*, lists the LCC Rating for each LCC category. The LCC score is determined by multiplying the LCC Rating by the proportion of the subject site covered by the corresponding soil type. The sum of the LCC scores (i.e., Total LCC Score) is the first half of the Land Evaluation Score and is given a weight of 25 percent of the total LESA score. The Storie Index rating is already based on a 100-point scale; therefore, to calculate the Storie Index score, the Storie Index rating is directly multiplied by the proportion of the subject area covered by the corresponding soil type. The sum of the Storie Index

scores (i.e., total Storie Index score) is the second half of the Land Evaluation Score and is given a weight of 25 percent of the total LESA score.

Table 4.1-3
NUMERIC CONVERSION OF LAND CAPABILITY CLASSIFICATION UNITS

LCC	LCC Rating
I	100
IIe	90
IIs,w	80
IIIe	70
IIIs,w	60
IVe	50
IVs,w	40
V	30
VI	20
VII	10
VIII	0

Source: Table 2 of CDC 1997
LCC = Land Capability Classification

Step 2: Site Assessment

Project Size Score

The project size score is included in the LESA model to account for the effect that overall farm size coupled with the quality of the farmland has on the productivity and economic viability of a commercial farming operation. The Project Size Score is calculated by grouping the acreages associated with each LCC into the categories listed in Table 4.1-4, *Project Size Scoring*. The total acreage within each grouping is then tabulated, and the highest category score is selected as the project size score.

Table 4.1-4
PROJECT SIZE SCORING

LCC Class I or II Soils		LCC Class III Soils		LCC Class IV or Lower	
Acres	**Score**	**Acres**	**Score**	**Acres**	**Score**
80 or above	100	160 or above	100	320 or above	100
60 - 79	90	120 - 159	90	240 - 319	80
40 - 59	80	80 - 119	80	160 - 239	60
20 - 39	50	60 - 79	70	100 - 159	40
10 - 19	30	40 - 59	60	40 - 99	20
Fewer than 10	0	20 – 39	30	Fewer than 40	0
		10 - 19	10		
		Fewer than 10	0		

Source: Table 3 of CDC 1997
LCC = Land Capability Classification

Water Resource Availability Score

The water resource availability score is based on overall water availability on the property, as well as potential restrictions on water availability in drought years compared to non-drought years. Potential restrictions are classified as physical restrictions (i.e., an occasional or regular interruption or reduction in a water supply that forces a change in agricultural practices) and/or economic restrictions (i.e., a rise in the cost of water to a level that forces a reduction in consumption). As shown in Table 4.1-5, *Water Resource Availability Scoring*, the water resource availability score is based on the feasibility of irrigated production and potential restrictions in years of both non-drought and drought.

Table 4.1-5
WATER RESOURCE AVAILABILITY SCORING

	Non-Drought Years			**Drought Years**			
Option	Is irrigated production feasible?	Are there physical restrictions?	Are there economic restrictions?	Is irrigated production feasible?	Are there physical restrictions?	Are there economic restrictions?	**Water Resource Availability Score**
1	Yes	No	No	Yes	No	No	100
2	Yes	No	No	Yes	No	Yes	95
3	Yes	No	Yes	Yes	No	Yes	90
4	Yes	No	No	Yes	Yes	No	85
5	Yes	No	No	Yes	Yes	Yes	80
6	Yes	Yes	No	Yes	Yes	No	75
7	Yes	Yes	Yes	Yes	Yes	Yes	65
8	Yes	No	No	No	--	--	50
9	Yes	No	Yes	No	--	--	45
10	Yes	Yes	No	No	--	--	35
11	Yes	Yes	Yes	No	--	--	30
12	†	†	†	†	†	†	25
13	††	††	††	††	††	††	20
14	†††	†††	†††	†††	†††	†††	0

Source: Table 5 of CDC 1997

† Irrigated production not feasible, but rainfall adequate for dryland production in both drought and non-drought years.

†† Irrigated production not feasible, but rainfall adequate for dryland production in non-drought years (but not drought years).

††† Neither irrigated nor dryland production feasible.

Surrounding Agricultural Land Score

The surrounding agricultural land score is designed to provide a measurement of the level of agricultural land use for lands in close proximity to the subject property site. The LESA model assigns a higher surrounding agricultural land score to projects where the conversion of an agricultural parcel would occur in an area that has a large proportion of surrounding land in agricultural production, as shown in Table 4.1-6, *Surrounding Agricultural Land Scoring*. The procedure for determining the zone of influence (ZOI) is provided by the CDC (CDC 1997) and involves identifying land near a project site that would likely influence or be influenced by the agricultural use on the subject property. For the subject site, the ZOI was determined via the following steps (from CDC 1997):

1. Locate the proposed project on an appropriate map and outline the area and dimensions of the proposed project site.

2. Determine the smallest rectangle that will completely contain the project site (Rectangle A).

3. Create a second rectangle (Rectangle B) that extends 0.25 mile (1,320 feet) beyond Rectangle A on all sides.

4. Identify all parcels that are within or are intersected by Rectangle B.

5. Define the project site's "zone of influence" as the entire area of all parcels identified in Step 4, less the area of the proposed project from Step 1.

Table 4.1-6
SURROUNDING AGRICULTURAL LAND SCORING

Proportion of ZOI in Agricultural Use	Surrounding Agricultural Land Score
90 – 100%	100
80 – 89%	90
75 – 79%	80
70 – 74%	70
65 – 69%	60
60 – 64%	50
55 – 59%	40
50 – 54%	30
45 – 49%	20
40 – 44%	10
<40%	0

Source: Table 6 of CDC 1997
ZOI = Zone of Influence

The ZOI for the proposed project's subject site is shown on Figure 4.1-2, *Agricultural Zone of Influence.*

Surrounding Protected Resource Land Score

The surrounding protected resource land score is an extension of the surrounding agricultural land score and includes lands with long-term use restrictions that are compatible with, or supportive of, agricultural land uses. Examples of lands in this category include:

- Williamson Act contracted lands/agricultural preserves;
- Publicly owned lands maintained as park, forest, or watershed resources; and,
- Lands with agricultural, wildlife habitat, open space, or other natural resource easements that restrict the conversion of such lands to urban or industrial uses.

The LESA model assigns a higher surrounding protected resource land score to projects where the conversion of an agricultural parcel would occur in an area that has a large proportion of surrounding protected resource land, as shown in Table 4.1-7, *Surrounding Protected Resource Land Scoring*.

Table 4.1-7
SURROUNDING PROTECTED RESOURCE LAND SCORING

Proportion of ZOI Designated as Protected Resource Land	Surrounding Protected Resource Land Score
90 – 100%	100
80 – 89%	90
75 – 79%	80
70 – 74%	70
65 – 69%	60
60 – 64%	50
55 – 59%	40
50 – 54%	30
45 – 49%	20
40 – 44%	10
< 40%	0

Source: Table 7 of CDC 1997
ZOI = Zone of Influence

Step 3: Final LESA Score

Each of the preceding scores are assigned a weight in the LESA model; half of the final LESA score is attributed to the land evaluation factors, and the other half of the score is attributed to the site assessment factors. The potential significance of a project's conversion of agricultural lands to non-agricultural use is then determined based on the California LESA Model Scoring Thresholds presented above in Table 4.1-2.

4.1.4.2 Issue 1: Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance

Would the proposed project convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to a non-agricultural use?

Impact Analysis

Implementation of the project would result in the conversion of the farmland to non-agricultural uses and would result in impacts to agricultural resources. Specifically, land designated as Unique Farmland and Farmland of Statewide Importance within the combined AWTF site and brine management system footprint (subject site) would be converted to non-agricultural uses. The significance of these impacts as assessed based on the LESA model scores, as detailed below.

Land Evaluation

Identified soils types within the subject site are shown on Figure 4.1-1 and listed in Table 4.1.8, *Land Capability Classification and Storie Index Scores for the Subject Site.* The LCC rating for each soil type was identified based on Table 4.1-3, and the Storie Index rating was determined based on the Soil Survey for the Western Riverside Area (SCS 1971). Results indicate a total LCC score of 41.6 and a total Storie Index score of 14.0.

Table 4.1-8
LAND CAPABILITY CLASSIFICATION AND STORIE INDEX SCORES FOR THE SUBJECT SITE

Map Symbol – Soil Type	Soil Description	Acres	Proportion of the Subject Site	LCC	LCC Rating	LCC Score	Storie Index Rating	Storie Index Score
Tt2	Traver fine sandy loam, strongly saline-alkali, eroded	31.04	92.18%	IVs	40	36.9	12	11.1
Tr2	Traver loamy fine sand, saline-alkali, eroded	2.63	7.82%	IIIs	60	4.7	37	2.9
	Totals	**33.67**	**100%**		**Total LCC Score**	**41.6**	**Total Storie Index Score**	**14.0**

Sources: CDC 1997
LCC = Land Capability Classification

Site Assessment

As described in Section 4.1.4.1, scoring for the site assessment involves factors related to project size, water resources availability, and surrounding land uses, as described below.

Project Size Score

The majority of the subject site is classified as LCC Class IV or lower, as shown in Table 4.1-9, *Project Size Score for the Subject Site;* however, since the score for all categories (as provided in Table 4.1-4) was 0, the project size score for the subject site is 0.

Table 4.1-9
PROJECT SIZE SCORE FOR THE SUBJECT SITE

LCC Class I or II Soils		LCC Class III Soils		LCC Class IV or Lower	
Subject Site Acres	**Score**	**Subject Site Acres**	**Score**	**Subject Site Acres**	**Score**
0	0	2.63	0	31.04	**0**

Note: Bold font indicated the highest score, which becomes the project size score for the Land Evaluation and Site Assessment (LESA) model.
LCC = Land Capability Classification

Water Resource Availability Score

The subject site is served by the District. A review of aerial images from Google Earth, dated from 1996 to 2018, indicate that portions of the subject site have been farmed during both non-drought and drought years. While water scarcity coupled with high cost of water would most likely result in restrictions to water availability, particularly in drought years, it was conservatively assumed that there are no restrictions to water availability at the subject site. The water resource availability score associated with Option 1 in Table 4.1-5 was selected, resulting in a water resource availability score of 100, as shown in Table 4.1-10, *Water Resource Availability Score for the Subject Site.*

Table 4.1-10
WATER RESOURCE AVAILABILITY SCORE FOR THE SUBJECT SITE

Water Source	Acres	Proportion of Subject Site	Water Resource Availability Score	Weighted Water Resource Availability Score
Eastern Municipal Water District	33.67	100%	100[1]	100
Total	**33.67**	**100%**	**Total Water Resource Availability Score**	**100**

[1] Option 1 from Table 4.1-4

Surrounding Agricultural Land Score

For this analysis, all land designated as farmland by the CDC's FMMP was conservatively considered to be actively used for agriculture. This includes approximately 873 acres of land within the 1,076-acre ZOI of the subject site. Table 4.1-11, *Agricultural Production within the Zone of Influence*, shows the surrounding agricultural land score associated with the agricultural uses in the area.

Table 4.1-11
AGRICULTURAL PRODUCTION WITHIN THE ZONE OF INFLUENCE

Total Acres within Zone of Influence	Acres of Agricultural Land	Percent in Agriculture	Surrounding Agricultural Land Score
1,076	837	78	80[1]

[1] Determined from Table 4.1-6.

Surrounding Protected Resource Land

There are no identified protected resources lands or preserves, such as Williamson Act contracted lands/agricultural preserves, publicly owned lands maintained as park, forest, or watershed resources, or lands with agricultural, wildlife habitat, open space, or other natural resource easements that restrict the conversion of such lands to urban or industrial uses within the subject site ZOI. Table 4.1-12, *Protected Resource Land within the Zone of Influence*, shows the surrounding protected resource land score associated with the proposed project's subject site ZOI.

Table 4.1-12
PROTECTED RESOURCE LAND WITHIN THE ZONE OF INFLUENCE

Total Acres within Zone of Influence	Acres of Protected Resource Land	Percent Protected Resource Land	Surrounding Protected Resource Land Score
1,076	0	0%	0[1]

[1] Determined from Table 4.1-7.

Final LESA Score

The total scores for the land evaluation and site assessment are shown in Table 4.1-13, *Final LESA Score for the Subject Site.* The final LESA score for the proposed project's subject site is 40.9, which would only be considered significant if the Land Evaluation Score and Site Assessment Score are both equal to or greater than 20 (refer to Table 4.1-2). Since the Land Evaluation Score is less than 20, the LESA model

indicates that the project's impacts to agricultural resources would not be significant. Factors that resulted in a relatively low score include the absence of soils on the site with a Storie Index rating of 80 or above and absence of soils with an LCC rating of Class I or Class II, as well as the relatively small size of the site. In addition, the lack of identified protected resource lands within the ZOI result in a corresponding score of zero. Based on the results of the LESA model, impacts related to the conversion of farmland to non-agricultural use are less than significant.

Table 4.1-13
FINAL LESA SCORE FOR THE SUBJECT SITE

	Total Scores	Weight	Weighted Scores
Land Evaluation			
Land Capability Classification (LCC)	41.6	0.25	10.4
Storie Index Rating	14.0	0.25	3.5
		Land Evaluation Score	*13.9*
Site Assessment			
Project Size	0	0.15	0.0
Water Resource Availability	100	0.15	15.0
Surrounding Agricultural Lands	80	0.15	12.0
Protected Resource Lands	0	0.05	0
		Site Assessment Score	*27.0*
		FINAL LESA Score	**40.9**

LESA = Land Evaluation and Site Assessment

Mitigation Measures

Impacts related to the conversion of farmland to a non-agricultural use would be less than significant; therefore, no mitigation is necessary.

4.1.4.3 Issue 2: Williamson Act Contract

Would the proposed project conflict with existing zoning for agricultural use, or a Williamson Act contact?

Impact Analysis

As discussed above under Section 4.1.2.1, Williamson Act contract lands within the county are identified as County-designated agricultural preserves. There are no County-designated agricultural preserves within or adjacent to the impact footprint of the proposed project (County of Riverside 2020). In addition, the proposed project components that would permanently convert land from its existing use and would occur on land currently utilized for agriculture (the AWTF and brine management system; identified above as the subject site for this analysis), would be located on land that is zoned as RM (Residential, Medium Density) by the City; therefore, the proposed project would not conflict with existing zoning for agricultural use or a Williamson Act contract. No impacts would occur.

Mitigation Measures

No impacts related to conflicting with existing zoning for agricultural use or a Williamson Act contract would occur; therefore, no mitigation is necessary.

4.1.4.4 Issue 3: Zoning for Forest Land

Would the proposed project conflict with existing zoning for, or cause rezoning of, forest land (as defined in PRC section 1220[g]), timberland (as defined by PRC section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104[g])?

Impact Analysis

There is no land zoned as forest land, timberland, or timberland zoned Timberland Production in the vicinity of the project; therefore, the project would not conflict with such zoning and no impacts would occur.

Mitigation Measures

No impacts related to conflict with forest land or timberland would occur; therefore, no mitigation is necessary.

4.1.4.5 Issue 4: Loss or Conversion of Forest Land

Would the proposed project result in the loss of forest land or conversion of forest land to non-forest use?

Impact Analysis

There is no forest land is the vicinity of the project; therefore, the project would not result in the loss of forest land or conversion of forest land to non-forest use and no impacts would occur.

Mitigation Measures

No impacts related to the loss of forest land or conversion of forest land to non-forest use would occur; therefore, no mitigation is necessary.

4.1.4.6 Issue 5: Conversion of Farmland to Non-agricultural Use or Forest Land to Non-forest Use

Would the proposed project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?

Impact Analysis

As discussed above, the project's proposed AWTF site and brine management system would be located on land that is currently used for agricultural production and includes land that is mapped by the CDC's FMMP as Unique Farmland and Farmland of Statewide Importance. The project would therefore result in the conversion of farmland to non-agricultural use; however, as detailed in Section 4.1.4.2, the results of the LESA model indicate that impacts related to the conversion of farmland to non-agricultural would be less than significant, primarily due to the relatively small size of the site and types of soils present on site. In addition, as discussed in Sections 4.1.4.4 and 4.1.4.5, the project would not covert forest land to non-forest use. The project would not involve other changes in the existing environment which, due to

their location or nature, could result in conversion of farmland to non-agricultural use or conversion of forest land to non-forest use. Impacts would be less than significant.

Mitigation Measures

Impacts related to the conversion of farmland to a non-agricultural use or conversion of forest land to non-forest use would be less than significant; therefore, no mitigation is necessary.

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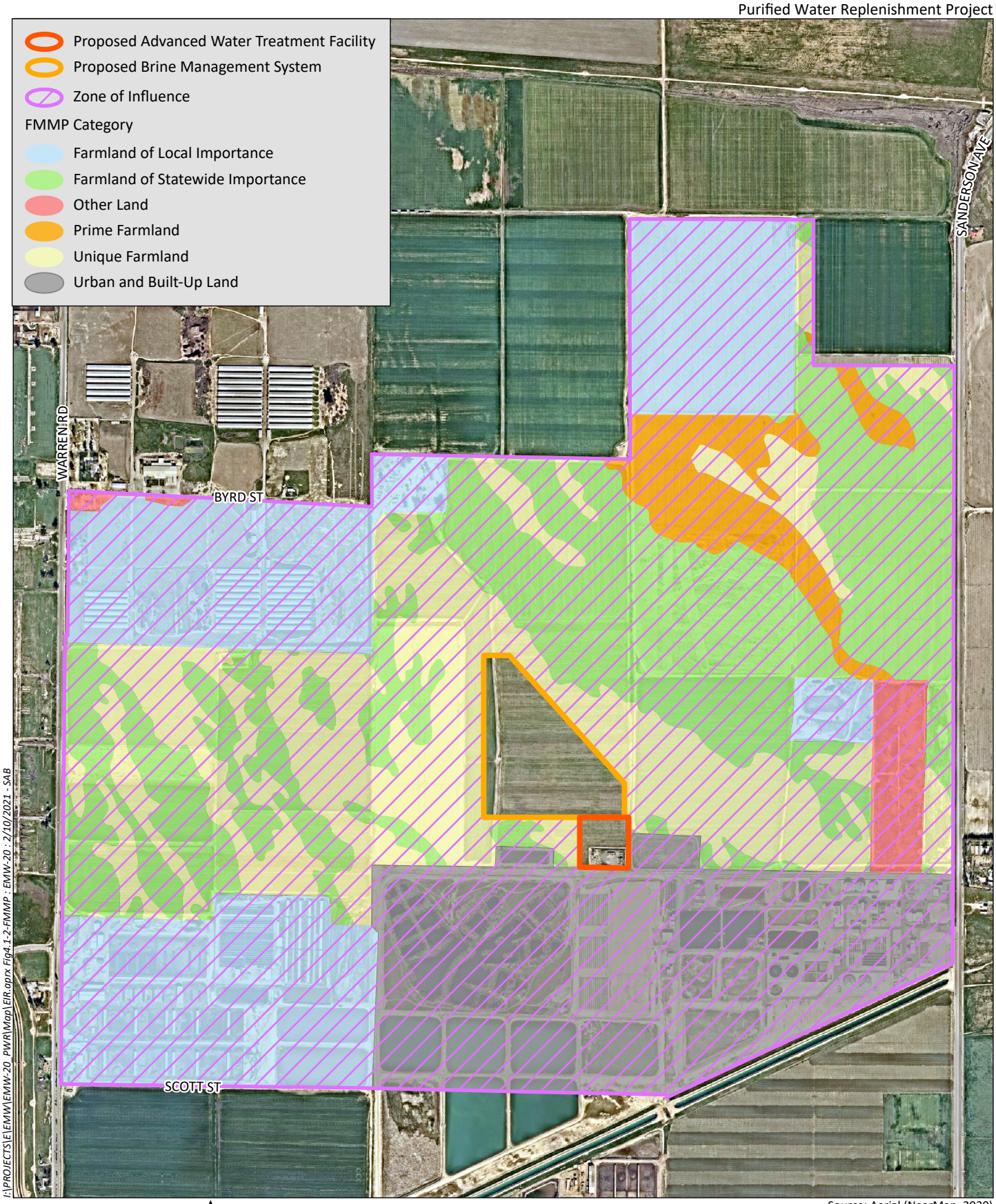
0 250 Feet

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Farmland Designations and Soils

Figure 4.1-1



0 1,200 Feet

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Agricultural Zone of Influence

Figure 4.1-2

4.2 AIR QUALITY

This section addresses the potential air quality impacts of the proposed project. The following discussion includes a description of existing conditions as related to air quality, a summary of applicable regulations, and an evaluation of the proposed project's potential environmental effects associated with conflict with an applicable air quality plan, a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment, exposure of sensitive receptors to substantial pollutant concentrations, and other emissions such as those leading to odors adversely affecting a substantial number of people. This section is based on the *Air Quality/Greenhouse Gas Emissions Technical Report* prepared for the proposed project (HELIX 2021; Appendix B).

4.2.1 Existing Conditions

4.2.1.1 Climate and Meteorology

The project site is in the SCAB, which consists of all or part of four counties: Los Angeles, San Bernardino, Riverside, and Orange. The distinctive climate of the SCAB is determined by its terrain and geographic location. The SCAB is a coastal plain with connecting broad valleys and low hills. It is bound by the Pacific Ocean to the southwest and high mountains around the rest of its perimeter. The general region lies in the semi-permanent high-pressure zone of the eastern Pacific, resulting in a mild climate tempered by cool sea breezes with light, average wind speeds.

The usually mild climatological pattern is interrupted occasionally by periods of extremely hot weather, winter storms, or Santa Ana winds. Winds in the Project area are usually driven by the dominant land/ sea breeze circulation system. Regional wind patterns are dominated by daytime onshore sea breezes. At night, the wind generally slows and reverses direction traveling toward the sea. Local canyons can also alter wind direction, with wind tending to flow parallel to the canyons. The vertical dispersion of air pollutants in the SCAB is hampered by the presence of persistent temperature inversions. High pressure systems, such as the semi-permanent high-pressure zone in which the SCAB is located, are characterized by an upper layer of dry air that warms as it descends, restricting the mobility of cooler marine-influenced air near the ground surface, and resulting in the formation of subsidence inversions. Such inversions restrict the vertical dispersion of air pollutants released into the marine layer and, together with strong sunlight, can produce worst-case conditions for the formation of photochemical smog.

The highest monthly average maximum temperature (98.9°F) in the project area, as measured at the Hemet climatic station, occurs in August, and the lowest monthly average minimum temperature (37.3°F) occurs in January (WRCC 2016). The average annual precipitation is approximately 11 inches, most of which occurs in the winter months (WRCC 2016).

4.2.1.2 Existing Air Quality

Criteria Air Pollutants

Six air pollutants have been identified by the U.S. Environmental Protection Agency (USEPA) and the California Air Resources Board (CARB) as being of concern both on a nationwide and statewide level: ground-level ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead, and particulate matter (PM), which is subdivided into two classes based on particle size: respirable PM equal to or less than 10 micrometers in diameter (PM_{10}) and fine PM equal to or less than 2.5 micrometers in

diameter ($PM_{2.5}$). These air pollutants are commonly referred to as "criteria air pollutants" because air quality standards are regulated using human health and environmentally based criteria. Criteria pollutants can be emitted directly from sources (primary pollutants; e.g., CO, SO_2, PM_{10}, $PM_{2.5}$, and lead), or they may be formed through chemical and photochemical reactions of precursor pollutants (secondary pollutants; e.g., ozone, NO_2, PM_{10}, and $PM_{2.5}$) in the atmosphere. PM_{10} and $PM_{2.5}$ can be both primary pollutants emitted directly from a source and secondary pollutants formed through chemical reactions in the atmosphere. The principal precursor pollutants of concern are reactive organic gasses ([ROGs] also known as volatile organic compounds [VOCs])[1] and nitrogen oxides (NO_X).

The descriptions of sources and general health effects for each of the criteria air pollutants are shown in Table 4.2-1, *Summary of Common Sources and Human Health Effects of Criteria Air Pollutants,* based on information provided by the California Air Pollution Control Officers Association ([CAPCOA] 2019). Specific adverse health effects to individuals or population groups induced by criteria pollutant emissions are highly dependent on a multitude of interconnected variables (e.g., cumulative concentrations, local meteorology and atmospheric conditions, and the number and character of exposed individuals [e.g., age, gender]). Criteria pollutant precursors (ROG and NO_X) affect air quality on a regional scale, typically after significant delay and distance from the pollutant source emissions. Health effects related to ozone and NO_2 are, therefore, the product of emissions generated by numerous sources throughout a region. As such, specific health effects from these criteria pollutant emissions cannot be directly correlated to the incremental contribution from a single project.

Table 4.2-1
SUMMARY OF COMMON SOURCES AND HUMAN HEALTH EFFECTS OF CRITERIA AIR POLLUTANTS

Pollutant	Major Man-Made Sources	Human Health Effects
Carbon Monoxide (CO)	An odorless, colorless gas formed when carbon in fuel is not burned completely; a component of motor vehicle exhaust.	Reduces the ability of blood to deliver oxygen to vital tissues, affecting the cardiovascular and nervous system. Impairs vision, causes dizziness, and can lead to unconsciousness or death.
Nitrogen Dioxide (NO_2)	A reddish-brown gas formed during fuel combustion for motor vehicles and industrial sources. Sources include motor vehicles, electric utilities, and other sources that burn fuel.	Respiratory irritant; aggravates lung and heart problems. Precursor to ozone and acid rain. Contributes to climate change and nutrient overloading which deteriorates water quality. Causes brown discoloration of the atmosphere.
Ozone (O_3)	Formed by a chemical reaction between reactive organic gases (ROGs) and nitrogen oxides (NO_X) in the presence of sunlight. Common sources of these precursor pollutants include motor vehicle exhaust, industrial emissions, gasoline storage and transport, solvents, paints, and landfills.	Irritates and causes inflammation of the mucous membranes and lung airways; causes wheezing, coughing, and pain when inhaling deeply; decreases lung capacity; aggravates lung and heart problems. Damages plants; reduces crop yield. Damages rubber, some textiles and dyes.

[1] CARB defines and uses the term ROGs while the USEPA defines and uses the term VOCs. The compounds included in the lists of ROGs and VOCs and the methods of calculation are slightly different. However, for the purposes of estimating criteria pollutant precursor emissions, the two terms are often used interchangeably.

Table 4.2-1 (cont.)
SUMMARY OF COMMON SOURCES AND HUMAN HEALTH EFFECTS OF CRITERIA AIR POLLUTANTS

Pollutant	Major Man-Made Sources	Human Health Effects
Particulate Matter (PM_{10} and $PM_{2.5}$)	Produced by power plants, steel mills, chemical plants, unpaved roads and parking lots, wood-burning stoves and fireplaces, automobiles, and other sources.	Increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing; aggravated asthma; development of chronic bronchitis; irregular heartbeat; nonfatal heart attacks; and premature death in people with heart or lung disease. Impairs visibility (haze).
Sulfur Dioxide (SO_2)	A colorless, nonflammable gas formed when fuel containing sulfur is burned, when gasoline is extracted from oil, or when metal is extracted from ore. Examples are petroleum refineries, cement manufacturing, metal processing facilities, locomotives, and ships.	Respiratory irritant. Aggravates lung and heart problems. In the presence of moisture and oxygen, sulfur dioxide converts to sulfuric acid which can damage marble, iron, and steel. Damages crops and natural vegetation. Impairs visibility. Precursor to acid rain.
Lead	Metallic element emitted from metal refineries, smelters, battery manufacturers, iron, and steel producers, use of leaded fuels by racing and aircraft industries.	Anemia, high blood pressure, brain and kidney damage, neurological disorders, cancer, lowered IQ. Affects animals, plants, and aquatic ecosystems.

Source: CAPCOA 2019

Toxic Air Contaminants

Toxic air contaminants (TACs) are a diverse group of air pollutants that may cause or contribute to an increase in deaths or in serious illness or that may pose a present or potential hazard to human health. TACs can cause long-term health effects such as cancer, birth defects, neurological damage, asthma, bronchitis, or genetic damage, or short-term acute effects such as eye watering, respiratory irritation (a cough), runny nose, throat pain, and headaches. TACs are considered either carcinogenic or noncarcinogenic based on the nature of the health effects associated with exposure to the pollutant. For carcinogenic TACs, there is no level of exposure that is considered safe and impacts are evaluated in terms of overall relative risk expressed as excess cancer cases per one million exposed individuals. Noncarcinogenic TACs differ in that there is generally assumed to be a safe level of exposure below which no negative health impact is believed to occur. These levels are determined on a pollutant-by-pollutant basis.

Monitored Air Quality

The SCAQMD maintains monitoring stations to measure ambient concentrations of pollutants in the SCAB. The nearest monitoring station to the project site is the Perris monitoring station, located approximately 12 miles east of the project site. The Perris station monitors ozone and PM_{10}. Data from the Lake Elsinore – W. Flint Street monitoring station, located approximately 20 miles southwest of the project site, was used for $PM_{2.5}$ and NO_2. Table 4.2-2, *Air Quality Monitoring Data*, presents a summary of the ambient pollutant concentrations monitored at the Perris and Lake Elsinore air quality monitoring stations during the years of 2017 through 2019 for which the SCAQMD has reported data. As shown in Table 4.2-2, the 1- and 8-hour ozone standards, as well as the state PM_{10} standard, were exceeded numerous times in each of the sample years.

Table 4.2-2
AIR QUALITY MONITORING DATA

Pollutant Standards	2017	2018	2019
Ozone (O_3)			
Maximum concentration 1-hour period (ppm)	0.120	0.117	0.118
Maximum concentration 8-hour period (ppm)	0.105	0.103	0.095
Days above 1-hour state standard (>0.09 ppm)	33	31	28
Days above 8-hour state/federal standard (>0.070 ppm)	80	67	64
Nitrogen Dioxide (NO_2)			
Maximum 1-hour concentration (ppm)	0.049	0.041	0.038
Days above state 1-hour standard (0.18 ppm)	0	0	0
Days above federal 1-hour standard (0.100 ppm)	0	0	0
Respirable Particulates (PM_{10})			
Maximum 24-hour concentration (µg/m^3)	75.4	64.4	97.0
Days above state standard (>50 µg/m^3)	11	2	4
Days above federal standard (>150 µg/m^3)	0	0	0
Fine Particulates ($PM_{2.5}$)			
Maximum 24-hour concentration (µg/m^3)	27.2	31.3	17.6
Days above federal standard (>35 µg/m^3)	*	*	*

Source: CARB 2021
*Insufficient data available to determine the value
ppm = parts per million

4.2.2 Regulatory Framework

4.2.2.1 Federal

Federal Clean Air Act

Air quality is defined by ambient air concentrations of specific pollutants identified by the USEPA to be of concern with respect to health and welfare of the public. The USEPA is responsible for enforcing the Federal Clean Air Act (CAA), first enacted in 1963 and amended numerous times in subsequent years (1965, 1967, 1970, 1977, and 1990). The CAA mandates the USEPA to establish National Ambient Air Quality Standards (NAAQS), which identify concentrations of pollutants in the ambient air below which no adverse effects on the public health and welfare are anticipated. In response, the USEPA established both primary and secondary standards for several criteria pollutants, which are introduced above. Table 4.2-3, *Ambient Air Quality Standards*, shows the federal and state ambient air quality standards for these pollutants.

Table 4.2-3
AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	California Standards	Federal Standards Primary[1]	Federal Standards Secondary[2]
O_3	1 Hour	0.09 ppm (180 µg/m^3)	–	–
	8 Hour	0.070 ppm (137 µg/m^3)	0.070 ppm (137 µg/m^3)	Same as Primary
PM_{10}	24 Hour	50 µg/m^3	150 µg/m^3	Same as Primary
	AAM	20 µg/m^3	–	Same as Primary
$PM_{2.5}$	24 Hour	–	35 µg/m^3	Same as Primary
	AAM	12 µg/m^3	12.0 µg/m^3	15.0 µg/m^3
CO	1 Hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	–
	8 Hour	9.0 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	–
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)	–	–
NO_2	1 Hour	0.18 ppm (339 µg/m^3)	0.100 ppm (188 µg/m^3)	–
	AAM	0.030 ppm (57 µg/m^3)	0.053 ppm (100 µg/m^3)	Same as Primary
SO_2	1 Hour	0.25 ppm (655 µg/m^3)	0.075 ppm (196 µg/m^3)	–
	3 Hour	–	–	0.5 ppm (1,300 µg/m^3)
	24 Hour	0.04 ppm (105 µg/m^3)	–	–
Lead	30-day Avg.	1.5 µg/m^3	–	–
	Calendar Quarter	–	1.5 µg/m^3	Same as Primary
	Rolling 3-month Avg.	–	0.15 µg/m^3	
Visibility Reducing Particles	8 Hour	Extinction coefficient of 0.23 per km – visibility ≥ 10 miles (0.07 per km – ≥30 miles for Lake Tahoe)	No Federal Standards	No Federal Standards
Sulfates	24 Hour	25 µg/m^3	No Federal Standards	No Federal Standards
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	No Federal Standards	No Federal Standards
Vinyl Chloride	24 Hour	0.01 ppm (26 µg/m^3)	No Federal Standards	No Federal Standards

Source: CARB 2020

[1] National Primary Standards: The levels of air quality necessary, within an adequate margin of safety, to protect the public health.

[2] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

AAM = Annual Arithmetic Mean; CO = carbon monoxide; km = kilometer; mg/m^3 = milligrams per cubic meter; NO_2 = nitrogen dioxide; O_3 = ozone; ppm = parts per million; PM_{10} = respirable particulate matter 10 microns or less in diameter; $PM_{2.5}$ = fine particulate matter 2.5 microns or less in diameter; SO_2 = sulfur dioxide; – = No Standard; µg/m^3 = micrograms per cubic meter

The CAA allows states to adopt ambient air quality standards and other regulations provided they are at least as stringent as federal standards. CARB has established the more stringent California Ambient Air Quality Standards (CAAQS) for the six criteria pollutants described in Table 4.2-1 through the California Clean Air Act of 1988, and also has established CAAQS for additional pollutants, including sulfates, hydrogen sulfide (H_2S), vinyl chloride, and visibility-reducing particles. Areas that do not meet the

NAAQS or the CAAQS for a particular pollutant are considered to be "nonattainment areas" for that pollutant.

The USEPA has classified air basins (or portions thereof) as being in "attainment," "nonattainment," or "unclassified" for each criteria air pollutant, based on whether or not the NAAQS have been achieved. If an area is designated unclassified, it is because inadequate air quality data were available as a basis for a nonattainment or attainment designation. The project site is located within the SCAB and, as such, is in an area designated a nonattainment area for certain pollutants that are regulated under the CAA. Table 4.2-4, *South Coast Air Basin Attainment Status*, in Section 4.2.2.3 lists the federal and state attainment status of the SCAB for the criteria pollutants. The USEPA classifies the SCAB as in attainment for CO, $PM_{10,}$ $NO_{2,}$ SO_2, and lead; in extreme nonattainment for 8-hour ozone; and in serious nonattainment for $PM_{2.5}$ with respect to federal air quality standards.

The CAA (and its subsequent amendments) requires each state to prepare an air quality control plan referred to as the State Implementation Plan (SIP). The CAA Amendments dictate that states containing areas violating the NAAQS revise their SIPs to include extra control measures to reduce air pollution. The SIP includes strategies and control measures to attain the NAAQS by deadlines established by the CAA. The SIP is periodically modified to reflect the latest emissions inventories, plans, and rules and regulations of air basins as reported by the agencies with jurisdiction over them. The USEPA has the responsibility to review all SIPs to determine whether they conform to the requirements of the CAA.

4.2.2.2 State

California Clean Air Act

The federal CAA allows states to adopt ambient air quality standards and other regulations provided that they are at least as stringent as federal standards. CARB, a part of the California Environmental Protection Agency (CalEPA), is responsible for the coordination and administration of both federal and state air pollution control programs within California, including setting the CAAQS. CARB also conducts research, compiles emission inventories, develops suggested control measures, and provides oversight of local programs. CARB establishes emissions standards for motor vehicles sold in California, consumer products (such as hairspray, aerosol paints, and barbecue lighter fluid), and various types of commercial equipment. It also sets fuel specifications to further reduce vehicular emissions. CARB also has primary responsibility for the development of California's SIP, for which it works closely with the federal government and the local air districts.

Table 4.2-4 lists the state attainment status of the SCAB for the criteria pollutants. Under state designation, the SCAB is currently in attainment for CO, $NO_{2,}$ $SO_{2,}$ and lead; and in nonattainment for ozone, $PM_{10,}$ and $PM_{2.5}$.

Toxic Air Contaminants

California's air toxics control program began in 1983 with the passage of the Toxic Air Contaminant Identification and Control Act, better known as AB 1807 or the Tanner Bill. When a compound becomes listed as a TAC under the Tanner process, CARB normally establishes minimum statewide emission control measures to be adopted by local air pollution control districts (APCDs). Later legislative amendments (Assembly Bill [AB] 2728) required CARB to incorporate all 189 federal hazardous air pollutants (HAPs) into the state list of TACs.

Supplementing the Tanner process, AB 2588 – the Air Toxics "Hot Spots" Information and Assessment Act of 1987 – currently regulates over 600 air compounds, including all of the Tanner-designated TACs. Under AB 2588, specified facilities must quantify emissions of regulated air toxics and report them to the local APCD. If the APCD determines that a potentially significant public health risk is posed by a given facility, the facility is required to perform a health risk assessment (HRA) and notify the public in the affected area if the calculated risks exceed specified criteria.

Diesel engines emit a complex mixture of air pollutants, including both gaseous and solid material. The solid material in diesel exhaust is known as diesel particulate matter (DPM). Almost all DPM is 10 microns or less in diameter, and 90 percent of DPM is less than 2.5 microns in diameter. Because of their extremely small size, these particles can be inhaled and eventually trapped in the bronchial and alveolar regions of the lung. In 1998, the CARB identified DPM as a toxic air contaminant based on published evidence of a relationship between diesel exhaust exposure and lung cancer and other adverse health effects. DPM has a significant impact on California's population—it is estimated that about 70 percent of total known cancer risk related to air toxics in California is attributable to DPM (CARB 2018).

In September 2000, CARB approved the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles* (Diesel Risk Reduction Plan; CARB 2000). The Diesel Risk Reduction Plan outlined a comprehensive and ambitious program that included the development of numerous new control measures over the next several years aimed at substantially reducing emissions from new and existing on-road vehicles (e.g., heavy-duty trucks and buses), off-road equipment (e.g., graders, tractors, forklifts, sweepers, and boats), portable equipment (e.g., pumps), and stationary engines (e.g., stand-by power generators). These requirements are now in force on a statewide basis.

4.2.2.3 Local

South Coast Air Quality Management District

The project is located in western Riverside County (County). Air quality in the western portion of the County is regulated by the SCAQMD. As a regional agency, the SCAQMD works directly with the Southern California Association of Governments (SCAG), County transportation commissions, and local governments and cooperates actively with all federal and state government agencies. The SCAQMD develops rules and regulations; establishes permitting requirements for stationary sources; inspects emissions sources; and enforces such measures through educational programs or fines, when necessary.

The SCAQMD is directly responsible for reducing emissions from stationary (area and point), mobile, and indirect sources. It has responded to this requirement by preparing a sequence of Air Quality Management Plans (AQMP).

On March 3, 2017, the SCAQMD adopted the 2016 AQMP, which is a regional and multi-agency effort (SCAQMD, CARB, SCAG, and USEPA). The 2016 AQMP represents a comprehensive analysis of emissions, meteorology, atmospheric chemistry, regional growth projections, and the impact of existing control measures. The plan seeks to achieve multiple goals in partnership with other entities promoting reductions in criteria pollutant, greenhouse gases, and toxic risk, as well as efficiencies in energy use, transportation, and goods movement (SCAQMD 2017a).

The AQMP, in combination with those from all other California nonattainment areas with serious (or worse) air quality problems, is submitted to CARB for inclusion in the SIP. The SIP relies on the same

information from SCAG to develop emission inventories and emission reduction strategies that are included in the attainment demonstration for the air basin. The current federal and state attainment status for the SCAB is presented in Table 4.2-4.

The SCAQMD Rule 403, *Fugitive Dust,* requires the implementation of best available dust control measures (BACM) during active operations capable of generating fugitive dust. Rule 403 prohibits the emissions of fugitive dust from any active operation, open storage pile, or disturbed surface area such that the dust remains visible in the atmosphere beyond the property line of the emission source; or the dust emission exceeds 20 percent opacity, if the dust emission is the result of movement of a motorized vehicle (SCAQMD 2005).

Table 4.2-4
SOUTH COAST AIR BASIN ATTAINMENT STATUS

Criteria Pollutant	Federal Designation	State Designation
O_3 (1-hour)	(No federal standard)	Nonattainment
O_3 (8-hour)	Extreme Nonattainment	Nonattainment
CO	Attainment (Maintenance)	Attainment
PM_{10}	Attainment (Maintenance)	Nonattainment
$PM_{2.5}$	Serious Nonattainment	Nonattainment
NO_2	Attainment (Maintenance)	Attainment
SO_2	Attainment	Attainment
Lead	Attainment	Attainment
Sulfates	(No federal standard)	Attainment
Hydrogen Sulfide	(No federal standard)	Attainment
Visibility	(No federal standard)	Attainment

Source: SCAQMD 2016
O_3 = ozone; CO = carbon monoxide; PM_{10} = particulate matter 10 micrometers or less in diameter; $PM_{2.5}$ = particulate matter 2.5 micrometers or less in diameter; NO_2 = nitrogen dioxide; SO_2 = sulfur dioxide

4.2.3 Thresholds of Significance

The following criteria from Appendix G of the *CEQA Guidelines* are used as thresholds of significance to determine the impacts of the proposed project as related to air quality. The proposed project would have a significant impact if it would:

1. Conflict with or obstruct implementation of the applicable air quality plan;

2. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard;

3. Expose sensitive receptors to substantial pollutant concentrations; or

4. Result in other emissions such as those leading to odors adversely affecting a substantial number of people.

Appendix G of the State *CEQA Guidelines* states that the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the above determinations. The SCAQMD has established significance thresholds to assess the regional and

localized impacts of project-related air pollutant emissions. The significance thresholds are updated, as needed, to appropriately represent the most current technical information and attainment status in the SCAB. Table 4.2-5, *SCAQMD Air Quality Significance Thresholds*, presents the most current significance thresholds, including regional daily thresholds for short-term construction and long-term operational emissions; maximum incremental cancer risk and hazard indices for TACs; and maximum ambient concentrations for exposure of sensitive receptors to localized pollutants. If the project's criteria pollutant and precursor emissions are below the SCAQMD daily regional thresholds, the project would not result in a cumulatively considerable net increase of any criteria pollutant, contribute substantially to a project air quality violation, or have an adverse effect on human health. If the project's emissions of criteria pollutants, precursors, and TACs result in localized concentrations and/or risk values below the SCAQMD thresholds, the project's impacts to sensitive receptors would be less than significant.

Table 4.2-5
SCAQMD AIR QUALITY SIGNIFICANCE THRESHOLDS

Mass Daily Thresholds (pounds per day)		
Pollutant	**Construction**	**Operation**
VOC	75	55
NO_X	100	55
CO	550	550
PM_{10}	150	150
$PM_{2.5}$	55	55
SO_X	150	150
Lead	3	3
Toxic Air Contaminants		
TACs	Maximum Incremental Cancer Risk ≥ 10 in 1 million cases (in areas ≥ 1 in 1 million) Cancer Burden > 0.5 excess cancer Chronic & Acute Hazard Index ≥ 1.0 (project increment)	
Ambient Air Quality for Criteria Pollutants		
NO_2	1-hour average ≥ 0.18 ppm Annual average ≥ 0.03 ppm	
CO	1-hour average ≥ 20.0 ppm (state) 8-hour average ≥ 9.0 ppm (state/federal)	
PM_{10}	24-hour average ≥ 10.4 µg/m^3 (construction) 24-hour average ≥ 2.5 µg/m^3 (operation) Annual average ≥ 1.0 µg/m^3	
$PM_{2.5}$	24-hour average ≥ 10.4 µg/m^3 (construction) 24-hour average ≥ 2.5 µg/m^3 (operation)	
SO_2	24-hour average ≥ 25 µg/m^3	

Source: SCAQMD 2015
lbs/day = pounds per day; VOC = volatile organic compound; NO_X = nitrogen oxides; CO = carbon monoxide; PM_{10} = respirable particulate matter 10 microns or less in diameter; $PM_{2.5}$ = fine particulate matter 2.5 microns or less in diameter; SO_X: sulfur oxides; TACs: toxic air contaminants; GHG: greenhouse gas emissions; MT/yr: metric tons per year; NO_2: nitrogen dioxide; ppm: parts per million; µg/m^3: micrograms per cubic meter

4.2.4 Project Impacts and Mitigation

4.2.4.1 Issue 1: Conflicts with Air Quality Plans

Would the proposed project conflict with or obstruct implementation of the applicable air quality plan?

Impact Analysis

SCAG is the regional planning agency for Los Angeles, Orange, Ventura, Riverside, San Bernardino, and Imperial Counties, and addresses regional issues relating to transportation, economy, community development, and environment. With regard to air quality planning, SCAG has prepared the Regional Transportation Plan (RTP)/Sustainable Communities Strategy (SCS), a long-range transportation plan that uses growth forecasts to project trends over a 20-year period to identify regional transportation strategies to address mobility needs. These growth forecasts form the basis for the land use and transportation control portions of the AQMP. These documents are utilized in the preparation of the air quality forecasts and consistency analysis included in the AQMP. Both the RTP/SCS and AQMP are based, in part, on projections originating with County and City General Plans.[2]

The two principal criteria for determining conformance to the AQMP are:

1. Whether the project would result in an increase in the frequency or severity of existing air quality violations; cause or contribute to new violations; or delay timely attainment of air quality standards and

2. Whether the project would result in population or employment growth that exceeds the assumptions in the AQMP.

With respect to the first criterion, the analyses presented in Sections 4.2.4.2 and 4.2.4.3, below, demonstrate that the project would not generate short-term or long-term emissions that could potentially cause an increase in the frequency or severity of existing air quality violations; cause or contribute to new violations; or delay timely attainment of air quality standards. With respect to the second criterion, the purpose of the project is to implement the District's PWR project to increase local water supply reliability and decrease dependence on imported water. The project would manage the water system in accordance with expected population growth and would not result in population growth beyond estimates for the area. In addition, jobs associated with construction and operation of the project would likely be filled by the local labor pool and the project would not create conditions for employment growth that exceeds growth estimates for the area. Based on these considerations, the project would not exceed the projections of the RTP/SCS and AQMP. Therefore, the project would not conflict with or obstruct implementation of the AQMP, and the impact would be less than significant.

Mitigation Measures

Impacts related to conflict with or obstruction of the applicable air quality plan would be less than significant; therefore, no mitigation is necessary.

[2] SCAG serves as the federally designated MPO for the Southern California region.

4.2.4.2 Issue 2: Air Quality Standards

Would the proposed project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?

Impact Analysis

The project would generate criteria pollutants and precursors in the short-term during construction and the long-term during operation. To determine whether the project's emissions would result a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment, contribute substantially to a projected air quality violation, or have an adverse effect on human health, the project's emissions were evaluated based on the quantitative emission thresholds established by the SCAQMD (as shown in Table 4.2-5). The project's emissions were estimated using the California Emissions Estimator Model (CalEEMod), Version 2016.3.2 (SCAQMD 2017b). CalEEMod is a computer model used to estimate criteria air pollutant resulting from construction and operation of land development projects throughout the state of California. CalEEMod was developed by the SCAQMD with the input of several air quality management and pollution control districts. As applicable to this analysis, the model calculates emissions of CO, PM_{10}, $PM_{2.5}$, SO_2 and the ozone precursors VOC and NO_X. For the full scope of methodology and assumptions used in this analysis, refer to Appendix B.

Phase I Construction Emissions

The project's Phase I construction would result in temporary increases in air pollutant emissions. These emissions would be generated in the form of fugitive dust emissions (PM_{10} and $PM_{2.5}$) and ozone precursor emissions (NO_X and VOCs). Operation of heavy equipment and vehicles during the construction phases would generate exhaust emissions from fuel combustion. Excavators, loaders, forklifts, pavers, generators, rollers, air compressors, backhoes, dozers, graders, dump trucks, compactors, welders, pumps, and cranes would be the primary equipment used for project construction. Fugitive dust emissions would be generated from earth disturbance during site grading, as well as from construction vehicles operating on open fields or dirt roadways within or adjacent to construction sites. Maximum daily emissions of NO_X, CO, SO_2, PM_{10}, and $PM_{2.5}$ from Phase I construction are anticipated to occur when the following activities occur simultaneously in 2022: AWTF building construction, brine management system grading, insertion/pulling pits excavation, pipeline sliplining, pipeline trenching, and pipeline installation. Maximum daily emissions of VOCs from Phase I construction are anticipated to occur during architectural coating of the AWTF in 2023. Emissions calculations assume application of water twice per day during grading, a 15-miles per hour (mph) speed limit on unpaved surfaces, and a 12 percent moisture content on unpaved roads in compliance with SCAQMD Rule 403, Fugitive Dust.

The results of the emissions calculations for these activities are shown in Table 4.2-6, *Maximum Daily Phase I Construction Emissions*. The data are presented as the maximum anticipated daily emissions for comparison with the thresholds identified previously in Table 4.2-6.

Table 4.2-6
MAXIMUM DAILY PHASE I CONSTRUCTION EMISSIONS

Activity	VOC*	NO_X*	CO*	SO_X*	PM_{10}*	$PM_{2.5}$*
AWTF Building Construction - 2022	2	15	18	<0.5	10	2
Brine Management System Grading - 2022	4	34	24	<0.5	14	4
Insertion/Pulling Pit Excavation - 2022	<0.5	3	5	<0.5	<0.5	<0.5
Pipeline Sliplining - 2022	1	6	8	<0.5	<0.5	<0.5
Pipeline Trenching - 2022	<0.5	3	5	<0.5	<0.5	<0.5
Pipeline Installation - 2022	1	8	10	<0.5	1	<0.5
AWTF Architectural Coating – 2023	10	--	--	--	--	--
Total Maximum Daily Emissions	**10**	**69**	**70**	**<0.5**	**25**	**7**
Significance Thresholds	*75*	*100*	*550*	*150*	*150*	*55*
Significant Impact?	***No***	***No***	***No***	***No***	***No***	***No***

Source: HELIX 2021
Note: Emissions calculations assume application of water twice per day during grading, a 15 miles per hour (mph) speed limit on unpaved surfaces, and a 12 percent moisture content on unpaved roads in compliance with SCAQMD Rule 403, Fugitive Dust.
* Pollutant Emissions (pounds per day)
VOC = volatile organic compound; NO_X = nitrogen oxides; CO = carbon monoxide; SO_X = sulfur oxides; PM_{10} = respirable particulate matter 10 microns or less in diameter; $PM_{2.5}$ = fine particulate matter 2.5 microns or less in diameter

As shown in Table 4.2-6, emissions from Phase I construction activities would not exceed the SCAQMD daily thresholds; therefore, the project's Phase I construction emissions would result in a less-than-significant impact.

Phase I Operational Emissions

Main operational emissions include those from area sources, such as landscaping equipment and consumer products, mobile sources associated with traffic, on-site energy use, and stationary sources, such as generators. It was conservatively assumed that operation of Phase I would involve an average of 10 daily vehicle trips to the AWTF site, accounting for up to five staff members, occasional visitor tours, and 10 chemical deliveries per month. The electricity use associated with Phase I project operation was estimated to be 2,971,470 kilowatt hours (kWh) per year at the AWTF, consisting of electricity for the process equipment in the Process Area and for heating, ventilation, and air conditioning (HVAC) systems and lighting in the Control Area. Energy use associated with pumps operating at the brine ponds is estimated to be 1,303,842 kWh per year. A 12.47 kilovolt (kV)/400 kilowatt (kW) standby diesel generator would be provided at the AWTF site to be used in the event of power failure. An additional emergency generator may also be provided at the site. The generators were assumed to be tested for 30 minutes once per month.

Table 4.2-7, *Maximum Daily Phase I (2024) Operational Emissions*, presents the summary of operational emissions for Phase I of the project in year 2024.

Table 4.2-7
MAXIMUM DAILY PHASE I (2024) OPERATIONAL EMISSIONS

Category	VOC*	NO_X*	CO*	SO_2*	PM_{10}*	$PM_{2.5}$*
Area	18	0.0	<0.5	0.0	0.0	0.0
Energy	0.0	0.0	0.0	0.0	0.0	0.0
Mobile	<0.5	<0.5	<0.5	0.0	<0.5	<0.5
Stationary	1	3	2	0.0	<0.5	<0.5
Total Daily Emissions	**19**	**3**	**3**	**0.0**	**<0.5**	**<0.5**
Significance Thresholds	*55*	*55*	*550*	*150*	*150*	*55*
Significant Impact?	***No***	***No***	***No***	***No***	***No***	***No***

Source: HELIX 2021
* Pollutant Emissions (pounds per day)
VOC = volatile organic compound; NO_X = nitrogen oxides; CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = respirable particulate matter 10 microns or less in diameter; $PM_{2.5}$ = fine particulate matter 2.5 microns or less in diameter

As shown in Table 4.2-7, project emissions of all criteria pollutants during Phase I operation would be below the daily thresholds; therefore, the project's Phase I operational emissions would result in a less-than-significant impact.

Concurrent Phase I Operations and Phase II Construction

Due to the anticipated project phasing, Phase I operations would likely occur concurrently with Phase II construction in year 2034. Table 4.2-8, *Concurrent Phase I Operational and Phase II Construction Emissions*, shows the maximum daily emissions from this anticipated overlap.

Table 4.2-8
CONCURRENT PHASE I OPERATIONAL AND PHASE II CONSTRUCTION EMISSIONS

Category	VOC*	NO_X*	CO*	SO_2*	PM_{10}*	$PM_{2.5}$*
Phase I Operations (2034)	19	3	2	0.0	<0.5	<0.5
Phase II Construction	10	7	18	<0.5	1	<0.5
Total Daily Emissions	**29**	**10**	**20**	**<0.5**	**1**	**<0.5**
Screening-Level Thresholds	*55*	*55*	*550*	*150*	*150*	*55*
Significant Impact?	***No***	***No***	***No***	***No***	***No***	***No***

Source: HELIX 2021
Note: Construction emissions calculations assume application of water twice per day during grading, a 15-miles per hour (mph) speed limit on unpaved surfaces, and a 12 percent moisture content on unpaved roads in compliance with SCAQMD Rule 403, Fugitive Dust.
* Pollutant Emissions (pounds per day)
VOC = volatile organic compound; NO_X = nitrogen oxides; CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = respirable particulate matter 10 microns or less in diameter; $PM_{2.5}$ = fine particulate matter 2.5 microns or less in diameter

As shown in Table 4.2-8, the combined Phase I operational emissions and Phase II construction emissions would be below the significance threshold for all criteria pollutants; therefore, the project's concurrent Phase I operational and Phase II construction emissions would result in a less-than-significant impact.

Phase II Operations

Phase II (full) project operational emissions sources would be the same as those from Phase I, including those from area sources, such as landscaping equipment and consumer products, mobile sources associated with traffic, and on-site energy use. Phase II involves an increase in vehicle trips associated with increased chemical deliveries and increased energy use associated with the increased treatment capacity. An average of 11 daily trips was assumed. The electricity usage during operation of Phase II was estimated to be 10,764,116 kWh per year. The energy usage associated with the brine ponds would remain the same at 1,303,842 kWh per year.

Table 4.2-9, *Maximum Daily Phase II Operational Emissions*, presents the summary of operational emissions for Phase II of the project in year 2035.

Table 4.2-9
MAXIMUM DAILY PHASE II OPERATIONAL EMISSIONS

Category	VOC*	NO_X*	CO*	SO_2*	PM_{10}*	$PM_{2.5}$*
Area	20	0.0	<0.5	0.0	0.0	0.0
Energy	0.0	0.0	0.0	0.0	0.0	0.0
Mobile	<0.5	<0.5	<0.5	0.0	<0.5	<0.5
Stationary	1	3	2	0.0	<0.5	<0.5
Total Daily Emissions	**21**	**3**	**3**	**0.0**	<0.5	<0.5
Screening-Level Thresholds	*55*	*55*	*550*	*150*	*150*	*55*
Significant Impact?	***No***	***No***	***No***	***No***	***No***	***No***

Source: CalEEMod (output data is provided in Appendix A)
Note: Total is the sum of the unrounded values.
* Pollutant Emissions (pounds per day)
VOC = volatile organic compound; NO_X = nitrogen oxides; CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = respirable particulate matter 10 microns or less in diameter; $PM_{2.5}$ = fine particulate matter 2.5 microns or less in diameter

As shown in Table 4.2-9, project emissions of all criteria pollutants during full Phase II project operations would be below the daily thresholds; therefore, the project's Phase II operational emissions would result in a less-than-significant impact.

Conclusion

The region is a federal and/or state nonattainment area for PM_{10}, $PM_{2.5,}$ and ozone. As shown above and in Section 4.2.4.3 below, the project would not result in emissions of PM_{10}, $PM_{2.5}$, or the ozone precursors NO_X and VOCs during construction that would exceed regional or local thresholds and would therefore not be cumulatively considerable. Long-term emissions, as shown in Table 4.2-9, would be well below regional thresholds and, therefore, not cumulatively considerable. Impacts associated with emissions resulting in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment are assessed as less than significant.

Mitigation Measures

Impacts related to emissions resulting in a cumulatively considerable net increase of criteria pollutants for which the project region is non-attainment would be less than significant; therefore, no mitigation is necessary.

4.2.4.3 Issue 3: Sensitive Receptors

Would the proposed project expose sensitive receptors to substantial pollutant concentrations?

Impact Analysis

Construction Activities

Criteria Pollutants

The localized effects from the on-site portion of daily construction emissions were evaluated at sensitive receptor locations potentially impacted by the project according to the SCAQMD's localized significance threshold (LST) methodology. The LST methodology and associated mass rate look-up tables by source receptor area (SRA) can be used to determine whether a project may generate significant adverse localized air quality impacts. LSTs represent the maximum emissions from a project that will not cause or contribute to an exceedance of the most stringent applicable federal or state ambient air quality standard; they are developed based on the ambient concentrations of that pollutant for each SRA (SCAQMD 2009).

The proposed project would involve various components that would be constructed at different locations, thus affecting different receptors, and at different times (Phase I vs. Phase II); therefore, the following four construction components were assessed separately for localized air quality impacts: (1) Phase I combined AWTF and brine management system construction; (2) Phase I pipeline sliplining; (3) Phase I pipeline installation; and (4) Phase II AWTF expansion. For each component, the phase resulting in maximum emissions was analyzed. Note that although construction of the AWTF and brine management system would occur at set locations and have the potential to affect a given receptor for the entirety of the construction phase, construction associated with the pipelines would progress along the alignments (an average of 80 feet per day for the 36-inch pipeline) and would not affect a given receptor for the entirety of the construction phase.

Consistent with the LST guidelines, when quantifying mass emissions for localized analysis, only emissions that occur on-site are considered. Emissions related to off-site delivery and material transport truck trips and construction worker trips are not considered in the evaluation of construction-related localized impacts, as these do not contribute to emissions generated on a project site. The LSTs being applied to the project are based on SRA 28, Hemet/San Jacinto Valley. As shown in Table 4.2-10, *Maximum Localized Daily Construction Emissions*, localized emissions would not exceed the SCAQMD LSTs. Therefore, project construction would not expose sensitive receptors to substantial criteria pollutant concentrations, and impacts would be less than significant.

Table 4.2-10
MAXIMUM LOCALIZED DAILY CONSTRUCTION EMISSIONS

Phase(s)	NO_X*	CO*	PM_{10}*	$PM_{2.5}$*
Phase I Combined AWTF and Brine Management System Construction				
AWTF Building Construction	34	23	5	3
Brine Management System Grading	13	17	1	1
Total Daily Emissions	**47**	**40**	**6**	**4**
Localized Significance Thresholds	*1,072*	*29,256*	*207*	*105*
Significant Impact?	***No***	***No***	***No***	***No***
Phase I Pipeline Sliplining				
Insertion/Pulling Pits Excavation	3	5	<0.5	<0.5
Pipeline Sliplining	5	8	<0.5	<0.5
Total Daily Emissions	**8**	**12**	**<0.5**	**<0.5**
Localized Significance Thresholds	*162*	*750*	*4*	*3*
Significant Impact?	***No***	***No***	***No***	***No***
Phase I Pipeline Installation				
Pipeline Trenching	3	5	<0.5	<0.5
Pipeline Installation	7	10	<0.5	<0.5
Total Daily Emissions	**10**	**15**	**<0.5**	**<0.5**
Localized Significance Thresholds	*162*	*750*	*4*	*3*
Significant Impact?	***No***	***No***	***No***	***No***
Phase II AWTF Expansion				
Building Construction	6	17	<0.5	<0.5
Total Daily Emissions	**6**	**17**	**<0.5**	**<0.5**
Localized Significance Thresholds	*896*	*23,866*	*178*	*86*
Significant Impact?	***No***	***No***	***No***	***No***

Note: Totals may not add up due to rounding.
* Pollutant Emissions (pounds per day)
NO_X = nitrogen oxides; CO = carbon monoxide; PM_{10} = respirable particulate matter 10 microns or less in diameter; $PM_{2.5}$ = fine particulate matter 2.5 microns or less in diameter; AWTF = Advanced Water Treatment Facility

Toxic Air Contaminants

Construction activities would result in short-term, project-generated emissions of diesel PM from the exhaust of off-road, heavy-duty diesel equipment. CARB identified diesel PM as a TAC in 1998. The dose to which receptors are exposed is the primary factor used to determine health risk. Dose is a function of the concentration of a substance or substances in the environment and the duration of exposure to the substance. Thus, the risks estimated for a maximally exposed individual (MEI) are higher if a fixed exposure occurs over a longer time period. According to the Office of Environmental Health Hazard Assessment, HRAs, which determine the exposure of sensitive receptors to TAC emissions, should be based on a 30-year exposure period; however, such assessments should be limited to the period/duration of activities associated with the project.

The construction period would be relatively short when compared to a 30-year exposure period. In addition, the construction would occur at various locations over a large area, and a large amount of equipment would not occur near a single sensitive receptor for an extended period of time. As described above, construction associated with the pipelines would progress along the alignments (an average of 80 feet per day for the 36-inch pipeline) and would not affect a given receptor for the entirety of the

construction phase. Combined with the highly dispersive properties of diesel PM and additional reductions in exhaust emissions from improved equipment, construction-related emissions would not expose sensitive receptors to substantial emissions of diesel PM.

Operational Activities

Carbon Monoxide Hotspots

A CO hotspot is an area of localized CO pollution caused by severe vehicle congestion on major roadways, typically near intersections. A quantitative screening is required in two instances: (1) if a project increases the average delay at signalized intersections operating at Level of Service (LOS) E or F; or (2) if a project causes an intersection that would operate at LOS D or better without the project to operate at LOS E or F with the project. Vehicular traffic generated during operation of the proposed project would be limited to daily commute trips for up to five staff members at the AWTF site, chemical delivery trips (estimated at 10 trips per month during Phase I and 11 trips per month during Phase II), and occasional trips associated with public tours of the AWTF site. This would result in a low number of average daily vehicle trips and the project would neither cause new severe congestion nor significantly worsen existing congestion at nearby intersections. There would be no potential for a CO hotspot or exposure of sensitive receptors to substantial, project-generated, local CO emissions. The impact would be less than significant.

Toxic Air Contaminants

With regard to long-term operations, a new source of TACs includes two backup diesel generators. The backup generator would only be used for testing or during emergency situations. It is anticipated to be tested for 30 minutes per month, equating to 6 hours of operation per year. At this length of operation, the generators would emit negligible TACs. As shown in Tables 4.2-7 and 4.2-9, above, operational emissions of PM from stationary sources (which include the generators) would be less one pound per day. The proposed pumps and other equipment at the AWTF would be electrically powered and would not generate on-site emissions of TACs.

Impacts related to exposure of sensitive receptors to substantial pollutant concentrations during project construction and operation would be less than significant.

Mitigation Measures

Impacts related to the exposure of sensitive receptors to substantial pollutant concentrations would be less than significant; therefore, no mitigation is necessary.

4.2.4.4 Issue 4: Odors

Would the proposed project result in other emissions such as those leading to odors adversely affecting a substantial number of people?

Impact Analysis

Implementation of the proposed project could have the potential to generate objectionable odors through construction activities and during operation of some of the project components, as discussed below.

Construction

Construction activities are not a typical source of nuisance odors, although construction could result in minor amounts of odorous compounds associated with diesel heavy equipment exhaust or evaporation of volatile compounds within paint or other coatings. The smell of diesel exhaust is due in most part to the presence of sulfur and the creation of hydrocarbons during combustion (Nett Technologies 2018). As shown above, project construction would not result in significant emissions of sulfur oxides. Additionally, because project construction would occur at various locations for the different project components, use of construction equipment would not occur all at once or at the same location. Odorous hydrocarbons emissions would also dissipate beyond the emissions sources and would only affect residents in the immediate vicinity of the construction sites. Potentially affected residents would be limited to those at residential properties adjacent to the conveyance pipelines construction along SR 79 and Ramona Expressway. Construction of the conveyance pipelines would occur in a linear manner and equipment would not operate, and odorous hydrocarbons would not be emitted, adjacent to a given residential location for extended periods of time. There are no residents in the vicinity of the AWTF or brine ponds construction sites that would be affected by construction-related odors. Construction odor emissions would also be temporary and would cease upon completion of construction. Odor impacts associated with project construction would be less than significant.

Operation

CARB's Air Quality and Land Use Handbook includes a list of the most common sources of odor complaints received by local air districts. Typical sources of odor complaints include facilities such as sewage treatment plants, landfills, recycling facilities, petroleum refineries, and livestock operations.

While the proposed project would involve water treatment, the treatment process would use recycled water that has already undergone tertiary treatment. The primary odor associated with sewage water treatment is from the release of odorous hydrogen sulfide from the anaerobic decomposition of organic compounds that occurs when treating the sewage. The tertiary recycled water that would be used in the advanced water treatment process would have already gone through this process. In other words, the water that would be used in the project's advanced water treatment process is relatively clean and would not involve the same odor generation as a sewage treatment process. In addition, the project's advanced water treatment process, including the use and storage of chemicals, would occur within closed tanks and pipes and would not emit vapors into the air.

The proposed brine management system would accommodate and store the waste product from the advanced water treatment process, which would be a brine (i.e., salt) concentrate. The main compounds in the brine concentrate would include the anions and cations of chloride, nitrate, sulfate, potassium, and sodium, which are non-odorous compounds that occur widely in everyday life. The brine management system would function by storing the waste product and evaporating out water, thus leaving behind the salt compounds. The evaporated water droplets would be contained within the brine management system, per state regulations. As such, the storage of the project's advanced water treatment process waste would not emit objectionable odors off site. In addition, there are no residents within the vicinity of the proposed brine management system site.

The conveyance pipelines would be the only operational components of the project that would be located in proximity to residents that could be affected by objectionable odors, as the pipelines would run adjacent to single-family residences located along Ramona Expressway. The conveyance pipelines,

however, would convey advanced treated water and would be located below ground; therefore, they would not be a source of odors to nearby residents.

As such, operation of the proposed project would not result in significant objectionable odors and impacts would be less than significant.

Mitigation Measures

Impacts related to the project resulting in other emissions such as those leading to odors adversely affecting a substantial number of people would be less than significant; therefore, no mitigation is necessary.

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4.3 BIOLOGICAL RESOURCES

This section addresses the potential impacts of the proposed project to biological resources. The following discussion includes a description of existing conditions as related to biological resources, a summary of applicable regulations, and an evaluation of the proposed project's potential environmental effects associated with biological resources, including special-status species, sensitive natural communities, wetlands, wildlife movement, and local policies and plans protecting biological resources. The section is based on the Biological Technical Report prepared for the proposed project (HELIX 2020a; Appendix C). Information included in the Biological Technical Report was obtained through a literature review related to biological resources, a general biological survey, focused biological surveys, vegetation mapping, and a jurisdictional delineation. The study area included the various project components with a 100-foot buffer.

4.3.1 Existing Conditions

4.3.1.1 Vegetation Communities/Land Covers

Vegetation communities present within the study area were mapped based on the Holland/Oberbauer classification system and cross-walked to the Manual of California Vegetation (MCV). For communities not described by the MCV, the communities were described using the Holland/Oberbauer code distribution. Six vegetation communities/land covers are present within the study area, including red willow association (southern willow scrub), open water, California buckwheat association (Riversidian sage scrub), field/pasture, disturbed habitat, and urban/developed. Acreages of each vegetation community/land cover that is present within the study area are shown in Table 4.3-1, *Vegetation Communities and Land Covers.*

Table 4.3-1
VEGETATION COMMUNITIES AND LAND COVERS

Vegetation Community/Land Cover	Acres
Red Willow Association (Southern Willow Scrub)	8.13
Open Water	2.06
California Buckwheat Association (Riversidian Sage Scrub)	0.48
Field/Pasture	72.80
Disturbed Habitat	50.47
Urban and Developed	88.43
Total	**222.38**

Source: HELIX 2020a
Note: Totals may not add up exactly due to rounding.

These vegetation communities/land covers are described below (refer to Figure 4.3-1, *Vegetation and Sensitive Resources/Land Use Impacts*).

Red Willow Association (Southern Willow Scrub)

Red willow association or southern willow scrub consists of dense, broadleaved, winter-deciduous stands of trees dominated by shrubby willows (*Salix* spp.) in association with mule fat (*Baccharis salicifolia*), and with scattered emergent cottonwood (*Populus fremontii*) and western sycamores (*Platanus racemosa*). This vegetation community occurs on loose, sandy or fine gravelly alluvium

deposited near stream channels during flood flows. Within the study area, this habitat is dominated by red willow (*Salix laevigata*). A total of 8.13 acres of southern willow scrub occurs within the study area, located along the portion of the alignment of the 18-inch pipeline to be sliplined between Sanderson Avenue and Lyon Avenue (refer to Figures 4.3-1b and 4.3-1c).

Open Water

Open water is an unvegetated habitat. It is made up of year-round bodies of saline or fresh water. Fresh water bodies include lakes, streams, ponds, or rivers. A total of 2.06 acres of open water occurs within the study area associated with a pond feature east of Sanderson Avenue and the Alessandro Ponds (refer to Figures 4.3-1b, 4.3-1c, and 4.3-1f).

California Buckwheat Association (Riversidian Sage Scrub)

California buckwheat association or Riversidian sage scrub is the most xeric expression of coastal sage scrub, typically found on xeric sites such as steep slopes, severely drained soils, or clays that release stored soil moisture slowly. Typical stands are fairly open and dominated by California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum* ssp. *fasciculatum*), and foxtail chess (*Bromus madritensis* ssp. *rubens*). Riversidian sage scrub within the study area is dominated by California buckwheat and felt-leaved yerba santa (*Eriodictyon crassifolium*). A total of 0.48 acre of Riversidian sage scrub occurs within the study area at the northeast and southeast corners of the intersection of Ramona Expressway and Main Street, adjacent to the proposed 36-inch pipeline alignment (refer to Figure 4.3-1h).

Field/Pasture

In fields/pastures, planted fields are usually monoculture crops that are irrigated and usually artificially seeded and maintained. A total of 72.80 acres of field/pasture occurs within the study area along the entire project alignment, with a large portion of the mapped acreage occurring at the site of the proposed brine management system (refer to Figure 4.3-1a).

Disturbed Habitat

Disturbed habitat includes land cleared of vegetation (e.g., dirt roads), land containing a preponderance of non-native plant species such as ornamentals or ruderal exotic species that take advantage of disturbance (previously cleared or abandoned landscaping), or land showing signs of past or present animal usage that removes any capability of providing viable habitat. Within the study area, disturbed habitat consists of bare ground with scattered annual non-native species including mustard (*Brassica* ssp.), Russian thistle (*Salsola tragus*) and filaree (*Erodium cicutarium*). Disturbed habitat covers 50.47 acres of the study area and consists of dirt roads and undeveloped land adjacent to roadsides. Disturbed habitat within the study area occurs adjacent to most of the project alignment (refer to Figures 4.3-1a through 4.3-1i).

Urban/Developed

Urban/developed land includes areas that have been constructed upon or otherwise covered with a permanent, unnatural surface and may include, for example, structures, pavement, irrigated landscaping, or hardscape to the extent that no natural land is evident. These areas no longer support native or naturalized vegetation. Developed portions of the study area consist of paved roads,

residential developments, and access paths with compacted soil/gravel. A total of 88.43 acres of urban/developed land occurs in the study area adjacent to most of the project alignment, except for where the project alignment is within field/pasture areas (refer to Figures 4.3-1a through 4.3-1i).

4.3.1.2 Plants

A total of 86 plant species were observed within the study area during the general biological survey and focused species surveys, of which 49 (57 percent) are non-native species (refer to Appendix C for a complete list of plant species observed). The predominance of non-native species is indicative of the high degree of disturbance as a result of historical and current uses of the study area.

4.3.1.3 Animals

A total of 45 animal species were observed/detected within the study area during the general biological survey and focused species surveys, including one butterfly, two reptiles, one amphibian, and 38 bird species (refer to Appendix C for a complete list of animal species observed or detected).

4.3.1.4 Sensitive Resources

Sensitive Vegetation Communities/Habitats

Sensitive vegetation communities/habitat types are defined as land that supports unique vegetation communities or the habitats of rare or endangered species or subspecies of animals or plants as defined by Section 15380 of the State *CEQA Guidelines*.

The CDFW evaluates the rarity of natural communities using the NatureServe's Heritage Methodology (Faber-Langendoen et. al 2012) in which communities are given a G (global) and S (State) rank based on their degree of imperilment (as measured by rarity, trends, and threats). Communities are assigned an overall rank of 1 through 5 with 1 being considered very rare and threatened and 5 being considered demonstrably secure. Communities with a Rarity Ranking of S1 (critically imperiled), S2 (imperiled), or S3 (vulnerable) are considered sensitive by the CDFW.

Vegetation types used by the CDFW follow the National Vegetation Classification System (NVCS) using the MCV, 2nd Edition (Sawyer et al. 2009). The MCV serves as the California extension of the NVCS. The MCV classifies vegetation based on floristic and structural details that are represented as alliances and associations. Vegetation mapped within the Study Area followed Holland (1986). Direct translations between Holland and MCV do not exist for all vegetation types. Additionally, a single vegetation community under Holland may fit the definition of several different alliances or associations described within the MCV. Vegetation communities mapped within the Study Area were translated to the equivalent classification unit under MCV in order to determine sensitivity rankings. For communities that do not have direct translations within MCV, professional judgment was used to find the best corresponding association or alliance.

One sensitive vegetation community occurs within the study area: southern willow scrub. Riversidian sage scrub dominated by California buckwheat has a ranking of S5; therefore, it is not considered a sensitive vegetation community. Disturbed habitat, field/pasture, open water, and developed lands also do not meet the definition of sensitive habitat under CEQA. Impacts to these vegetation communities do not require mitigation.

Special Status Plant Species

Special status plant species have been afforded special status and/or recognition by the U.S. Fish and Wildlife Service (USFWS), CDFW, and/or the County, and may also be included in the California Native Plant Society's (CNPS') Inventory of Rare and Endangered Plants. Their status is often based on one or more of three distributional attributes: geographic range, habitat specificity, and/or population size. Sensitive species are those considered unusual or limited in that they are: (1) only found in the region; (2) a local representative of a species or association of species not otherwise found in the region; or (3) severely depleted within their ranges or within the region.

In addition to the general biological survey conducted for the study area, a rare plant survey of the was conducted during two survey events in spring and early summer 2020. The rare plant survey included a complete botanical inventory and 100 percent visual coverage of the study area. The survey periods were determined based on the recorded blooming periods of special status plant species known to occur within the study area and surrounding area. The first survey was conducted in April 2020 to detect early blooming spring annual species. The second survey period was conducted in June 2020 to detect late-blooming spring annual species. A list of rare plants with potential to occur was compiled and reviewed for habitat suitability. Two sensitive plant species were observed within the study area: smooth tarplant (*Centromadia pungens* ssp. *laevis*) and chaparral (foothill) sand-verbena (*Abronia villosa* var. *aurita*). Smooth tarplant was predominantly observed near the existing SJVRWRF and along the portion of the 18-inch pipeline to be sliplined located near Sanderson Road. Chaparral (foothill) san-verbena was predominantly observed along the southern-most portion of the proposed 36-inch pipeline alignment, along Ramona Expressway. Refer to Figure 4.3-1.

Additional special status plant species that were not observed may have potential to occur within the study area. These species are listed in Appendix C. No additional plant species have a high potential to occur based on geographic range, elevation range, and/or lack of suitable habitat in the study area.

Special Status Animal Species

Special status animal species include those that have been afforded special status and/or recognition by the USFWS and/or CDFW. In general, the principal reason an individual taxon (species or subspecies) is given such recognition is the documented or perceived decline or limitations of its population size or geographical extent and/or distribution, resulting in most cases from habitat loss.

Two special status animal species were observed within or adjacent to the study area during the 2020 biological surveys. An individual (single, unpaired) least Bell's vireo (*Vireo bellii pusillus*) was observed within suitable riparian habitat that occurs within the study area adjacent to the 18-inch pipeline to be sliplined (refer to Figure 7c of Appendix C). Suitable riparian habitat does not occur elsewhere within the study area. A group of white-faced ibis (*Plegadis chihi*) were observed flying over the proposed AWTF.

Special status animal species that were not observed or otherwise detected, but determined to have some potential to occur on-site are included in Appendix C. None of the species analyzed have a high potential to occur within the project site based on geographic range, elevation range, and/or lack of suitable. Two special status species are known from the local area but are not expected to occur within the project site itself due to lack suitable habitat: burrowing owl (*Athene cunicularia*) and San Bernardino kangaroo rat (*Dipodomys merriami parvus*).

Breeding season surveys for the burrowing owl were conducted for the project in accordance with the survey guidelines in the *CDFW 2012 Staff Report on Burrowing Owl Mitigation* (CDFW 2012). Due to unforeseen circumstances, the first burrowing owl survey was conducted one week later than recommended protocol; however, all surveys were completed during the peak of the breeding season and the circumstances did not change the quality of the data collected or the results of the survey. Four site visits were made from April 24, 2020 through July 2, 2020 to survey potential burrowing owl habitat (i.e., non-native grassland, disturbed habitat, and scrub communities where the shrub cover was sparse) where it occurs in the study area and 500 feet beyond. Much of the potential burrowing owl habitat in the study area was inspected with the aid of binoculars due to restricted access to private property. The surveys were conducted by walking meandering transects through areas of potential habitat where it was legally accessible. Fence posts, rocks, and other possible perching locations, as well as mammal burrows (especially those of California ground squirrel [*Otospermophilus beecheyi*]) potentially suitable for use by burrowing owls were inspected and mapped with a hand-held GPS unit. These burrows were specifically searched for sign of recent burrowing owl occupation including pellets with regurgitated fur, bones, and insect parts; white wash (excrement); and feathers. In addition, structures such as concrete culverts/piles, wood debris piles, trash piles, and openings beneath cement or asphalt pavement that were present were checked for burrowing owl sign.

Burrowing owl was not detected during the protocol-level surveys and is presumed to be absent from the study area. A total of 32 potential burrows were recorded within the study area but sign of burrowing owl presence or use was not observed at any of the burrows.

San Bernardino kangaroo rat and sign of the species (e.g., potential burrows, tail drags, suitable substrate) was not detected during the 2020 biological surveys. No portions of the project site support suitable habitat for the species due to existing developments and land uses, in addition to previous and ongoing intensive soil disturbance as a result of agricultural practices and roadway maintenance.

No other species have high potential to occur based on geographic range, elevation range, and/or lack of suitable habitat in the project site.

Nesting Birds

Trees and shrubs both within and adjacent to the study area could provide suitable nesting habitat for numerous bird species known to the region.

Raptor Foraging

Two raptor species were observed near the study area during the biological survey (red-tailed hawk [*Buteo jamaicensis*] and turkey vulture [*Cathartes aura*]) and several others have potential to forage in the project vicinity. The project site does not provide high-quality raptor habitat due to the active agricultural, residential, and transportation uses. Extensive raptor foraging habitat occurs off-site in the project vicinity within undeveloped fallow and dry-farmed lands in the San Jacinto Valley.

4.3.1.5 Jurisdictional Waters and Wetlands

In the context of this analysis, jurisdictional waters and wetlands include waters of the U.S., including wetlands regulated by the U.S. Army Corps of Engineers (USACE) pursuant to the CWA Section 404; waters of the State regulated by the Regional Water Quality Control Board (RWQCB) pursuant to Section 401 of the CWA and State Porter-Cologne Water Quality Control Act; and/or streambed and

riparian habitat regulated by the CDFW pursuant to Sections 1600 *et seq*. of the California Fish and Game Code (CFG Code).

A field-based jurisdictional delineation of the study area was conducted for the project on May 5, 2020 to identify and map potentially jurisdictional aquatic resources. Prior to the delineation, recent aerial photographs, topographic maps, soil mapping, National Wetlands Inventory mapping, and U.S. Geological Survey (USGS) topographical maps were reviewed to determine the location of potential jurisdictional areas. The delineation was conducted on foot with the aid of aerials and topographic maps. Potential aquatic resources evaluated within the study area included drainage features, depressions, and/or wetland vegetation that crossed or were adjacent to the proposed project impact areas.

Potential waters of the U.S., waters of the State, and CDFW jurisdictional habitat are present within the study area (refer to Figure 4.3-2, *Aquatic Resources Avoidance*). The delineation methodologies for each type of jurisdictional water and wetlands are discussed below.

Waters of the U.S.

Potential USACE-jurisdictional waters of the U.S. were generally determined based on the presence of a discernible ordinary high water mark (OHWM) and/or wetland conditions expressed by three parameters (vegetation, hydrology, and soils) established for wetland delineations. Mapping of drainage features was performed in the field based on the OHWM and surface indications of hydrology. Sampling points were inspected for primary and secondary wetland hydrology indicators. Areas were determined to be potential wetland waters of the U.S. if there was a dominance of hydrophytic vegetation, hydric soils, and wetland hydrology indicators. Areas were determined to be non-wetland waters of the U.S. if there was evidence of regular surface flow within an OHWM, but the vegetation and/or soils criterion were not met.

Ten locations with potential aquatic resources were identified and evaluated on and immediately adjacent to the study area.

Regional Water Quality Control Board Jurisdictional Waters

Potential RWQCB-jurisdictional areas were delineated in the same manner as potential waters of the U.S. All waters of the State are subject to jurisdiction pursuant to CWA Section 401. Ephemeral features, while not considered waters of the U.S., were determined to be waters of the State under exclusive regulatory jurisdiction of the RWQCB pursuant to the State Porter-Cologne Water Quality Control Act.

California Department of Fish and Wildlife Jurisdictional Areas

Potential CDFW-jurisdictional streambed and riparian habitat were determined based on the presence of riparian vegetation or regular surface flow within a measurable bed and bank. Streambeds within CDFW jurisdiction were delineated based on the definition of streambed as “a body of water that flows at least periodically or intermittently through a bed or channel having banks and supporting fish or other aquatic life. This includes watercourses having a surface or subsurface flow that support riparian vegetation” (Title 14, Section 1.72). Potential CDFW-jurisdictional unvegetated streambed encompasses the top-of-bank to top-of-bank width for the features within the study area. Riparian habitat is not defined in Title 14, but the section refers to vegetation and habitat associated with a stream. The CDFW

jurisdictional habitat includes all riparian shrub or tree canopy that may extend beyond the banks of a stream.

4.3.1.6 Wildlife Corridor/Core Wildlife Areas

Wildlife corridors connect otherwise isolated pieces of habitat and allow movement or dispersal of plants and animals. Wildlife corridors can be local or regional in scale and may function in different ways depending on species and time of year. Wildlife corridors represent areas where wildlife movement is concentrated due to natural or manufactured constraints. Local corridors provide access to resources such as food, water, and shelter. Animals can use these corridors, such as hillsides and tributary drainages to main drainages, to travel among different habitats (i.e., riparian, and upland habitats). Some animals require riparian habitat for breeding and upland habitat for burrowing. Regional corridors provide these functions and also link two or more large areas of open space. Regional corridors also provide avenues for wildlife dispersal, migration, and contact between otherwise distinct populations. The project is not located within any linkages recognized by the South Coast Missing Linkages report (South Coast Wildlands 2008) or MSHCP.

4.3.2 Regulatory Framework

4.3.2.1 Federal

Federal Endangered Species Act

Administered by the USFWS, the federal Endangered Species Act (ESA) provides the legal framework for the listing and protection of species (and their habitats) that are identified as being endangered or threatened with extinction. Actions that jeopardize endangered or threatened species and the habitats upon which they rely are considered take under the ESA. Section 9(a) of the ESA defines take as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." "Harm" and "harass" are further defined in federal regulations and case law to include actions that adversely impair or disrupt a listed species' behavioral patterns.

Sections 7 and 4(d) of the federal ESA regulate actions that could jeopardize endangered or threatened species. Section 7, administered by the USFWS, describes a process of federal interagency consultation for use when federal actions may adversely affect listed species. A Section 7 Consultation (formal or informal) is required when there is a nexus between a listed species' use of a site and if the project is funded (wholly or in part) by the State Revolving Fund. A biological assessment is required for any major construction activity if it may affect listed species. Take can be authorized via a letter of Biological Opinion, issued by the USFWS, for non-marine related listed species issues. The project would be funded in part by the State Resolving Fund. A Section 7 Consultation would be required if impacts to a federally listed species would occur.

Identified by the USFWS, critical habitat is defined as areas of land that are considered necessary for endangered or threatened species to recover. The ultimate goal is to restore healthy populations of listed species within their native habitat, so they can be removed from the list of threatened or endangered species. Once an area is designated as critical habitat pursuant to the federal ESA, all federal agencies must consult with the USFWS to ensure that any action they authorize, fund, or carry out is not likely to result in destruction or adverse modification of the critical habitat.

Migratory Bird Treaty Act

All migratory bird species that are native to the United States or its territories are protected under the federal Migratory Bird Treaty Act (MBTA), as amended under the Migratory Bird Treaty Reform Act of 2004 (FR Doc. 05-5127). The MBTA is generally protective of migratory birds but does not actually stipulate the type of protection required. In common practice, the MBTA is used to place restrictions on disturbance of active bird nests during the nesting season (generally February 1 to August 31). In addition, the USFWS commonly places restrictions on disturbances allowed near active raptor nests.

Clean Water Act and Rivers and Harbors Act

Federal wetland regulation (non-marine issues) is guided by the Rivers and Harbors Act of 1899 and the CWA. The Rivers and Harbors Act deals primarily with discharges into navigable waters, while the purpose of the CWA is to restore and maintain the chemical, physical, and biological integrity of all waters of the U.S. Permitting for projects filling waters of the U.S. is overseen by the USACE under Section 404 of the CWA. Most development projects are permitted using Individual Permit or Nationwide Permit instruments.

4.3.2.2 State

California Environmental Quality Act

Primary environmental legislation in California is found in CEQA and its implementing guidelines (State *CEQA Guidelines*), which require that projects with potential adverse effects (i.e., impacts) on the environment undergo environmental review. Adverse environmental impacts are typically mitigated as a result of the environmental review process in accordance with existing laws and regulations.

California Endangered Species Act

The California Endangered Species Act (CESA) established that it is state policy to conserve, protect, restore, and enhance state endangered species and their habitats. Under state law, plant and animal species may be formally designated rare, threatened, or endangered by official listing by the California Fish and Game Commission. The CESA authorizes that private entities may "take" plant or wildlife species listed as endangered or threatened under the ESA and CESA, pursuant to a federal Incidental Take Permit if the CDFW certifies that the incidental take is consistent with CESA (CFG Code Section 2080.1[a]). For state-only listed species, Section 2081 of CFG Code authorizes the CDFW to issue an Incidental Take Permit for state listed threatened and endangered species if specific criteria are met. The MSCP is a regional Natural Communities Conservation Plan that was granted take coverage under Section 2081 of the CESA.

Native Plant Protection Act

Sections 1900–1913 of the CFG Code (Native Plant Protection Act; NPPA) direct the CDFW to carry out the state legislature's intent to "…preserve, protect, and enhance endangered or rare native plants of this state." The NPPA gives the California Fish and Game Commission the power to designate native plants as "endangered" or "rare" and protect endangered and rare plants from take.

California Fish and Game Code

The CFG Code provides specific protection and listing for several types of biological resources. Section 1600 of CFG Code requires a Streambed Alteration Agreement (SAA) for any activity that would alter the flow, change, or use any material from the bed, channel, or bank of any perennial, intermittent, or ephemeral river, stream, and/or lake. Typical activities that require an SAA include excavation or fill placed within a channel, vegetation clearing, structures for diversion of water, installation of culverts and bridge supports, cofferdams for construction dewatering, and bank reinforcement. Notification is required prior to any such activities.

Pursuant to CFG Code Section 3503, it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto. Raptors and owls and their active nests are protected by CFG Code Section 3503.5, which states that it is unlawful to take, possess, or destroy any birds of prey or to take, possess, or destroy the nest or eggs of any such bird unless authorized by the CDFW. Section 3513 states that it is unlawful to take or possess any migratory non-game bird as designated in the MBTA. These regulations could require that construction activities (particularly vegetation removal or construction near nests) be reduced or eliminated during critical phases of the nesting cycle unless surveys by a qualified biologist demonstrate that nests, eggs, or nesting birds will not be disturbed, subject to approval by CDFW and/or USFWS.

Western Riverside Multiple Species Habitat Conservation Plan

The MSHCP is a comprehensive, multi-jurisdictional HCP focusing on the conservation of species and their associated habitats in Western Riverside County. The MSHCP allows the County and its incorporated cities to better control local land use decisions and maintain strong economic function in the region while addressing the requirements of the state and federal Endangered Species Acts. Rather than addressing sensitive species on an individual basis, the MSHCP focuses on the conservation of 146 species, proposing a reserve system of approximately 500,000 acres and a mechanism to fund and implement the reserve system. Most importantly, the MSHCP allows participating entities to issue take permits for listed species so that individual applicants need not seek their own permits from the USFWS and/or CDFW. The MSHCP was adopted on June 17, 2003 by the Riverside County Board of Supervisors. The Incidental Take Permit was issued by both the USFWS and CDFW on June 22, 2004.

The District is not a signatory to the MSHCP, and as such is not subject to the requirements of the MSHCP, though a discussion regarding project consistency with the MSHCP is provided in this EIR for informational purposes.

4.3.3 Thresholds of Significance

The significance of impacts to biological resources present or those with potential to occur was determined based upon the sensitivity of the resource and the extent of the anticipated impacts. For certain highly sensitive resources (e.g., a federally listed species), any impact would be significant. Conversely, other resources that are of low sensitivity (e.g., species with a large, locally stable population in the County but declining elsewhere) could sustain some impact with a less-than-significant effect.

The following criteria from Appendix G of the *CEQA Guidelines* are used as thresholds of significance to determine the impacts of the proposed project as related to biological resources. The proposed project would have a significant impact if it would:

1. Result in a substantial adverse impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service;

2. Result in a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or the U.S. Fish and Wildlife Service;

3. Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;

4. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;

5. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or

6. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

4.3.4 Project Impacts and Mitigation

4.3.4.1 Issue 1: Special Status Species

Would the proposed project result in a substantial adverse impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Impact Analysis

Special Status Plant Species

Two non-listed sensitive plant species were observed within the study area and are present along portions of the project alignment: smooth tarplant and chaparral sand-verbena (refer to Figure 4.3-1). Smooth tarplant generally occurs along the western portion of the alignment of the 18-inch pipeline to be sliplined. Chaparral sand-verbena generally occurs along the southern portion of the proposed 36-inch pipeline alignment. Smooth tarplant and chaparral sand-verbena are both a California Rare Plant Rank (CRPR) 1B.1 species. As a CRPR 1B.1 plant species, both smooth tarplant and chaparral sand-verbena have been assigned to a watch list for plants of reported limited distribution and moderate degree and immediacy of threat by the CNPS.

Potential impacts on smooth tarplant and chaparral sand-verbena would be limited to a very low number of individuals. Approximately eight individuals of smooth tarplant and three individuals of sand-verbena could be affected by construction. The project would avoid approximately 43 individuals of smooth tarplant (99 percent) and 10 individuals of sand-verbena (79 percent) that were mapped within

the study area. The individuals that may be affected are scattered in their local arrangement and are not part of a core population in the local or regional area.

There are numerous documented occurrences of these species throughout the surrounding area indicating that the study area does not represent a geographically significant population. Given the low number of individuals that could be affected and numerous recorded occurrences within the project vicinity (both within and outside of the study area along the adjacent San Jacinto River corridor, in particular), the potential impacts are considered to be less than significant. However, if project work limits are exceeded, the impacts could increase in severity and could represent a potentially significant impact. Therefore, mitigation measures MM-BIO-1 and MM-BIO-2, which involve the installation of temporary construction fencing and biological monitoring in areas where work limits occur adjacent to known sensitive resources, would be required.

The project would have no impact on federal or State listed plant species.

Special Status Animal Species

San Bernardino Kangaroo Rat

San Bernardino kangaroo rat and sign of the species (e.g., potential burrows, tail drags, suitable substrate) was not detected during the 2020 biological surveys. No portions of the project site support suitable habitat for the species due to existing developments and land uses, in addition to previous and ongoing intensive soil disturbance as a result of agricultural practices and roadway maintenance. The southeastern portion of the project site occurs within areas mapped as USFWS critical habitat for the San Bernardino kangaroo rat. This portion of the project site comprises the disturbed and developed right-of-way associated with the Ramona Expressway where the 36-inch pipeline is proposed to be installed.

The project site at this location was inspected for the presence or absence of the Primary Constituent Elements (PCE; the physical and biological features that are essential to the conservation of the subspecies) required for this species. Alluvial fans, washes, and associated floodplain habitat consisting of predominantly sandy soils with open sage scrub habitat do not occur within the project site. Additionally, suitable upland areas adjacent to alluvial fan habitat with sandy soils and open sage scrub that provide foraging or repopulation opportunities do not occur within the project site. This species prefers burrowing and foraging in soils deposited by alluvial processes, which are found further east of the study area along the San Jacinto River corridor. Habitat within the project site consists of disturbed, compacted soils mainly along road shoulders and lacks open sage scrub habitat, which would exclude this species from occurring within the project site. While this species may occur along the San Jacinto River east of the project site, existing barriers to movement (i.e., levee, vertical banks, fences, developments) occur between the river and the project site that preclude this species from traveling onto the project site. In addition, installation of temporary construction fencing along project impact limits per mitigation measure MM-BIO-1 (mentioned below), which would prevent inadvertent encroachment beyond work limits, would further prevent the species from entering the project work areas during construction. Therefore, no direct or indirect impacts on the species or its critical habitat are anticipated.

Nesting Birds

The project would require the removal of non-sensitive vegetation and other potential nesting habitat for common birds and raptors protected under the MBTA and CFG Code. Impacts on active nests belonging to bird species protected under the MBTA and CFG Code would be significant. As such, mitigation measure MM-BIO-3, which involves a pre-construction survey and avoidance measures (if necessary) prior to and during construction, would be required.

Least Bell's Vireo

The off-site southern willow scrub habitat near San Jacinto Reservoir that occurs adjacent to the 18-inch pipeline to be sliplined has the potential to support the federally and State listed endangered least Bell's vireo. An unpaired individual was incidentally observed during biological surveys within 500 feet of the proposed location for sliplining and excavation activities (refer to Figure 4.3-1c). The impact footprint for the sliplining and excavation activities have been specifically sited within disturbed uplands setback from the off-site southern willow scrub by at least 500 feet. Direct or indirect impacts to least Bell's vireo would be avoided. No impacts or take of least Bell's vireo or suitable habitat for the species are proposed; none are authorized without additional consultation with the USFWS and CDFW. MM-BIO-1 and MM-BIO-2 would further require the installation of temporary construction fencing and biological monitoring where work limits occur adjacent to known sensitive resources. Implementation of these additional avoidance measures would ensure that no inadvertent encroachment or other impacts on sensitive biological resources occur during construction.

Burrowing Owl

Portions of the study area adjacent to the proposed brine management system and proposed 36-inch pipeline support suitable habitat for burrowing owl, which is a USFWS Bird of Conservation Concern (BCC), and CDFW Species of Special Concern (SSC). No burrowing owls or signs of burrowing owl presence were observed during the 2020 protocol-level burrowing owl surveys, which were conducted for potential burrowing owl habitat (i.e., non-native grassland, disturbed habitat, and scrub communities where the shrub cover was sparse) where it occurs in the study area and 500 feet beyond. However, potential burrows were observed near the AWTF and brine management system site and adjacent to the 18-inch pipeline to be sliplined on the southern side of Ramona Expressway between State Street and Eagle Road. In addition, this species has been documented along the San Jacinto River, east of the proposed 36-inch pipeline, and two adults and one breeding pair were observed in 2007 in the area approximately 1,400 feet east of proposed AWTF. Therefore, although no owls were present in 2020, there remains the potential for owls to move into the potential impact area in the future and prior to project construction. Direct and indirect impacts on the species would be considered significant. As such, mitigation measure MM-BIO-4 would be required.

Implementation of the proposed project would not result in permanent loss of potential burrowing owl habitat, as the general conditions would be returned to pre-project conditions (i.e., disturbed habitat) upon completion of the project.

Mitigation Measures

The following mitigation measures would be implemented to avoid direct and/or indirect impacts to sensitive biological resources.

MM-BIO-1 **Temporary Construction Fencing.** Prior to construction, to help ensure inadvertent impacts to environmentally sensitive areas outside of the approved impact footprint are avoided, temporary construction fencing, including silt fencing, as appropriate and where determined necessary by the SWPPP, shall be installed at the edges of the approved impact limits for the project. Temporary fencing shall be installed at locations where the project components occur adjacent to resources depicted on Figure 4.3-1, *Vegetation and Sensitive Resources/Land Use Impacts,* and Figure 4.3-2*, Aquatic Resources Avoidance*, in addition to locations at the proposed Alessandro Blending Facility and the proposed 36-inch pipeline trenching along Ramona Expressway, from Vernon Avenue to Old Mountain Avenue. A qualified biologist shall be retained to monitor the installation of the temporary construction fencing wherever it would abut environmentally sensitive areas. Construction activities shall be restricted to areas within the approved impact limits at all times during construction.

MM-BIO-2 **Biological Monitoring.** A qualified biologist will conduct a pre-construction environmental training session for construction personnel to inform them of the sensitive biological resources in the local area and the avoidance measures in place to remain in compliance. The biologist will periodically monitor construction activities where temporary construction fencing has been installed in accordance with mitigation measure MM-BIO-1.

MM-BIO-3 **Nesting Bird and Raptor Avoidance.** Trimming, grubbing, and clearing of vegetation shall be avoided during the general avian breeding season (January 15 to July 15 for raptors; February 15 to August 31 for other avian species) to the extent feasible. If trimming, grubbing, or clearing of vegetation is proposed to occur during the general avian breeding season, a pre-construction survey shall be conducted by a qualified biologist no more than 7 days prior to vegetation clearing to determine if active bird nests are present in the affected areas. If there are no nesting birds (includes nest building or other breeding/nesting behavior) within this area, trimming, grubbing, and clearing of vegetation shall be allowed to proceed. If active bird nests are confirmed to be present during the pre-construction survey, a buffer zone will be established by the biologist. Construction activities shall avoid any active nests until a qualified biologist has verified that the young have fledged, or the nest has otherwise become inactive.

MM-BIO-4 **Burrowing Owl Pre-Construction Take Avoidance Survey**. Prior to construction, the District shall retain a qualified biologist to conduct required pre-construction take avoidance surveys for the burrowing owl in accordance with the protocol described in the CDFW Staff Report on Burrowing Owl Mitigation (CDFW 2012). The initial take avoidance survey shall occur no less than 14 days prior to initiating ground-disturbing activities, with a final survey conducted within 24 hours prior to initiating ground-disturbing activities. If, after the initial take avoidance survey, no suitable burrowing owl habitat, including burrows, is present, then the second survey 24 hours prior to ground disturbance would not be required. If no active burrowing owl burrows (nesting sites) are identified within the potential impact area of the project during the take avoidance surveys, then no additional action would be required.

If active burrowing owl burrows are identified within the potential impact area, the project shall avoid disturbing active burrowing owl burrows (nesting sites) and

burrowing owl individuals. Buffers shall be established around occupied burrows in accordance with guidance provided in the CDFW Staff Report on Burrowing Owl Mitigation (CDFW 2012) based on the proposed level of disturbance. For low disturbance projects, initial setback distances for avoidance of active burrows shall be 200 meters (approximately 656 feet) from April 1 to October 15 and 50 meters (164 feet) from October 16 to March 31. Exceptions can be made to the avoidance distance for areas with natural (hills, trees) or artificial (buildings, walls) barriers in place. The final avoidance buffer shall be at the discretion of the biologist. If, after consideration of a reduced buffer, an adequate avoidance buffer cannot be provided between an occupied burrow and required ground-disturbing activities, then passive relocation activities during the non-breeding season (September 1 through January 31) may be authorized in consultation with CDFW, which would include preparation, approval, and implementation of a Burrowing Owl Exclusion Plan in accordance with protocol described in the CDFW Staff Report on Burrowing Owl Mitigation.

Significance After Mitigation

Implementation of mitigation measures MM-BIO-1**,** MM-BIO-2, MM-BIO-3, and MM-BIO-4 would reduce potentially significant impacts to sensitive biological resources, including smooth tarplant, chaparral sand-verbena, nesting birds and raptors, and special status avian species (i.e., burrowing owl), to a less-than-significant level.

4.3.4.2 Issue 2: Sensitive Habitats

Would the proposed project result in a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or the U.S. Fish and Wildlife Service?

Impact Analysis

The study area is predominantly characterized by field/pastures, disturbed habitat, and developed land and only supports a small portion of sensitive vegetation communities (southern willow scrub) that are not anticipated to be impacted. The proposed project would result in impacts to field/pasture (31.0 acres), disturbed habitat (1.9 acres), and developed land (2.7 acres), which are not considered sensitive natural communities (refer to Figure 4.3-1 and Table 3, *Vegetation Communities/Land Use Impacts,* of Appendix C). Impacts to these vegetation communities are not considered significant and, therefore, do not require mitigation.

Mitigation Measures

No impacts to sensitive habitats would occur; therefore, no mitigation is necessary.

4.3.4.3 Issue 3: Wetlands

Would the proposed project have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Impact Analysis

Potential waters of the U.S., waters of the State, and CDFW jurisdictional habitat are present within the study area (see Figure 4.3-2). The southern willow scrub habitat is considered potentially jurisdictional to the USACE, RWQCB, and/or CDFW. Several ephemeral concrete and earthen bottom drainages occur within the study area along the sides of paved roadways. Agricultural ditches, erosional features, and areas of open water that function as holding basins for the District are regularly maintained, lack vegetation, lack connectivity to other jurisdictional drainage courses, and would not be considered to be under the jurisdiction of USACE, RWQCB, and/or CDFW. The project has been specifically designed to avoid impacts to federally protected wetlands and other potential jurisdictional aquatic resources by restricting project components to occur entirely within upland areas and by implementing trenchless construction methods for the 18-inch pipeline to be sliplined. The sliplining insertion and pulling pits would be located in upland areas. The sliplining process would not involve a directional drill auger or fluid that could inadvertently release during operation and cause a potential frac-out event, and no such impacts are anticipated. Therefore, no direct impacts on federally protected wetlands or other potential jurisdictional aquatic resources would occur.

Potential indirect impacts on drainage features would be prevented during construction through successful implementation of standard BMPs as part of the project's SWPPP. Implementation of a SWPPP and associated BMPs are a regulatory requirement for the proposed project. Specific BMPs may include but would not necessarily be limited to maintaining the project work areas free of trash and debris; employing appropriate standard spill prevention practices and clean-up materials; installing and maintaining sediment and erosion control measures; maintaining effective control of fugitive dust; and properly storing, handling, and disposing of toxins and pollutants, including waste materials.

If temporary construction fencing and other BMPs are not properly implemented during construction, there would be a potential for materials, equipment, and personnel to inadvertently encroach into potential jurisdictional aquatic resources, locations of which are shown on Figure 4.3-2. Therefore, impacts are considered potentially significant.

Mitigation Measures

In addition to required BMPs as part of the project's SWPPP, mitigation measures MM-BIO-1 and MM-BIO-2 would be implemented to avoid impacts to jurisdictional resources.

Significance After Mitigation

With implementation of the mitigation measures MM-BIO-1 and MM-BIO-2, potential impacts to jurisdictional resources would be less than significant.

4.3.4.4 Issue 4: Wildlife Movement

Would the proposed project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

Impact Analysis

The project is not located within any linkages recognized by the South Coast Missing Linkages report (South Coast Wildlands 2008) or MSHCP. The study area does not by itself function as nor does it contribute to any local or regional wildlife corridors or linkages. It is also not contained within or connected to any local or regional core resource areas. The majority of the study area and project features occur within developed roadways/public right-of-way, active agricultural fields, and previously established pipeline easements. A strip of southern willow scrub occurs east of Sanderson Avenue and north of the San Jacinto Reservoir. This narrow strip of habitat is isolated and does not connect to the San Jacinto River corridor or other areas of intact undeveloped/undisturbed land. As such, the southern willow scrub would not function as a wildlife corridor or core wildlife area, although it may function as a stopover site for migrating bird species. The San Jacinto River corridor is located approximately 2.5 miles east of the strip of willow habitat and over 700 feet east of the proposed 36-inch pipeline. The San Jacinto River corridor functions to facilitate regional wildlife movement but is not connected to the project site due to a flood levee that occurs to the east of the Ramona Expressway.

The project does include several aboveground components in the form of small treatment facilities and a brine management system, but these features would not act as major impediments to wildlife movement, including access to nursery sites, foraging habitat, breeding habitat, water sources, or other areas necessary for their life history. Higher quality habitat that functions as a wildlife movement corridor occurs east of the project site along the San Jacinto River. The project avoids and is set back from the San Jacinto River corridor, with the closest project components being sited within the Ramona Expressway right-of-way and on existing developed land, all of which are separated from the River corridor by existing barriers (e.g., fences, levee, vertical walls). As the project components have been specifically sited within existing disturbed and developed areas, the potential impact on wildlife movement and nursery sites would be less than significant and no additional mitigation is required.

Mitigation Measures

Impacts associated with wildlife movement would be less than significant; therefore, no mitigation is necessary.

4.3.4.5 Issue 5: Local Policies

Would the proposed project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

Impact Analysis

No local policies or ordinances pertaining to biological resources are applicable to the project. The project is an essential public utility that would primarily occur within the existing disturbed areas and public road rights-of-way. No impact or conflict would occur.

Mitigation Measures

No impacts related to local policies or ordinances protecting biological resources would occur; therefore, no mitigation is necessary.

4.3.4.6 Issue 6: Conservation Planning

Would the proposed project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

Impact Analysis

The project is located within the boundaries of the adopted Western Riverside MSHCP; however, the District is not a signatory to the MSHCP, and as such is not subject to the requirements of the MSHCP. The project is not located within the Stephen's kangaroo rat HCP or any core areas for the HCP, and focused surveys are not required under the HCP for activities occurring on lands outside of core reserves. No other adopted conservation plans are applicable to the project. Therefore, no impact on an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved habitat conservation plan would occur.

A brief consistency analysis was conducted to demonstrate how the project would not conflict with the conservation goals and objectives of the MSHCP. The site occurs within portions of Criteria Cells 2775, 2878, 2893, 3098, 3024, and 3312, but is situated primarily within disturbed lands, field/pastures, and existing developed lands. The project was specifically designed to place the proposed components within disturbed and developed areas. Conservation in the local area is generally targeted further to the northeast and east within the alluvial system of the San Jacinto River and contiguous uplands connecting the river with the San Jacinto Mountains. Perhaps the most important conservation target for the local area is that for the San Bernardino kangaroo rat, which critical habitat (Unit 3) has been designated around the reach of the San Jacinto River that occurs east of the project. A thorough assessment was completed to confirm the presence or absence of suitable habitat as well as any PCEs identified for its critical habitat. Consistent with the MSHCP survey requirements, surveys for narrow endemic and criteria area plant species were completed as part of the rare plant survey effort for the project. Additional, protocol-level surveys for burrowing owl were completed during the peak breeding season for the species. Last, an assessment and delineation of riparian/riverine areas and vernal pools was completed consistent with MSHCP requirements.

The following was determined upon completion of the biological surveys completed for the project: no permanent loss of habitat targeted under the MSHCP would result from the project; no suitable habitat or PCEs for San Bernardino kangaroo rat occurs within the project impact area; no burrowing owl occur within the project impact area; and no riparian/riverine areas or vernal pools occur within the project impact area. Where these resources occur or have potential to occur adjacent to the project impact areas, the project would implement site protection and other BMPs in accordance with the required SWPPP and mitigation measure MM-BIO-1. A qualified biologist would be required to monitor installation of site protection and periodically monitor activities in accordance with mitigation measure MM-BIO-2. These measures would help to ensure that off-site sensitive resources are protected from construction activities and that the activities are monitored by a qualified biologist. In addition, the project would implement breeding season avoidance and pre-construction take avoidance surveys for nesting birds and raptors, including burrowing owl, under mitigation measures MM-BIO-3 and MM-BIO-4 to ensure that no impacts occur to individuals consistent with MSHCP requirements.

The biological surveys did confirm the presence of two rare plants (smooth tarplant and chaparral sand-verbena), one of which (smooth tarplant) requires additional avoidance procedures under the MSHCP.

The MSHCP states that 90 percent of those portions of the property that provide for long-term conservation value for the identified species shall be avoided until it is demonstrated that conservation goals for the particular species are met. The smooth tarplant found within and immediately adjacent to the project impact area include low numbers of scattered individuals, primarily situated within roadway right-of-way areas. The project would avoid the large majority of the smooth tarplant individuals found during the assessment and would avoid more than 90 percent of those portions of the right-of-way areas and adjoining properties that could provide for long-term conservation value toward the species. Therefore, the project would be consistent with MHSCP requirements for smooth tarplant.

No other adopted HCP, Resource Management Plan, Special Area Management Plan, Watershed Plan, or other regional planning efforts are applicable to the project.

Mitigation Measures

The District is not a signatory to the MSHCP; therefore, no impact would occur and no mitigation is necessary.



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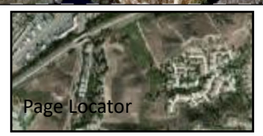
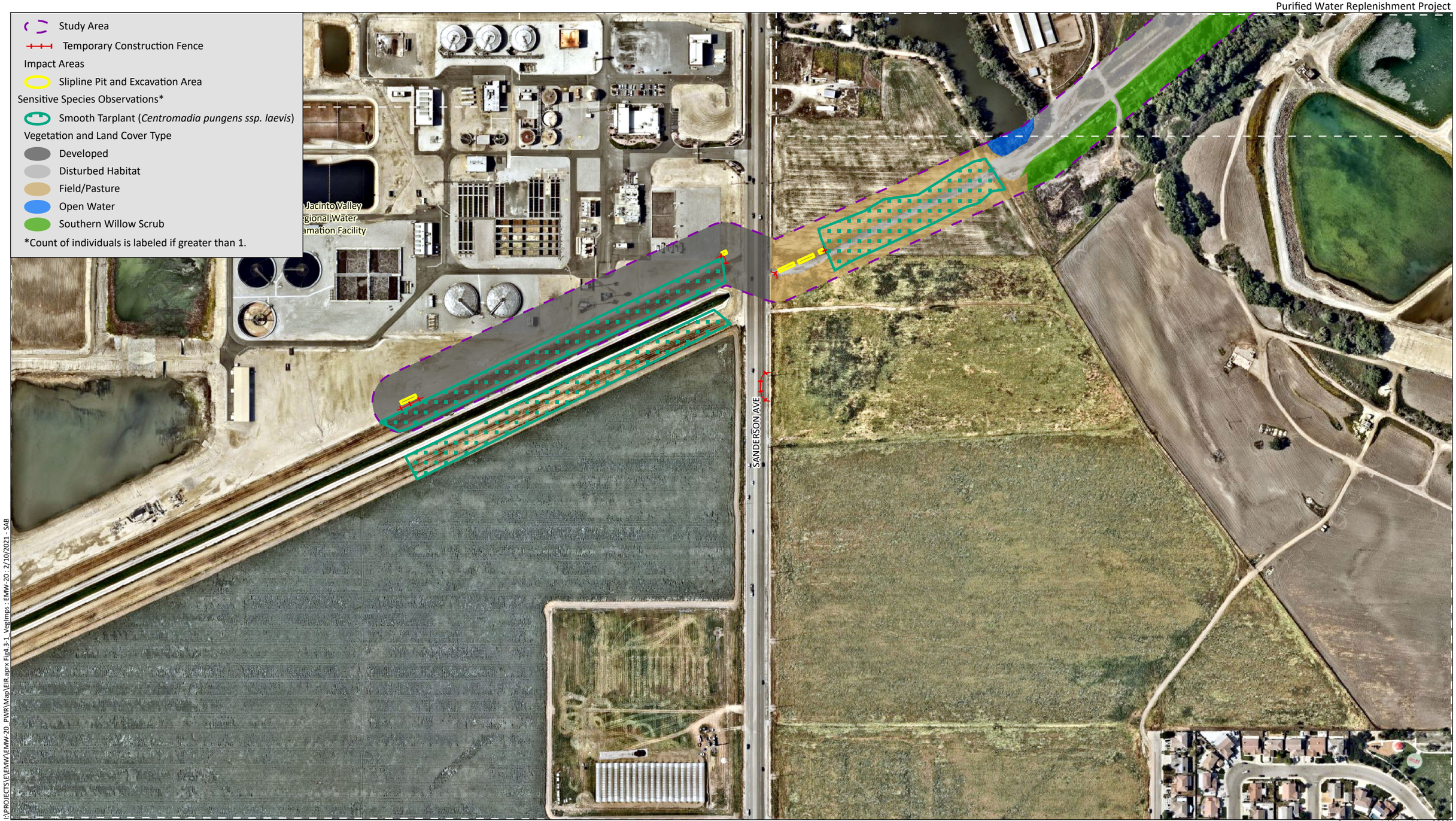
Source: Aerial (NearMap, 2020)



HELIX Environmental Planning

Vegetation and Sensitive Resources/Land Use Impacts

Figure 4.3-1a



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Vegetation and Sensitive Resources/Land Use Impacts

Figure 4.3-1b



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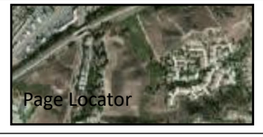

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Vegetation and Sensitive Resources/Land Use Impacts

Figure 4.3-1c



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Source: Aerial (NearMap, 2020)

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HELIX Environmental Planning

Vegetation and Sensitive Resources/Land Use Impacts

Figure 4.3-1d

Study Area
Temporary Construction Fence
Impact Areas
Slipline Pit and Excavation Area
Vegetation and Land Cover Type
Developed

STATE ST
79
RAMONA EXPY

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Page Locator

Source: Aerial (NearMap, 2020)

HELIX
Environmental Planning

Vegetation and Sensitive Resources/Land Use Impacts

Figure 4.3-1e

Study Area
Temporary Construction Fence
Impact Areas
Slipline Pit and Excavation Area
Proposed 36" Pipeline
Proposed Alessandro Blending Facility
Vegetation and Land Cover Type
Developed
Disturbed Habitat
Field/Pasture
Open Water

RAMONA EXPY
SAN JACINTO AVE

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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Vegetation and Sensitive Resources/Land Use Impacts

Figure 4.3-1f



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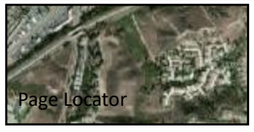

HELIX Environmental Planning

Vegetation and Sensitive Resources/Land Use Impacts

Figure 4.3-1g



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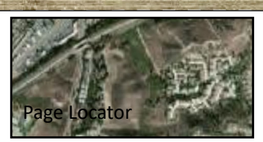
Source: Aerial (NearMap, 2020)



HELIX Environmental Planning

Vegetation and Sensitive Resources/Land Use Impacts

Figure 4.3-1h

Study Area
Temporary Construction Fence
Impact Areas
Proposed 36" Pipeline
Vegetation and Land Cover Type
Developed
Disturbed Habitat
Field/Pasture
*Count of individuals is labeled if greater than 1.

BROOKMERE RD
BROOKMERE RD
SHANONDOAH RD
COURTLAND AVE
COURTLAND AVE
OAK KNOLL RD
OAK KNOLL RD
ST ALBAN RD
ST ALBAN RD
MOUNTAIN AVE
OLD MOUNTAIN AVE
ESPLANADE AVE
RAMONA EXPY
7TH ST

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Page Locator

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Vegetation and Sensitive Resources/Land Use Impacts

Figure 4.3-1i

Study Area
Temporary Construction Fence
Impact Areas
Proposed Advanced Water Treatment Facility
Proposed Brine Management System
Potential RWQCB and CDFW Jurisdiction
Agricultural Ditch (Ephemeral)

12
4
6

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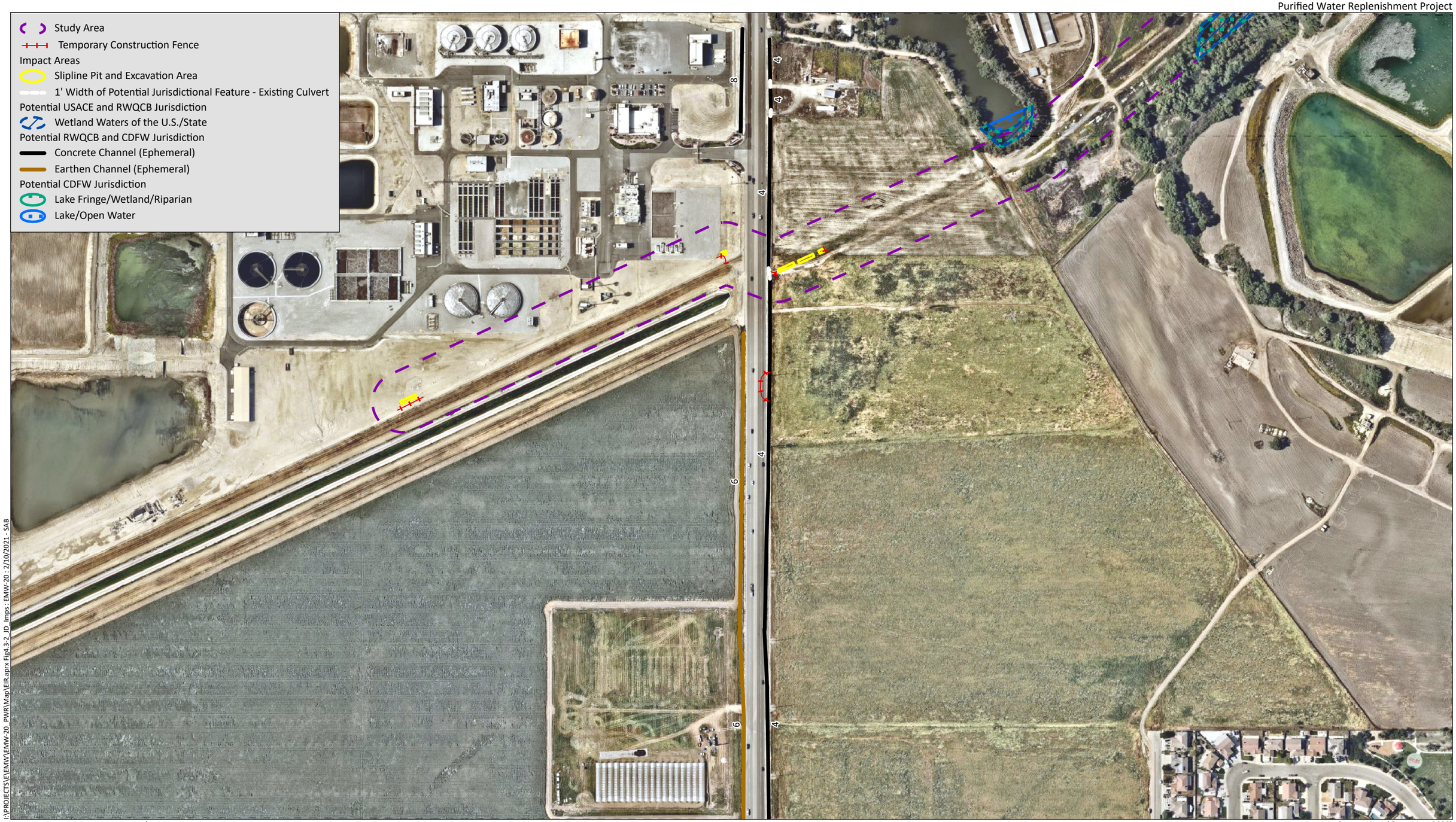
Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 4.3-2a



Source: Aerial (NearMap, 2020)

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HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 4.3-2b

Purified Water Replenishment Project

Study Area
Temporary Construction Fence
Impact Areas
Slipline Pit and Excavation Area
Potential USACE and RWQCB Jurisdiction
Wetland Waters of the U.S./State
Potential CDFW Jurisdiction
Lake Fringe/Wetland/Riparian
Lake/Open Water



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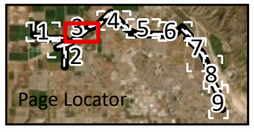


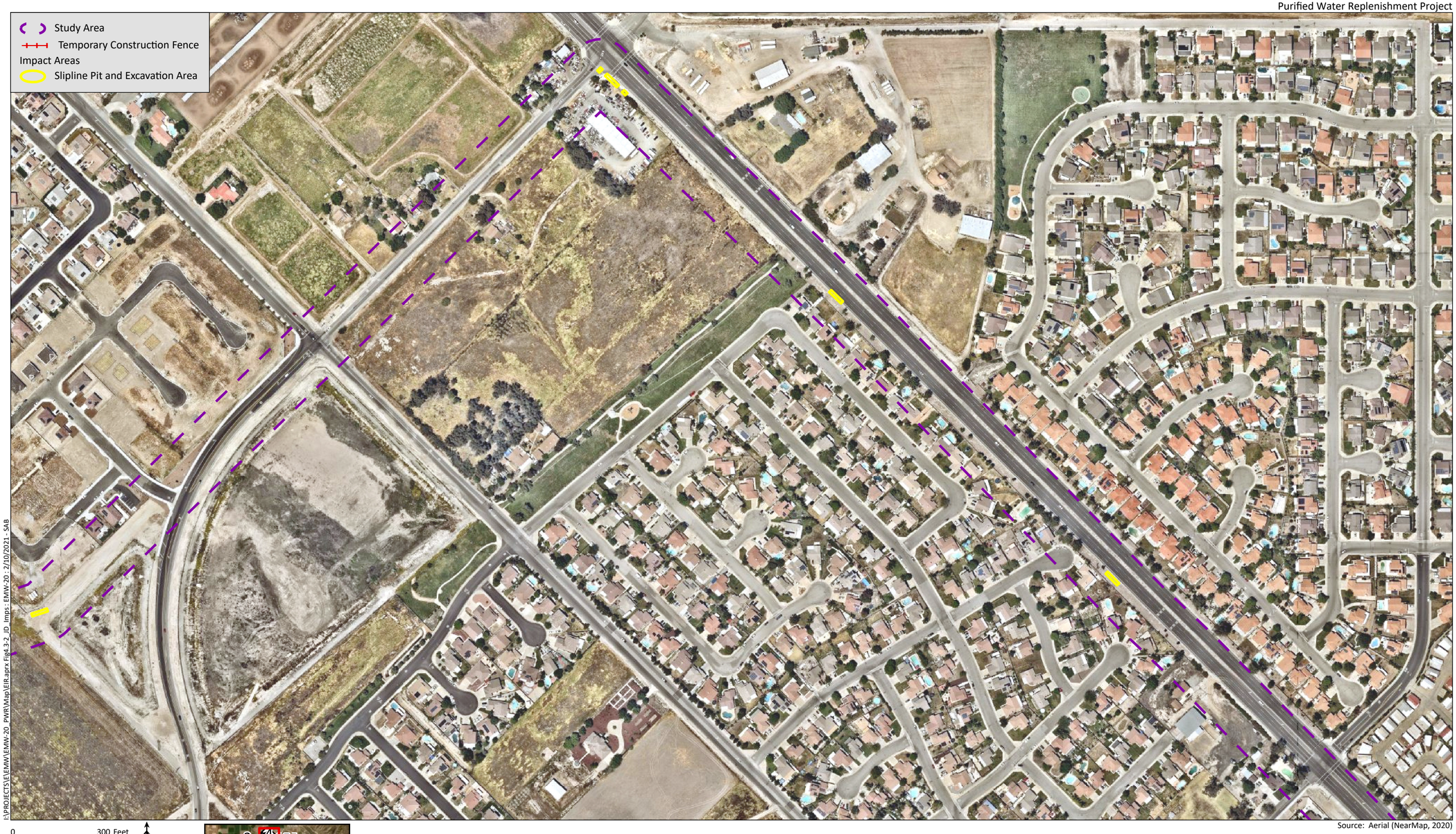
Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 4.3-2c

Study Area
Temporary Construction Fence
Impact Areas
Slipline Pit and Excavation Area



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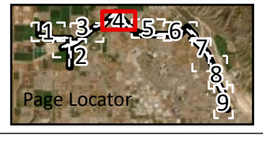

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 4.3-2d

Study Area
Temporary Construction Fence
Impact Areas
Slipline Pit and Excavation Area

0 300 Feet

Page Locator

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 4.3-2e

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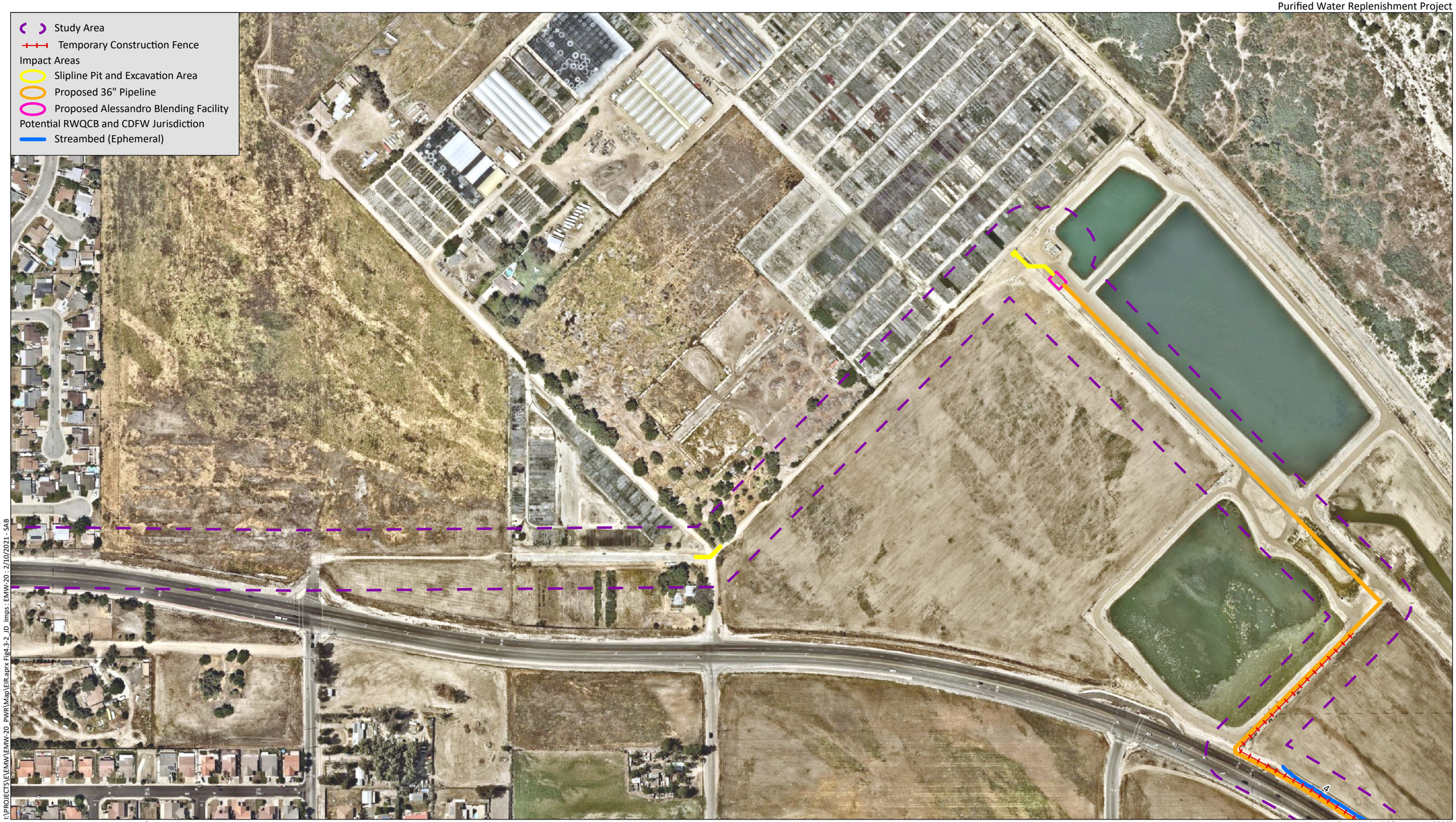
Purified Water Replenishment Project

Study Area
Temporary Construction Fence
Impact Areas
Slipline Pit and Excavation Area
Proposed 36" Pipeline
Proposed Alessandro Blending Facility
Potential RWQCB and CDFW Jurisdiction
Streambed (Ephemeral)



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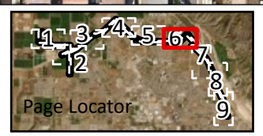

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 4.3-2f



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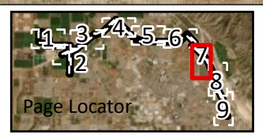

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 4.3-2g

Study Area
Temporary Construction Fence
Impact Areas
Proposed 36" Pipeline
Erosion in Existing Maintenance Area Uplands (Non-Jurisdictional)
Potential RWQCB and CDFW Jurisdiction
Earthen Channel (Ephemeral)



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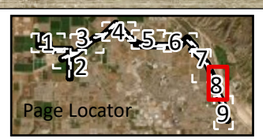


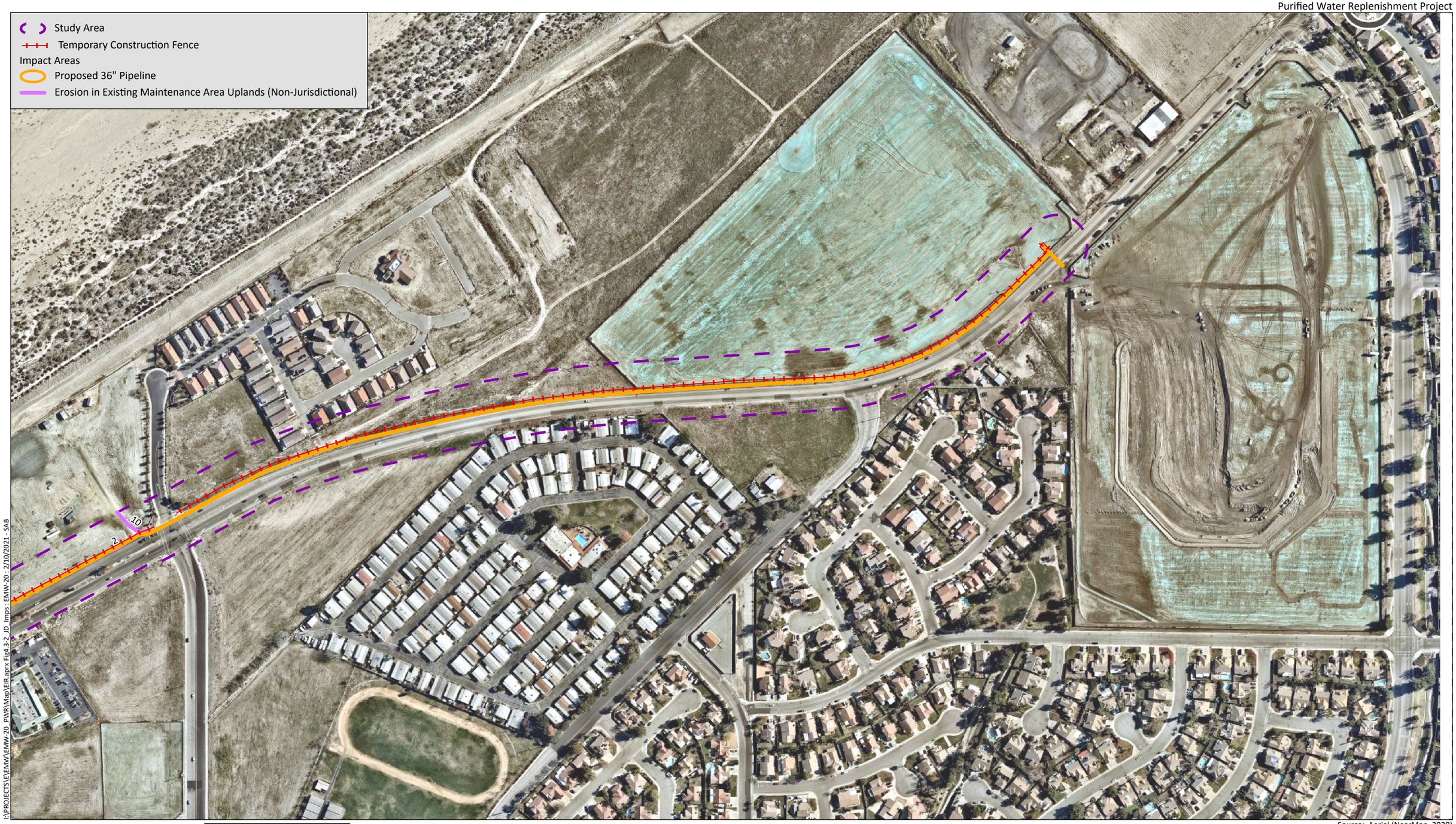
Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 4.3-2h

Study Area
Temporary Construction Fence
Impact Areas
Proposed 36" Pipeline
Erosion in Existing Maintenance Area Uplands (Non-Jurisdictional)



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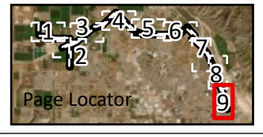

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 4.3-2i

4.4 CULTURAL RESOURCES AND TRIBAL CULTURAL RESOURCES

This section addresses the potential impacts of the proposed project to cultural resources and tribal cultural resources. The following discussion includes a description of existing conditions as related to cultural resources and tribal cultural resources, a summary of applicable regulations, and an evaluation of the proposed project's potential environmental effects associated with an adverse change in historical, archaeological, and tribal cultural resources, and the disturbance of human remains. This section incorporates information from the *Cultural Resources Survey* prepared for the proposed project (HELIX 2020b; Appendix D).

4.4.1 Existing Conditions

4.4.1.1 Cultural Setting

Prehistoric Setting

The approximately 10,000 years of documented prehistory of the project region can be divided into three periods: Early Prehistoric Period (San Dieguito Tradition), Archaic Period (Milling Stone Horizon and Encinitas Tradition), and Late Prehistoric Period. The Early Prehistoric Period represents the time of the entrance of the first known human inhabitants into California. In some areas of California, it is referred to as the Paleo-Indian period, and it is associated with the Big-Game-Hunting activities of the peoples of the last Ice Age, occurring during the Terminal Pleistocene (pre-10,000 years ago) and the Early Holocene (beginning circa 10,000 years ago). The earliest sites in the San Diego subregion, documented to be over 9,000 years old, belong to the San Dieguito Tradition. The San Dieguito Tradition has been documented mostly in the coastal and near coastal areas in San Diego County, as well as in the southeastern California deserts. The content of the earliest component of the C.W. Harris Site (CA-SDI-149/316/4935B), located along the San Dieguito River, approximately 46 miles to the south of the project, formed the basis upon which the "San Dieguito complex" was identified and which was later reclassified as the San Dieguito Tradition.

During the subsequent Archaic Period, generally classified as occurring between approximately 9,500 years ago and 1,500 years ago, artifact assemblages of the Milling Stone Horizon/Encinitas Tradition occur at a range of coastal and adjacent inland sites, and, in contrast to those of the previous Early Prehistoric Period, are relatively common in the study area region. These assemblages appear to indicate that a relatively stable, sedentary, predominantly gathering complex, possibly associated with one people, was present in the coastal and immediately inland areas of southern California for more than 7,000 years.

The beginning of the Late Prehistoric Period, circa 1,500 years ago, is seen as a time marked by a number of rather abrupt changes, at least partially caused by significant variations in climatic conditions, resulting in alteration of previous subsistence practices, the adoption of significant new technologies, and shift in settlement. Subsistence and technological changes that occurred include a shift from hunting using atlatl and dart to the bow and arrow; a de-emphasizing of shellfish gathering along some areas of the coast (possibly due to silting-in of the coastal lagoons); and an increase in the storage of crops, such as acorns and pinyon nuts. The shift in settlement in the early part of the period, from 1,500 to 750 years ago, is evidenced locally by a rather sudden decline in population, likely due to warm and arid conditions associated with the Medieval Warm Period, documented to have occurred between approximately 1,100 and 600 years ago. During the latter part of the Late Prehistoric Period, beginning

around 750 years ago, the climate was cooler and moister, resulting in reoccupation of the area and more sedentary land use.

The Late Prehistoric Period has been commonly described archaeologically in northern San Diego County and the western portion of Riverside County as the San Luis Rey (SLR) complex. As originally defined, the SLR complex is associated with the ethnographic Luiseño, who were present in the area at the time of first contact with Europeans.

Ethnographic Setting

While ethnographers do not entirely agree, the project location is generally considered to lie within the traditional territory of the Luiseño people. The name Luiseño derives from Mission San Luis Rey de Francia and has been used to refer to the Native people associated with the mission. Some ethnographers place the area of the project within or adjacent to a "transitional" area between the Luiseño and the linguistically related Cahuilla to the east, but others place it firmly within the traditional territory of the Luiseño people. The Luiseño and Cahuilla are both Takic-speaking people of the Uto-Aztecan linguistic stock. The Luiseño followed a seasonal gathering cycle, with bands occupying a series of campsites within their territory. The Luiseño lived in semi-sedentary villages usually located along major drainages, in valley bottoms, and also on the coastal strand, with each family controlling gathering areas.

Historical Setting

Spanish Period

The beginning of the historic period in the San Diego area, generally given as 1769, was marked by a Spanish expedition headed by Gaspar de Portolá and Junípero Serra that established the Royal Presidio of San Diego. Portolá then traveled north from San Diego seeking suitable locations to establish military presidios and religious missions to extend the Spanish Empire into Alta California. The first documented Spanish contact in what is now Riverside County was by Spanish military captain Juan Bautista de Anza who led expeditions in 1774 and 1775 from Sonora to Monterey, via the San Jacinto Mountains and San Jacinto Valley.

Mission San Juan Capistrano and Mission San Luis Rey de Francia, established in 1776 and 1798, respectively, claimed a large part of southwestern Riverside County. Due to the inland geographical location of the Cahuilla territory, the Spanish missions did not have as direct an effect on them as it did on the Luiseño who lived along the coast. On the coast, the Luiseño were moved into the Mission environment, where living conditions and diseases promoted the decline of the Luiseño population. However, throughout the Spanish Period, the influence of the Spanish progressively spread further from the coast and into the inland areas of southern California as Missions San Luis Rey and San Gabriel extended their influence into the surrounding regions and used the lands for grazing cattle and other animals. In the 1810s, ranchos and mission outposts called *asistencias* were established, increasing the amount of Spanish contact in the region. While there were efforts to develop *asistencias* located in San Bernardino and Pala into full missions in order to establish an inland mission system, Mexico won independence from Spain in 1821, bringing an end to the Spanish Period in California.

Mexican Period

Although Mexico gained its independence from Spain in 1821, Spanish patterns of culture and influence remained for a time. The missions continued to operate as they had in the past, and laws governing the distribution of land were also retained in the 1820s. Following secularization of the missions in 1834, large ranchos were granted to prominent and well-connected individuals, ushering in the Rancho Era, with the society making a transition from one dominated by the church and the military to a more civilian population, with people living on ranchos or in pueblos. With the numerous new ranchos in private hands, cattle ranching expanded and prevailed over agricultural activities.

In 1835, Jose Antonio Estudillo of San Diego submitted a petition for the San Jacinto Rancho, and in 1842 he was granted close to the maximum size allowed of 11 square leagues. In 1845, Estudillo's son-in-law, Miguel de Pedrorena filed a petition for half of the San Jacinto Viejo Rancho and a small additional portion of land two miles to the northeast in the hills east of Lamb Canyon. This portion, the northern half of the San Jacinto Viejo Rancho, became known as the San Jacinto Nuevo y Potrero Rancho.

Following the secularization of the missions in 1834, the political instability led to Indian revolts and uprisings against the Mexican rancheros who, not uncommonly, treated Indians as serfs. Many Indians left the missions and ranchos and sought refuge among inland inhabitants. Some Luiseño people even acquired land grants and eventually entered into mainstream Mexican culture. During the Mexican period, the Cahuilla were likewise increasingly influenced by Mexican culture. Some of the Cahuilla acquired Spanish names, learned Spanish, and adopted forms of Spanish subsistence, such as raising cattle, agriculture, and wage labor. Many Cahuilla worked seasonally for the Mexicans, traveling to and from their villages.

American Period

American governance began in 1848, when Mexico signed the Treaty of Guadalupe Hidalgo, ceding California to the United States at the conclusion of the Mexican–American War. California soon experienced substantial population growth as a result of the California gold rush, the end of the Civil War, and the passage of the Homestead Act. While the American system required that the newly acquired land be surveyed prior to settlement, the Treaty of Guadalupe Hidalgo bound the United States to honor the land claims of Mexican citizens who were granted ownership of ranchos by the Mexican government. The Land Act of 1851 established a board of commissioners to review land grant claims, and land patents for the land grants were issued from 1876 to 1893. The San Jacinto Nuevo y Potrero Rancho land grant was patented in 1883 to Miguel Pedrorena, Maria Antonia Estudillo Pedrorena, Isabel Pedrorena, and Helena Pedrorena.

Southern California was developed by Americans and other immigrants who migrated to the western frontier in pursuit of gold and other mining, agriculture, trade, and land speculation. During the latter part of the nineteenth century "boom and bust" cycles brought thousands of people into southern California. While many eventually left, some remained to later form the foundations of small communities based on farming, orchards, dairies, and livestock ranching. The population growth of southern California during these early years of the American Period brought a need for mail and freight travel, and numerous mail routes were established in the region, leading to opening of San Jacinto's first post office in 1870.

During the early days of the American Period, the San Jacinto Valley had centered on the Estudillos' stock farm on the San Jacinto Rancho. By the 1860s, however, economic considerations forced the

Estudillo family to begin selling portions of their rancho. Americans began immigrating in great numbers, by 1870 almost 100 people were living in the San Jacinto region, and orchards and farms rapidly replaced cattle ranching.

By 1880, Henry Hewitt had bought approximately 8,000 acres of land in the San Jacinto Valley and was running a store and a hotel. In the early 1880s, the San Jacinto Land Association bought more than 10,000 acres of land and developed the town of New San Jacinto, which grew rapidly and by 1886 had 250 residents, 150 houses, two hotels, a brickyard, lumberyards, a blacksmith, and a newspaper. By 1887 the Estudillo Land and Water Company had been incorporated in order to subdivide and market the last remaining 1,100 acres of the Estudillo land grant. The Estudillo Land and Water Company offered the San Jacinto Valley Railway, purchased by the California Central Railway that same year, 27 acres of land for a railroad right-of-way and depot. As such, the railroad to the San Jacinto Valley ended on the Estudillo tract approximately 0.5 mile west of San Jacinto.

With the completion of the California Southern Railway, settlers flocked to the Perris and San Jacinto valleys in even greater numbers. By the early 1890s, San Jacinto had a population of 1,500, three hotels, 24 stores, a bank, and was a thriving civic center for the region. The project area and surrounding region continued to develop along with the railroad; however, as with much of southern California, the San Jacinto and Perris valleys were plagued by water scarcity in the late nineteenth and early twentieth centuries.

In 1922, California reached an agreement with the other states in the Colorado River watershed basin allowing the allotment of water needed to construct the Colorado River Aqueduct, which runs through the San Jacinto Valley directly north of, and also through, the project area. The construction of the Colorado River Aqueduct by the Los Angeles Metropolitan Water District occurred along various points simultaneously between 1934 and 1941, helping to fuel a torpid economy in the midst of the Great Depression. At its completion, the Colorado River Aqueduct was a huge American engineering achievement stretching for 242 miles.

Due to construction of the Colorado River Aqueduct and other efforts to bring water to the region by the District in the 1950s, agriculture in the area shifted from dry farming crops to a more diverse collection of crops; irrigation allowed alfalfa, the King potato, and sugar beets to be grown in the Perris valley. The State Water Project was approved by the California Legislature in 1951, with construction beginning in 1957; the terminus of this approximately 600-mile long water delivery and storage system is Lake Perris, which was constructed in the latter part of the 1960s and early 1970s. In addition to being an important water resource, Lake Perris afforded the area with recreational activities.

The portion of the Colorado River Aqueduct within and in proximity to the project area is the Casa Loma Siphon and Canal.

4.4.1.2 Identification of Cultural Resources

Records Search

A records search of the California Historical Resources Information System (CHRIS) was conducted at the Eastern Information Center (EIC) on February 4, 2020. The records search covered the project site and a one-mile radius around it and included a review of archaeological and historical resource data, locations and citations for previous cultural resource studies, and a review of the State Office of Historic Preservation's (OHP's) historic properties directory. The records search identified 87 previous cultural

resource studies within the one-mile-radius records search limits, 19 of which are immediately adjacent to or include portion of the project area. Of these 19 studies, 15 were indicated as archaeological/ cultural resources surveys or assessment reports; one as a historic properties survey report; one as a cultural resource "study"; one as a cultural resources monitoring report; and one was vague as to the nature of the study. One survey, conducted in 2009, covered a large section of the current project area, extending from Sanderson Avenue on the west to the Alessandro Ponds on the east. The only resource noted during that survey was the San Diego Aqueduct (P-33-015734), which was noted as being deeply buried.

The records search identified 90 previously recorded cultural resources within a one-mile radius of the project site. Eight of these resources are situated within or in immediate proximity to the project: CA-RIV-3970, CA-RIV-3971, and CA-RIV-12672 are historic refuse scatters/deposits; P-33-007297 is the remnants (concrete slabs and driveway) of the Raymar Dairy; CA-RIV-6726H is the Colorado River Aqueduct, and CA-RIV-8195 is the San Diego Aqueduct and San Diego Canal, constructed in the mid-twentieth century, but these two resources have overlapping segments; P-33-015735 is a historic residence and associated outbuildings constructed in the Craftsman style, circa 1920s (now demolished); and CA-RIV-11852 consists of two concrete slabs and a refuse deposit post-dating 1945.

Other Archival Research

Various additional archival sources were consulted, including historic topographic maps and aerial imagery. In general, the early topographic maps and aerial photographs examined indicate that, prior to 45 years ago, and dating back into the nineteenth century, the area in which the project lies contained mostly rural farm and/or dairy-related activity, with structures associated with scattered farmsteads and/or dairy operations predominating in the area. Communities such as San Jacinto and Hemet were rural communities associated with these agricultural and dairy activities. Other than these rural activities, the other features noted on the historic aerials were the construction, beginning in the 1930s, of the Colorado and San Diego aqueducts and associated facilities in the area. Not surprisingly, six of the eight cultural resources recorded within or immediate proximity to the project alignment are related to these rural farming and dairy activities with the other two related to the construction of the aqueducts and associated facilities in the area.

Native American Contact Program

The NAHC was contacted on January 28, 2020 for a Sacred Lands File search and list of Native American contacts for the project area. The NAHC indicated in a response dated February 11, 2020 that the Sacred Lands File search was positive and recommended contacting the tribal contacts provided in order to obtain additional cultural resources information. Letters were sent on February 18, 2020 to Native American representatives and interested parties identified by the NAHC. Three responses have been received to date, from the Morongo Band of Mission Indians, Agua Caliente Band of Cahuilla Indians (ACBCI), and the Soboba Band of Luiseño Indians (Soboba). The Morongo Band of Mission Indians responded that it has no additional comments and will likely defer to Soboba during formal consultation. ACBCI indicated that the project is not within the ACBCI's reservation but is located with its Traditional Use Area and requested copies of cultural resource documentation associated with the project be provided to them. Soboba indicated that the project is outside their existing reservation but is within their Tribal Traditional Use Areas and "is in proximity to known sites, is a shared use area that was used in ongoing trade between tribes and is considered to be culturally sensitive by the people of Soboba." Soboba requests ongoing consultation and transfer of information as related to the project,

that Native American Monitor(s) from Soboba be present during the project's ground-disturbing activities, and that proper procedures be taken and the tribe be honored.

Pedestrian Survey

An intensive pedestrian survey of the proposed pipeline alignments and facility locations was undertaken on February 20, 2020 by two HELIX archaeologists and a Soboba tribal cultural monitor. No newly identified cultural resources were observed during the current survey, but five of the eight cultural resources previously recorded within or immediately adjacent to project were reidentified. These include the Colorado River Aqueduct and San Diego Aqueduct (CA-RIV-6726 and CA-RIV-8195) and three historic trash scatters: CA-RIV-3970, CA-RIV-3971 and CA-RIV-12672. Three of the eight previously recorded cultural resources, P-33-007297 (the former Raymar Dairy), P-33-015735 (a historic rural residential complex), and P-33-024874/CA-RIV-11852 (a post-1945 resource consisting of two concrete slabs), were found not to extend into the project area. Portions of the project area were not able to be surveyed due to active agricultural uses, which obscured views and precluded access.

4.4.2 Regulatory Framework

Cultural resources are defined as buildings, sites, structures, or objects, each of which may have historical, architectural, archaeological, cultural, and/or scientific importance. Significant resources are those resources that have been found eligible for listing in the California Register of Historical Resources (CRHR) or the National Register of Historic Places (NRHP), as applicable.

4.4.2.1 National Historic Preservation Act

Federal regulations that would be applicable to the project if there is a federal nexus (e.g., permitting or funding from a federal agency) consist of the National Historic Preservation Act (NHPA) and its implementing regulations (16 United States Code 470 et seq., 36 CFR [Code of Federal Regulations] Part 800). Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on "historic properties", that is, properties (either historic or archaeological) that are eligible for the NRHP. To be eligible for the NRHP, a historic property must be significant at the local, state, or national level under one or more of the following four criteria:

A. Associated with events that have made a significant contribution to the broad patterns of our history;

B. Associated with the lives of persons significant in our past;

C. Embodies the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; and/or

D. Has yielded or may be likely to yield, information important in prehistory or history.

4.4.2.2 California Environmental Quality Act

CEQA, PRC 21084.1 and *CEQA Guidelines*, CCR Title 14 Section 15064.5 discuss significant cultural resources as "historical resources," and define them as:

- Resource(s) listed in or determined eligible by the State Historical Resources Commission for listing in the CRHR (14 CCR Section 15064.5[a][1]);

- Resource(s) either listed in the NRHP or in a "local register of historical resources" or identified as significant in a historical resource survey meeting the requirements of Section 5024.1(g) of the PRC, unless "the preponderance of evidence demonstrates that it is not historically or culturally significant" (14 CCR Section 15064.5[a][2]);

- Resources determined by the Lead Agency to meet the criteria for listing in the CRHR (14 CCR Section 15064.5[a][3]).

For listing in the CRHR, a historical resource must be significant at the local, state, or national level under one or more of the following four criteria:

1. It is associated with events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States;

2. It is associated with the lives of persons important to local, California, or national history;

3. It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of a master or possesses high artistic values; and/or

4. It has yielded or has the potential to yield information important to the prehistory or history of the local area, California, or the nation.

Under 14 CCR Section 15064.5(a)(4), a resource may also be considered a "historical resource" for the purposes of CEQA at the discretion of the lead agency.

All resources that are eligible for listing in the NRHP or CRHR must have integrity, which is the authenticity of a historical resource's physical identity evidenced by the survival of characteristics that existed during the resource's period of significance. Resources, therefore, must retain enough of their historic character or appearance to be recognizable as historical resources and to convey the reasons for their significance. Integrity is evaluated with regard to the retention of location, design, setting, materials, workmanship, feeling, and association. In an archaeological deposit, integrity is assessed with reference to the preservation of material constituents and their culturally and historically meaningful spatial relationships. A resource must also be judged with reference to the particular criteria under which it is proposed for nomination. Under Section 106 of the NHPA, actions that alter any of the characteristics that qualify a property for eligibility for listing in the NRHP "in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association" (36 CFR 800.5[a]) constitute an adverse effect to the historic property.

4.4.2.3 Native American Heritage Values

Federal and state laws mandate that consideration be given to the concerns of contemporary Native Americans with regard to potentially ancestral human remains, associated funerary objects, and items of cultural patrimony. Consequently, an important element in assessing the significance of the study site has been to evaluate the likelihood that these classes of items are present in areas that would be affected by the proposed project.

Potentially relevant to prehistoric archaeological sites is the category termed Traditional Cultural Properties in discussions of cultural resource management performed under federal auspices. According to Patricia L. Parker and Thomas F. King (1998), "Traditional" in this context refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or through practice. The traditional cultural significance of a historic property, then, is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices. Cultural resources can include Traditional Cultural Properties, such as gathering areas, landmarks, and ethnographic locations, in addition to archaeological districts. Generally, a Traditional Cultural Property may consist of a single site, or group of associated archaeological sites (district or traditional cultural landscape), or an area of cultural/ethnographic importance.

In California, the Traditional Tribal Cultural Places Bill of 2004 requires local governments to consult with Native American Tribes during the project planning process, specifically before adopting or amending a General Plan or a Specific Plan, or when designating land as open space for the purpose of protecting Native American cultural places. The intent of this legislation is to encourage consultation and assist in the preservation of Native American places of prehistoric, archaeological, cultural, spiritual, and ceremonial importance. State AB 52, effective July 1, 2015, introduced the Tribal Cultural Resource (TCR) as a class of cultural resource and additional considerations relating to Native American consultation into CEQA. As a general concept, a TCR is similar to the federally defined Traditional Cultural Property; however, it incorporates consideration of local and state significance and required mitigation under CEQA. A TCR may be considered significant if included in a local or state register of historical resources; or determined by the lead agency to be significant pursuant to criteria set forth in PRC §5024.1; or is a geographically defined cultural landscape that meets one or more of these criteria; or is a historical resource described in PRC §21084.1, a unique archaeological resource described in PRC §21083.2; or is a non-unique archaeological resource if it conforms with the above criteria.

4.4.3 Thresholds of Significance

The following criteria from Appendix G of the *CEQA Guidelines* are used as thresholds of significance to determine the impacts of the proposed project as related to cultural resources and tribal cultural resources. The proposed project would have a significant impact if it would:

1. Cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5;

2. Cause a substantial adverse change in the significance of an archaeological resources pursuant to §15064.5;

3. Disturb human remains, including those interred outside of formal cemeteries; or

4. Cause a substantial change in the significance of a tribal cultural resource, defined in PRC §21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

    a. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in PRC §5020.1(k), or

b. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of PRC §5024.1. In applying the criteria set forth in subdivision (c) of PRC §5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

4.4.4 Project Impacts and Mitigation

4.4.4.1 Issue 1: Historical Resources

Would the proposed project cause a substantial adverse change in the significance of a historical resource pursuant to §5064.5?

Impact Analysis

Five cultural resources were determined to be located within or immediately adjacent to the project, as discussed previously in Section 4.4.1. These include the Colorado River Aqueduct and San Diego Aqueduct (CA-RIV-6726H and CA-RIV-8195) and three historic trash scatters: CA-RIV-3970, CA-RIV-3971, and CA-RIV-12672.

The Colorado River Aqueduct (CA-RIV-6726H) traverses approximately 242 miles to bring water from the Colorado River at Lake Havasu to Lake Mathews and ultimately to constituent cities. The segment of the resource within the project area is part of the Casa Loma Siphon Barrel 2 of the Aqueduct. The Aqueduct as a whole has previously been assessed as eligible for the NRHP and the CRHR, although not all segments have been assessed. The segment of the Casa Loma Siphon within the project area was built in 1959-1960 and is entirely underground. To the west of the project area, the Casa Loma Canal is an aboveground channel. South of the existing pipeline, a bridge constructed of railroad ties was identified within the project area. The bridge appeared to be built to channel the water flow in the creek and allow vehicles to cross; its age is indeterminate. The Aqueduct would not be affected by the project, which proposes to slipline the existing District pipeline in this area.

The segment of The San Diego Aqueduct and San Diego Canal (CA-RIV-8195) within the project area is the same as the segment of the Colorado River Aqueduct recorded within the project area as part of CA-RIV-6726H). As noted above, the Aqueduct would not be affected by the proposed project.

CA-RIV-3970, CA-RIV-3971, and CA-RIV-12672 are historic trash scatters located along portions of the project's proposed 36-inch pipeline route. The sites are recorded as scatters of historic and modern refuse, dating from the late nineteenth century to mid-twentieth century, and consisting of objects such as glass bottles and jars and ceramic fragments. CA-RIV-3970 was previously assessed and is not considered a significant resource under CEQA, due to its limited research potential and the large amount of disturbance to the site. CA-RIV-3971 and CA-RIV-12672 have also been subject to a great deal of past disturbance and have very limited research potential, if any. All three resources are therefore ineligible for the NRHP or CRHP. In addition, these three sites (1) are not associated with events that have made a significant contribution to the broad patterns of history; (2) cannot be shown to be associated with the lives of persons significant to the past; (3) do not embody the distinctive characteristics of a type, period, or method of construction or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction; and (4) are not likely to yield information important in prehistory or history.

As such, no historical resources per CEQA would be affected by the project, and no impacts would occur.

Mitigation Measures

No impacts to historical resources would occur; therefore, no mitigation is required.

4.4.4.2 Issue 2: Archaeological Resources

Would the proposed project cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?

Impact Analysis

As discussed previously under Section 4.4.1, cultural resources are known to occur in the immediate vicinity of the project area and the area is considered as sensitive for cultural resources, as noted by the Soboba tribe. Based on the presence of cultural resources in the project area, the cultural sensitivity of the project area, and the fact that portions of the area could not be surveyed due to active agricultural uses and other factors that could have been obscuring cultural resources within the project area, unidentified resources could be present within the project footprint. The project therefore has the potential to affect archaeological resources during ground-disturbing activities, such as clearing, trenching, and grading, and impacts are considered potentially significant. As such, an archaeological and Native American monitoring program would be required, as outlined below in mitigation measures MM-CUL-1 through MM-CUL-6.

Mitigation Measures

The following mitigation measures would be required to be implemented during project construction to avoid potential impacts to archaeological resources:

MM-CUL-1 **Cultural Resources Treatment and Monitoring Agreement**. At least 30 days prior to the start of ground-disturbing activities, the District shall contact the Consulting Tribe(s) to develop Cultural Resource Treatment Monitoring Agreement(s) ("Agreement"). The Agreement(s) shall address the treatment of archaeological resources inadvertently discovered on the project site; project grading; ground disturbance and development scheduling; the designation, responsibilities, and participation of tribal monitor(s) during grading, excavation, and ground-disturbing activities; and compensation for the tribal monitors, including overtime, weekend rates, and mileage reimbursements.

MM-CUL-2 **Develop a Cultural Resources Monitoring Plan.** Prior to grading activities, a Cultural Resources Monitoring Plan shall be prepared by a qualified archaeologist in consultation with the Consulting Tribe(s). The plan shall also identify the location and timing of cultural resources monitoring. The plan shall contain an allowance that the qualified archaeologist, based on observations of subsurface soil stratigraphy or other factors during initial grading, and in consultation with the Native American monitor and the lead agency, may reduce or discontinue monitoring as warranted if the archaeologist determines that the possibility of encountering archaeological deposits is low. The plan shall outline the appropriate measures to be followed in the event of unanticipated discovery of cultural resources during project implementation (including during the survey to occur following vegetation removal and monitoring during ground-disturbing

activities). The plan shall identify avoidance as the preferred manner of mitigating impacts to cultural resources. The plan shall establish the criteria utilized to evaluate the historic significance (per CEQA) of the discoveries, methods of avoidance consistent with *CEQA Guidelines* Section 15126.4(b)(3), as well as identify the appropriate data recovery methods and procedures to mitigate the effect of the project if avoidance of significant historical or unique archaeological resources is determined to be infeasible. The plan shall also include reporting of monitoring results within a timely manner, disposition of artifacts, curation of data, and dissemination of reports to local and state repositories, libraries, and interested professionals. A qualified archaeologist and Consulting Tribe(s) tribal monitor shall attend a pre-grade meeting with District staff, the contractor, and appropriate subcontractors to discuss the monitoring program, including protocols to be followed in the event that cultural material is encountered.

MM-CUL-3 **Tribal Monitoring Agreements.** A qualified archaeological monitor and a Consulting Tribe(s) monitor shall be present for ground-disturbing activities associated with the Project, and both the project archaeologist and tribal monitor(s) will make a determination as to the areas with a potential for encountering cultural material. At least seven business days prior to project grading, the District shall contact the tribal monitors to notify the Tribe of grading/excavation and the monitoring program/ schedule, and to coordinate with the Tribe on the monitoring work schedule. Both the archaeologist and the tribal monitor shall have the authority to stop and redirect grading activities in order to evaluate the nature and significance of any archaeological resources discovered within the project limits. Such evaluation shall include culturally appropriate temporary and permanent treatment pursuant to the Cultural Resources Treatment and Monitoring Agreement, which may include avoidance of cultural resources, in-place preservation, data recovery, and/or reburial so the resources are not subject to further disturbance in perpetuity. Any reburial shall occur at a location predetermined between the District and the Consulting Tribe(s), details of which shall be addressed in the Cultural Resources Treatment and Monitoring Agreement in MM-CUL-1. Treatment may also include curation of the cultural resources at a tribal curation facility, as determined in discussion among the District, the project archaeologist, and the tribal representatives and addressed in the Cultural Resources Treatment and Monitoring Agreement referenced in MM-CUL-1.

MM-CUL-4 **Evaluation of Discovered Artifacts.** All artifacts discovered at the development site shall be inventoried and analyzed by the project archaeologist and tribal monitor(s). A monitoring report will be prepared, detailing the methods and results of the monitoring program, as well as the disposition of any cultural material encountered. If no cultural material is encountered, a brief letter report will be sufficient to document monitoring activities.

MM-CUL-5 **Disposition of Inadvertent Discoveries.** In the event that Native American cultural resources are recovered during the course of grading (inadvertent discoveries), the following procedures shall be carried out for final disposition of the discoveries with the tribe. The District shall relinquish ownership of all cultural resources, including sacred items, burial goods, and all archaeological artifacts and non-human remains as part of the required mitigation for impacts to cultural resources, and adhere to the following:

1. Preservation-in-place is the preferred option; preservation-in-place means avoiding the resources and leaving them in the place where they were found with no development affecting the integrity of the resource.

2. If preservation-in-place is not feasible, on-site reburial of the discovered items as detailed in the Monitoring Plan required pursuant to MM-CUL-2 is the next preferable treatment measure. This shall include measures and provisions to protect the future reburial area from future impacts in perpetuity. Reburial shall not occur until all legally required cataloging and basic recordation have been completed. No recordation of sacred items is permitted without the written consent of all Consulting Native American Tribal Governments.

3. In the event that on-site reburial is not feasible, the District shall enter into a curation agreement with an appropriate qualified repository within Riverside County that meets federal standards per 36 Code of Federal Regulations 800 Part 79 and therefore would be curated and made available to other archaeologists/researchers for further study. The collections and associated records shall be transferred, including title, to an appropriate curation facility within Riverside County, to be accompanied by payment of the fees necessary for permanent curation.

MM-CUL-6 **Non-Disclosure of Reburial Locations.** It is understood by all parties that unless otherwise required by law, the site of any reburial of culturally sensitive resources shall not be disclosed and shall not be governed by public disclosure requirements of the California Public Records Act. The Coroner, pursuant to the specific exemption set forth in California Government Code 6254(r), parties, and Lead Agencies will be asked to withhold public disclosure information related to such reburial.

Significance After Mitigation

With implementation of MM-CUL-1 through MM-CUL-6, potential impacts to archaeological resources would be less than significant.

4.4.4.3 Issue 3: Human Remains

Would the proposed project disturb any human remains, including those interred outside of formal cemeteries?

Impact Analysis

No formal cemeteries are known to occur in the immediate vicinity of the project and no human remains were observed or identified during the survey conducted for the project. Although not anticipated, the potential exists to encounter human remains during the project's ground-disturbing activities, such as clearing, trenching, and grading. The potential for inadvertent disturbance of any human remains would be considered a significant impact, regardless of archaeological significance or association. As such, mitigation measure MM-CUL-7 below would be implemented.

Mitigation Measures

The following mitigation measure would be implemented during project construction to avoid potential impacts to human remains.

MM-CUL-7 **Procedure to Address Inadvertent Disturbance of Human Remains.** If Native American human remains are encountered, PRC Section 5097.98 and California Health and Safety Code Section 7050.5 will be followed. If human remains are encountered no further disturbance shall occur until the Riverside County Coroner has made the necessary findings as to origin. Further, pursuant to California PRC Section 5097.98(b), remains shall be left in place and free from disturbance until a final decision as to the treatment and disposition has been made. If the Riverside County Coroner determines the remains to be Native American, the coroner shall contact the NAHC within 24 hours. Subsequently, the NAHC shall identify the person or persons it believes to be the "most likely descendant." The most likely descendant shall then make recommendations and engage in consultations concerning the treatment of the remains as provided in PRC Section 5097.98.

Significance After Mitigation

With implementation of MM-CUL-7, potential impacts to human remains would be less than significant.

4.4.4.4 Issue 4: Tribal Cultural Resources

Would the proposed project cause a substantial change in the significance of a tribal cultural resource, defined in Public Resources Code §21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

1. *Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code §5020.1(k), or*

2. *A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code §5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code §5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.*

Impact Analysis

Per AB 52, the District initiated consultation with California Native American tribes that are traditionally and culturally affiliated with the geographic area of a proposed project to identify resources of cultural or spiritual value to the tribe. On February 21, 2020, the District sent consultation notification letters via certified mail to Native American groups on the District's Master List pursuant to the requirements of AB 52 pertaining to government-to-government consultation. The District followed this with a corrected notice on February 26, 2020 to the same list of tribes. Table 4.4-1, *Native American Tribal Consultation Summary*, summarizes the District's consultation efforts. To date, the District has conducted consultation with three Native American Tribes: The Soboba Band of Luiseno Indians (Soboba), Rincon Band of Luiseño Indians (Rincon), and the Agua Caliente Band of Cahuilla Indians (Agua Caliente). In

consultation meetings, Tribes highlighted their concerns for the site and made recommendations. They noted potential tribal cultural resources known to be in the vicinity, but none that were identified within the proposed project site. All Tribes expressed concern with potential unearthing of unknown artifacts while grading the sites for the brine ponds and AWTF, as well as trenching for pipeline installation and re-lining. Tribes recommended tribal monitoring to cover the potential for uncovering of unknown buried artifacts.

Table 4.4-1
NATIVE AMERICAN TRIBAL CONSULTATION SUMMARY

Tribe/ Organization	Individual Contacted	Date Letter Mailed	Response Received	Consultation Held
Agua Caliente	Katie Croft	February 21 and 26, 2020	Requested consultation	July 23, 2020
Morongo	Travis Armstrong	February 21 and 26, 2020	Deferred to Soboba Band of Luiseno Indians.	N/A
Pechanga	Ebru Ozdil	February 21 and 26, 2020	Did not respond	
Rincon	Destiny Colocho	February 21 and 26, 2020	Identified location is within Territory of the Luiseno people, and within Rincon's specific area of Historic interest. Also requested documents and consultation.	April 22, 2020
San Manuel	Jessica Mauck and Alexandra McCleary	February 21 and 26, 2020	Site is located outside Serrano ancestral territory - declined consultation	N/A
Soboba	Joseph Ontiveros	February 21 and 26, 2020	Requested consultation	April 28, 2020

As discussed above, there are no identified resources, including tribal cultural resources, that are listed or eligible for listing in the CRHR that would be affected by implementation of the project. In addition, no specific significant tribal cultural resources were identified within the project footprint by Tribes during consultation through the NAHC; however, Soboba has indicated that the project is within their Traditional Use Areas, is in proximity to known sites, and is considered to be culturally significant by the people of Soboba. Based on the culturally sensitivity of the area, tribal cultural resources could be present within the project's proposed footprint, and the project therefore has the potential to affect tribal cultural resources during ground-disturbing activities, such as clearing, trenching, and grading. Impacts are considered to be potentially significant. As such, an archaeological and Native American monitoring program would be implemented, as outlined above in mitigation measures MM-CUL-1 through MM-CUL-6. MM-CUL-7 would also be implemented to avoid impacts to Native American human remains, if encountered.

Mitigation Measures

MM-CUL-1 through MM-CUL-7 would be implemented during project construction to avoid impacts to tribal cultural resources.

Significance After Mitigation

With implementation of MM-CUL-1 through MM-CUL-7, potential impacts to tribal cultural resources would be less than significant.

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4.5 ENERGY

This section addresses the potential energy-related impacts of the proposed project. The following discussion includes a description of existing conditions as related to energy, a summary of applicable regulations, and an evaluation of the proposed project's potential environmental effects associated with the wasteful, inefficient, or unnecessary consumption of energy resources and conflict with plans for renewable energy or energy efficiency. This section is based in part on information from the Air Quality/ Greenhouse Gas Emissions Technical Report prepared by HELIX (2021; Appendix B); the California Energy Demand (CED) 2018-2030 Revised Forecast (California Energy Commission [CEC] 2018); and the CEC's Final 2019 Integrated Energy Policy Report (CEC 2020a).

4.5.1 Existing Conditions

4.5.1.1 Existing Energy Consumption and Generation

Units of Measure

The units of energy used in this section are the British thermal units (BTU), kWh[1], therms, and gallons. A BTU is the quantity of heat required to raise the temperature of one pound of water one °F at sea level. Because the other units of energy can all be converted into equivalent BTU, the BTU is used as the basis for comparing energy consumption associated with different resources. A kWh is a unit of electrical energy, and one kWh is equivalent to approximately 3,413 BTU, taking into account initial conversion losses (i.e., from one type of energy, such as chemical, to another type of energy, such as mechanical) and transmission losses. Natural gas consumption is described typically in terms of cubic feet or therms; one cubic foot of natural gas is equivalent to approximately 1,050 BTU, and one therm represents 100,000 BTU. One gallon of gasoline/diesel is equivalent to approximately 125,000/139,000 BTU, respectively, taking into account energy consumed in the refining process.

California Energy Overview

Electricity

Historically, California has relied heavily on oil- and gas-fired power plants to generate electricity. As a result of regulatory measures and tax incentives, California's electrical system has become more reliant over recent years on renewable energy sources, including cogeneration, wind energy, solar energy, geothermal energy, biomass conversion, transformation plants, and small hydroelectric plants.

California's electricity needs are satisfied by a variety of entities, including investor-owned utilities, publicly owned utilities, electric service providers, and community choice aggregators.[2] In 2018, the California power mix totaled 285,488 gigawatt hours (GWh). In-state generation accounted for 194,842 GWh, or 68 percent, of the state's power mix. The remaining electricity came from out-of-state

[1] Kilowatt hours is the most commonly used measure of electrical consumption; however, due to the scope of this analysis, gigawatt hours (GWh; equivalent to one million kWh) is also used.

[2] Community choice aggregation is authorized in California by AB 117 (Chapter 836, Statutes of 2002), which allows cities, counties, and groups of cities and counties to aggregate the electric load of the residents, businesses, and institutions within their jurisdictions to provide them electricity.

imports (CEC 2020b). Table 4.5-1 provides a summary of California's total (in-state generation plus out-of-state imports) power mix sources as of 2018.

Table 4.5-1
CALIFORNIA ELECTRICITY SOURCES 2018

Fuel Type	Percent of California Power
Natural Gas	34.9
Nuclear	9.1
Large Hydro	10.7
Coal	3.3
Renewable	31.4
Unspecified	10.5

Source: CEC 2020b
Note: Total may not add to 100 percent due to rounding.

Since deregulation in 1998, the CEC has licensed or given small power plant exemptions to:

- 66 projects representing 22,965 megawatts[3] (MW) currently on-line;
- 4 projects totaling 2,635 MW currently under construction or pre-construction;
- 2 projects totaling 795 MW currently on hold or under suspension; and
- 15 projects totaling 5,844.5 MW approved but then cancelled by applicants, or license expired or terminated before construction.

In addition, as of June 2020, the CEC had seven proposed projects under review, totaling approximately 651 MW (CEC 2020c). One additional geothermal steam turbine project, representing a total of 250 MW, has been announced but has not yet filed with the CEC.

On the demand side, Californians consumed 284,060 GWh of electricity in 2016 (CEC 2018). CEC staff forecasts of future electricity demand anticipate that consumption will grow by between 0.99 and 1.59 percent per year from 2017 to 2030, with peak demand forecasts growing by 0.30 to 1.52 percent annually from 2017 to 2030 (CEC 2018).

Natural Gas

Natural gas provides the largest portion of the total in-state capacity and electricity generation in California, with nearly 45 percent of the natural gas burned in California used for electricity generation (CEC 2019a). Much of the remainder was consumed in the residential (21 percent), industrial (25 percent), and commercial (9 percent) sectors for uses such as cooking, space heating, and as an alternative transportation fuel. In 2012, total natural gas demand in California for industrial, residential, commercial, and electric power generation was 2,313 billion cubic feet (bcf) per year, up from 2,196 bcf per year in 2010 (CEC 2019a).

[3] Megawatts (MW) is a unit of power and represents the rate at which energy is generated or used. One MW is equivalent to one million watts.

Transportation Fuels

Transportation accounts for a major portion of California's energy budget. Automobiles and trucks consume gasoline and diesel fuel, which are nonrenewable energy products derived from crude oil. Gasoline is the most used transportation fuel in California, with 97 percent of all gasoline being consumed by light-duty cars, pickup trucks, and sport utility vehicles (SUVs). In 2015, 15.1 billion gallons of gasoline were sold in California (CEC 2019b). Diesel fuel is the second most consumed fuel in California, used by heavy-duty trucks, delivery vehicles, buses, trains, ships, boats, and farm and construction equipment. In 2015, 4.2 billion gallons of diesel were sold in California (CEC 2019b).

Regional Energy Overview

Electricity

Electrical service in the project area is provided by Southern California Edison (SCE). In 2015, SCE delivered more than 87 billion kWh of electricity to 15 million people over 15 counties and a service area of 50,000 square miles (SCE 2020). Approximately 36 percent of SCE's 2018 power mix was from renewable power sources, predominantly solar (13 percent), wind (13 percent), and geothermal (8 percent). The remaining 64 percent of the power mix was from natural gas (17 percent), nuclear (6 percent), large hydroelectric (4 percent), and unspecified sources (i.e., electricity transactions that are not traceable to specific generation sources; 37 percent; SCE 2019a). In 2016, SCE's Tehachapi Renewable Transmission Project, the nation's largest wind energy delivery infrastructure, became operational. It is a series of new and upgraded high-voltage transmission lines and substations capable of carrying 4,500 MW of electricity (enough energy to supply three million homes) from renewable wind and other generators in Kern County. The project is designed to provide added capacity to strengthen SCE's electrical system and also deliver clean, renewable energy to the region to help meet California's renewable energy goals (SCE 2019b).

The CED 2018-2030 Revised Forecast presents three demand scenarios for the SCE planning area's forecasted electricity consumption: high demand, mid demand, and low demand. The high demand scenario is characterized by low electricity rates, high population growth, low levels of efficiency, and low self-generation. Inversely, the low demand scenario is characterized by high electricity rates, low population growth, high levels of efficiency, and high self-generation. The mid demand scenario uses assumptions in between the high and low scenarios. The CED 2018-2030 Revised Forecast estimates that annual electricity consumption for the SCE planning area would reach between approximately 120,000 and 135,000 GWh by 2030, depending on which demand scenario is realized. The SCE Planning Area's consumption in 2016 was approximately 110,000 GWh (CEC 2018).

The County is one of the 15 counties serviced by SCE. The County's electricity consumption over from the five-year period of 2014 through 2018 is shown in Table 4.5-2, *Riverside County Electricity Consumption 2014-2018.* As shown in Table, 4.5-2, electricity consumption within the County decreased from 2014 to 2015 and then increased each year from 2015 to 2018.

Table 4.5-2
RIVERSIDE COUNTY ELECTRICITY CONSUMPTION 2014-2018

Year	Electricity Consumption (GWh)
2014	15,551
2015	15,286
2016	15,471
2017	16,159
2018	16,257

Source: CEC 2016a
GWh = gigawatt hours

In April 2018, San Jacinto Power (SJP) began serving customers in the City. SJP is a locally controlled electricity provider, governed and administered by the San Jacinto City Council, that generates electricity and then utilizes SCE transmission lines to deliver electricity to homes and businesses. Through SJP, customers within the city can choose between different electricity products that have different percentages of renewable energy, with one product providing a 100 percent renewable energy option.

Natural Gas

Natural gas service in the project area is provided by the Southern California Gas Company (SoCalGas). SoCalGas serves 21.8 million consumers over more than 500 communities and a service area of 24,000 square miles.

The County's gas consumption over from the five-year period of 2014 through 2018 is shown in Table 4.5-3, *Riverside County Gas Consumption 2014-2018.* As shown in Table 4.5-3, gas consumption within the County increased from 2014 to 2016 and then remained relatively constant from 2016 to 2018.

Table 4.5-3
RIVERSIDE COUNTY GAS CONSUMPTION 2014-2018

Year	Gas Consumption (millions of Therms)
2014	331
2015	353
2016	396
2017	393
2018	399

Source: CEC 2016b

Water-related Energy

Approximately 75 percent of the District's water supply is provided by the Metropolitan Water District of Southern California through the State Water Project and Colorado River Aqueduct. Before it reaches the District's service area, this imported water is pumped hundreds of miles from either the Sacramento-San Joaquin Bay Delta in northern California or from the Colorado River. Energy is used in the conveyance, treatment, and distribution of water; therefore, there is a certain amount of energy use

associated with every unit of water utilized by a consumer. This is known as "embedded" energy. Each unit of water may have a different amount of embedded energy in it depending on how much it is processed or conveyed before it is delivered to the user. For example, this energy is quite different in northern California compared to southern California, because it depends on pumping requirements related to distance and topography. The pumping of water along the Federal and State Water projects and across the Tehachapi Mountains into the Los Angeles Basin account for the higher energy embedded in consumption of water in southern California.

In California, the pumping, treating, and heating of water accounts for approximately 20 percent of the statewide electricity use (Public Policy Institute of California 2016).

4.5.2 Regulatory Framework

Energy consumption is a significant source of greenhouse gas (GHG) emissions. As such, federal, state, regional, and local regulations adopted for the purpose of reducing GHG emissions inherently include policies and goals related to energy consumption. Such policies and goals applicable to the project (most notably Corporate Average Fuel Economy [CAFE] standards; CCR, Title 24, Part 6 [California Energy Code]; CCR, Title 24, Part 11 [California Green Building Standards Code]; EO S-3-05; EO B-30-15; SB 32; AB 1493; CARB Scoping Plan; and the SCAG 2016-2040 RTP/SCS) are detailed in Chapter 4.7, Greenhouse Gas Emissions. Additional energy-related regulations not included in Chapter 4.7 are discussed below.

4.5.2.1 Federal

Energy Independence and Security Act of 2007

House of Representatives Bill 6 (HR 6), the federal Energy Independence and Security Act of 2007, established new standards for a few equipment types not already subjected to a standard, and updated some existing standards. Perhaps the most substantial new standard that HR 6 established is for general service lighting that is being deployed in two phases. First, phased in between 2012 through 2014, common light bulbs were required to use about 20 to 30 percent less energy than previous incandescent bulbs. Second, by 2020, light bulbs were required to consume 60 percent less energy than previous incandescent bulbs; this requirement will effectively phase out the incandescent light bulb.

4.5.2.2 State

California Energy Plan

The CEC is responsible for preparing the State Energy Plan, which identifies emerging trends related to energy supply, demand, conservation, public health and safety, and the maintenance of a healthy economy. The plan calls for the state to assist in the transformation of the transportation system to improve air quality, reduce congestion, and increase the efficient use of fuel supplies with the fewest environmental and energy costs. To further this policy, the plan identifies a number of strategies, including providing assistance to public agencies and fleet operators.

4.5.2.3 Local

City of San Jacinto General Plan

One of the seven resource management goals identified in the Resource Management Element of the City's General Plan is to promote the conservation of energy (Resource Management Goal 7). Policies to support this goal include the following:

Policy 7.1: Encourage the efficient use of energy resources.

Policy 7.2: Promote the use of alternative energy sources.

Policy 7.3: Support the use of energy-efficient building materials, equipment, and design in City facilities and infrastructure.

Policy 7.4: Encourage recycling programs that reduce emissions associated with manufacturing and waste disposal.

4.5.3 Thresholds of Significance

The following criteria from Appendix G of the *CEQA Guidelines* are used as thresholds of significance to determine the impacts of the proposed project as related to energy. The proposed project would have a significant impact if it would:

1. Result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation; or

2. Conflict with or obstruct a state or local plan for renewable energy or energy efficiency.

4.5.4 Project Impacts and Mitigation

4.5.4.1 Issue 1: Wasteful, Inefficient, or Unnecessary Energy Consumption

Would the proposed project result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

Impact Analysis

Construction Energy Use

Project construction would require the use of heavy off-road construction equipment for the various construction activities associated with each project component. Construction would also involve construction workers commuting to and from the work sites, and vendors vehicles and haul trucks delivering materials to and from the work sites. Construction equipment and vehicles would require gasoline, diesel, and potentially other fuel sources to operate. Information related to the number of heavy off-road equipment pieces and to vehicle miles traveled (VMT) for on-road construction vehicles, as well as associated fuel usage, was obtained from Appendix B of this EIR. Table 4.5-4, *Estimated Energy Consumption from Construction Equipment and Vehicles,* presents the anticipated types and quantities of heavy off-road equipment by project phase and construction activity, the diesel fuel gallons

required, and the energy consumed. The table also shows the fuel usage and energy consumption associated with on-road construction vehicles. The project is not anticipated to consume natural gas or substantial amounts of electricity during construction.

Table 4.5-4
ESTIMATED ENERGY CONSUMPTION FROM CONSTRUCTION EQUIPMENT AND VEHICLES

Project Component	Activity	Equipment	Qty	Diesel Fuel (gallons)	kBTU
PHASE I					
AWTF	Site Preparation	Tractor/Loader/Backhoe	2	106	14,695
	Grading	Dozer	1	101	14,051
		Grader	1	250	34,701
		Excavator	1	183	25,392
		Dump Truck	1	465	64,598
	Underground Utilities	Excavator	2	349	48,476
		Tractor/Loader/Backhoe	2	202	28,054
	Construction	Crane	1	1,246	173,252
		Excavator	2	4,152	577,099
		Tractor/Loader/Backhoe	2	2,403	333,974
		Boom Forklift	1	1,456	202,430
		Roller	1	1,032	143,490
		Dump Truck	1	3,772	524,334
		Plate Compactor	1	148	20,501
	Paving	Roller	2	91	12,627
		Paver	2	181	25,160
	Architectural Coatings	Air Compressor	1	42	5,800
Brine Management System	Site Preparation	Tractor/Loader/Backhoe	2	317	44,085
	Grading	Dozer	2	1,103	153,288
		Grader	2	2,723	378,557
		Excavator	2	1,993	277,008
		Tractor/Loader/Backhoe	2	1,153	160,307
		Dump Truck	3	5,432	755,042
	Underground utilities/ infrastructure (lining system)	Crane	1	648	90,901
		Excavator	2	2,159	300,092
		Tractor/Loader/Backhoe	2	1,249	173,666
	Insertion/Receiving Pits Excavation	Excavator	1	2,167	301,246
		Tractor/Loader/Backhoe	1	1,254	174,334

Table 4.5-4 (cont.)
ESTIMATED ENERGY CONSUMPTION FROM CONSTRUCTION EQUIPMENT AND VEHICLES

Project Component	Activity	Equipment	Qty	Diesel Fuel (gallons)	kBTU
PHASE I (cont.)					
Conveyance Pipelines	Pipeline Sliplining	Excavator	1	2,167	301,246
		Generator	1	1,758	244,339
		Welder	1	977	135,857
	Trenching	Excavator	1	2,167	301,246
		Tractor/Loader/Backhoe	1	1,254	174,334
	Pipeline Installation	Excavator	1	2,167	301,246
		Tractor/Loader/Backhoe	1	1,254	174,334
		Generator	1	1,758	244,339
		Welder	1	977	135,857
		Phase I Construction Equipment Total		50,857 (diesel)	7,069,150
		Phase I On-road Construction Vehicles		9,342 (diesel) 15,134 (gas)	3,175,128
		Total Phase I Construction Energy Expenditure			**10,244,278**
PHASE II					
AWTF Expansion	Underground Utilities	Excavator	1	266	36,945
		Tractor/Loader/Backhoe	1	154	21,355
	Construction	Crane	1	1,033	143,529
		Excavator	2	3,439	477,970
		Tractor/Loader/Backhoe	2	1,988	276,275
		Boom Forklift	1	1,207	167,782
		Roller	1	856	118,947
		Dump Truck	1	3,133	435,443
		Plate Compactor	1	122	17,016
	Architectural Coatings	Air Compressor	2	46	6,422
		Phase II Construction Equipment Total		12,242 (diesel)	1,701,682
		Phase II On-road Construction Vehicles		4,076 (diesel) 2,866 (gas)	921,963
		Total Phase II Construction Energy Expenditure			**2,623,645**

As shown in Table 4.5-4, the project's Phase I construction is estimated to consume a total of 10,244,278 kBTU of energy and the project's Phase II construction is estimated to consume a total of 2,623,645 kBTU of energy. The project's short-term energy use would be limited to that which is necessary to achieve successful completion of project construction; therefore, project construction would not use energy in a wasteful, inefficient, or unnecessary manner.

Operational Energy Use

Operation of the proposed project would require energy at the AWTF for lighting, HVAC, and the process equipment used for the advanced water treatment, as well as at the brine management system

for the operation of various pumps. Interior and exterior lighting at the AWTF would comply with Title 24 requirements. The electricity use associated with Phase I project operation of the AWTF is estimated to be 2,971,470 kWh per year and the electricity use associated with Phase II project operation of the AWTF is estimated to be 10,764,116 kWh per year. Electricity use associated with the brine management system pumps is estimated to be 1,303,842 kWh per year during both Phases I and II. Project-generated traffic, anticipated to be limited to up to five employees commuting to the AWTF, occasional chemical deliveries to the AWTF, and occasional trips made by the public for tours of the AWTF, would not represent a substantial increase in energy (in the form of fuel) usage. The project's long-term energy use would be limited to that which is necessary for the project to successfully operate; therefore, project operations would not use energy in a wasteful, inefficient, or unnecessary manner.

Energy Savings

By providing a local source of potable water, the project would reduce reliance on imported water, thereby reducing the energy used to pump water from the Sacramento-San Joaquin Bay Delta in northern California or from the Colorado River. The provision of potable water consumes large amounts of energy associated with regional source and conveyance, treatment, and local distribution. As discussed above, this type of energy use is known as embedded energy. While the project would result in a reduction in energy used for regional import, energy would still be required to locally pump water produced by the project that would be recharged into the groundwater table. As such, the electricity intensity factor associated with local pumping was subtracted from the electricity intensity factors for import to achieve a factor that represents the net savings electricity intensity factor associated with the provision of potable water that would result from the project. The electricity intensity factors are provided by the CEC's *California's Water – Energy Relationship Final Staff Report* (CEC 2005).

It is estimated that the project, at full Phase II buildout, would achieve a total potable water recharge capacity of 15,000 AFY. After factoring in a minor loss from evaporation, the project is estimated to save, and therefore reduce import of, 14,670 acre-feet, or 4,780 million gallons, of potable water per year. This would result in an electricity reduction of approximately 24,207,794 kWh per year.

Overall, the project would result in a net decrease in energy consumption and would therefore not use energy in a wasteful, inefficient, or unnecessary manner. Impacts would be less than significant.

Mitigation Measures

Impacts related to the wasteful, inefficient, or unnecessary consumption of energy resources during project construction and operation would be less than significant; therefore, no mitigation is necessary.

4.5.4.2 Issue 2: Conflict with Energy Plans

Would the proposed project conflict with or obstruct a state or local plan for renewable energy or energy efficiency?

Impact Analysis

As discussed above under Section 4.5.2, because energy consumption is a significant source of GHGs, many regulations adopted for the purpose of reducing GHG emissions inherently include policies and goals related to energy consumption. A number of prominent plans and regulations aimed at reducing energy use and associated GHG emissions, including AB 1493 and the Low Carbon Fuel Standard (LCFS)

at the statewide level and SCAG's RTP/SCS at regional level, focus on reducing transportation source energy consumption and GHG emissions. The proposed project would generate minimal VMT and would therefore not conflict with such policies and regulations. In addition, the project would comply with applicable non-transportation energy regulations, such as Title 24 energy efficiency standards.

By producing a local supply of potable water, the project would reduce the energy used to import water to the region and would therefore result in a net decrease in energy consumption. As such, the project would not conflict with or obstruct a state or local plan for renewable energy or energy efficiency, and impacts would be less than significant.

Mitigation Measures

Impacts related to conflict with a state or local plan for renewable energy or energy efficiency would less than significant; therefore, no mitigation is necessary.

4.6 GEOLOGY AND SOILS

This section addresses the potential geology and soils impacts of the proposed project. The following discussion includes a description of existing conditions as related to geology, soils, and seismicity; a summary of applicable regulations; and an evaluation of the proposed project's potential environmental effects associated with geology, soils, and seismic conditions.

4.6.1 Existing Conditions

4.6.1.1 Geologic Setting

The project is located in western Riverside County, which is within the Peninsular Ranges geomorphic province. The Peninsular Ranges province lies in the southwestern-most region of California and extends south 775 miles past the U.S./Mexico border. It is bounded by the Transverse Ranges to the north, the Colorado Desert to the east, and the Pacific Ocean to the West. Included within the province is Orange County, as well as portions of Los Angeles, San Bernardino, Riverside, San Diego, and Imperial Counties. This province consists of a series of mountain ranges separated by long valleys, formed from faults branching from the San Andreas Fault. Due to tectonic movement, the Peninsular Ranges are slowly moving northward along the coast headed toward Alaska. The generalized geology of this province is summarized as intrusive granitic rocks that have pushed into older metamorphic rocks (California Geological Survey [CGS] and California State Parks 2015).

The project area is located between the two 7.5-minute quadrangles of Lakeview and San Jacinto. These quadrangles are located in the northern part of the Peninsular Ranges Province within the San Jacinto fault zone. The channel and floodplain of the ephemeral San Jacinto River is within the San Jacinto quadrangle. The project site is located within the San Jacinto Valley, which is a flat inland area situated at the western base of the San Jacinto Mountains. Most of the area west of the San Jacinto River near the project site consists of Pleistocene age fluvial deposits, the upper part of which forms the Paloma surface (CDC 2020). The project area is underlain by weathered granitic bedrock of variable thickness overlain by alluvial deposits. A majority of the project area is generally flat and composed of varying degrees of sandy to silty loam soils (U.S. Department of Agriculture [USDA] 2020). The project area elevation is approximately 1,500 feet AMSL.

4.6.1.2 Seismicity

Southern California is a region of high seismic activity with numerous active and potentially active faults. Earthquakes along the San Andreas Fault relieve convergent plate stress in the form of right lateral strike slip offsets. The Transverse Ranges work as a block causing the San Andreas Fault to bend, producing compressional stresses that are manifested as reverse, thrust, and right lateral faults. Faulting associated with the compressional forces creates earthquakes and is primarily responsible for the mountain building, basin development, and regional upwarping found in this area.

Major earthquakes have affected the region in the past and can be expected to occur again in the near future on one of the principal active faults in the San Andreas Fault System. The principal active faults in the region include the San Andreas, San Jacinto, and Elsinore faults. The Alquist-Priolo Earthquake Fault Zoning Act, described in more detail under Section 4.6.2, *Regulatory Setting*, requires publication of earthquake fault zone maps around the surface traces of active faults so these areas can be avoided for future development. As shown on Figure 4.6-1, *Earthquake Faults*, and in Table 4.6-1, *Fault Zones in the*

Project Vicinity, Alquist-Priolo Earthquake Fault Zones pass through the project area, including the San Jacinto Casa Loma Segment that bisects the project site.

Table 4.6-1
FAULT ZONES IN THE PROJECT VICINITY

Fault	Distance (miles)[1]	Direction	Maximum Probable Earthquake
San Jacinto	Casa Loma Segment Bisects Project Site	Casa Loma Segment Bisects Project Site	7.2
San Andreas	10	NE	8.0
Elsinore	15	SW	7.1

Source: CDC 2015
[1] Closest distance to the project site

Earthquake magnitude and intensity are two separate characteristics that can be measured to describe an earthquake. Magnitude measures the energy released at the source of the earthquake and is determined from measurements on seismographs. Intensity measures the strength of shaking produced by the earthquake at a certain location and is described by the Maximum Modified Mercalli Intensity Scale. Intensity is determined from effects on people, human structures, and the natural environment. Although magnitude and intensity describe different aspects of an earthquake, they are inherently linked. Over the last 100 years, there have been approximately four significant seismic events, or earthquakes, in the San Jacinto region according to the Southern California Earthquake Data Center (SCEDC; 2013).

4.6.1.3 Seismic Hazards

Given the highly seismic nature of southern California, the project area is prone to experiencing seismic hazards associated with earthquakes. The probability of each seismic hazard with respect to the project area is defined in more detail below.

Surface Fault Rupture

Surface rupture occurs when movement on a fault breaks through to the surface. Rupture may occur suddenly during an earthquake or slowly in the form of fault creep. Fault rupture almost always follows preexisting faults, which are zones of weakness. Ground rupture from fault displacement and related effects such as lurching (i.e., the rolling motion of surface materials associated with passing seismic waves) can adversely affect surface and subsurface facilities such as structures, pipelines, and wells. Since the San Jacinto Fault Zone bisects the project area, there is the potential for earthquake-related ground rupture and/or related effects.

Ground Shaking

Earthquakes on major faults can produce strong ground shaking. Ground shaking is affected by several things including the size of the earthquake, the type of ground the earthquake waves travel through, and the distance away from the earthquake source. The principal seismic hazard that could affect the project area is seismic ground shaking, which can affect the integrity of surface and subsurface facilities such as structures, foundations, pipelines (or other utilities) and wells, either directly from vibration-

related damage to rigid structures, or indirectly through associated hazards including liquefaction (as described below).

Liquefaction

Liquefaction is the phenomenon whereby soils subjected to seismic (or other) ground shaking effects exhibit a loss of shear strength and demonstrate fluid-like flow behavior due to excess pore pressure. Loose, granular (low clay/silt content) and saturated soils with relative densities of less than approximately 70 percent are most susceptible to these effects, with liquefaction potential greatest at depths of less than approximately 50 feet. Surface and near surface manifestations from these events can include loss of support for structures/foundations, pavement, and utilities; dynamic settlement (including volume reductions in dry soils); lateral spreading (i.e., horizontal displacement on sloped surfaces as a result of underlying liquefaction), and ground lurching (a permanent displacement or shift of the ground surface). Site-specific geotechnical studies are the only reliable way of determining the specific liquefaction potential of a site; however, a determination of general risk potential can be provided based on soil type and depth of groundwater. According to the CDC's Geologic Survey, the project is located in an area of moderate liquefaction potential based on the soil type and presence of shallow groundwater (CDC 2020).

Tsunamis and Seiches

Tsunamis (commonly referred to as tidal waves) are sea waves generated by sources such as underwater earthquakes or volcanic eruptions and can generate impacts related to inundation in coastal zones. Because the project area is located approximately 40 miles inland and at elevations of approximately 1,500 feet or more AMSL, potential hazards associated with tsunamis are considered low.

Seiches are defined as wave-like oscillatory movements in enclosed or semi-enclosed bodies of water such as lakes or reservoirs and are most typically associated with seismic activity. Seiches can result in flooding damage and related effects (e.g., erosion) in surrounding areas from spilling or sloshing water, as well as increasing pressure on containment structures. The potential for seiche-related hazards in the project area is generally considered low. The San Jacinto Reservoir and Diamond Valley Lake, located one mile east and six miles south of the AWTF project site, do not represent a seiche or dam inundation risk to the project due to the intervening distances.

4.6.1.4 Geologic Hazards

Landslides and Slope Failure

The occurrence of landslides and other types of slope failures (e.g., rock falls and mudflows) is influenced by a number of factors, including slope grade, geologic and soil characteristics, moisture levels and vegetation cover. Landslides can be triggered by a variety of potentially destabilizing conditions or events, such as gravity, fires, precipitation, grading, and seismic activity. Seismically induced landslides and rock falls could occur throughout Riverside County in a major earthquake and occur most often on steep or compromised slopes. Factors controlling the stability of slopes include: (1) slope height and steepness; (2) engineering characteristics of the earth materials comprising the slope; and (3) intensity of ground shaking. Based on these conditions, the potential for hazards from seismic-related landslides and other slope failures in the project area is considered low since the terrain is relatively flat. In addition, according to Figure PS-1 from the City of San Jacinto's General Plan Public

Safety Element, the project area is not located in a steep slope area and would not be at risk for landslides or slope failure (City of San Jacinto 2006).

Lateral Spreading

Lateral spreads are horizontal displacement on sloped surfaces as a result of underlying liquefaction. Lateral spreads can be triggered by an earthquake or artificially induced. Lateral spreading in fine-grained materials on shallow slopes is usually progressive (USGS 2004). Lateral spreading could occur as the project is located in an area of moderate liquefaction potential based on the soil type and presence of shallow groundwater (CDC 2020).

Expansive Soils

Expansive soils are soils that have a significant amount of clay particles which can give up water (shrink) or take on water (swell) depending on the amount of moisture present. The cyclical change in volume over time exerts stress on buildings and other loads placed on these soils that can lead to damage. The ability of clayey soil to change volume can result in uplift or cracking to foundation elements or other rigid structures such as slabs-on-grade, rigid pavements, sidewalks, or other slabs or hardscape founded on these soils. Expansive soils can be widely dispersed and can be found in hillside areas as well as low-lying alluvial basins (County of Riverside 2015). According to the City of San Jacinto's General Plan Public Safety Element, moderately to highly expansive clay is present in the sediments underlying the project site (City of San Jacinto 2006).

Subsidence

Potential hazards related to subsidence are typically associated with conditions such as karst/limestone terrain (i.e., the formation of subsurface cavities by dissolution of soluble rocks), subsurface mining, large-scale groundwater or oil and gas withdrawal, or decomposition of thick organic (peat) layers. Subsidence can result in a loss of support capability within the associated soil or formational materials, potentially resulting in damage to surface and subsurface structures such as buildings, pavement, pipelines, and utilities. Recently deposited alluvial sediments could be subject to settlement. San Jacinto has experienced documented subsidence and is susceptible to subsidence due to shallow groundwater levels (County of Riverside 2015).

4.6.2 Regulatory Framework

4.6.2.1 Federal

International Building Code

The IBC is the building code that must be implemented throughout the United States and its territories and is an essential tool to preserve public health and safety that provides safeguards from hazards associated with the built environment. It addresses design and installation of innovative materials that meet or exceed public health and safety goals. Provisions within the IBC are intended to ensure that structures can adequately resist seismic forces during earthquakes. These seismic provisions represent the best available guidance on how structures should be designed and constructed to limit seismic risk (Federal Emergency Management Agency [FEMA] 2016).

4.6.2.2 State

California Building Code

The CBC, which is codified in Title 24 of the California Code of Regulations, Part 2, was promulgated to safeguard the public health, safety, and general welfare by establishing minimum standards related to structural strength, means of egress to facilities (entering and exiting), and general stability of buildings. The purpose of the CBC is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all buildings and structures within its jurisdiction. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. The provisions of the CBC apply to the construction, alteration, movement, replacement, location, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

The CBC provides requirements for general structural design and includes means for determining earthquake loads. Seismic design provisions of the building code generally prescribe minimum lateral forces applied statically to the structure, combined with the gravity forces of the dead and live loads of the structure, which the structure then must be designed to withstand. According to the CBC, structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some nonstructural damage, and (3) resist major earthquakes without collapse, but with some structural as well as nonstructural damage. Although no guarantees can be made, it is reasonable to expect that a structure designed in-accordance with the seismic requirements of the CBC should not collapse in a major earthquake.

Seismic design specifications are determined according to the seismic design category (SDC) in accordance with Chapter 16 of the CBC. Chapter 18 of the CBC covers the requirements of geotechnical investigations (Section 1803), excavation, grading, and fills (Section 1804), loadbearing of soils (Section 1806), as well as foundations (Section 1808), shallow foundations (Section 1809), and deep foundations (Section 1810). For Seismic Design Categories D, E, and F, Chapter 18 requires analysis of slope instability, liquefaction, and surface rupture attributable to faulting or lateral spreading, plus an evaluation of lateral pressures on basement and retaining walls, liquefaction and soil strength loss, and lateral movement or reduction in foundation soil-bearing capacity. It also addresses measures to be considered in structural design, which may include ground stabilization, selecting appropriate foundation type and depths, selecting appropriate structural systems to accommodate anticipated displacements, or any combination of these measures. The potential for liquefaction and soil strength loss must be evaluated for site-specific peak ground acceleration magnitudes and source characteristics consistent with the design earthquake ground motions.

Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act)

The Alquist-Priolo Act was passed in 1972 to provide a mechanism for reducing losses from surface fault rupture on a statewide basis. The main intent of the Alquist-Priolo Act is to ensure public safety by preventing the construction of buildings used for human occupancy on the surface trace of active faults. The Alquist-Priolo Act only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards. The law requires the State Geologist to establish regulatory zones, known as Earthquake Fault Zones, around the surface traces of active faults and to issue appropriate maps. The maps are distributed to all affected cities, counties, and state agencies for their use in planning and

controlling new or renewed construction. Local agencies must regulate most development projects within the zones.

Construction General Permit

The NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities, otherwise referred to as the "Construction General Permit," regulates discharges of pollutants in stormwater associated with construction activity to waters of the U.S. from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface. The permit regulates stormwater discharges associated with construction or demolition activities, such as clearing and excavation; construction of buildings; and linear underground projects (LUP), including installation of water pipelines and other utility lines.

The Construction General Permit requires the development and implementation of a SWPPP that includes specific BMPs designed to prevent pollutants from contacting stormwater and keep sediment and other chemicals or pollutants from moving offsite into receiving waters. Types of BMPs include, but are not limited to, erosion control, sediment control, waste management, and good housekeeping. The Construction General Permit also includes post-construction requirements for construction projects that state post-project hydrology must match pre-project hydrology; however, LUPs including pipelines are not subject to post-construction requirements due to the nature of their construction to return project sites to preconstruction conditions. For LUPs, the permit states that one of the following conditions must be met: (1) at least 70 percent of pre-existing vegetative cover is reestablished following construction; (2) in areas that were not previously vegetated, sites must be returned to original grade and/or soils must be compacted 3) or equivalent measures such as blankets, soil cement or geotextiles have been. Routine inspection of all BMPs is required under the provisions of the Construction General Permit. In addition, the SWPPP is required to contain a visual monitoring program, a chemical monitoring program for non-visible pollutants, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

California Well Standards

In June of 1991, the California DWR published well standards to ensure groundwater quality is protected. These include surface construction features, sealing, casing, and rehabilitation and repair standards.

4.6.2.3 Local

Riverside County Well Permit Application

The County of Riverside Department of Environmental Health (DEH) requires permits for the construction and/or abandonment of water wells, including monitoring and extraction wells. Permits are to be obtained by those who plan to build a well as well as companies that provide well drilling services. The County application for a well permit requires disclosure of well information including its location, depth, type of casing, perforation, and sealed zones. Wells are inspected by the County during different stages of construction to help verify State and County standards are being met.

4.6.3 Thresholds of Significance

The following criteria from Appendix G of the *CEQA Guidelines* are used as thresholds of significance to determine the impacts of the proposed project as related to geology and soils. The proposed project would have a significant impact if it would:

1. Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure including liquefaction, or landslides;

2. Result in substantial soil erosion or the loss of topsoil;

3. Result in on or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse by being located on a geologic unit or soil that is unstable, or that would become unstable as a result of the proposed project;

4. Create substantial direct or indirect risks to life or property by being located on expansive soil;

5. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater; or

6. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

4.6.4 Project Impacts and Mitigation

4.6.4.1 Issue 1: Seismic Hazards

Would the proposed project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure including liquefaction, or landslides?

Impact Analysis

Ground Rupture

As described above, the Casa Loma Segment of the San Jacinto fault bisects the project site. Therefore, potentially significant earthquake-related ground rupture and/or related effects could occur on-site. A Geotechnical Engineering Services Report was prepared was prepared by Kleinfelder in November 2017 for the AWTF/brine pond site and the proposed conveyance pipeline. The northeast corner of the AWTF and brine ponds site is situated within the San Jacinto fault zone. In accordance with the Title 27 regulations, the brine ponds and facility would be located 200 feet from this Holocene fault. Additional design considerations that could reduce the likelihood of ground rupture include the use of artificial fill and reinforced foundations and slabs to accommodate minor ground deformation. As a result, inclusion of the seismic design considerations included in the report would reduce impacts related to potential ground rupture to a less-than-significant level.

Ground Shaking

The proposed project area is subject to potential moderate to severe ground shaking from earthquake events along major regional faults, including the Casa Loma Segment of the San Jacinto fault that bisects the project site. Accordingly, ground shaking could occur at project facilities and project development could potentially expose people and structures to moderate peak ground acceleration (PGA) levels and associated potential effects. However, the project would be required to conform with applicable regulatory/industry and code standards related to geologic hazards, including seismic ground shaking. Specifically, this would include pertinent elements of the Seismic Hazards Mapping Act, CBC/IBC, and related County standards. Associated criteria under the CBC for example, include: (1) applicable seismic loading factors for the design of facilities such as structures, foundations/slabs, pavement, and utilities; (2) remedial grading standards (e.g., removing/replacing and/or reconditioning unsuitable soils); (3) appropriate manufactured slope, retaining wall, and drainage design; and (4) use of properly engineered fill. Implementation of such measures, as described in the Geotechnical Engineering Services Report (Kleinfelder 2017) and in conformance with applicable regulatory/ industry standards, would reduce potential impacts related to seismic ground shaking hazards from implementation of the project to a less-than-significant level.

Liquefaction

As described above, the proposed project is located in an area of moderate liquefaction potential based on the soil type and presence of shallow groundwater (CDC 2020). Liquefaction could therefore occur at project facilities, thus increasing risks associated with liquefaction events. According to the Geotechnical Engineering Services Report (Kleinfelder 2017), the area around the Alessandro Blending Station is designated as having a “High” potential for liquefaction. Due to the lack of groundwater, the potential for liquefaction induced settlement is considered relatively low and unlikely to impact the project. Settlement of up to 4 to 7 inches is possible if the groundwater elevation rises to less than 50 feet below the ground surface and there is a strong earthquake.

Standard remedial efforts to reduce liquefaction-related impacts may include: (1) removal of unsuitable soils and replacement with engineered fill per applicable regulatory/industry standards (e.g., IBC/CBC); (2) use of efforts such as deep soil mixing (i.e., introducing cement to consolidate loose soils) or subsurface structures (e.g., stone columns or piles) to provide support (i.e., by extending structures into competent underlying units); and (3) designing proposed facilities for potential settlement of liquefiable materials through means such as use of post-tensioned foundations and/or flexible couplings for pipeline connections. Specific measures would be required and approved pursuant to final grading plans, the Geotechnical Engineering Services Report (Kleinfelder 2017), and CBC requirements, prior to issuance of a grading permit. Therefore, liquefaction-related impacts would be less than significant.

Landslides/Slope Instability

The proposed project is not located in an area where landslides are anticipated to occur since the terrain is relatively flat (City of San Jacinto 2006). In addition, according to the Geotechnical Engineering Services Report, the project area is level and away from any significant topographic relief. Therefore, impacts associated with landslides or slope failure would be less than significant.

Tsunamis and Seiches

The project area is not located near the coast or a large body of water. As a result, hazards associated with tsunamis would not occur because the project is located approximately 40 miles inland from the Pacific Ocean. The nearest enclosed bodies of water are San Jacinto Reservoir and Diamond Valley Lake, located one mile east and six miles south of the AWTF project site, respectively. According to the Riverside County General Plan Safety Element, due to the intervening distance between the project site and nearest enclosed bodies of water, the project is not located within a seiche hazard zone (County of Riverside 2015). There would be no impact associated with tsunamis and seiches.

Summary

Potential impacts related to seismic hazards from implementation of the proposed project would be avoided or reduced below a level of significance through incorporation of required site-specific design/construction measures from the Geotechnical Engineering Services Report (Kleinfelder 2017; see Section 2.7) and mandatory conformance with applicable regulatory/industry standard and codes, including the IBC/CBC and pertinent County criteria. Therefore, the project would not exacerbate risks or cause substantial adverse effects related to ground rupture, ground shaking, liquefaction, landslides, slope instability, tsunamis or seiches, and impacts would be less than significant.

Mitigation Measures

Impacts related to seismic hazards would be less than significant; therefore, no mitigation is necessary.

4.6.4.2 Issue 2: Erosion and Sedimentation

Would the proposed project result in substantial soil erosion or the loss of topsoil?

Impact Analysis

As previously described, the potential for erosion and sedimentation within the project site is generally low. Potential erosion and sedimentation impacts would be temporarily increased during proposed construction due to activities such as excavation, grading, and removal of surface stabilizing features (e.g., vegetation or pavement), particularly between the beginning of grading/construction and the establishment of permanent cover. Generally, extensive or prolonged erosion can result in effects such as damaging or destabilizing slopes, soil loss, and deposition of eroded material in roadways or drainage structures. In addition, the off-site transport of sediment can potentially result in effects to downstream receiving water quality, such as increased turbidity and the provision of a transport mechanism for other contaminants that tend to adhere to sediment particles (e.g., hydrocarbons). Additional discussion of potential water quality effects related to erosion and sedimentation is provided in Section 4.8, *Hydrology and Water Quality*. Erosion and sedimentation are not considered to be significant long-term concerns at the project site because developed areas would be stabilized through installation of structures/hardscape as noted.

The proposed project may include the temporary stockpiling of soils on the site from excavation of the brine pond facilities. Details associated with this potential project element would be confirmed prior to issuance of a grading permit. As described in Section 4.2, *Air Quality*, the SCAQMD Rule 403, *Fugitive Dust,* the project requires the implementation of BACM during active operations capable of generating fugitive dust. Rule 403 prohibits the emissions of fugitive dust from any active operation, open storage

pile, or disturbed surface area such that the dust remains visible in the atmosphere beyond the property line of the emission source; or the dust emission exceeds 20 percent opacity, if the dust emission is the result of movement of a motorized vehicle (SCAQMD 2005).

Short-term erosion and sedimentation impacts would be addressed through conformance with NPDES standards. Specifically, this would entail conformance with the NPDES Construction General Permit. Pursuant to the discussion of construction-related water quality concerns in Section 4.8, *Hydrology and Water Quality*, this would entail implementing an approved SWPPP and related plans and BMPs, including appropriate measures to address erosion and sedimentation.

In addition, the project includes the construction of a brine management system with five interconnected evaporation ponds with a surface area of approximately 20 acres located north of the proposed AWTF. The total depth of the brine ponds would be 11 feet with a maximum operating depth of 8.3 feet. Given the distance between the maximum water level and top of the pond (2.7 feet), it is unlikely that the shallow pond water would slosh over the edge of the evaporation ponds in the event of an earthquake. Furthermore, based on the implementation of appropriate erosion and sediment control BMPs as part of, and in conformance with, an approved SWPPP and related NPDES requirements, associated potential erosion and sedimentation impacts from implementation of the project would be less than significant.

Summary

Potential impacts related to erosion and sedimentation from development of the project would be avoided or reduced below a level of significance through implementation of construction and post-construction BMPs and related maintenance efforts, and mandatory conformance with applicable regulatory/industry standard and codes, including the NPDES Construction General Permit as outlined in Section 4.8, *Hydrology and Water Quality*. Impacts would be less than significant.

Mitigation Measures

Impacts related to erosion and sedimentation would be less than significant; therefore, no mitigation is necessary.

4.6.4.3 Issue 3: Geologic Instability

Would the proposed project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the proposed project, and potentially result in on or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?

Impact Analysis

As previously discussed above under Issue 1, Seismic Hazards, the proposed project is not located in an area where landslides are anticipated to occur since the terrain is relatively flat (City of San Jacinto 2006). In addition, according to the Geotechnical Engineering Services Report (Kleinfelder 2017), the project area is level and away from any significant topographic relief. Therefore, impacts associated with increasing landslide or lateral spreading risks would be less than significant.

According to the Geotechnical Engineer Services Report (Kleinfelder 2017), the area around the Alessandro Blending Station is designated as having a “high” potential for liquefaction. However, due to

the lack of shallow groundwater, the potential for liquefaction induced settlement is considered relatively low. Settlement of up to 4-7 inches is possible if the groundwater elevation rises to less than 50 feet below the ground surface and there is a strong earthquake. Both the conveyance pipeline and the AWTF project sites are located within an area designated as having "moderate" potential for liquefaction and "active subsidence" by Riverside County (County of Riverside 2015). However, implementation of the previously discussed standard remedial efforts and project design would reduce impacts associated with increasing liquefaction-related risk to a less-than-significant level. In addition, the project would be reviewed for compliance with the District's Engineering Standards and Specifications, which would ensure structural resiliency.

The Geotechnical Engineering Services Report (Kleinfelder 2017) identified the presence of artificial fill (2.5 to 8.5 feet below the ground surface) underlaid by alluvium (maximum boring depth of 26.5 feet below the ground surface) at the proposed conveyance pipeline site. The subsurface conditions of the proposed AWTF/brine ponds include undocumented fill (4.5-foot thickness) underlaid by alluvium (maximum boring depth of 51.5 feet below the ground surface). The potential for non-seismic soil subsidence and shrinkage (hydro-consolidation) to occur at the project site does exist due to the presence of alluvium. The potential occurrence of compressible materials and localized subsidence from structural loading could result in hazards such as differential settlement (different degrees of settlement over relatively short distances), with associated potential effects to structures, pavement, foundations/ footings, and utilities. As described in the Geotechnical Engineer Services Report (Kleinfelder 2017), implementation of remedial grading of the noted surficial materials, which are unusable in their current condition, would reduce potential impacts related to non-seismic soil subsidence and collapse. Therefore, with the incorporation of the measures included in the Geotechnical Engineer Services Report, construction of the project would not cause geologic instability or exacerbate related risks, and impacts would be less than significant.

Mitigation Measures

Impacts related to geologic instability would be less than significant; therefore, no mitigation is necessary.

4.6.4.4 Issue 4: Expansive Soil

Would the proposed project be located on expansive soil creating substantial direct or indirect risks to life or property?

Impact Analysis

Expansive soils could shrink and swell, causing damage to project facilities including cracking of rigid structures at the AWTF site. However, the Geotechnical Engineering Services Report (Kleinfelder 2017) determined that due to the granular nature of the near surface soils beneath the proposed facility site, the expansion potential for the near surface soils is considered low. In addition, facility design would be reviewed for compliance with the District's Engineering Standards and Specifications, which would ensure structural resiliency. As a result, the project would not cause substantial risks related to expansive soil and impacts would be less than significant.

Mitigation Measures

Impacts related to expansive soils would be less than significant; therefore, no mitigation is necessary.

4.6.4.5 Issue 5: Septic Tanks

Would the proposed project have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

Impact Analysis

The proposed project would not include the construction or operation of septic tanks. Wastewater generated from day-to-day operation of the AWTF would not substantially increase from existing conditions at the SJVRWF due to the small number of employees needed for the facility. Construction of the project would require a temporary increase in employees and operation of the project would involve up to five permanent employees at the AWTF.

Mitigation Measures

No impacts to septic tanks or alternative wastewater disposal systems are anticipated to occur; therefore, no mitigation is necessary.

4.6.4.6 Issue 6: Paleontological Resources

Would the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Impact Analysis

Paleontological resources are typically buried and therefore not apparent until revealed by excavation. As such, significant impacts to paleontological resources are often determined based on the geological formations that would be disturbed and the potential for those geologic formations to contain fossils. According to the County of Riverside's General Plan EIR, the entirety of the project site is located in an area of high paleontological sensitivity, including the Alessandro Blending Station, the AWTF/brine pond site, and the proposed conveyance pipeline (County of Riverside 2015). The project area is underlain by Quaternary alluvium and deposits with the ability to produce significant paleontological resources. The paleontological sensitivity assigned to this area by the County is High Sensitivity B (*Hb)*, which connotes high sensitivity at a subsurface depth of four feet or deeper. Therefore, excavation that would exceed four feet in depth could potentially encounter fossils. Impacts during construction are considered potentially significant.

Mitigation Measures

The following mitigation measure would be required to address potential impacts associated with paleontological resources.

MM-GEO-1 **Paleontological Resources Mitigation and Monitoring Plan.** A Paleontological Resources Mitigation and Monitoring Plan shall be prepared prior to commencing construction activities that would exceed four feet in depth that could directly affect geologic formations with high paleontological resource sensitivity. A qualified paleontologist shall be retained to carry out and manage the plan. Fieldwork may be carried out by a qualified paleontological monitor working under the direction of the

paleontologist. Components of the Paleontological Resources Mitigation and Monitoring Plan shall include, but not be limited to:

- The paleontologist shall attend the pre-grading meeting(s) to inform the grading and excavation contractors of the paleontological resource mitigation program and shall consult with them with respect to its implementation.

- The paleontological monitor shall be on site at all times during the original cutting of previously undisturbed sediments of high resource sensitivity formation at a subsurface depth of four feet or deeper to inspect cuts for contained fossils.

- If fossils are discovered, the paleontologist or monitor shall recover them. In instances where recovery requires an extended salvage time, the paleontologist or monitor shall be allowed to temporarily direct, divert, or halt ground-disturbing activities to allow recovery of fossil remains in a timely manner. Where deemed appropriate by the paleontologist or monitor, a screen-washing operation for small fossil remains shall be set up.

- Recovered fossils, along with copies of pertinent field notes, photographs, and maps, shall be deposited in a scientific institution with paleontological collections. A final summary report that outlines the results of the mitigation program shall be completed. This report shall include discussion of the methods used, stratigraphy exposed, fossils collected, and significance of recovered fossils.

Significance After Mitigation

Impacts related to unique paleontological resources would be less than significant upon implementation of mitigation measure MM-GEO-1.

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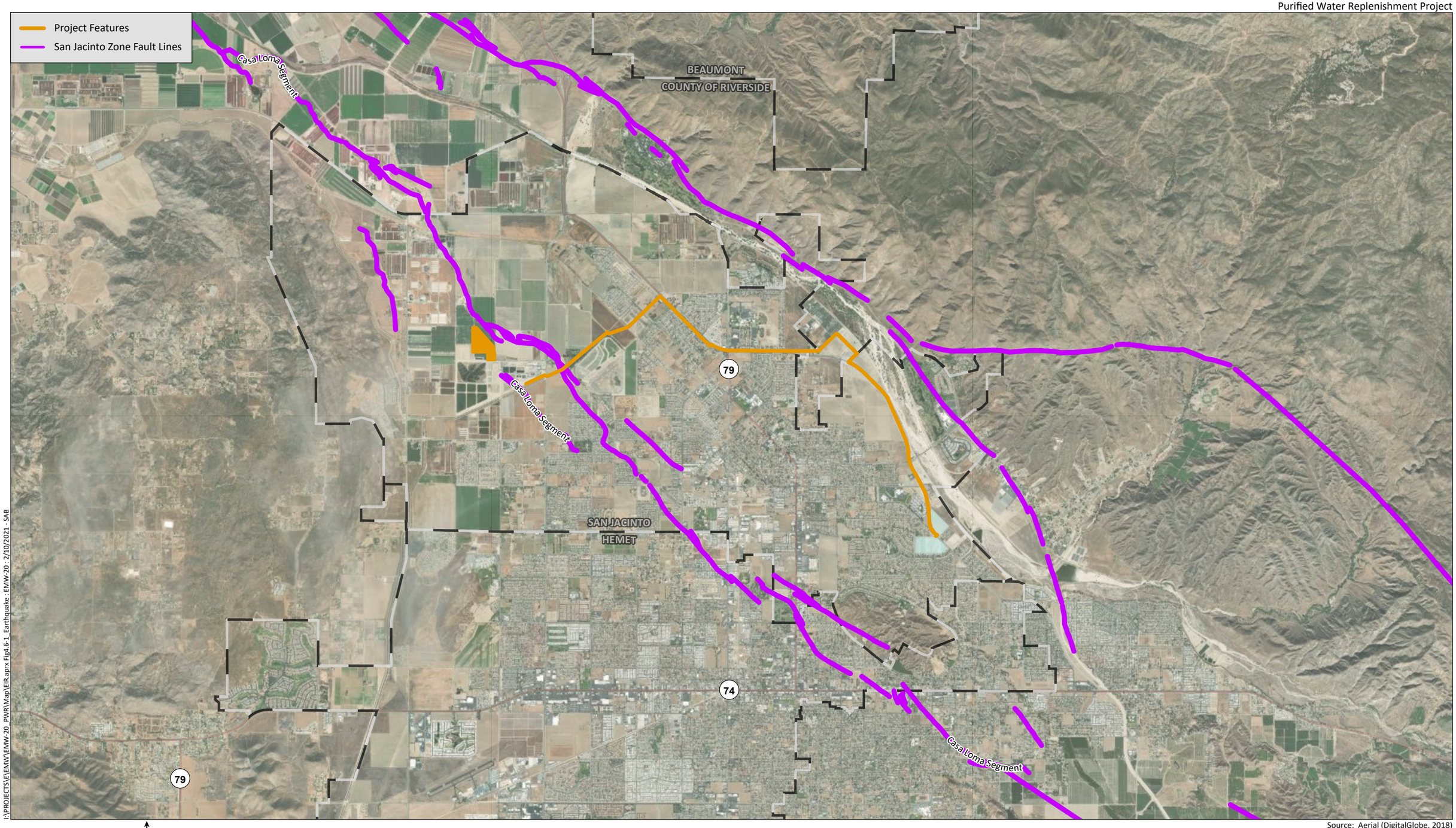

Source: Aerial (DigitalGlobe, 2018)

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HELIX Environmental Planning

Earthquake Faults

Figure 4.6-1

4.7 GREENHOUSE GAS EMISSIONS

This section addresses the potential GHG emissions impacts of the proposed project. The following discussion includes a description of existing conditions as related to GHGs, a summary of applicable regulations, and an evaluation of the proposed project's potential environmental effects associated with the generation of GHGs and conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHGs. This section is based on the *Air Quality/Greenhouse Gas Emissions Technical Report* prepared for the proposed project (HELIX 2021; Appendix B).

4.7.1 Existing Conditions

4.7.1.1 Climate Change Overview

Global climate change refers to changes in average climatic conditions on Earth including temperature, wind patterns, precipitation, and storms. Global temperatures are moderated by atmospheric gases. These gases are commonly referred to as GHGs because they function like a greenhouse by letting sunlight in but preventing heat from escaping, thus warming the Earth's atmosphere. These gases allow solar radiation (sunlight) into the Earth's atmosphere but prevent radiative heat from escaping, thus warming the Earth's atmosphere.

GHGs are emitted by natural processes and human (anthropogenic) activities. Anthropogenic GHG emissions are primarily associated with: (1) the burning of fossil fuels during motorized transport, electricity generation, natural gas consumption, industrial activity, manufacturing, and other activities; (2) deforestation; (3) agricultural activity; and (4) solid waste decomposition.

The temperature record shows a decades-long trend of warming, with 2016 global surface temperatures ranking as the warmest year on record since 1880 and 2017 as the second warmest. The 2017 global average surface temperatures were 0.9 degree Celsius warmer than the 1951 to 1980 mean temperature (National Aeronautics and Space Administration [NASA] 2018). GHG emissions from human activities are the most significant driver of observed climate change since the mid-20th century (Intergovernmental Panel on Climate Change [IPCC] 2013). The IPCC constructed several emission trajectories of GHGs needed to stabilize global temperatures and climate change impacts. The statistical models show a "high confidence" that temperature increase caused by anthropogenic GHG emissions could be kept to less than two degrees Celsius relative to pre-industrial levels if atmospheric concentrations are stabilized at about 450 parts per million (ppm) carbon dioxide equivalent (CO_2e) by the year 2100 (IPCC 2014).

4.7.1.2 Types of Greenhouse Gases

The GHGs defined under California's AB 32 include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

Carbon dioxide. CO_2 is the most important and common anthropogenic GHG. CO_2 is an odorless, colorless GHG. Natural sources include the decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungi; evaporation from oceans; and volcanic outgassing. Anthropogenic sources of CO_2 include burning fuels, such as coal, oil, natural gas, and wood. Data from ice cores indicate that CO_2 concentrations remained steady prior to the current period for approximately 10,000 years. The atmospheric CO_2 concentration in 2010 was 390 ppm, 39 percent above the

concentration at the start of the Industrial Revolution (approximately 280 ppm in 1750). In May 2020, the CO_2 concentration was 417 ppm, a 49 percent increase since 1750 (National Oceanic and Atmospheric Administration [NOAA] 2020).

Methane. CH_4 is the main component of natural gas used in homes. Geological deposits known as natural gas fields contain methane, which is extracted for fuel. Other sources are from decay of organic material in landfills, fermentation of manure, and cattle digestion.

Nitrous oxide. N_2O is produced by both natural and human-related sources. N_2O is emitted during agricultural and industrial activities, as well as during the combustion of fossil fuels and solid waste. Primary human-related sources of N_2O are agricultural soil management, animal manure management, sewage treatment, mobile and stationary combustion of fossil fuel, adipic (fatty) acid production, and nitric acid production.

Hydrofluorocarbons. Fluorocarbons are gases formed synthetically by replacing all hydrogen atoms in methane or ethane with chlorine and/or fluorine atoms. Chlorofluorocarbons are nontoxic, nonflammable, insoluble, and chemically nonreactive in the troposphere (the level of air at Earth's surface). Chlorofluorocarbons were first synthesized in 1928 for use as refrigerants, aerosol propellants, and cleaning solvents. They destroy stratospheric ozone; therefore, their production was stopped as required by the 1989 Montreal Protocol.

Sulfur Hexafluoride. SF_6 is an inorganic, odorless, colorless, nontoxic, nonflammable gas. SF_6 is used for insulation in electric power transmission and distribution equipment, in the magnesium industry, in semi-conductor manufacturing, and as a tracer gas for leak detection.

GHGs have long atmospheric lifetimes that range from one year to several thousand years. Long atmospheric lifetimes allow for GHG emissions to disperse around the globe. Because GHG emissions vary widely in the power of their climatic effects, climate scientists have established a unit called global warming potential (GWP). The GWP of a gas is a measure of both potency and lifespan in the atmosphere as compared to CO_2. For example, because methane and N_2O are approximately 25 and 298 times more powerful than CO_2, respectively, in their ability to trap heat in the atmosphere, they have GWPs of 25 and 298, respectively (CO_2 has a GWP of 1). Estimates of GHG emissions are often presented in CO_2e, which weigh each gas by its GWP. Expressing GHG emissions in CO_2e takes the contribution of all GHG emissions to the greenhouse effect and converts them to a single unit equivalent to the effect that would occur if only CO_2 were being emitted. Emissions of CO_2e are commonly presented in metric tons (MT; 1 MT equals approximately 2,205 pounds). The atmospheric lifetime and GWP of selected GHGs are summarized in Table 4.7-1, *Global Warming Potentials and Atmospheric Lifetimes*.

Table 4.7-1
GLOBAL WARMING POTENTIALS AND ATMOSPHERIC LIFETIMES

Greenhouse Gas	Atmospheric Lifetime (years)	Global Warming Potential (100-year time horizon)
Carbon Dioxide (CO_2)	50-200	1
Methane (CH_4)	12	25
Nitrous Oxide (N_2O)	114	298
HFC-134a	14	1,430
PFC: Tetraflouromethane (CF_4)	50,000	7,390
PFC: Hexafluoroethane (C_2F_6)	10,000	12,200
Sulfur Hexafluoride (SF_6)	3,200	22,800

Source: IPCC 2007
HFC: hydrofluorocarbon; PFC: perfluorocarbon

4.7.1.3 GHG Emissions Inventories

In an effort to evaluate and reduce the potential adverse impact of global climate change, international, state, and local organizations have conducted GHG inventories to estimate their levels of GHG emissions and removals. The following summarizes the results of these global, national, state, countywide, and local GHG inventories.

For 2016, total GHG emissions worldwide were estimated at 49,358 million metric tons (MMT) CO_2e (World Resources Institute 2020). The U.S. contributed the second largest portion of GHG emissions (behind China) at 12 percent of global emissions, with 5,833 MMT CO_2e in 2016. On a national level in 2013, approximately 27 percent of GHG emissions are associated with transportation and about 31 percent are associated with electricity generation (USEPA 2015).

California GHG Emissions

CARB performs statewide GHG inventories. The inventory is divided into six broad sectors: agriculture and forestry, commercial, electricity generation, industrial, residential, and transportation. Emissions are quantified in MMT CO_2e. Table 4.7-2, *California GHG Emissions by Sector*, shows the estimated statewide GHG emissions for the years 1990, 2000, 2010, and 2017.

Table 4.7-2
CALIFORNIA GHG EMISSIONS BY SECTOR
(MMT CO_2e)

Sector	1990	2000	2010	2017
Agriculture and Forestry	23.6 (5%)	31.6 (7%)	34.3 (8%)	32.4 (8%)
Commercial	14.4 (3%)	14.2 (3%)	20.1 (4%)	23.3 (5%)
Electricity Generation	110.6 (26%)	105.3 (22%)	90.6 (20%)	62.6 (15%)
Industrial	103.0 (24%)	104.6 (22%)	100.9 (23%)	101.1 (24%)
Residential	29.7 (7%)	31.0 (7%)	31.3 (7%)	30.4 (7%)
Transportation	150.7 (35%)	183.9 (39%)	170.2 (38%)	174.3 (41%)
Unspecified Remaining	1.3 (<1%)	1.2 (<1%)	0.8 (<1%)	-
Total	**433.3**	**471.7**	**448.1**	**424.1**

Source: CARB 2007 and CARB 2019
MMT = million metric tons; CO_2e = carbon dioxide equivalent

As shown in Table 4.7-2, statewide GHG emissions totaled 433 MMT CO_2e in 1990, 472 MMT CO2e in 2000, 448 MMT CO_2e in 2010, and 424 MMT CO_2e in 2017. Transportation-related emissions consistently contribute the most GHG emissions, followed by industrial emissions and electricity generation.

Riverside County GHG Emissions

The County's Climate Action Plan (CAP) Update provides net 2017 emissions of CO_2e associated with the unincorporated areas of the County as broken down by emissions category. The unincorporated areas of Riverside County together emitted 4,905,518 MT CO_2e in 2017. The largest portion of Riverside County's 2017 emissions were from transportation (36 percent), followed by agriculture (34 percent), and electricity and natural gas use in buildings (24 percent). Emissions by category are shown in Table 4.7-3, *2017 County-wide GHG Emissions by Source.*

Table 4.7-3
2017 COUNTY-WIDE GHG EMISSIONS BY SOURCE

Emissions Category	MT CO_2e	Percentage of Total
On-road Transportation	1,766,784	36%
Agriculture	1,670,954	34%
Energy (Electricity and Natural Gas)	1,188,138	24%
Solid Waste	204,365	4%
Water and Wastewater	44,606	1%
Aviation	26,786	1%
Off-road Sources	3,883	<1%
Total	**4,905,518**	**100%**

Source: County 2019
MT = metric tons; CO_2e = carbon dioxide equivalent

The Western Riverside Council of Governments (WRCOG) prepared an emissions inventory as part of their Subregional CAP. In 2010, Subregional CAP cities emitted approximately 5,834,400 MT of GHG emissions. The breakdown of emissions by sector is shown below in Table 4.7-4, *Western Riverside Council of Governments GHG Emissions by Sector*. With the exception of transportation, the sectors reported in the CAP inventory do not correspond directly to those reported in the statewide inventory.

Table 4.7-4
WESTERN RIVERSIDE COUNCIL OF GOVERNMENTS 2010 GHG EMISSIONS BY SECTOR

Sector	MT CO_2e	Percentage of Total
Transportation	3,317,387	57%
Commercial/Industrial Energy	1,226,479	21%
Residential Energy	1,167,843	20
Solid Waste	112,161	2%
Wastewater	10,531	<1%
Total	**5,834,400**	**100%**

Source: WRCOG 2014
MT = metric tons; CO_2e = carbon dioxide equivalent

Similar to the statewide and County-wide emissions, transportation-related GHG emissions for the Subregional CAP cities were the greatest contributor, followed by energy-related GHG emissions.

4.7.2 Regulatory Framework

4.7.2.1 Federal

Federal Clean Air Act

The U.S. Supreme Court ruled on April 2, 2007, in *Massachusetts v. U.S. Environmental Protection Agency* that CO_2 is an air pollutant, as defined under the CAA, and that the USEPA has the authority to regulate emissions of GHGs. The USEPA announced that GHGs (including CO_2, CH_4, N_2O, HFC, PFC, and SF_6) threaten the public health and welfare of the American people.

Light-Duty Vehicle Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standards

The USEPA and the Department of Transportation's National Highway Traffic Safety Administration (NHTSA) worked together on developing a national program of regulations to reduce GHG emissions and to improve fuel economy of light-duty vehicles. On April 1, 2010, the USEPA and NHTSA announced a joint Final Rulemaking establishing standards for 2012 through 2016 model year vehicles. This was followed up on October 15, 2012, when the agencies issued a Final Rulemaking with standards for model years 2017 through 2025. On August 2, 2018, the agencies released a notice of proposed rulemaking—the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks. The purpose of the SAFE Vehicles Rule is "to correct the national automobile fuel economy and GHG emissions standards to give the American people greater access to safer, more affordable vehicles that are cleaner for the environment." The direct effect of the rule is to eliminate the standards that were put in place to gradually raise average fuel economy for passenger cars and light trucks under test conditions from 37 miles per gallon in 2020 to 50 miles per gallon in 2025. By contrast, the new SAFE Vehicles Rule freezes the average fuel economy level standards indefinitely at the 2020 levels. The new SAFE Vehicles Rule also results in the withdraw of the waiver previously provided to California for that State's GHG and zero emissions vehicle (ZEV) programs under section 209 of the CAA.

4.7.2.2 State

California Code of Regulations, Title 24, Part 6

CCR Title 24 Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings were first established in 1978 in response to a legislative mandate to reduce California's energy consumption. Energy-efficient buildings require less electricity, natural gas, and other fuels. Electricity production from fossil fuels and on-site fuel combustion (typically for water heating) results in GHG emissions.

The Title 24 standards are updated approximately every three years to allow consideration and possible incorporation of new energy efficiency technologies and methods. The latest update to the Title 24 standards occurred in 2019 and went into effect on January 1, 2020. The Building Energy Efficiency Standards focus on several key areas to improve the energy efficiency of newly constructed buildings and additions and alterations to existing buildings. The most significant efficiency improvements to the

residential standards include improvements for attics, walls, water heating, and lighting. The standards are divided into three basic sets. First, there is a basic set of mandatory requirements that apply to all buildings. Second, there is a set of performance standards – the energy budgets – that vary by climate zone (of which there are 16 in California) and building type; thus, the standards are tailored to local conditions. Finally, the third set constitutes an alternative to the performance standards, which is a set of prescriptive packages that are basically a recipe or a checklist compliance approach.

California Green Building Standards Code

The California Green Building Standards Code (CALGreen; CCR Title 24, Part 11) is a code with mandatory requirements for new residential and nonresidential buildings (including industrial buildings) throughout California. The code is Part 11 of the California Building Standards Code in Title 24 of the CCR. The current 2019 Standards for new construction of, and additions and alterations to, residential and nonresidential buildings went into effect on January 1, 2020.

The development of CALGreen is intended to (1) cause a reduction in GHG emissions from buildings; (2) promote environmentally responsible, cost-effective, healthier places to live and work; (3) reduce energy and water consumption; and (4) respond to the directives by the Governor. In short, the code is established to reduce construction waste; make buildings more efficient in the use of materials and energy; and reduce environmental impact during and after construction.

CALGreen contains requirements for stormwater control during construction; construction waste reduction; indoor water use reduction; material selection; natural resource conservation; site irrigation conservation; and more. The code provides for design options allowing the designer to determine how best to achieve compliance for a given site or building condition. The code also requires building commissioning, which is a process for the verification that all building systems, like heating and cooling equipment and lighting systems, are functioning at their maximum efficiency.

Executive Order S-3-05

On June 1, 2005, Executive Order (EO) S-3-05 proclaimed that California is vulnerable to climate change impacts. It declared that increased temperatures could reduce snowpack in the Sierra Nevada, further exacerbate California's air quality problems, and potentially cause a rise in sea levels. To avoid or reduce climate change impacts, EO S-3-05 calls for a reduction in GHG emissions to the year 2000 level by 2010, to year 1990 levels by 2020, and to 80 percent below 1990 levels by 2050. EOs are not laws and can only provide the governor's direction to state agencies to act within their authority. Legislation is required to enact the goals of EO S-3-05 and establish a framework for statewide implementation. AB 32, described below, mandates the 2020 GHG reduction goals of EO S-3-05. The 2050 GHG reduction goal of EO S-3-05 has not been enacted by any legislation and remains only a goal of the EO.

Executive Order B-30-15

On April 29, 2015, EO B-30-15 established a California GHG emission reduction target of 40 percent below 1990 levels by 2030. The EO aligns California's GHG emission reduction targets with those of leading international governments, including the 28-nation European Union. California is on track to meet or exceed the target of reducing greenhouse gas emissions to 1990 levels by 2020, as established in AB 32. California's new emission reduction target of 40 percent below 1990 levels by 2030 will make it possible to reach the goal established by EO S-3-05 of reducing emissions 80 percent under 1990 levels by 2050. Senate Bill (SB) 32, described below, mandates the 2030 GHG reduction goals of EO B-30-15.

Assembly Bill 32 – Global Warming Solutions Act of 2006

The California Global Warming Solutions Act of 2006 (AB 32 and Health and Safety Code Sections 38500, 38501, 28510, 38530, 38550, 38560, 38561–38565, 38570, 38571, 38574, 38580, 38590, 38592–38599), widely known as AB 32, requires that the CARB develop and enforce regulations for the reporting and verification of statewide GHG emissions. CARB is directed to set a GHG emission limit, based on 1990 levels, to be achieved by 2020. The bill requires CARB to adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective GHG reductions. AB 32 enacts the goals of EO S-3-05.

Senate Bill 32

SB 32 (Amendments to the California Global Warming Solutions Action of 2006) extends California's GHG reduction programs beyond 2020. SB 32 amended the Health and Safety Code to include Section 38566, which contains language to authorize CARB to achieve a statewide GHG emission reduction of at least 40 percent below 1990 levels by no later than December 31, 2030. SB 32 codified the targets established by EO B-30-15 for 2030, which set the next interim step in the State's continuing efforts to pursue the long-term target expressed in EO B-30-15 of 80 percent below 1990 emissions levels by 2050.

Assembly Bill 197

A condition of approval for SB 32 was the passage of AB 197. AB 197 requires that CARB consider the social costs of GHG emissions and prioritize direct reductions in GHG emissions at mobile sources and large stationary sources. AB 197 also gives the California legislature more oversight over CARB through the addition of two legislatively appointed members to the CARB Board and the establishment a legislative committee to make recommendations about CARB programs to the legislature.

Assembly Bill 1493 – Vehicular Emissions of Greenhouse Gases

AB 1493 (Pavley) requires that CARB develop and adopt regulations that achieve "the maximum feasible reduction of GHGs emitted by passenger vehicles and light-duty truck and other vehicles determined by CARB to be vehicles whose primary use is noncommercial personal transportation in the State." On September 24, 2009, CARB adopted amendments to the Pavley regulations that intend to reduce GHG emissions in new passenger vehicles from 2009 through 2016. The amendments bind California's enforcement of AB 1493 (starting in 2009), while providing vehicle manufacturers with new compliance flexibility. The amendments also prepare California to merge its rules with the federal CAFE rules for passenger vehicles (CARB 2013). In January 2012, CARB approved a new emissions-control program for model years 2017 through 2025. However, as described previously, the adoption of the new SAFE Vehicles Rule results in the withdrawal of the waiver previously provided to California for that State's GHG and ZEV programs, freezing the average fuel economy level standards indefinitely at the 2020 levels.

Assembly Bill 75

AB 75 was passed in 1999 and mandates state agencies to develop and implement an integrated waste management plan to reduce GHG emissions related to solid waste disposal. In addition, the bill mandates that community service districts providing solid waste services report the disposal and diversion information to the appropriate city, county, or regional jurisdiction. The bill requires diversion

of at least 50 percent of the solid waste from landfills and transformation facilities, and submission to the California Department of Resources Recycling and Recovery (CalRecycle; formerly known as California Integrated Waste Management Board) of an annual report describing the diversion rates.

Assembly Bill 341

The state legislature enacted AB 341 (California PRC Section 42649.2), increasing the diversion target to 75 percent statewide. AB 341 requires all businesses and public entities that generate 4 cubic yards or more of waste per week to have a recycling program in place. The final regulation was approved by the Office of Administrative Law on May 7, 2012 and went into effect on July 1, 2012.

Executive Order S-01-07

EO S-01-07, signed by Governor Schwarzenegger on January 18, 2007, directs that a statewide goal be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by the year 2020. It orders that a LCFS for transportation fuels be established for California and directs CARB to determine whether a LCFS can be adopted as a discrete early action measure pursuant to AB 32. CARB approved the LCFS as a discrete early action item with a regulation adopted and implemented in April 2010. Although challenged in 2011, the Ninth Circuit reversed the District Court's opinion and rejected arguments that implementing LCFS violates the interstate commerce clause in September 2013. CARB is therefore continuing to implement the LCFS statewide.

Senate Bill 350

Approved by Governor Brown on October 7, 2015, SB 350 increases California's renewable electricity procurement goal from 33 percent by 2020 to 50 percent by 2030. This will increase the use of Renewables Portfolio Standard eligible resources, including solar, wind, biomass, and geothermal. In addition, large utilities are required to develop and submit Integrated Resource Plans to detail how each entity will meet their customers resource needs, reduce greenhouse gas emissions, and increase the use of clean energy.

Senate Bill 100

Approved by Governor Brown on September 10, 2018, SB 100 increases the portion of California's electricity that must come from renewable sources from 50 percent (as mandated by SB 350) to 60 percent by 2030. The bill also establishes a goal of 100 percent of California's electricity sourced from renewable energy and other zero net GHG emissions resources (such as nuclear power) by 2045.

Senate Bill 97 – CEQA: Greenhouse Gas Emissions

SB 97 required the Governor's Office of Planning and Research (OPR) to prepare, develop, and transmit to the Resources Agency guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions, as required by CEQA, including but not limited to, effects associated with transportation or energy consumption. The Resources Agency certified and adopted the guidelines on December 31, 2009. The OPR guidance states that the lead agency can rely on qualitative or other performance-based standards for estimating the significance of GHG emissions, although the new *CEQA Guidelines* did not establish a threshold of significance.

Senate Bill 375

SB 375 aligns regional transportation planning efforts, regional GHG reduction targets, and affordable housing allocations. Metropolitan Planning Organizations (MPOs) are required to adopt an SCS, which allocates land uses in the MPOs' RTP. Qualified projects consistent with an approved SCS or Alternative Planning Strategy categorized as "transit priority projects" would receive incentives to streamline CEQA processing.

California Air Resources Board: Climate Change Scoping Plan

In December 2008, CARB adopted its first version of its Climate Change Scoping Plan (Scoping Plan), which contained the main strategies California will implement to achieve the mandate of AB 32 to reduce statewide GHG emissions to 1990 levels by 2020. The Scoping Plan establishes an overall framework for the measures that will be adopted to reduce California's GHG emissions. The Scoping Plan evaluates opportunities for sector-specific reductions, integrates all CARB and Climate Action Team early actions and additional GHG reduction measures by both entities, identifies additional measures to be pursued as regulations, and outlines the role of a cap-and-trade program.

On December 14, 2017, CARB adopted the 2017 Climate Change Scoping Plan (2017 Scoping Plan), which lays out the framework for achieving the mandate of SB 32 (2016) to reduce statewide GHG emissions to at least 40 percent below 1990 levels by the end of 2030 (CARB 2017).

The 2017 Scoping Plan includes guidance to local governments in Chapter 5, including plan-level GHG emissions reduction goals and methods to reduce communitywide GHG emissions. In its guidance, CARB recommends that "local governments evaluate and adopt robust and quantitative locally-appropriate goals that align with the statewide per capita targets and the State's sustainable development objectives and develop plans to achieve the local goals." CARB further states that "it is appropriate for local jurisdictions to derive evidence-based local per capita goals [or some other metric] that the local jurisdiction deems appropriate, such as mass emissions or per service population, based on local emissions sectors and population projections that are consistent with the framework used to develop the statewide per capita targets" (CARB 2017).

4.7.2.3 Local

Southern California Association of Governments

SCAG, of which the City of San Jacinto is a member agency, adopted the 2016-2040 RTP/SCS in April 2016. The RTP/SCS is a State- and federally required long-range plan for regional transportation and land use. The plan anticipates expenditures of $556.5 billion—of which $275.5 billion is budgeted for operations and maintenance of the regional transportation system and another $246.6 billion is reserved for transportation capital improvements. It is anticipated that implementation of the RTP/SCS would result in an eight percent reduction in GHG emissions per capita by 2020, an 18 percent reduction by 2035 and a 21 percent reduction by 2040, compared with 2005 levels (SCAG 2016).

County of Riverside

As part of the General Plan Air Quality Element, the County of Riverside adopted a CAP in 2015. The CAP "establishes goals and policies that incorporate environmental responsibility into its daily management of residential, commercial and industrial growth, education, energy and water use, air quality,

transportation, waste, education, economic development and open space and natural habitats to further their commitment." The CAP identified an emissions reduction target for 2020.

The 2019 CAP Update was approved on December 17, 2019. The 2019 CAP Update refines the County's efforts to meet GHG reduction strategies, specifically for the years 2035 and 2050. The 2019 CAP Update builds upon the GHG reduction strategies in the 2015 CAP. The CAP Update addresses cumulative GHG emissions, presents reduction measures that achieve reduction targets, and provides an implementation plan to implement the reduction measures.

Western Riverside Council of Governments

The twelve cities of the WRCOG, which includes the City of San Jacinto, adopted a Subregional Climate Action Plan (Subregional CAP) in September 2014. The Subregional CAP provides a 2010 baseline inventory of GHG emissions for the subregion cities of 5,834,400 MT of CO_2e. Approximately 57 percent of the GHG inventory was from transportation sources, 21 percent from commercial/industrial energy use, 20 percent from residential energy use, and the remaining from wastewater and solid waste sources. The Subregional CAP established a target of reducing subregional GHG emissions 15 percent below 2010 levels by 2020 and 49 percent below 2010 levels by 2035. To achieve the 2020 reduction target, the Subregional CAP identifies 14 State and regional measures, 3 local energy sector measures, 18 local transportation sector measures, and 2 solid waste sector measures. The Subregional CAP does not identify GHG reduction measures for achieving goals beyond 2020 (WRCOG 2014). The Subregional CAP does not include thresholds for determining the significance of GHG emissions for new land development, nor does it include a checklist or other methodology for determining consistency of new development with the goals and measures in the Subregional CAP. Since adoption of the original Subregional CAP, WRCOG received grant funding from the California Department of Transportation (Caltrans) Sustainable Transportation Planning Grant Program to prepare an update and expansion to the Subregional CAP, which is termed the CAP Update. The CAP Update will include a comprehensive update to GHG inventories and GHG emissions reduction strategies for all sectors and will establish GHG targets for the year 2050 for WRCOG member jurisdictions.

4.7.3 Thresholds of Significance

GHG impacts are the result of combined worldwide emissions over many years, and additional development would incrementally contribute to the significant adverse environmental impacts of global climate change. No single project could generate enough GHG emissions to contribute noticeably to a change in the global average temperature. However, the combination of GHG emissions from past, present, and future projects contribute substantially to the phenomenon of global climate change and its associated environmental impacts. Therefore, GHG emissions impacts are only evaluated cumulatively.

The following criteria from Appendix G of the *CEQA Guidelines* are used as thresholds of significance to determine the impacts of the proposed project as related to GHG emissions. The proposed project would have a significant impact if it would:

1. Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; or

2. Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs.

There are no established federal, state, or local quantitative thresholds, including in the County's CAP Update and WRCOG's Subregional CAP, applicable to the project to determine the quantity of GHG emissions that may have a significant effect on the environment. CARB, the SCAQMD, the County, WRCOG, and various cities and agencies have proposed, or adopted on an interim basis, thresholds of significance that require the implementation of GHG emission reduction measures. The proposed project is best categorized as an industrial project and is within the jurisdiction of the SCAQMD; therefore, for this analysis, the most appropriate screening threshold for determining GHG emissions impacts is the SCAQMD proposed Tier 3 screening threshold for industrial projects of 10,000 MT CO_2e (SCAQMD 2010). The SCAQMD's Tier 3 screening threshold was developed to meet the year 2020 statewide GHG emissions targets as mandated by AB 32 and implemented by the CARB Scoping Plan. The SCAQMD has not proposed revised thresholds to account for GHG reduction targets beyond 2020. Accordingly, a threshold reduced by 4.98 percent for each year between 2020 and 2030 would meet the mandates of SB 32 for a 40 percent reduction in emissions by 2030. A threshold then reduced by 5.35 percent for each year between 2030 and 2050 would meet the mandates of SB 32 for an 80 percent reduction in emissions by 2050. The first full year of operation for Phase I of the project is anticipated to be 2024; therefore, a threshold of 8,152 MT CO_2e per year for Phase I is used in this analysis. The first full year of operation for Phase II of the project is anticipated to be 2035; therefore, a threshold of 4,558 MT CO_2e per year for Phase II is used.

4.7.4 Project Impacts and Mitigation

4.7.4.1 Issue 1: Greenhouse Gas Emissions

Would the proposed project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Impact Analysis

The project would generate GHGs in the short-term during construction and the long-term during operation. The project's emissions were estimated using CalEEMod Version 2016.3.2 (SCAQMD 2017b). As applicable to this analysis, the model calculates emissions of the GHG emissions for CO_2, CH_4, and N_2O. For the full scope of methodology and assumptions used in this analysis, refer to Appendix B.

Emissions of GHGs are presented in MT CO_2e, which is a metric used to compare the emissions from various GHGs based on their global warming potential. The CO_2e of a gas is determined by multiplying the tons of that gas by its global warming potential.

Phase I Construction

The project's Phase I construction would generate GHG emissions associated with exhaust from heavy off-road construction equipment, on-road haul trucks delivering material to and from the work sites, and construction worker vehicle trips to and from the work sites. The primary GHG emissions would be CO_2 from gasoline and diesel combustion, with more limited vehicle tailpipe emissions of N_2O and CH_4. Total GHG emissions during Phase I project construction are presented in Table 4.7-5, *Estimated Phase I Construction GHG Emissions*. As shown in Table 4.7-5, the project would result in GHG emissions from Phase I construction of 1,570 MT CO_2e. Amortized over 30 years, the proposed construction activities would contribute approximately 52 MT CO_2e emissions per year.

Table 4.7-5
ESTIMATED PHASE I CONSTRUCTION GHG EMISSIONS

Year	Emissions (MT CO_2e)
2022	1,026
2023	544
Total Phase I Construction Emissions	**1,570**
Amortized Construction Emissions[2]	52

Source: HELIX 2021

[1] The total presented is the sum of the unrounded values.

[2] Construction emissions are amortized over 30 years.

MT = metric tons; CO_2e = carbon dioxide equivalent

Phase I Operations

Operational sources of emissions from the project include: (1) area sources (landscape equipment and consumer products); (2) energy use (electricity); (3) vehicle use; (4) stationary sources (emergency generators); (5) solid waste generation; and (6) indoor and outdoor water use. The project would achieve an annual recharge of up to 4,000 acre-feet of potable water during Phase I, which would reduce reliance on imported water, thereby reducing GHG emissions associated with the conveyance of imported water. The project's GHG emissions estimates are presented below both with and without this savings.

Area Sources

Area sources include GHG emissions that would occur from the use of landscaping equipment and consumer products. Landscape equipment would occasionally be used for maintenance of formal landscaping at the AWTF site and likely for weed abatement near the brine management system. Due to the limited amount of equipment and time required for maintenance, area source GHG emissions would be negligible.

Energy Use

Projects that increase electricity consumption also result in an indirect increase in GHG emissions. The off-site generation of electricity through the combustion of fossil fuels typically yields CO_2, and to a much smaller extent, CH_4 and N_2O. Most of the project's electricity consumption would be associated with the advanced water treatment process equipment at the Process Center of the AWTF. Electricity would also be used, to a much lesser extent, for uses such as lighting and HVAC systems at the Control Center of the AWTF. The annual GHG emissions from energy usage are estimated to be 1,369 MT CO_2e per year.

Vehicular (Mobile) Sources

The project's mobile sources of GHG emissions would occur from an average of 10 daily vehicle trips to the AWTF site, accounting for up to five staff members, occasional visitor tours, and 10 chemical deliveries per month. The project would result in emissions of 21 MT CO_2e per year from mobile sources.

Stationary Sources (Emergency Generators)

Two diesel-powered standby/emergency generators would be used for backup power during electric power failures. Generator emissions were estimated using CalEEMod based on the monthly testing frequency and duration, as well as the power output of the engines. The project would result in emissions of 3 MT CO_2e from stationary sources.

Solid Waste

Solid waste generated by the project would also contribute to GHG emissions. Treatment and disposal of solid waste produces emissions of methane. The project is estimated to result in emissions of 9 MT CO_2e from solid waste.

Water Use

Water-related GHG emissions are from the conveyance and treatment of water. The California Energy Commission's 2006 Refining Estimates of Water-Related Energy Use in California defines average energy values for water in southern California. These values are used in CalEEMod to establish default water related emission factors. Model default indoor and outdoor water usage was used. A 20 percent outdoor water use reduction per CALGreen requirements was also incorporated into the model. The Project's annual GHG emissions from water sources are estimated to be 27 MT CO_2e.

Potable Water Savings

By providing a local source of potable water, the project would reduce reliance on imported water, thereby reducing GHG emissions associated with the energy used to pump water from the Sacramento-San Joaquin Bay Delta in northern California or from the Colorado River. The provision of potable water consumes large amounts of energy associated with regional source and conveyance, treatment, and local distribution. This type of energy use is known as embedded energy. While the project would result in a reduction in energy used for regional import, energy would still be required to locally pump water produced by the project that would be recharged into the groundwater table. As such, the electricity intensity factor associated with local pumping was subtracted from the electricity intensity factors for import to achieve a factor that represents the net savings electricity intensity factor associated with the provision of potable water that would result from the project. The electricity intensity factors are provided by the CEC's *California's Water – Energy Relationship Final Staff Report* (CEC 2005).

To then calculate GHG emissions associated with this embedded energy, the electricity intensity factors are multiplied by the utility intensity factors for the GHGs and are classified as indirect emissions. The GHG emissions associated with water use are calculated by multiplying the embedded energy in a gallon of potable water by the total number of gallons provided and then by the electricity generation GHG emissions factors. It is estimated that Phase I of the project would achieve a potable water recharge capacity of 4,000 AFY. After factoring in a minor loss from evaporation, Phase I of the project is estimated to save, and therefore reduce import of, 3,912 acre-feet, or 1,275 million gallons, of potable water per year. This would result in a GHG emissions reduction of approximately 2,063 MT CO_2e per year.

Emissions

Table 4.7-6, *Total Estimated Phase I Operational GHG Emissions*, includes the total annual emissions for Phase I operation of the project. The emissions include the amortized annual Phase I construction emissions anticipated for the project. Without considering potable water savings, the project would result in annual emissions of 1,480 MT CO_2e during Phase I operations. With potable water savings, the project would result in a net reduction in emissions of 583 MT CO_2e per year. Under both scenarios, the project's Phase I operational emissions would be below the annual threshold of 8,152 MT CO_2e calculated for year 2024. Impacts would be less than significant.

Table 4.7-6
TOTAL ESTIMATED PHASE I OPERATIONAL GHG EMISSIONS

Emission Sources	Emissions (MT CO_2e)
Area Sources	0
Energy Sources	1,369
Vehicular (Mobile) Sources	21
Stationary Sources	3
Solid Waste Sources	9
Water Sources	27
Phase I Operational Subtotal	1,428
Phase I Construction (amortized over 30 years)	52
Total Phase I Operational Emissions without Potable Water Savings	**1,480**
Phase I Potable Water Savings	**2,063**
Total Phase I Operational Emissions with Potable Water Savings	**(583)**
Calculated Year 2024 Threshold	***8,152***
Exceed Threshold?	**No**

Source: HELIX 2021
Note: Totals may not add up exactly due to rounding.
MT = metric tons; CO_2e = carbon dioxide equivalent

Phase II Construction

As with Phase I construction, the project's Phase II construction would generate GHG emissions associated with exhaust from heavy off-road construction equipment, on-road haul trucks delivering material to and from the work sites, and construction worker vehicle trips, although to a much lesser extent than Phase I construction. Total GHG emissions during the project's Phase II construction are presented in Table 4.7-7, *Estimated Phase II Construction GHG Emissions*. As shown in Table 4.7-7, the project would result in GHG emissions from Phase II construction of 517 MT CO_2e. Amortized over 30 years, the proposed construction activities would contribute approximately 17 MT CO_2e emissions per year.

Table 4.7-7
ESTIMATED PHASE II CONSTRUCTION GHG EMISSIONS

Year	Emissions (MT CO_2e)
2034	517
Total Phase I Construction Emissions	**517**
Amortized Construction Emissions[2]	17

Source: HELIX 2021

[1] The total presented is the sum of the unrounded values.

[2] Construction emissions are amortized over 30 years.

MT = metric tons; CO_2e = carbon dioxide equivalent

Phase II Operations

As with Phase I operations, sources of emissions from the project's Phase II operations would include area sources, energy use, vehicle use, stationary sources, solid waste generation, and water use. Of these sources, area source emissions and stationary source emissions are not anticipated to increase. The primary increase in emissions would be associated with the increased electricity used for the increased treatment capacity of Phase II. Although Phase II would involve a slight increase in vehicle trips from increased chemical deliveries, emissions are calculated to decrease due to anticipated stricter emissions regulations for vehicles in the future. Solid waste source and water source emissions would slightly increase.

Phase II of the project is estimated to achieve an additional potable water recharge capacity of 11,000 AFY, for a total Phase II recharge capacity of 15,000 AFY. After factoring in a minor loss from evaporation, Phase II of the project is estimated to save, and therefore reduce import of, 14,670 acre-feet, or 4,780 million gallons, of potable water per year. This would result in a GHG emissions reduction of approximately 7,736 MT CO_2e per year.

Table 4.7-8, *Total Estimated Phase II Operational GHG Emissions*, includes the total annual emissions for Phase II operation of the project. The emissions include the amortized annual Phase I and Phase II construction emissions anticipated for the project. Without considering potable water savings, the project would result in annual emissions of 4,006 MT CO_2e during Phase II operations. With potable water savings, the project would result in a net reduction in emissions of 3,730 MT CO_2e per year. Under both scenarios, the project's Phase II operational emissions would be below the annual threshold of 4,558 MT CO_2e calculated for year 2035. Impacts would be less than significant.

Table 4.7-8
TOTAL ESTIMATED PHASE II OPERATIONAL GHG EMISSIONS

Emission Sources	Emissions ($MT CO_2e$)
Area Sources	0
Energy Sources	3,861
Vehicular (Mobile) Sources	19
Stationary Sources	3
Solid Waste Sources	14
Water Sources	40
Phase II Operational Subtotal	3,937
Phase I Construction (amortized over 30 years)	52
Phase II Construction (amortized over 30 years)	17
Total Phase II Operational Emissions without Potable Water Savings	**4,006**
Phase II Potable Water Savings	**7,736**
Total Phase II Operational Emissions with Potable Water Savings	**(3,730)**
Calculated Year 2035 Threshold	***4,558***
Exceed Threshold?	**No**

Source: HELIX 2021
Note: Totals may not add up exactly due to rounding.
MT = metric tons; CO_2e = carbon dioxide equivalent

The proposed project would not generate GHGs, either directly or indirectly, that may have a significant impact on the environment during construction or operation. Impacts would be less than significant.

Mitigation Measures

Impacts related to GHG emissions would be less than significant; therefore, no mitigation is necessary.

4.7.4.2 Issue 2: Conflict with Plans or Policies

Would the proposed project conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs?

Impact Analysis

There are numerous State plans, policies, and regulations adopted for the purpose of reducing GHG emissions. The principal overall State plan and policy is AB 32 and SB 32, the California Global Warming Solutions Act of 2006. The quantitative goal of AB 32 was to reduce GHG emissions to 1990 levels by 2020. SB 32 requires further reductions of 40 percent below 1990 levels by 2030 and 80 percent below 1990 levels by 2050. Statewide plans are regulations are being implemented at the statewide level, and compliance on a project-specific level is not addressed. Further, a number of prominent statewide plans and regulations (e.g., AB 1493 and the LCFS), as well as regional plans (e.g., SCAG's RTP/SCS), aimed at reducing GHG emissions focus on reducing transportation source emissions. The proposed project would generate minimal VMT and would therefore not conflict with such policies and regulations.

As previously discussed, the increase in GHG emissions would be less than the reduced SCAQMD significance thresholds being applied to this analysis in accordance with SB 32 reduction targets. In addition, the project would implement a potable water replenishment program to provide the District's service area with a local, sustainable, and reliable drinking water supply. By providing a local, reliable source of potable water, the project would reduce GHG emissions associated with embedded energy required for the conveyance of water from the Sacramento-San Joaquin Bay Delta in northern California or from the Colorado River. This would aid in meeting the County's CAP Update and WRCOG's Subregional CAP GHG emissions reductions targets.

Given the aforementioned, implementation of the proposed project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. This would represent a less-than-significant impact.

Mitigation Measures

Impacts related to conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions would be less than significant; therefore, no mitigation is necessary.

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4.8 HYDROLOGY AND WATER QUALITY

The section addresses the potential impacts of the proposed project to hydrology and water quality. The following discussion includes a description of existing conditions as related to hydrology and water quality, a summary of applicable regulations, and an evaluation of the proposed project's potential environmental effects associated with hydrology and water quality.

4.8.1 Existing Conditions

4.8.1.1 Hydrology Setting

Surface Water

San Jacinto Valley Hydrologic Unit

The proposed project is located in the San Jacinto Valley Hydrologic Unit (HU), which incorporates approximately 700 square miles, including the San Jacinto River watershed between the southeastern boundary of the Santa Ana Basin and Lake Elsinore. Surface drainage in the San Jacinto Valley HU flows generally to the west and south via the San Jacinto River, although drainage patterns vary locally with topography. The San Jacinto River normally terminates at Lake Elsinore, which has no outflow, although in exceptionally large storms or extended wet periods excess flows may enter Temescal Wash downstream of Canyon Reservoir. The San Jacinto Valley HU is divided into three smaller hydrologic areas (HAs) on the basis of local drainage characteristics, including Perris (802.10), San Jacinto (802.20), and Elsinore (802.30) HA (RWQCB 1986; 1995). The proposed project falls within the San Jacinto HA. Hydrologic areas within the San Jacinto Valley HU are further divided into Hydrologic Subareas (HSAs). The proposed project is located within the Gilman Hot Springs HSA (802.21; see Figure 4.8-1, *San Jacinto Valley Hydrologic Unit*).

San Jacinto River Watershed

The proposed project is located in the San Jacinto River Watershed which is located on the western flanks of the San Jacinto Mountains. The watershed includes several lakes and reservoirs (Lake Elsinore, Canyon Lake, Lake Perris, Lake Hemet, and Mystic Lake). Major tributaries include Bautista Creek, Poppet Creek, Potrero Creek, Perris Valley Drain and Salt Creek. The San Jacinto River is formed at the western base of the San Jacinto Mountains by the confluence of its North and South forks. The South Fork flows from near Santa Rosa Summit, through Pine Meadow and Garner Valley to Lake Hemet. Downstream of the dam, the South Fork joins the North Fork east of the town of Valle Vista near Highway 74, and the main stem of the San Jacinto River continues northwest until it discharges into Mystic Lake, a couple of miles east of Lake Perris. Overflow from the river then flows southwest, passing under Ramona Expressway and I-215, and through Railroad Canyon to Canyon Lake. Downstream of Canyon Lake, the river continues flowing roughly west southwest through the canyon through the Temescal Mountains for about three miles until it drains into Lake Elsinore. The lake usually has no outflow other than evaporation, but in years of heavy rainfall it overflows into Temescal Creek, which flows northwest to the Santa Ana River in Corona, California.

Regional Groundwater Setting

The proposed project is located within the San Jacinto Groundwater Basin (see Figure 4.8-2, *San Jacinto Groundwater Basin*). The San Jacinto Groundwater Basin consists primarily of alluvial and fluvial

sedimentary deposits containing coarse-grained sand and gravel deposits as well as finer-grained silt and clay layers. The alluvial aquifer valleys are bounded by lower permeability, primarily crystalline and sedimentary rocks of the San Jacinto Mountains to the east, the San Timoteo Badlands to the northeast, the Box Mountains to the north, the Santa Rosa Hills and Bell Mountains to the south, and unnamed hills west of Mead Valley and Perris. The basin is essentially closed, without significant groundwater inflow or outflow to or from other groundwater basins. Several bedrock hills and ranges are present within the basin, separating the alluvial aquifer into different "compartments" or subareas. There are eight Groundwater Management Zones covering these subareas within the larger San Jacinto Groundwater Basin. The project area is located within the Hemet North and San Jacinto Upper Pressure Area Management Zone, in the eastern portion of the basin (see Figure 4.8-3, *Groundwater Management Zones*).

4.8.1.2 Water Quality

Surface Water Quality

Existing water quality data from the San Jacinto River Watershed includes quantitative and qualitative monitoring and/or testing results from sources such as the CWA Section 303(d) impaired water evaluations conducted by the SWRCB and RWQCB, urban runoff monitoring and water quality improvement plans associated with the NPDES Municipal Permit (described below under Regulatory Framework), and the State Surface Water Ambient Monitoring Program (SWAMP). An overview of selected monitoring and reporting data is provided below.

Clean Water Act 303(d) List

As part of the requirements of the Clean Water Act, beneficial uses for surface waters must be identified in the Santa Ana RWQCB's Water Quality Control Plan for the Santa Ana River Basin (Basin Plan). Water bodies in the San Jacinto River Watershed that have been placed on the CWA Section 303(d) list are shown in Table 4.8-1, *Water Bodies within the San Jacinto River Watershed Identified as Impaired under the Clean Water Act*, and on Figure 4.8-4, *Clean Water Act Impaired Water Bodies*. A number of beneficial uses have been identified in the San Jacinto Valley HU including municipal supply, agricultural supply, groundwater supply, contact and noncontact recreation, warm freshwater habitat, and wildlife habitat. Water quality management for the watershed is based on these identified uses. The Basin Plan sets water quality objectives that are qualitative and quantitative to protect the identified beneficial uses. The water quality parameters for which numerical limits were selected from the sources listed above are total dissolved solids, hardness, sodium, chloride, total inorganic nitrogen, sulfate, and chemical oxygen demand. However, in some cases the natural background level of a particular constituent is higher than the beneficial use protective numerical limit. In such instances, the natural background level is considered to comply with the water quality objective (RWQCB 2017).

Table 4.8-1
WATER BODIES WITHIN THE SAN JACINTO RIVER WATERSHED IDENTIFIED AS IMPAIRED UNDER THE CLEAN WATER ACT

Water Body Name	Hydrologic Subarea (HSA)	Pollutant/Stressor
Canyon Lake	802.30	Nutrients and Bacterial Indicators
Lake Elsinore	802.30	Organic Enrichment/Low Dissolved Oxygen
Lake Fulmor	802.20	Nutrients and Pathogens

Source: RWQCB 2017

The Santa Ana RWQCB has listed impairments for Canyon Lake (Railroad Canyon Reservoir), and Lake Elsinore due to elevated levels of contaminants that include nutrients (Canyon Lake) from non-point sources, organic enrichment (Lake Elsinore), PCBs (Lake Elsinore), and unknown toxicity (Lake Elsinore; RWQCB 2017).

NPDES Water Quality Improvement Plans

Pursuant to the RWQCB Municipal Permit for the Santa Ana Region, listed copermittees for the San Jacinto River Watershed Management Area (WMA) have adopted Water Quality Improvement Plans (WQIPs) to prioritize and address water quality conditions that arise from stormwater drain discharges. The highest priority water quality condition of concern for the San Jacinto River WMA is nutrient runoff. Additional priority water quality conditions include bacteria, nitrogen and phosphorus, TDS, eutrophic conditions, and biological integrity (RWQCB 1995).

Surface Water Ambient Monitoring Program

The SWRCB coordinates the SWAMP to assess water quality in California's surface waters. Monitoring occurred most recently in 2012-2015 throughout the Santa Ana Region. Water and sediment samples were taken to assess water chemistry and toxicity; macroinvertebrate samples were taken to analyze for metals, polychlorinated biphenyls (PCBs), and overall ecological health; and components of the physical habitat were recorded, with the primary goal of assessing impacts to aquatic life in each watershed.

In the San Jacinto subregion, five sites were sampled along Strawberry Creek, one site each on the North and South Forks of the San Jacinto River, and one site on the main stem of the San Jacinto River. The results indicate that poor water quality throughout portions of the watershed is impacting aquatic life. Tests revealed the presence of pesticides, nutrient levels above aquatic life thresholds, and high levels of toxicity to indicator species from both water and sediment samples (SWAMP 2017).

Groundwater Quality

Groundwater contaminants originate from both natural and anthropogenic sources. The aforementioned Basin Plan and the San Jacinto Groundwater Basin Plan set water quality objectives for groundwater that are qualitative and quantitative in order to protect beneficial uses. The water quality constituents that have numerical limits for groundwater include arsenic, bacteria, barium, boron, chloride, cyanide, total dissolved solids, fluoride, metals, Methylene Blue-Activated Substances, pH, radioactivity, sodium, and sulfate (RWQCB 2017). The District's San Jacinto Valley Water Banking Enhanced Recharge and Recovery Program EIR (SCH No: 2015071002) conducted a groundwater study

in 2018 for the San Jacinto Upper Pressure Zone to determine key water quality parameters and evaluate general groundwater quality (District 2018). This discussion is based in part on the findings of this study.

The groundwater study sampled wells throughout the District's service area, and all of the wells exhibited relatively normal concentrations of the key water quality parameters. Water quality data from 44 wells were tabulated, plotted, and compared to current California and U.S. EPA regulatory requirements including maximum contaminant levels (MCLs) for drinking water. Only one well (depth unknown) south of the Alessandro Storage Ponds in San Jacinto showed a nitrate concentration exceeding the MCL of 45 milligrams per liter (mg/L).

4.8.1.3 Flood Hazards

Flooding occurs under conditions such as excessive precipitation, inadequate drainage, dam failure, tsunamis, and/or seiches. Flood hazards as they relate to the proposed project are discussed below.

Precipitation Induced Flooding

Much of Riverside County is vulnerable to periodic flooding due to hydrology and terrain. Large weather systems that move inland from the Pacific Ocean are forced upward over the mountains where moisture-laden air cools and condenses, forming precipitation. This can result in large rain events and damaging floods. Rapid melt of mountain snowpack is also a concern during the spring and summer months. According to Riverside County's Operational Area Multi-Jurisdictional Local Hazard Mitigation Plan (LHMP), between 1950 and 2012, there were 116 Proclaimed States of Emergency in Riverside County due to flooding (County of Riverside 2018).

As outlined below under Section 4.8.2, *Regulatory Framework*, FEMA is involved in identifying and mapping flood-prone areas for jurisdictions that participate in the National Flood Insurance Program (NFIP). The City of San Jacinto and the County of Riverside participate in the NFIP; therefore, maps delineating the 100-year storm floodplain for the project area are available (FEMA 2020). The 100-year storm is defined as an event that has a 1 percent chance of occurring in any given year (i.e., rather than an event that occurs every 100 years). Potential floodplains cover much of the City of San Jacinto's jurisdiction due to the San Jacinto River corridor and associated tributaries. The proposed 36-inch pipeline and Alessandro Blending Station area is designated by FEMA as an area that is protected from the 1 percent-annual-chance or greater flood hazard by a levee system. However, overtopping or failure of any levee system is possible. The AWTF project site is located within an area designated as Zone X outside the 0.2 percent annual chance floodplain.

Drainage Facilities

Development in previously natural areas throughout Southern California has contributed to increased potential for flooding by expanding impervious land cover and therefore increasing runoff by reducing the rate of infiltration. Artificial conveyances, such as storm drains and modifications to river channels, are designed to accommodate the additional volume of runoff and accelerate the flow of water out of the watershed. If drainage facilities are not adequately designed or maintained, however, the fast moving, high volume of water moving through these conveyances can result in increased probability and severity of flooding. Low-lying, urbanized areas in the project area could be at risk for flooding due to inadequate drainage.

Dam Inundation

Dam inundation occurs when a structural failure or overtopping of a dam causes a large release of impounded water and floods downstream drainages from the dam. Events that could lead to dam inundation include extreme precipitation, earthquakes, or poor design and/or construction of dam structures. Potential risks of damages and loss due to dam inundation are highest in areas directly below the dam and decrease as distance from the dam increases.

According to the Riverside County General Plan EIR, the project site is located within a potential dam failure inundation zone. Lake Perris, located approximately nine miles northwest of the project site, impounds a roughly ten square mile watershed and holds nearly 155,000 acre-feet. The lake functions as the southern terminus of the State Water Project (which conveys water from the Sierra Nevada Mountains across the state). According to an extensive study conducted by the California DWR in 2005, there are fears that an earthquake of magnitude 7.5 or larger could breach the dam. As discussed in Section 4.6, *Geology and Soils*, this engineering study, combined with the reservoir's location within a few miles of the San Jacinto Fault, makes it a concern for seismically triggered dam failure and inundation hazards. However, in 2015, a remediation plan to reinforce the dam was completed to augment dam safety. As a result, there is no imminent threat to public safety.

Diamond Valley Lake forms Southern California's largest reservoir for storing surface water. It almost doubles Southern California's surface storage capacity and is intended to ensure a six-month water supply in the event of an emergency. The reservoir also provides additional water for drought protection and peak summer needs. The reservoir runs between 160 to 260 feet deep and has a storage capacity of 800,000 acre-feet. Water stored at Diamond Valley comes from the Colorado River Aqueduct through the San Diego Canal and from the State Water Project through the new 12-foot diameter, 45-mile Inland Feeder Project. The lake is also used for recreational activities, including boating and fishing. Diamond Valley Lake, while six miles south of the project site, is not identified as being at risk of failure or collapse as it was completed in 2002 and designed to withstand strong seismic events.

Tsunamis and Seiches

Tsunamis are a series of ocean waves generated by a displacement of large volumes of water, usually caused by underwater landslides, earthquakes, or volcanic activity. Near-shore areas are the most vulnerable to damages caused by tsunamis. Tsunamis would not occur in the project area because it is located approximately 40 miles inland from the Pacific Ocean.

A seiche is an oscillating standing wave in a completely or partially enclosed body of water. Seismic activity, strong winds, and/or abrupt changes in atmospheric pressure can cause a seiche to form. Due to the intervening distances between the nearest enclosed bodies of water, the San Jacinto Reservoir and Diamond Valley Lake, located one mile east and six miles south, respectively, the project site is not at risk of being impacted by a seiche event. However, the evaporation ponds themselves, when in operation and full of water, could be susceptible to seiche waves triggered by a seismic event from one of the region's active faults. The proposed design of the ponds and maximum operating water level would limit any potential damage from wave action, and the likelihood of substantive quantities of water overtopping the ponds is considered low. As discussed in Section 4.6, *Geology and Soils*, seiche- and tsunami-related hazards for the proposed project are considered low; therefore, no further analysis is provided in this section.

4.8.2 Regulatory Framework

4.8.2.1 Federal

Clean Water Act

Regulatory authorities exist on both the state and federal levels for the control of water quality in California. The EPA is the federal agency, governed by the CWA, responsible for water quality management. The purpose of the CWA is to protect and maintain the quality and integrity of the nation's waters by requiring states to develop and implement state water plans and policies. Section 303 of the CWA requires states to establish water quality standards consisting of designated beneficial uses of water bodies and water quality standards to protect those uses for all Waters of the United States. Under Section 303(d) of the CWA, states, territories, and authorized tribes are required to develop lists of impaired waters. Impaired waters are the waters that do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for water on the lists and develop action plans to improve water quality. This process includes development of Total Maximum Daily Loads (TMDLs) that set discharge limits for non-point source pollutants. The recently passed Ducheny Bill (AB 1740) requires the SWRCB and its nine Regional Water Quality Control Boards to post this list and to provide an estimated completion date for each TMDL. The list is administered by the Regional Boards, which for this project, is the Santa Ana Regional Water Quality Control Board.

National Pollutant Discharge Elimination System

Part of the CWA provides for the NPDES, in which discharges into navigable waters are prohibited except in compliance with specified requirements and authorizations. Under this system, municipal and industrial facilities are required to obtain a NPDES permit that specifies allowable limits, based on available wastewater treatment technologies, for pollutant levels in their effluent. In California, CalEPA has delegated the implementation of this program to the State Board and to the Regional Boards.

Stormwater discharges are regulated somewhat differently. Stormwater runoff from construction areas of one acre or more require either an individual permit or coverage under the statewide General Construction Storm Water Permit. In addition, specific industries, including wastewater treatment plants that have direct stormwater discharges to navigable waters are required to obtain either an individual permit issued by the Regional Board, or obtain coverage under the statewide General Industrial Storm Water Permit for stormwater discharges. A non-point source is a diffused source, such as land runoff, precipitation, deposit from the atmosphere, or percolation. Major non-point sources of water pollution are agriculture, mining, oil and gas extraction, pastureland and feedlots, land disposal, and urban runoff. For non-point sources, the Basin Plan outlines the approach that the Regional Board has taken to control nonpoint source pollution in its Urban Runoff Management scheme. Part of the strategy involves the permitting of stormwater discharges from all facilities associated with industrial activities and from all construction activities that result in the disturbance of land totaling one acre or more.

Federal Emergency Management Agency

Under Executive Order 11988, FEMA is responsible for the management and mapping of areas subject to flooding during a 100-year flood event (i.e., one percent chance of occurring in a given year). FEMA requires that local governments covered by federal flood insurance pass and enforce a floodplain

management ordinance that specifies minimum requirements for any construction within the 100-year flood plain, as depicted on FEMA maps.

4.8.2.2 State

State Water Resources Control Board

The SWRCB, located in Sacramento, is the agency with jurisdiction over water quality issues in the State of California. The SWRCB is governed by the Porter-Cologne Water Quality Act (Division 7 of the California Water Code), which establishes the legal framework for water quality control activities by the SWRCB. The intent of the Porter-Cologne Act is to regulate factors which may affect the quality of waters of the State to attain the highest quality which is reasonable, considering a full range of demands and values. Within the SWRCB, the Division of Drinking Water (DDW) regulates public drinking water systems. Much of the implementation of the SWRCB's responsibilities is delegated to its nine Regional Boards. The proposed project is located within the Santa Ana Region.

Regional Water Quality Control Board

The Santa Ana RWQCB is responsible for the protection of beneficial uses of water resources within the Santa Ana Region. The RWQCB uses planning, permitting, and enforcement authorities to meet this responsibility, and adopted the Water Quality Control Plan (WQCP) for the Santa Ana Region Basin Plan in February 2004 with minor editorial corrections made to Chapter 4 in 2011 and updated again in 2016. The Santa Ana Region Basin Plan comprehensive program requirements are designed to be consistent with federal regulations (40 CFR Parts 122-124) and are implemented through issuance of NPDES permits to point source and non-point sources of pollutant discharges including construction activities. The Santa Ana Region Basin Plan identifies beneficial uses and establishes water quality objectives for surface waters and groundwater in the Region, as well as effluent limitations and discharge prohibitions intended to protect those uses.

Construction Activity Permitting

The California Construction Stormwater Permit (Construction General Permit; *General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities,* Order No. 2009-0009-DWQ, as amended by Order No. 2010-0014-DWQ, National Pollutant Discharge Elimination System No. CAS000002), adopted by the SWRCB, regulates construction activities that include clearing, grading, and excavation resulting in soil disturbance of at least one acre of total land area. The Construction General Permit authorizes the discharge of stormwater to surface waters from construction activities. It prohibits the discharge of materials other than stormwater and authorized non-stormwater discharges and all discharges that contain a hazardous substance in excess of reportable quantities established at 40 CFR 117.3 or 40 CFR 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

The Construction General Permit requires that all developers of land where construction activities will occur over more than one acre do the following:

- Complete a Risk Assessment to determine pollution prevention requirements pursuant to the three Risk Levels established in the General Permit;

- Eliminate or reduce non-stormwater discharges to storm sewer systems and other waters of the Nation;

- Develop and implement a SWPPP, which specifies BMP that will reduce pollution in stormwater discharges to the Best Available Technology Economically Achievable/Best Conventional Pollutant Control Technology standards; and

- Perform inspections and maintenance of all BMPs.

Typical BMPs contained in SWPPPs are designed to minimize erosion during construction, stabilize construction areas, control sediment, control pollutants from construction materials, and address post construction runoff quantity (volume) and quality (treatment). The SWPPP must also include a discussion of the program to inspect and maintain all BMPs.

Urban Water Management Act

Water Code Section 10620(a) of the Urban Water Management Planning Act requires urban water suppliers to prepare and adopt an Urban Water Management Plan (UWMP) and sets forth parameters for doing so. Each UWMP is to assess current and projected water supplies; evaluate demand and customer type; evaluate reliability of water supplies; describe conservation measures implemented by the water supplier; provide a response plan for times of water shortage; and compare supply and demand projections. UWMPs must be updated every five years and the most recent update occurred in 2010.

The Water Conservation Act of 2009 set a requirement for water agencies to reduce their per capita water use by the year 2020. The overall goal is to reach a statewide reduction of per capita urban water use of 20 percent by December 31, 2020, with an intermediate goal of 10 percent reduction by December 31, 2015. In the 2010 UWMPs, urban suppliers were required to set targets and supply a plan to reduce per capita water consumption. Demand reduction can be achieved through both conservation and the use of recycled water as a potable demand offset. Agencies within the Management Area are involved in implementation of the Plan. As a result of the successful efforts to improve water efficiency, to recharge the basin as part of the Management Plan, and to increase the use of recycled water, water supplies will be available to meet demand for over 20 years into the future.

State Health and Safety Code

As part of the California Health and Safety Code in Title 17 of the CCR, public water suppliers must protect the public water supply from contamination by implementation of a cross connection control program. Water suppliers are required to ensure that the cross-control program includes provisions of backflow protection by, establishment of a system to test backflow preventers, provide trained staff in the cross-control program, and implement surveys and maintenance of the system to ensure adequacy. While the water supplier is required to evaluate the degree of potential health hazard to the public water supply which may be created as a result of conditions existing on a user's premises, they are not responsible for abatement of cross connections which may exist within a user's premises. As a minimum, the water supplier should evaluate as part of the cross-connection control program the existence of cross-connections, the nature of materials handled on the property, the probability of a backflow occurring, the degree of piping system complexity and the potential for piping system modification.

Sustainable Groundwater Management Act of 2014

The Sustainable Groundwater Management Act of 2014 (SGMA) is a three-bill package that collectively establishes a new structure for managing California's groundwater. A central feature of the SGMA is the recognition that groundwater management in California is best accomplished locally. The SGMA was signed by Governor Edmund G. Brown Jr. on September 16, 2014, and includes the provisions of SB 1168, AB 1739, and SB 1319. The SGMA builds upon the existing groundwater management provisions established by AB 3030 (1992), SB 1938 (2002), and AB 359 (2011), as well as SBX7 6 (2009) which established the California Statewide Groundwater Elevation Monitoring (CASGEM) Program.

The SGMA defines sustainable groundwater management as "the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results." Undesirable results include, but are not limited to, chronic lowering of groundwater levels, reduction of groundwater storage, seawater intrusion, degraded water quality, and land subsidence that interferes with surface land uses. The east portion of the San Jacinto Groundwater Basin, where the project is located, is adjudicated and therefore exempt from SGMA.

4.8.2.3 Local

Riverside County MS4 Permit

In large metropolitan areas with interconnected municipal storm sewer systems, Municipal Separate Storm Sewer (MS4) permits are often issued to multiple Permittees that work cooperatively to meet NPDES requirements. Riverside County is a permittee of the MS4 NPDES Permit within the Santa Ana Region of Riverside County. The Riverside County Flood Control and Water Conservation District is the Principal Permittee and the County of Riverside and the cities of Beaumont, Calimesa, Canyon Lake, Corona, Eastvale, Hemet, Jurupa Valley, Lake Elsinore, Menifee, Moreno Valley, Murrieta, Norco, Perris, Riverside, San Jacinto, and Wildomar are the Co-Permittees.

The first MS4 permit was issued by the Regional Board to the MS4 Permittees in 1990. The 1990 MS4 permit was followed by MS4 permits issued in 1996, 2002 and 2010. The Regional Board adopted a new MS4 permit for the Santa Ana Region of Riverside County on January 29, 2010 (Order No. 2010-0033, NPDES No. CAS618033). The Order regulates the discharge of pollutants in urban runoff from non-agricultural sources. All permittees must implement a WQMP that include post-construction BMP requirements. This permit also includes requirements directly addressing the waste load allocations (WLAs) for Lake Elsinore and Canyon Lake. Specifically, this permit explicitly requires implementation of tasks contained within the TMDLs and compliance with the WLAs. The permit also requires preparation of a Comprehensive Nutrient Reduction Plan (CNRP); which describes the specific actions that have been taken or will be taken to achieve compliance with the TMDL's WLA by December 31, 2020.

Riverside County Well Permit

Riverside County Ordinance No. 682.3 regulates the construction, reconstruction, abandonment, and destruction of community water supply wells, individual domestic wells, and agricultural wells. Under the auspices of the Department of Environmental Health, the County is responsible for issuing well drilling permits. A valid permit along with the payment of all applicable fees is required before anyone digs, drills, bores, drives, or reconstructs a well that is, or was, a water well, a cathodic protection well, or a monitoring well. Standards for the construction or reconstruction of wells are the standards

recommended in the California Department of Water Resources Bulletin No. 74-81, Chapter II, and Bulletin No. 74-90, as amended by the State.

4.8.3 Thresholds of Significance

The following criteria from Appendix G of the *CEQA Guidelines* are used as thresholds of significance to determine the impacts of the proposed project as related to hydrology and water quality. The proposed project would have a significant impact if it would:

1. Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality;

2. Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin;

3. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or the addition of impervious surfaces, in a manner which would: result in substantial erosion, siltation, or flooding on- or off-site; substantially increase the rate or amount of surface runoff; create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems; or provide substantial additional sources of polluted runoff;

4. Risk release of pollutants due to project inundation if located in a flood hazard, tsunami, or seiche zone; or

5. Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.

4.8.4 Project Impacts and Mitigation

4.8.4.1 Issue 1: Water Quality

Would the proposed project violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality?

Impact Analysis

The proposed project would have the potential to contribute to a violation of water quality standards or the degradation of surface water quality from construction, operation, and/or maintenance of the project facilities, as outlined below.

Construction Activities

Potential water quality impacts related to project construction include erosion/sedimentation, the use and storage of construction-related hazardous materials (e.g., fuels), generation of debris from demolition activities, and disposal of extracted groundwater (if required), as described below. In addition, construction activities would require the use of hazardous materials including but not limited to petroleum products (e.g., oil, gasoline, and diesel fuels) and automotive fluids (e.g., antifreeze and hydraulic fluids). Inadvertent spills or leaks of such pollutants could affect the quality of runoff water

from the construction sites. However, because the project would disturb more than one acre, construction would be subject to the NPDES General Permit for Discharges of Storm Water Runoff Associated with Construction Activity (General Construction Permit). As part of this process, the District would file a Notice of Intent with SWRCB, in compliance with the statewide NPDES General Construction Permit. The District would be required to prepare and submit a SWPPP that would identify pollutant sources that may affect the quality of stormwater discharge and identify BMPs, such as erosion control and pollution prevention measures, to be used during construction.

Erosion/Sedimentation

Construction of the proposed project could result in erosion/sedimentation from activities such as grading, trenching, and excavation. Sediment that is washed off site into surface waters can smother aquatic organisms, alter the substrate and habitat, and alter the drainage course. Additionally, increased turbidity associated with erosion and sedimentation can degrade water quality by transporting pollutants that adhere to sediment particles, such as hydrocarbons. These potential impacts would be addressed through conformance with District requirements, as well as requirements under the NPDES Construction General Permit, as described above in Section 4.8.2, *Regulatory Framework*.

Additionally, implementation of the SWPPP for project construction would be required. Minimum BMPs would be determined during the NPDES/SWPPP process and would likely include standard industry measures and guidelines from the NPDES Construction General Permit and the additional sources identified under Section 4.8.2. Based on the implementation of the required BMPs summarized below and/or other appropriate erosion and sediment control BMPs as part of (and in conformance with) the project's SWPPP and related regulatory requirements, associated potential erosion/sedimentation impacts from project development would be less than significant.

Erosion and sedimentation controls for the proposed project would be outlined in the SWPPP, with the resulting BMPs taking priority over the following more general types of standard industry measures:

- Comply with seasonal grading restrictions during the rainy season for applicable locations/ conditions.

- Prepare and implement a Construction Site Monitoring Program (CSMP) to ensure appropriate monitoring, testing, BMP effectiveness, and conformance with applicable discharge requirements.

- Prepare and implement a Rain Event Action Plan (REAP), if applicable (i.e., depending on risk level), to ensure that active construction areas/activities have adequate erosion and sediment controls in place within 48 hours of the onset of a likely precipitation event (i.e., 50 percent or greater probability of producing precipitation, per National Oceanic and Atmospheric Administration projections).

- Preserve existing vegetation wherever feasible and use phased grading schedules to limit the area subject to erosion at any given time.

- Properly manage stormwater and non-stormwater flows to minimize runoff.

- Use sediment controls to protect the construction site perimeter and prevent off-site sediment transport, including measures such as temporary inlet filters, silt fence, fiber rolls, silt dikes,

biofilter bags, gravel bag berms, compost bags/berms, temporary sediment basins, check dams, street sweeping/vacuuming, energy dissipators, stabilized construction access points/sediment stockpiles and properly fitted covers for sediment transport vehicles.

- Store BMP materials in applicable on-site areas to provide "standby" capacity adequate to provide complete protection of exposed areas and prevent off-site sediment transport.
- Provide full erosion control for disturbed areas and material stockpiles not scheduled for additional activity for 14 or more consecutive calendar days.
- Provide appropriate training, including emergency preparedness training, for the personnel responsible for BMP installation and maintenance.
- Use solid waste management efforts such as proper containment and disposal of construction trash and debris.
- Comply with local dust control requirements, potentially including measures such as regular watering, use of chemical palliatives, limiting construction vehicle/equipment speeds and restricting/precluding construction operations during periods of high wind speeds.
- Implement appropriate monitoring and maintenance efforts (e.g., prior to and after storm events) to ensure proper BMP function and efficiency.
- Implement sampling/analysis, monitoring/reporting and post-construction management programs per NPDES requirements.
- Implement additional BMPs as necessary to ensure adequate erosion and sediment control (e.g., enhanced treatment and more detailed monitoring/reporting).

Construction-related Hazardous Materials

Project construction would involve the on-site use and/or storage of hazardous materials such as fuels, lubricants, solvents, and concrete. The accidental discharge of such materials during project construction could potentially result in significant impacts if such materials reach downstream receiving waters, particularly materials such as petroleum compounds that can be toxic to aquatic species in low concentrations. The SWPPP under NPDES guidelines would prescribe detailed measures to avoid or mitigate potential impacts related to the use and potential discharge of construction-related hazardous materials. Project BMPs would likely include the types of standard measures listed below, as derived from the Construction General Permit and the additional sources identified under Section 4.8.2.

Based on the implementation of these and/or other appropriate BMPs as part of (and in conformance with) the project SWPPP and related regulatory requirements, potential impacts from construction-related hazardous materials would be less than significant. Construction-related hazardous material BMPs include, but are not limited to, the following:

- Minimize the amount of hazardous materials on site and restrict storage/use locations to areas at least 50 feet from storm drains and surface waters.

- Use raised (e.g., on pallets), covered, and/or enclosed storage facilities for all hazardous materials, and maintain accurate and up-to-date written inventories and labels.

- Use berms, ditches, and/or impervious liners (or other applicable methods) in hazardous material storage and vehicle/equipment maintenance and fueling areas, to provide a containment volume of 1.5 times the volume of stored/used materials and prevent discharge in the event of a spill.

- Place warning signs in areas of hazardous material use or storage, and along drainages and storm drains (or other appropriate locations), to avoid inadvertent disposal.

- Properly maintain all construction equipment and vehicles.

- Restrict paving operations during wet weather and use appropriate sediment control devices downstream of paving activities.

- Properly contain and dispose of wastes and/or slurry from sources including concrete, dry wall, and paint, by using methods such as properly designed and contained washout areas/facilities.

- Provide training for applicable employees in the proper use, handling, and disposal of hazardous materials, as well as appropriate action to take in the event of a spill.

- Store absorbent and clean-up materials in readily accessible on-site locations.

- Properly locate, maintain, and contain portable wastewater facilities.

- Use recycled or less hazardous materials wherever feasible.

- Post regulatory agency telephone numbers and a summary guide of clean-up procedures in a conspicuous on-site location.

- Regularly (at least weekly) monitor and maintain hazardous material use/storage facilities and operations to ensure proper working order.

Disposal of Extracted Groundwater

According to the Geotechnical Report prepared by Kleinfelder in 2017, shallow groundwater is generally not expected to be encountered directly as part of project construction or operation because regional groundwater is estimated to be at depths greater than 150 feet below the ground surface. However, construction dewatering could potentially be required during construction operations (e.g., excavation for the 36-inch pipeline or brine ponds). Disposal of groundwater extracted during construction activities into local drainages and/or storm drain facilities could potentially generate significant water quality impacts through erosion/sedimentation, or the possible occurrence of pollutants in local aquifers. Project construction would require conformance with Santa Ana RWQCB Order No. R8-2020-0006, NPDES No. CAG998001, General Waste Discharge Requirements for Insignificant Threat Discharges to Surface Waters for disposal of extracted groundwater. These permit requirements include discharge prohibitions, effluent limitations, receiving water limitations, and other provisions. The discharge prohibitions specified in the permit include the following:

- The discharge of oil, trash, industrial waste sludge, or other solids directly to the surface waters or in any manner that will ultimately affect surface waters is prohibited.
- The discharge of any substances in concentrations to toxic aquatic life, animal life, or plant life is prohibited.
- The discharge of wastes to property not owned or controlled by the Discharger is prohibited, except to surface water as authorized under this Order.
- Odors, vectors, and other nuisances of waste origin are prohibited beyond the limits of each Discharger's facility.
- The addition of chemicals to the extracted groundwater, exclusive of chlorine to control biofouling in treatment systems, is prohibited except when approved in writing by the Executive Officer.
- There shall be no direct discharges of waste to Areas of Special Biological Significance such as Newport Beach Marine Life Refuge and Irvine Coast Marine Life Refuge.

The effluent limitations included in the permit prohibit the discharge of wastewater containing concentrations of total petroleum hydrocarbons, total residual chlorine, total suspended solids, and sulfides in excess of specified maximum daily concentration limits. The effluent limitations also specify that the pH of the discharge shall be within 6.5 and 8.5 pH units and that there shall be no visible oil and grease in the discharge. The permit's receiving water limitations include limitations for discharges to both surface waters and underlying groundwater. Through conformance with the Santa Ana RWQCB Order No. R8-2020-0006, NPDES No. CAG998001, General Waste Discharge Requirements for Insignificant Threat Discharges to Surface Waters, potential impacts from construction-related dewatering would be less than significant.

Operation and Maintenance Activities

The long-term operation and maintenance of proposed project facilities would not result in the generation of substantial amounts of pollutants generally associated with most types of urban development, such as nutrients, trash and debris, hydrocarbons, oxygen demanding substances, bacteria and viruses, and pesticides. Specifically, the project facilities would consist of enclosed mechanical equipment, evaporation ponds, and underground pipelines that do not entail on-site habitation or associated uses (e.g., substantial vehicular traffic or pesticide/herbicide use) that would generate the noted types of pollutants. Long-term operation and maintenance of proposed facilities, however, could potentially generate pollutants in association with activities such as on-site fuel and lubricant use and vehicular/employee access for maintenance and related activities. However, such potential pollutant generation would be addressed through standard design measures and BMPs. Chemicals that would be used at the AWTF would be stored in containers that would include spill control and secondary containment features in accordance with standard hazardous material regulations (see Section 5.2, Hazards and Hazardous Materials, of this EIR). In addition, the project would comply with requirements of the NPDES General Permit for Storm Water Discharges Associated with Industrial Activities (Industrial Permit).

The proposed project would blend advanced treated water (RO permeate) from the AWTF with tertiary recycled water from the SJVRWRF for recharge into the groundwater table via the Mountain Avenue

West Recharge Basin. The tertiary recycled water from the SJVRWRF would also be the source for the RO permeate. Between 2010 and 2015, the SJVRWRF expanded and upgraded its treatment processes to meet more stringent state requirements for recycled water quality. A Water Quality Data Review Technical Memorandum (CDM Smith 2017) was prepared for the proposed project to evaluate the SJVRWRF's historical and current water quality data as related to general parameters, organics, metals, and emerging contaminants, and in turn provide design recommendations for the proposed AWTF to achieve the appropriate quality of water that would be recharged into the groundwater table.

Water recycling is regulated by Title 22, Division 4, Chapter 3 of the CCR. Title 22 Water Recycling Criteria are developed and administered by the SWRCB DDW. Requirements for groundwater replenishment with recycled water were added to Title 22 Water Recycling Criteria in 2014. Surface application recharge projects, such as the proposed project, are allowed to use recycled water that meets the Title 22 tertiary filtration and disinfection requirements. There are limitations on the amount of tertiary recycled water that can be applied and concomitant requirements for diluent water, which is water required to be combined with recycled water to dilute it. Surface application projects can also use recycled water that has undergone advanced treatment as defined in the regulations and can use higher quantities of recycled water relative to diluent water and potentially no diluent water.

A Preliminary Design Report was prepared for the proposed project that details how the project's proposed facilities would meet the Title 22 water quality requirements, in addition to other water quality requirements, including those set forth by the RWQCB in the Basin Plan for "maximum benefit" water quality objectives for the SJUPMZ (CDM Smith 2018; Appendix E). Per the Basin Plan, the "maximum benefit" objectives for the SJUPMZ are 500 mg/L TDS and 7.0 mg/L nitrate-nitrogen. The water recharged by the project would have a TDS of approximately 300 mg/L and a nitrate-nitrogen concentration of 3 mg/L (CDM Smith 2018; Appendix E), which would comply with the set objectives. Overall, water produced as part of the project that would be recharged into the groundwater table would improve the existing groundwater quality of the SJUPMZ.

Impacts during the proposed project's operation and maintenance activities would be less than significant.

Summary

Based on compliance with specifications under appropriate regulatory permits, impacts related to violations of water quality standards, waste discharge requirements, and surface and groundwater quality degradation would be less than significant.

Mitigation Measures

Impacts associated with water quality would be less than significant and no mitigation is necessary.

4.8.4.2 Issue 2: Groundwater Supply

Would the proposed project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

Impact Analysis

The proposed facilities would not include structures or activities that could directly affect groundwater quality, such as underground fuel tanks or septic systems. Project construction would be required to comply with the District's stormwater pollution prevention requirements as well as applicable construction stormwater permits, thereby reducing impacts to groundwater quality related to construction activities to a less-than-significant level. In the unlikely event that shallow groundwater is encountered during project construction, temporary dewatering efforts would be implemented in conformance with applicable Santa Ana RWQCB requirements. Based on the minor and temporary nature of such potential dewatering activities, no associated significant impacts related to drawdown or depletion of local groundwater resources are anticipated.

Operation of the proposed project does not entail withdrawal of groundwater, with no associated impacts to local groundwater supplies, aquifer volumes, or water tables. The project would result in groundwater recharge capacities of up to 4,000 AFY in Phase I and 15,000 AFY in Phase II. The project would convey the recharge water to the Mountain Avenue West Recharge Basin where the water would be stored and percolated into the belowground aquifer. Operation (including aquifer recharge) of the Mountain Avenue West Recharge Basin, which is part of the San Jacinto Valley Water Banking – ERRP, was previously analyzed the EIR prepared for the San Jacinto Valley Water Banking – ERRP (District 2018). As discussed in the EIR, monitoring wells would be used to monitor groundwater elevations and movement and would be used primarily to enact operational adjustments if groundwater mounding causes groundwater levels to rise above a level of 70 feet below ground surface. Such operational adjustments would include reduction or cessation of recharge operations and/or pumping at extraction wells. Given that groundwater levels in the project area range from 400 to 500 feet below ground surface, substantial localized groundwater mounding effects are not anticipated from recharge at the Mountain Avenue West Recharge Basin.

While the project would include the installation of new impervious surfaces associated with the Alessandro Blending Station and AWTF, these areas would be minor in extent and would not significantly affect groundwater recharge potential. As described in Chapter 2.0, the project's five brine ponds would not significantly affect groundwater recharge potential and would include a groundwater detection monitoring program and leak detection monitoring system to ensure no project-related impacts to groundwater occur. Brine pond design would include a LCRS with an upper layer primary liner, a bottom layer drain liner, and a sump to collect any liquid that leaks through the upper primary liner. In addition, the brine pond VZMS would consist of a gravel layer and lined sump directly below the LCRS sump and along the centerline of each pond where leaks are most likely to occur. The VZMS would be designed for moisture detection and monitoring, collection, and removal. Additional groundwater monitoring would occur at various nearby monitoring stations.

Furthermore, implementation of the proposed project would replenish the SJUPMZ aquifer with a combination of recycled water and advanced treated water. As a result, project implementation would assist the District in achieving the GRP objectives, reduce reliance on imported water sources, provide improved drought resiliency, and potentially improve the quality of the groundwater basin. Therefore, project-related impacts to groundwater would be less than significant.

Mitigation Measures

Impacts associated with decreasing groundwater supplies or interfering substantially with groundwater recharge would be less than significant; therefore, no mitigation is necessary.

4.8.4.3 Issue 3: Drainage

Would the proposed project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or the addition of impervious surfaces, in a manner which would: result in substantial erosion, siltation, or flooding on- or off-site; substantially increase the rate or amount of surface runoff; create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems; or provide substantial additional sources of polluted runoff?

Impact Analysis

Implementation of the proposed project would result in modification of the existing on-site drainage patterns through grading and construction. The project sites are currently undeveloped and existing discharges are minimal. Specifically, the project includes the development of the AWTF, Alessandro Blending Facility, brine ponds, and 36-inch belowground pipeline, as well as the sliplining of an existing 18-inch pipeline. Because the proposed project includes surface facilities, it would introduce new impervious surfaces to the project area. As a result, the proposed project would result in additional stormwater runoff compared to existing conditions. While the overall drainage and flow pattern alterations are not anticipated to be substantial, associated potential impacts to individual local flow patterns and associated erosion/sedimentation could occur.

As discussed in Section 4.8.4.1, construction and operation of the proposed project would be required to comply with state and local stormwater regulations, including construction BMPs and the SWPPP, which reduce the likelihood of runoff exceeding the capacity of an existing stormwater drainage system. As noted in Section 2.6, Drainage Plan, of the Project Description, the project would incorporate the recommendations in the Preliminary Design Report to address runoff from the proposed buildings and structures. Runoff would be collected in a site drainage system and discharged to two on-site stormwater bioretention basins. Final design of the stormwater management system would be coordinated with the stormwater management system from the future solar site. In addition, the brine evaporation basins would be designed to withstand a potential 1,000-year storm. Through project design and compliance with existing regulations, the proposed project would not result in increased polluted runoff volumes that would exceed pre-project site conditions or the capacity of existing stormwater drainage systems. Impacts associated with impervious surfaces, runoff generation, hydromodification, and erosion/sedimentation would be less than significant.

The Riverside County Flood Control and Water Conservation District's San Jacinto Valley Master Drainage Plan includes both existing and future planned drainage facilities within the project area. The existing San Jacinto Master Drainage Plan – Line E is located approximately 1.2 miles southeast of the AWTF and would not be affected by the proposed project. The San Jacinto River is identified as an existing facility and is proximate to the project's proposed 36-inch conveyance pipeline; however, installation of the 36-inch pipeline would not affect the San Jacinto River. Future facilities are planned near the project's proposed AWTF and brine management system but not within the footprints of these project components. Additional future planned drainage facilities would intersect and/or be located

near portions of the project's proposed 18-inch pipeline to be sliplined. Because the 18-inch pipeline already exists and because the sliplining process is relatively unimpactful, impacts to these future drainage facilities are not anticipated.

Mitigation Measures

Impacts associated with altering drainage patterns, runoff capacity, and polluted runoff would be less than significant; therefore, no mitigation is necessary.

4.8.4.4 Issue 4: Flood Hazard Areas

Would the proposed project risk release of pollutants due to project inundation if located in a flood hazard, tsunami, or seiche zone?

Impact Analysis

As discussed above, due to the intervening distance between the project site and nearest enclosed bodies of water, the project is not located within a seiche hazard zone. Similarly, hazards associated with tsunamis would not occur because the project is located approximately 40 miles inland from the Pacific Ocean. In addition, the proposed pipeline conveyance and Alessandro Blending Station area is designated by FEMA as being protected from the one-percent-annual-chance or greater flood hazard by a levee system. The AWTF project site is located within a floodplain area designated as Zone X outside the 0.2 percent annual chance floodplain. In the unlikely event of on-site flooding, the conveyance pipelines would not be at risk, but flooding of the AWTF could result in the release of pollutants. Many of the proposed facilities would be below grade upon completion (e.g., buried pipelines) or, if above ground, would not be permanently occupied (such as the AWTF and Alessandro Blending Station).

The AWTF site would include a bulk chemical storage area which would be classified in accordance with the CBC as an H4, High-Hazard Group occupancy based on the quantity of hazardous material being stored. In conformance with EPA guidelines, incompatible chemicals would be separated into groups including acids, bases, salts & polymers, oxidizing powders, and compressed gases. Incompatible chemical rooms would then be separated with one-hour fire rated separation walls. Chemicals would be stored in conformance with the California Fire Code and California Mechanical Code and would include approved storage containers, mechanical ventilation, spill control and secondary containment, and appropriate hazardous chemical storage signage. Where required, the chemical storage areas would also include monitor control equipment, gas detection systems and fire detection systems. Project development would also comply with local floodplain management ordinances, which must meet minimum federal requirements. Compliance with these guidelines would reduce potential impacts associated with the risk of release of pollutants due to project inundation to a less-than-significant level.

Mitigation Measures

Impacts associated with the release of pollutants due to project inundation would be less than significant; therefore, no mitigation is necessary.

4.8.4.5 Issue 5: Water Quality Plans

Would the proposed project conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

Impact Analysis

The proposed project site is within the Santa Ana RWQCB planning and management boundaries. Local water management plans must, at a minimum, comply with water quality thresholds and measures as defined by the RWQCB. The Basin Plan sets water quality objectives that are qualitative and quantitative in order to protect the identified beneficial uses of the watershed. The Basin Plan for the RWQCB floodplain recommends that suspended sediment load and discharge not be elevated such that it can be considered a nuisance, or such that the sediment load adversely affects other beneficial uses of the impacted water resource. Locally, the proposed floodplain area is covered by the San Jacinto General Plan, Resource Management Element and the Riverside County General Plan, Open Space and Safety Elements (County of Riverside 2015). While portions of the proposed project fall within a 100-year floodplain, the project would be consistent with the policies and objectives described in the Flood Protection Element.

The Riverside County General Plan requires that proposed development projects incorporate safeguards that would minimize floodplain sedimentation and erosion. While the proposed project could potentially increase floodplain sediment erosion and transport, possibly degrading the water quality of receiving waters, the project would comply with the requirements of the RWQCB and NPDES permits for stormwater runoff associated with construction activities and the District would implement standard BMPs to reduce potential impacts to a less-than-significant level. Therefore, implementation of the proposed project would not conflict with the Basin Plan or other local water quality or groundwater management plans impacting the floodplain. Impacts would be less than significant.

Mitigation Measures

Impacts associated with conflict with or obstruction of a water quality or groundwater management plan would be less than significant; therefore, no mitigation is necessary.

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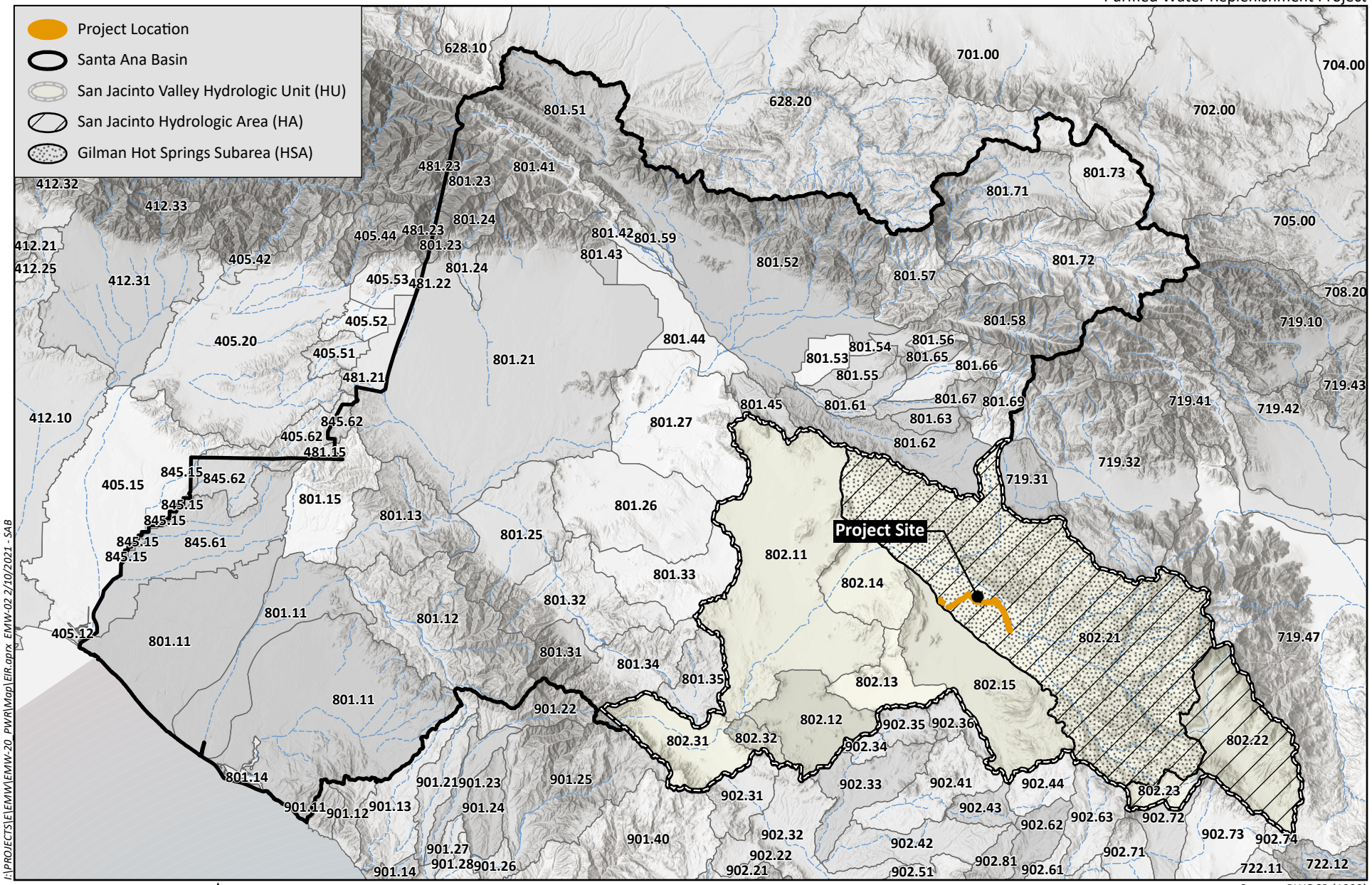
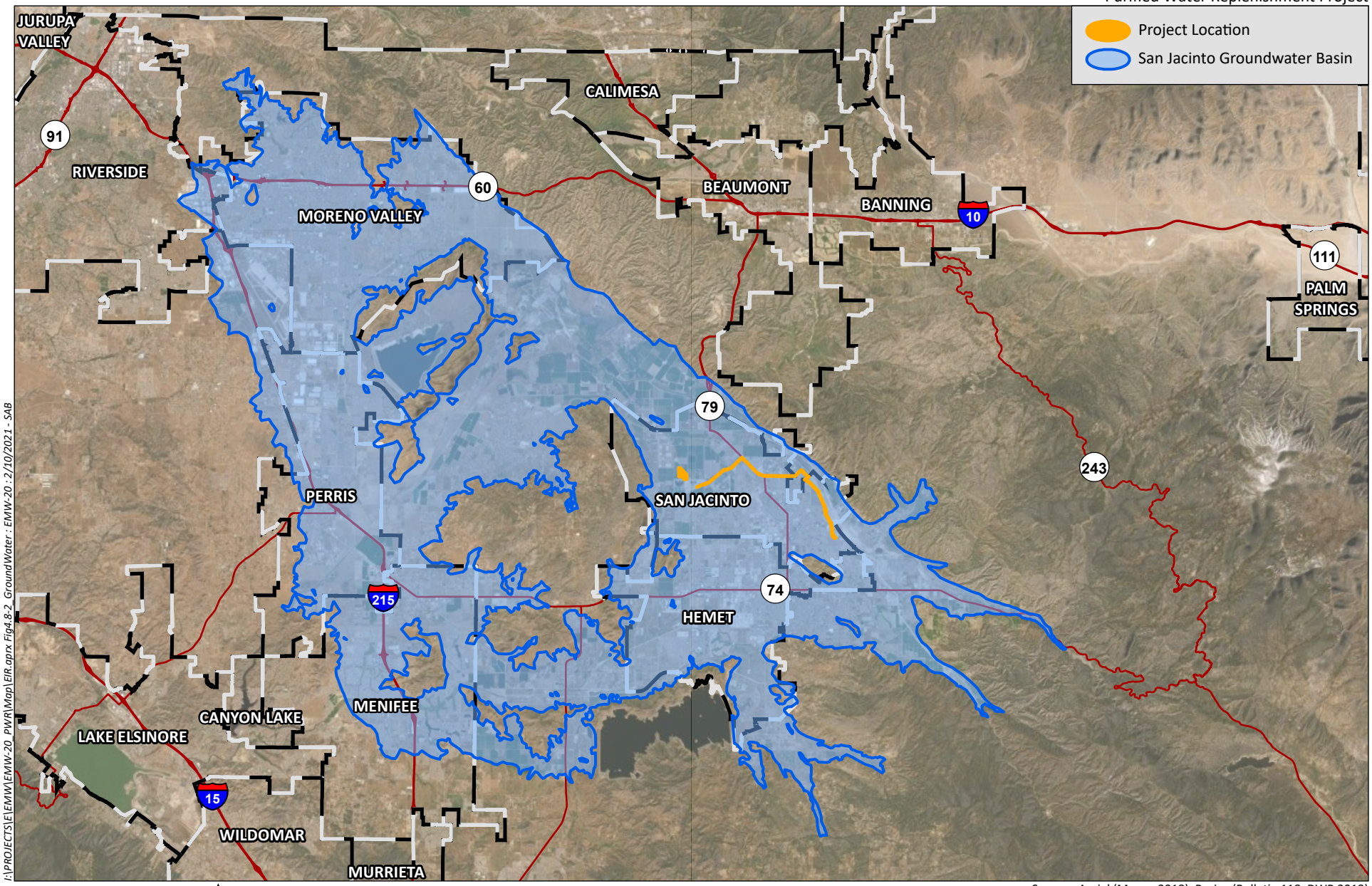


HELIX Environmental Planning

San Jacinto Valley Hydrologic Unit

Figure 4.8-1

Purified Water Replenishment Project



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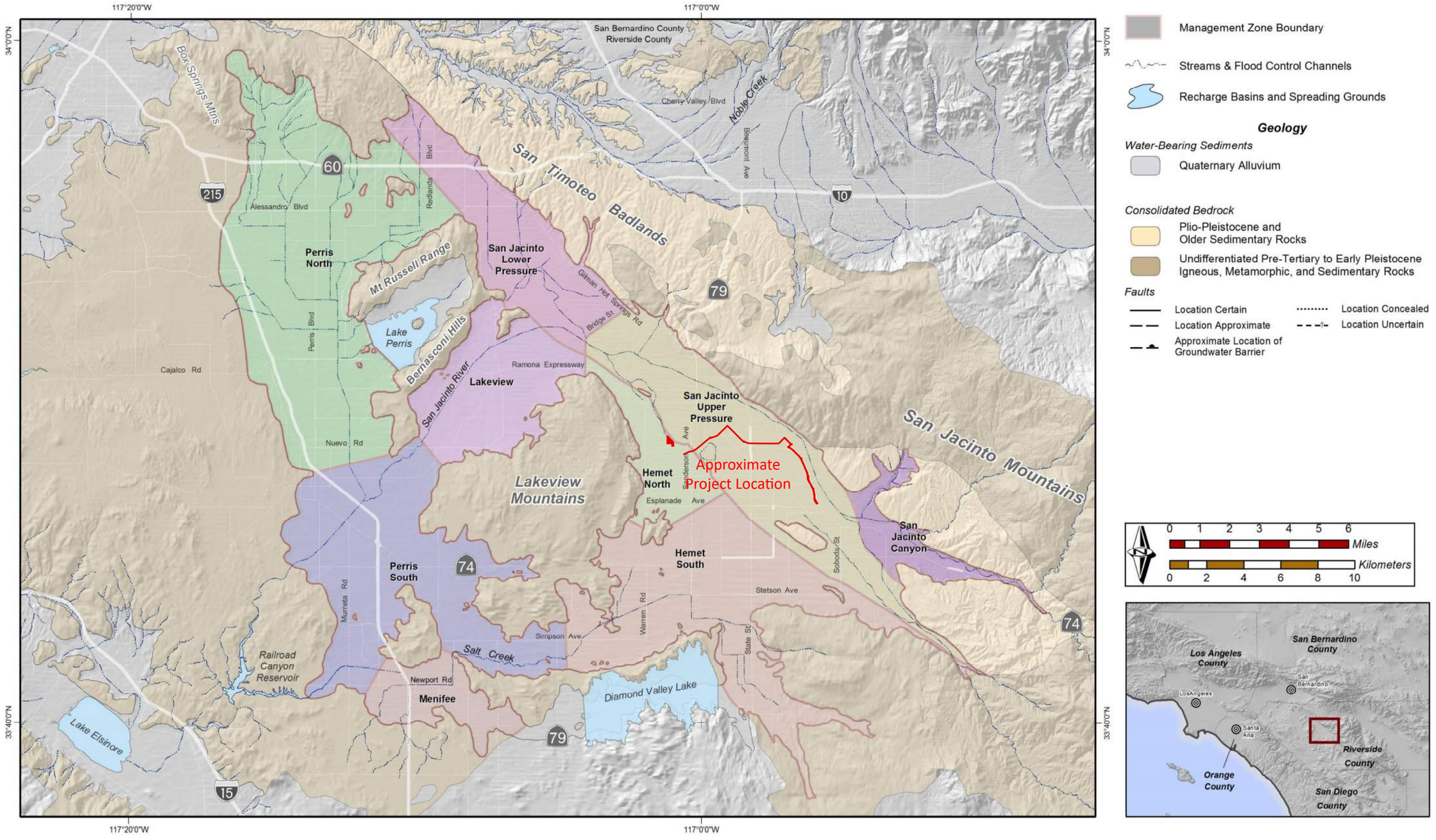
Source: Aerial (Maxar, 2018), Basins (Bulletin 118, DWR 2018)

HELIX Environmental Planning

San Jacinto Groundwater Basin

Figure 4.8-2



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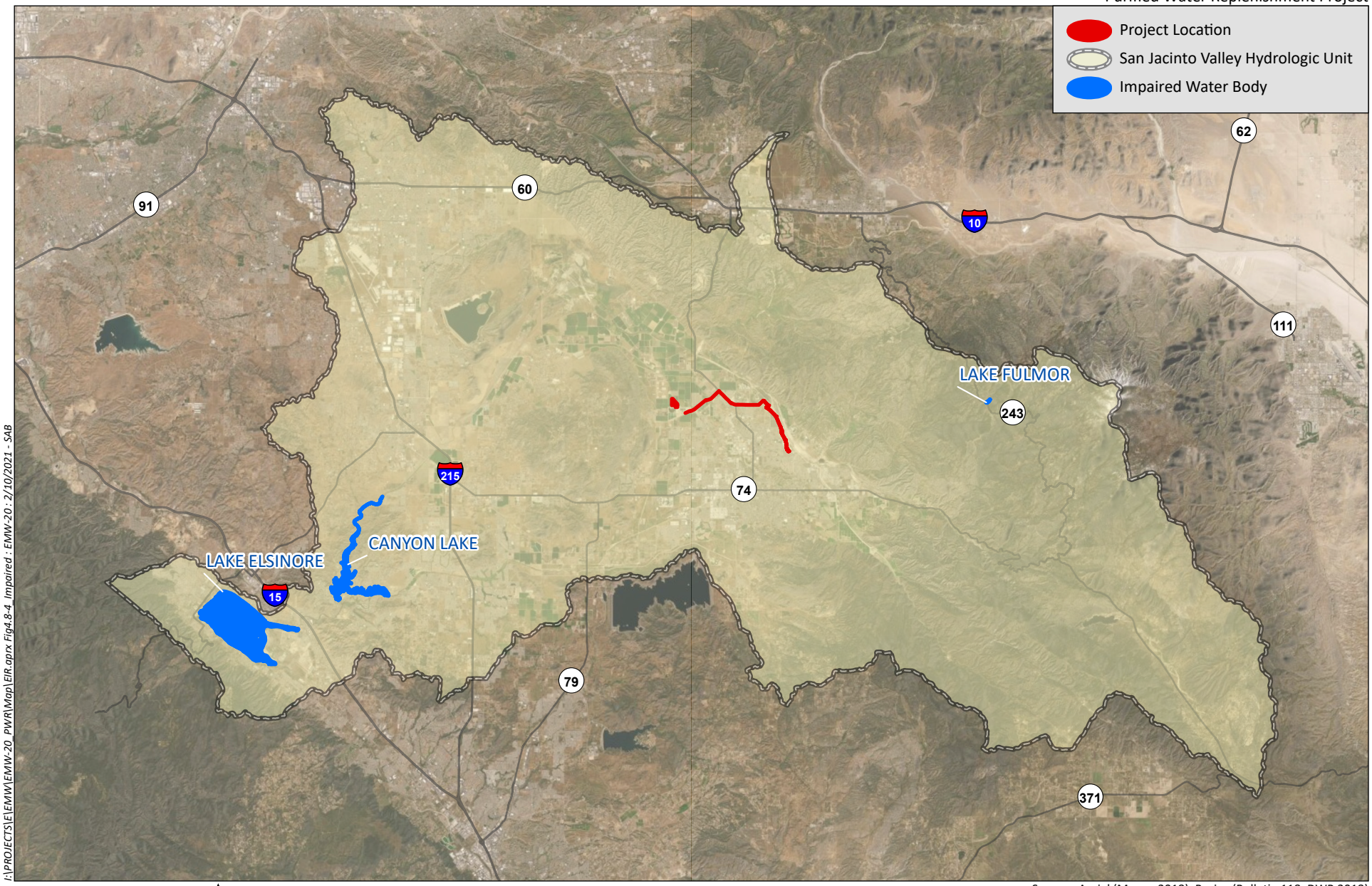
Source:Eastern Municipal Water District (2020)

HELIX Environmental Planning

Groundwater Management Zones

Figure 4.8-3

Purified Water Replenishment Project



I:\PROJECTS\E\EMW\EMW-20_PWR\Map\EIR.aprx Fig4.8-4_Impaired : EMW-20 : 2/10/2021 - SAB

Source: Aerial (Maxar, 2018), Basins (Bulletin 118, DWR 2018)

HELIX Environmental Planning

Clean Water Act Impaired Water Bodies

Figure 4.8-4

4.9 NOISE

This section addresses the potential noise impacts associated with the proposed project. The following discussion includes a description of existing conditions as related to noise, a summary of applicable regulations, and an evaluation of the proposed project's potential environmental effects associated with temporary and permanent increases in noise from construction and operation, vibration, and aircraft noise.

4.9.1 Existing Conditions

4.9.1.1 Fundamentals of Environmental Noise

Noise is commonly defined as unwanted sound. Sound pressure magnitude is measured and quantified using a logarithmic ratio of pressures, the scale of which gives the level of sound in decibels (dB). Sound pressures in the environment have a wide range of values. The sound pressure level is the logarithm of the ratio of the unknown sound pressure to a reference quantity of the same kind. To account for the pitch of sounds and the corresponding sensitivity of human hearing to them, the raw sound pressure level is adjusted with an A-weighting scheme based on frequency that is stated in units of decibels (dBA). Typical A-weighted noise levels are listed in Table 4.9-1, *Typical A-Weighted Noise Levels*.

Table 4.9-1
TYPICAL A-WEIGHTED NOISE LEVELS

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	— 110 —	Rock band
Jet fly-over at 1000 feet		
	— 100 —	
Gas lawn mower at 3 feet		
	— 90 —	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	— 80 —	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	**— 70 —**	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	**— 60 —**	
		Large business office
Quiet urban daytime	**— 50 —**	Dishwasher next room
Quiet urban nighttime	**— 40 —**	Theater, large conference room (background)
Quiet suburban nighttime		
	— 30 —	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	**— 0 —**	Lowest threshold of human hearing

Source: Caltrans 2013a
dBA = A-weighted decibel

A given level of noise may be more or less tolerable depending on the sound level, duration of exposure, character of the noise sources, the time of day during which the noise is experienced, and the activity affected by the noise. For example, noise that occurs at night tends to be more disturbing than that which occurs during the day because sleep may be disturbed. Additionally, rest at night is a critical requirement in the recovery from exposure to high noise levels during the day. In consideration of these factors, different measures of noise exposure have been developed to quantify the extent of the effects anticipated from these activities. Some indices consider the 24-hour noise environment of a location by using a weighted average to estimate its habitability on a long-term basis. Other measures consider portions of the day and evaluate the nearby activities affected by it as well as the noise sources. The most commonly used indices for measuring community noise levels are the Equivalent Sound Level (L_{EQ}), the Day-Night Sound Level (L_{DN}), and the Community Noise Equivalent Level (CNEL).

L_{EQ} is the average acoustical or sound energy content of noise, measured during a prescribed period, such as 1 minute, 15 minutes, 1 hour, or 8 hours. It is the decibel sound level that contains an equal amount of energy as a fluctuating sound level over a given period of time.

L_{DN} is a 24-hour average, where sound levels during the nighttime hours of 10 p.m. to 7 a.m. have an added 10 dB weighting. This measurement applies weights to noise levels during nighttime hours to compensate for the increased disturbance response of people at those times.

CNEL is similar to the L_{DN}. CNEL is the average equivalent A-weighted sound level over a 24-hour period. This measurement applies weights to noise levels during evening and nighttime hours to compensate for the increased disturbance response of people at those times. CNEL is the equivalent sound level for a 24-hour period with a 5 dBA weighting applied to all sound occurring between 7:00 p.m. and 10:00 p.m. and a 10 dBA weighting applied to all sound occurring between 10:00 p.m. and 7:00 a.m.

The decibel level of a sound decreases (or attenuates) exponentially as the distance from the source of that sound increases. For a single point source such as a piece of mechanical equipment, the sound level normally decreases by about 6 dBA every time the distance between the source and listener is doubled (doubling of distance). Sound that originates from a linear, or “line” source such as a heavily traveled traffic corridor, attenuates by approximately 3 dBA per doubling of distance, provided that the surrounding site conditions lack ground effects or obstacles that either scatter or reflect noise. Noise from roadways in environments with major ground effects due to vegetation and loose soils may either absorb or scatter the sound yielding attenuation rates as high as 4.5 dBA for each doubling of distance. Other contributing factors that affect sound reception include meteorological conditions and the presence of manmade obstacles such as buildings and sound barriers.

Noise has a significant effect on the quality of life. An individual’s reaction to a particular noise depends on many factors such as the source of the noise, its loudness relative to the background noise level, and the time of day. The reaction to noise can also be highly subjective; the perceived effect of a particular noise can vary widely among individuals in a community. Because of the nature of the human ear, a sound must be about 10 dBA greater than the reference sound to be judged as twice as loud. In general, a 3 dBA change in community noise levels is perceivable, while 1 to 2 dBA changes generally are not perceived. Although the reaction to noise may vary, it is clear that noise is a significant component of the environment, and excessively noisy conditions can affect an individual’s health and well-being. The effects of noise are often only transitory, but adverse effects can be cumulative with prolonged or repeated exposure. The effects of noise on a community can be organized into six broad categories:

sleep disturbance, permanent hearing loss, human performance and behavior, social interaction of communication, extra-auditory health effects, and general annoyance.

Community noise environments are typically represented by noise levels measured for brief periods throughout the day and night, or during a 24-hour period (e.g., CNEL). The one-hour period is especially useful for characterizing noise caused by short-term events, such as operation of construction equipment or concert noise (e.g., L_{EQ}). Community noise levels are generally perceived as quiet when the CNEL is below 50 dBA, moderate in the 50 to 60 dBA range, and loud above 60 dBA. Along major thoroughfares, roadside noise levels are typically between 65 and 75 dBA.

4.9.1.2 Fundamentals of Groundborne Vibration

Vibration consists of waves transmitted through solid material. Groundborne vibration propagates from the source through the ground to adjacent buildings by surface waves. Vibration may be comprised of a single pulse, a series of pulses, or a continuous oscillatory motion. The frequency of a vibrating object describes how rapidly it is oscillating, measured in Hertz (Hz). The normal frequency range of most groundborne vibration that can be felt generally starts from a low frequency of less than 1 Hz to a high of about 200 Hz.

Vibration energy spreads out as it travels through the ground, causing the vibration amplitude to decrease with distance away from the source. Ambient and source vibration are often expressed in terms of the peak particle velocity (PPV) or root mean square (RMS) velocity in inches per second (in/sec) that correlates best with human perception. Groundborne vibration can be a concern for nearby neighbors of a transit system route or maintenance facility, causing buildings to shake and rumbling sounds to be heard. In contrast to airborne noise, groundborne vibration is not a common environmental problem. It is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. Some common sources of groundborne vibration are trains, buses on rough roads, and construction activities such as blasting, pile-driving, and operating heavy earth-moving equipment.

4.9.1.3 Existing Noise Conditions

The primary noise source in the vicinity of the project alignment is roadway traffic, most notably along Ramona Expressway/SR 79, Warren Road, Sanderson Road, and North State Street (City of San Jacinto 2006). Existing facilities at the SJVRWRF generate noise near the proposed AWTF site and brine management system. Additional noise sources in the general project vicinity that are not directly related to transportation include those associated with commercial operations, such as on-site machinery and outdoor delivery truck activity, and agricultural operations, such as tractors and other related equipment. Noise from aircraft utilizing the Hemet-Ryan Airport, located approximately 4.4 miles south of the closest portion of the project alignment, may be audible at the project alignment.

4.9.1.4 Noise-Sensitive Land Uses

Noise-sensitive land uses (NSLUs) include uses where an excessive amount of noise would interfere with normal activities. Typical NSLUs include residences, public and private educational facilities, hospitals, convalescent homes, hotels/motels, daycare centers, passive recreational parks, and sensitive wildlife habitat. Sleep disturbance is the most critical concern for a NSLU on a 2-hour basis or longer compared to activities that are occupied only a portion of a day.

Existing land uses in the project vicinity include agricultural land, single-family residential development, undeveloped land, commercial development, parks, Mt. San Jacinto College, and the Soboba Springs Golf Course. Of these land uses, the primary NSLUs are single-family residences, which are located along the project's proposed conveyance pipeline alignments. Nearby parks and Mt. San Jacinto College are considered NSLUs as well.

4.9.1.5 Vibration-Sensitive Land Uses

Vibration-sensitive land uses include facilities where vibration would interfere with operations within the building, such as vibration-sensitive research and manufacturing, hospitals with vibration-sensitive equipment, and university research operations. The degree of sensitivity to vibration depends on the specific equipment that would be affected by the vibration. Electron microscopes and high-resolution lithography equipment function within certain scientific and manufacturing tolerances that can be compromised in high vibration environments. Certain fragile older or historic buildings may be vulnerable to damage from excessive vibration. Residential uses are also sensitive to excessive levels of vibration of either a regular or an intermittent nature.

Existing vibration-sensitive land uses along the project alignment include single-family residential uses.

4.9.2 Regulatory Framework

4.9.2.1 State

California Noise Control Act of 1973

Sections 46000 through 46080 of the California Health and Safety Code, known as the California Noise Control Act of 1973, finds that excessive noise is a serious hazard to the public health and welfare and that exposure to certain levels of noise can result in physiological, psychological, and economic damage. It also finds that there is a continuous and increasing bombardment of noise in the urban, suburban, and rural areas. The California Noise Control Act declares that the state has a responsibility to protect the health and welfare of its citizens by the control, prevention, and abatement of noise. It is the policy of the state to provide an environment for all Californians free from noise that jeopardizes their health or welfare.

California Department of Transportation Vibration Guidance

The Caltrans Transportation and Construction Vibration Guidance Manual (Caltrans 2013b) provides guidance for the analysis of environmental impacts due to groundborne noise and vibration relating to transportation and construction projects. The guidance is for impacts related to structural damage, as shown in Table 4.9-2, *Vibration Damage Potential Threshold Criteria,* and human annoyance, as shown in Table 4.9-3, *Vibration Annoyance Potential Threshold Criteria.*

Table 4.9-2
VIBRATION DAMAGE POTENTIAL THRESHOLD CRITERIA

Structure and Condition	Transient Sources*	Continuous/Frequent Intermittent Sources*
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: Caltrans 2013b
* Maximum PPV (in/sec)
PPV = peak particle velocity; in/sec = inches per second

Table 4.9-3
VIBRATION ANNOYANCE POTENTIAL THRESHOLD CRITERIA

Human Response	Transient Sources*	Continuous/Frequent Intermittent Sources*
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.10
Severe	2.0	0.4

Source: Caltrans 2013b
* Maximum PPV (in/sec)
PPV = peak particle velocity; in/sec = inches per second

4.9.2.2 Local

The proposed project alignment is located within the jurisdictions of the City and County. For the proposed project, noise regulations and standards of both jurisdictions are considered. As described in Section 3.4, Standard Regulatory Requirements, under Section 53091(d) and (e) of the California Government Code, building ordinances of a county or city shall not apply to the location or construction of facilities for the production, generation, storage, treatment, or transmission of water or wastewater. Zoning ordinances of a county or city shall not apply to the location of construction of facilities for the production, generation, storage, treatment, or transmission of water. Therefore, the District is not subject to other local jurisdictional agencies' noise ordinances, nor is the District required to obtain variances from local agencies. However, for the purposes of evaluation, local agency noise ordinances are utilized as thresholds to analyze noise levels from construction and operation of proposed District facilities and potential impacts to sensitive receptors. Local ordinances are also used as guidelines to develop mitigation measures that would typically be used to minimize impacts to sensitive receptors. The City's and County's noise ordinances and regulations are presented below.

City of San Jacinto Municipal Code

Section 8.40.070 of the City's Municipal Code states that it is unlawful for any loud excessive or offensive noises or sounds to be created that would unreasonably disturb the peace and quiet of any residential neighborhood or be physically annoying to persons of ordinary sensitivity. Section 8.40.040

establishes exterior noise standards for different land uses, which are shown in Table 4.9-4, *City of San Jacinto Exterior Noise Level Standards.* In addition, a noise violation would occur when a maximum instantaneous noise level equal to the value of the noise standard plus 20 dBA for any period of time. In the event that the ambient noise level exceeds the noise standard, the maximum allowable noise level is increased to reflect the maximum ambient noise level.

Table 4.9-4
CITY OF SAN JACINTO EXTERIOR NOISE LEVEL STANDARDS

Type of Land Use	Allowed Noise Level (dBA L_{EQ}) 7:00 a.m. to 10:00 p.m.	Allowed Noise Level (dBA L_{EQ}) 10:00 p.m. to 7:00 a.m.
Single-family Residential	65	45
Multi-family Residential, Mobile Home Parks	65	50
Commercial Property	65	60
Residential Portion of Mixed Use	70	70
Manufacturing and Industrial, Other Uses	70	70

Source: City of San Jacinto Municipal Code Section 8.40.040
dBA = A-weighted decibel; L_{EQ} = Equivalent Sound Level

For construction noise in the City, Section 8.40.090 stipulates that no person, while engaged in construction, remodeling, digging, grading, demolition or any other related building activity, shall operate any tool, equipment or machine in a manner that produces loud noise that disturbs a person of normal sensitivity who works or resides in the vicinity, or a peace officer, on any weekday or Saturday except between the hours of 7:00 a.m. and 7:00 p.m., or on anytime on a Sunday or federal holiday.

City of San Jacinto General Plan Noise Element

The Noise Element of the City's General Plan provides a description of the existing noise conditions in the City, discusses future noise conditions from mobile and stationary noise sources, and sets forth the steps to be taken by the City to ensure that land use decisions include the consideration of noise impacts. To ensure that noise sources do not adversely affect sensitive receptors, the City uses land use compatibility standards when planning. Table 4.9-5, *City of San Jacinto General Plan Interior and Exterior Noise Standards,* summarizes the City's noise standards for various types of land uses.

Table 4.9-5
CITY OF SAN JACINTO GENERAL PLAN INTERIOR AND EXTERIOR NOISE STANDARDS

Land Use	Noise Standard (CNEL) Exterior	Noise Standard (CNEL) Interior
Residential – Single-family, multi-family, duplex, and mobile home	65	45
Residential – transient lodging, hotels, motels, nursing homes, hospitals, assisted care facilities	65	45
Private offices, churches, libraries, theaters, concert halls, meeting halls, schools	65	45
General commercial, office, retail, reception, restaurant	65	45
Light industrial[1]	-	-
Parks and playgrounds	65	50
Golf courses, outdoor spectator sports	70	-

Source: City of San Jacinto 2006
[1] Noise standards do not apply to light industrial areas.
CNEL = Community Noise Level Equivalent

County of Riverside Municipal Code

Riverside Ordinance No. 847 establishes countywide standards regulating noise. Section 4 establishes general sound level standards for exterior noise levels within the boundaries of occupied properties. The exterior noise limits for each General Plan use designation are summarized in Table 4.9-6, *County of Riverside Exterior Sound Level Standards*.

Table 4.9-6
COUNTY OF RIVERSIDE EXTERIOR SOUND LEVEL STANDARDS

General Plan Foundation Component	General Plan Land Use Designation Code	General Plan Land Use Designation Name	Density	Maximum Decibel Level (dBA L_{MAX}) Daytime (7:00 a.m. – 10:00 p.m.)	Maximum Decibel Level (dBA L_{MAX}) Nighttime (10:00 p.m. – 7:00 a.m.)
Community Development	EDR	Estate Density Residential	2 ac	55	45
	VLDR	Very Low Density Residential	1 ac	55	45
	LDR	Low Density Residential	½ ac	55	45
	MDR	Medium Density Residential	2-5 du/ac	55	45
	MHDR	Medium High Density Residential	5-8 du/ac	55	45
	HDR	High Density Residential	8-14 du/ac	55	45
	VHDR	Very High Density Residential	14-20 du/ac	55	45
	H'TDR	Highest Density Residential	20+ du/ac	55	45
	CR	Retail Commercial	N/A	65	55
	CO	Office Commercial	N/A	65	55
	CT	Tourist Commercial	N/A	65	55
	CC	Community Center	N/A	65	55
	LI	Light Industrial	N/A	75	55
	HI	Heavy Industrial	N/A	75	75

Table 4.9-6 (cont.)
COUNTY OF RIVERSIDE EXTERIOR SOUND LEVEL STANDARDS

General Plan Foundation Component	General Plan Land Use Designation Code	General Plan Land Use Designation Name	Density	Maximum Decibel Level (dBA L_{MAX}) Daytime (7:00 a.m. – 10:00 p.m.)	Maximum Decibel Level (dBA L_{MAX}) Nighttime (10:00 p.m. – 7:00 a.m.)
Community Development	BP	Business Park	N/A	65	45
	PF	Public Facility	N/A	65	45
	SP	Specific Plan – Residential	N/A	55	45
		Specific Plan – Commercial	N/A	65	55
		Specific Plan – Light Industrial	N/A	75	55
		Specific Plan – Heavy Industrial	N/A	75	75
		Public Facility	N/A	65	45
Rural Community	EDR	Estate Density Residential	2 ac	55	45
	VLDR	Very Low Density Residential	1 ac	55	45
	LDR	Low Density Residential	½ ac	55	45
Rural	RR	Rural Residential	5 ac	45	45
	RM	Rural Mountainous	10 ac	45	45
	RD	Rural Desert	10 ac	45	45
Agriculture	AG	Agriculture	10 ac	45	45
Open Space	C	Conservation	N/A	45	45
	CH	Conservation Habitat	N/A	45	45
	REC	Recreation	N/A	45	45
	RUR	Rural	20 ac	45	45
	W	Watershed	N/A	45	45
	MR	Mineral Resources	N/A	75	45

Source: County of Riverside Municipal Code Ord. 847
dBA = A-weighted decibel; L_{MAX} = maximum sound level; ac = acre; du/ac = dwelling unit per acre

Section 2 provides exemptions for construction activities from the noise limits in Table 4.9-4. For projects located within one-quarter of a mile from an inhabited dwelling, construction noise is exempt if construction occurs outside the hours of 6:00 p.m. and 6:00 a.m. from June to September and 6:00 p.m. and 7:00 a.m. from October to May. Projects located one-quarter of a mile or more from an inhabited dwelling are exempt with no hour restrictions.

County of Riverside General Plan Noise Element

The Noise Element of the County of Riverside General Plan (County of Riverside 2015) provides a systematic approach to identifying and appraising noise problems in the community; quantifying existing and projected noise levels; addressing excessive noise exposure; and community planning for the regulation of noise. Table 4.9-7, *County of Riverside Land Use Compatibility for Community Noise Exposure*, summarizes the County's exterior land use-noise compatibility guidelines. Shading in this table represents the noise exposure level considered compatible for each land use category.

Table 4.9-7
COUNTY OF RIVERSIDE LAND USE COMPATIBILITY FOR COMMUNITY NOISE EXPOSURE

Land Use Category	55*	60*	65*	70*	75*	80*	85*
Residential – Low Density Single Family, Duplex, and Mobile Homes							
Residential – Multiple Family							
Transient Lodging – Motels, Hotels							
Schools, Libraries, Churches, Hospitals, and Nursing Homes							
Auditoriums, Concert Halls, Amphitheaters							
Sports Arena, Outdoor Spectator Sports							
Playgrounds, Neighborhood Parks							
Golf Courses, Riding Stables, Water Recreation, Cemeteries							
Office Buildings, Business, Commercial, and Professional							
Industrial, Manufacturing, Utilities, Agriculture							

Source: County of Riverside 2015
Notes: Light shading represents the maximum noise exposure level considered normally acceptable for each land use category. Dark shading represents the maximum noise exposure level considered conditionally acceptable for each land use category.
* Community Noise Exposure Level (L_{DN} or CNEL, dBA)
L_{DN} = Day-Night Sound Level; CNEL = Community Noise Equivalent Level; dBA = A-weighted decibel

The interior noise limit for residential land uses would be 45 CNEL in accordance with the California Building Standards, per County Noise Element Policy N 14.1.

Policy N 2.3 of the County of Riverside General Plan Noise Element requires projects to mitigate residential exterior and interior noise to the levels listed in Table 4.9-8, *Stationary Source Residential Land Use Standards*, to the extent feasible for stationary sources.

Table 4.9-8
STATIONARY SOURCE RESIDENTIAL LAND USE STANDARDS

Time Period	Standard (dBA L_{EQ} [10 minute]) Interior	Standard (dBA L_{EQ} [10 minute]) Exterior
10:00 p.m. to 7:00 a.m.	40	45
7:00 a.m. to 10:00 p.m.	55	65

Source: County of Riverside 2015
dBA = A-weighted decibel; L_{EQ} = Equivalent Sound Level

4.9.3 Thresholds of Significance

The following criteria from Appendix G of the *CEQA Guidelines* are used as thresholds of significance to determine the impacts of the proposed project as related to noise. The proposed project would have a significant impact if it would:

1. Result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

2. Result in the generation of excessive groundborne vibration or groundborne noise levels; or

3. Expose people residing or working in the project area to excessive noise levels by being located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport.

4.9.4 Project Impacts and Mitigation

4.9.4.1 Issue 1: Increase in Ambient Noise

Would the proposed project result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Impact Analysis

Construction

The proposed project would generate temporary noise associated with construction of its various components. Construction noise levels at and near facility locations would fluctuate depending on the particular type, number, and use duration of construction equipment for each activity. Construction-related material haul trips would temporarily slightly increase ambient noise levels along haul routes, depending on the number of haul trips and types of vehicles used. Table 4.9-9, *Typical Noise Levels from Anticipated Construction Equipment,* shows typical noise levels associated with various types of noise-generating equipment that are anticipated to be required for project construction.

Table 4.9-9
TYPICAL NOISE LEVELS FROM ANTICIPATED CONSTRUCTION EQUIPMENT

Unit	Percent Operating Time	dBA L_{MAX} at 50 feet	dBA L_{EQ} at 50 feet
Backhoe	40	77.6	73.6
Breaker	20	90.3	80.3
Compactor	20	83.2	76.2
Compressor	40	77.7	73.7
Concrete Mixer Truck	40	78.8	74.8
Concrete Pump Truck	20	81.4	74.4
Crane	16	80.6	76.7
Dozer	40	81.7	77.7
Dump Truck	50	76.5	72.5
Excavator (medium)	40	78.0	74.0
Excavator (large)	40	80.7	76.7
Front-End Loader	40	79.1	75.1
Grader	40	85.0	81.0
Paver	50	77.2	74.2
Roller	20	80.0	73.0
Welder	40	74.0	70.0

Source: United States Department of Transportation (USDOT) 2008
dBA = A-weighted decibel; L_{MAX} = Maximum Sound Level; L_{EQ} = Equivalent Sound Level

These pieces of equipment would not all operate at the same time or location, nor would they be in constant use over the course of a construction day. In addition, noise levels from point sources generally

attenuate at a rate of 6 dBA per doubling of distance. For example, 84 dBA L_{EQ} at a reference distance of 50 feet would attenuate by 6 dBA to 78 dBA L_{EQ} at 100 feet, and by another 6 dBA to 72 dBA L_{EQ} at 200 feet.

While construction activities associated with the proposed project facilities would be short-term, activity noise would be evaluated against, but not subject to, the noise regulations of the City and the County, which limit the allowable period of construction hours, but do not establish constriction noise level limits:

- The City of San Jacinto Municipal Code limits construction activity to weekdays and Saturdays between the hours of 7:00 a.m. and 7:00 p.m.; and

- The County of Riverside Municipal Code limits construction activity within one-quarter mile of an inhabited dwelling unit to between the hours of 6:00 a.m. and 6:00 p.m. during the months of June through September and to between the hours of 7:00 a.m. and 6:00 p.m. during the months of October through May.

Off-road Construction Equipment Noise

Construction of the brine management system would require substantial grading which would likely involve the simultaneous on-site use of numerous types of heavy construction equipment, including, but not limited to, dozers, excavators, graders, and dump trucks. Though multiple pieces may operate simultaneously, they would be spread out across the relatively large (approximately 20-acre) site and would not combine to emit noise at one concentrated location. In addition, the brine management system site is surrounded by agricultural/vacant land to the west, north, and east, and the existing SJVRWRF to the south. There are no NSLUs in proximity to the brine management system site that would be exposed to noise from the operation of heavy off-road equipment during grading, or other less noise-intensive construction activities at the brine management system site. The nearest NSLU, a single-family residence located south of the intersection of Warren Road and Upperline Avenue, is over 4,000 feet away.

Similarly, construction activities at the AWTF site, most notably grading (although to a lesser extent than that for the brine management system) and physical building construction, would generate noise through the use of heavy off-road construction equipment; however, there are no NSLUs in proximity to the AWTF site that would be exposed to such construction noise.

Unlike construction at the brine management system and AWTF site, construction of the project's conveyance pipelines, including sliplining the existing 18-inch pipeline and installing the new 36-inch pipeline, would occur in proximity to residential NSLUs within the city, in some instances adjacent to residential properties (refer to Figures 2-8c, 2-8d, 2-8e, and 2-8h). The primary noise generating activities associated with pipeline construction are anticipated to be excavation for the sliplining insertion and receiving pits for the 18-inch pipeline and trenching for the new 36-inch pipeline. Both activities would likely involve the simultaneous use of an excavator and loader, which are together estimated to generate a noise level of 87.0 dBA L_{EQ} at 20 feet. A breaker would likely be used to break up roadway asphalt and sidewalk concrete when insertion and/or receiving pits are located in paved areas within the right-of-way. At a distance of 20 feet, a breaker is estimated to generate a noise level of 91.2 dBA L_{EQ}. Due to the linear nature of the pipelines, however, construction activities would continuously progress down the pipeline alignments (at an average rate of 80 feet per day for the 36-inch pipeline) and noise generated at any one residence would be limited to several days.

Noise associated with construction of the Alessandro Blending Station is anticipated to be relatively minimal in comparison to construction of the conveyance pipelines, as construction would involve minor grading, laying of a concrete pad, and installing pipeline connections. There are also no NSLUs in proximity to the proposed Alessandro Blending Station site. The nearest NSLUs, single-family residences located south of the intersection of Ramona Expressway and San Jacinto Avenue, are over 2,500 feet away.

Noise generation from construction of the proposed project would be temporary. Impacts associated with construction of the brine management system, AWTF, and conveyance pipelines that would occur in the city of San Jacinto within the construction noise time restriction areas depicted on Figure 4.9-1, *Construction Noise Time Restriction Areas*, would be less than significant as long as construction occurs within the allowable construction hours of the City's Municipal Code, which are between the hours of 7:00 a.m. and 7:00 p.m. To ensure that construction occurs within the allowable construction hours and complies with the City's Municipal Code as related to construction, mitigation measure MM-NOI-1, detailed below, would be required. Construction of the Alessandro Blending Station and portions of the conveyance pipelines that would occur within the County of Riverside would not be within one-quarter mile of an inhabited dwelling unit; therefore, these construction activities do not have hourly restrictions, and impacts would be less than significant.

Construction Traffic Noise

The project would generate construction-related traffic, including material transport trucks and worker commute vehicles, along roadways in proximity to the project's various construction sites. These roadways generally either would not include adjacent NSLUs (e.g., Sanderson Avenue north of Cottonwood Avenue, which would provide access to the AWTF and brine management system sites) or would include existing high traffic levels where project-added traffic would not generate a perceptible increase in noise levels (e.g., SR 79 and Ramona Expressway, which would provide access to the work sites associated with the 18-inch pipeline to be sliplined, the 36-inch pipeline, and the Alessandro Blending Station). In addition, construction-related traffic would be temporary. As such, impacts would be less than significant.

Operation

Operation of the proposed project components would generate noise primarily from the process equipment at the AWTF and brine management system, namely the various pumps. Most of this equipment would be located within the Process Control building at AWTF site, which would attenuate noise from equipment operation. Some equipment, including pumps and a standby generator, would be located outside of the building. The standby generator would only be used in the event of utility power failure and would not generate constant noise. Similarly, inter-pond transfer pumps would be used intermittently at the brine management system to transfer brine waste between the ponds when necessary and would not be a constant source of operational noise. While the various pieces of operational equipment would generate noise, there are no NSLUs adjacent to the AWTF site or brine management system that would be subject to the operational noise, as agricultural land is located to the north, west, and east, and the existing SJVRWRF is located to the south. The nearest NSLU, a single-family residence located south of the intersection of Warren Road and Upperline Avenue, is over 4,000 feet away. In addition, the area near the proposed AWTF and brine management system is already subject to noise similar to what would be generated by proposed project operation, from operation of

the existing SJVRWRF. The project's conveyance pipelines would be located below ground and would not generate audible noise.

Operational vehicular traffic associated with the project would not generate substantial noise. Vehicular traffic would be limited to regular commute trips for up to five staff members, occasional public trips for AWTF tours, and occasional truck trips for chemical deliveries. This amount of traffic would not result in a perceptible increase in noise levels on local roadways. The project's operational noise impacts would be less than significant.

Mitigation Measures

The following mitigation measure would be implemented during project construction to minimize noise impacts to surrounding noise-sensitive land uses:

MM-NOI-1 **Construction Noise Hours.** Construction activities in the City of San Jacinto within the construction noise time restriction areas depicted on Figure 4.9-1, *Construction Noise Time Restriction Areas,* shall occur only on weekdays and Saturdays between the hours of 7:00 a.m. and 7:00 p.m.

Significance After Mitigation

With implementation of MM-NOI-1, temporary construction noise impacts would be less than significant.

4.9.4.2 Issue 2: Vibration

Would the proposed project generate excessive groundborne vibration or groundborne noise levels?

Impact Analysis

Construction

The primary source of vibration during project construction would be a vibratory roller, which would likely be used to achieve soil compaction for building foundations and new pavements at the AWTF site. There are no vibration-sensitive receptors in the vicinity of the AWTF site, and therefore use of a vibratory roller at this location would not generate excessive groundborne vibration that would affect people or vibration-sensitive equipment. Soil compaction would also be required prior to repaving areas in roadways excavated for sliplining insertion and pulling pits. Such areas would be located adjacent to residential properties; however, based on the size of the pits (up to approximately 550 square feet) it is anticipated that a plate compactor would be used instead of a vibratory roller. Plate compactors are handheld units that do not generate measurable vibration beyond 10 or 15 feet; therefore, residents would not be exposed to perceptible groundborne vibration levels. Impacts associated with construction-generated vibration would be less than significant.

Operation

Operation of the proposed project facilities would not include components that would generate substantial groundborne vibration. Thus, no impacts associated with operational vibration are anticipated to occur.

Mitigation Measures

Impacts associated with vibration would be less than significant; therefore, no mitigation is necessary.

4.9.4.3 Issue 3: Aircraft Noise

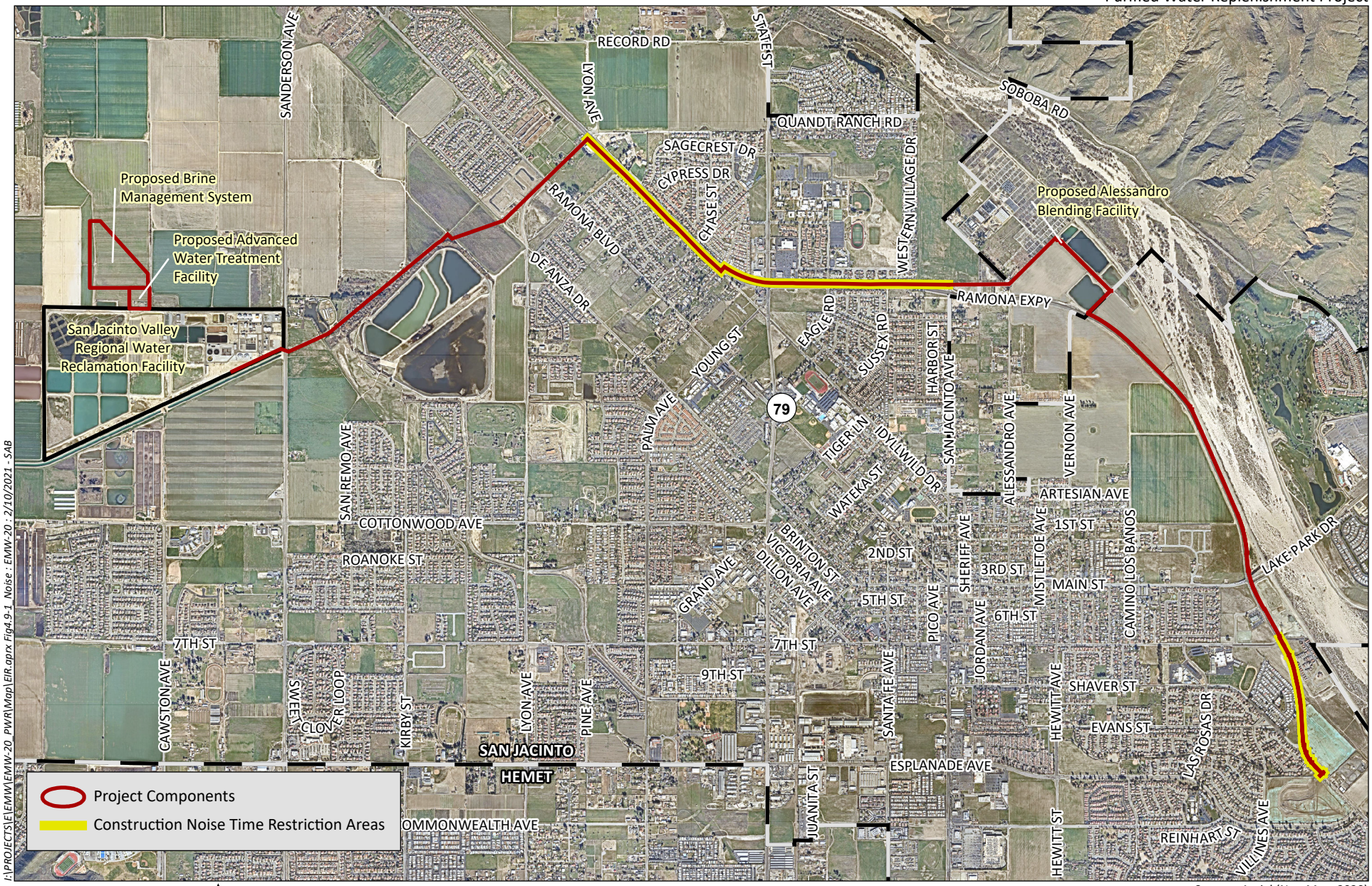
Would the proposed project expose people residing or working in the project area to excessive noise levels by being located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport?

Impact Analysis

The Hemet-Ryan Airport is located approximately 4.4 miles from the closest portion of the project alignment. No portion of the project alignment is within either the existing of future mapped noise contours of the Hemet-Ryan Airport (Riverside County Airport Land Use Commission 2017). As such, while distant aircraft activity may be audible, neither the project's temporary construction workers nor permanent facility workers would be exposed to excessive aircraft noise. Impacts would be less than significant.

Mitigation Measures

Impacts associated with aircraft noise would be less than significant and no mitigation is necessary.



I:\PROJECTS\E\EMW\EMW-20_PWR\Map\EIR.aprx Fig4.9-1 Noise : EMW-20 : 2/10/2021 - SAB

0 3,000 Feet

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Construction Noise Time Restriction Areas

Figure 4.9-1

4.10 TRANSPORTATION

This section addressed the potential transportation impacts of the proposed project. The following discussion includes a description of existing conditions as related to transportation, a summary of applicable regulations, and an evaluation of the proposed project's potential environmental effects associated with traffic circulation, generation of VMT, traffic hazards, and emergency access.

4.10.1 Existing Conditions

4.10.1.1 Regional Roadway Circulation System

The proposed project is located within western Riverside County, specifically the city of San Jacinto and an area of unincorporated Riverside County. The regional transportation system where vehicles associated with construction and operation of the proposed project would travel to access the project areas consists of the following regional highways:

- **State Route 79** – SR 79 is a north-south freeway that connects I-10 in the city of Beaumont (Riverside County) south to I-8 in the community of Descanso (San Diego County). SR 79 intersects SR 74 in the city of Hemet and travels through the city of San Jacinto. The project alignment runs along the portion of SR 79 between North Lyon Avenue and North State Street in the city of San Jacinto (refer to Figure 2-3).

- **Ramona Expressway** – Ramona Expressway is a north-south roadway ranging between four and six lanes in the project area that connects I-215 in the city of Perris (Riverside County) southeast to SR 74 in the unincorporated community of Valle Vista (Riverside County). The project alignment runs along the portions of Ramona Expressway from North State Street to approximately North San Jacinto Avenue and from approximately North Vernon Avenue to approximately 1,000 feet north of East Esplanade Avenue.

- **State Route 74** – SR 74 is an east-west freeway that connects I-5 in the city of San Juan Capistrano (Orange County) east to the city of Palm Desert (Riverside County). SR 74 runs through the city of Hemet approximately 1.7 miles south of the southeastern-most portion of the project alignment.

4.10.1.2 Local Roadway Circulation System

The proposed project alignment travels along North Lyon Avenue, SR 79, and Ramona Expressway. It also intersects or is located near North Sanderson Avenue, North State Street, North San Jacinto Avenue, Main Street, East 7th Street, and East Esplanade Avenue. Project-related vehicles would likely travel along these roadways during project construction and operation. Roadway descriptions with classifications per the City's General Plan Circulation Element (City of San Jacinto 2006) are as follows (SR 79 and Ramona Expressway are described above):

- **Lyon Avenue** – Lyon Avenue is a north-south two-lane collector with a painted median that connects SR 79 in the city of San Jacinto south to Chambers Street in the city of Hemet. The project alignment is within the portion of Lyon Avenue from approximately Ramona Boulevard to SR 79.

- **Sanderson Avenue** – Sanderson Avenue is a north-south four-lane urban arterial with a painted median. It begins at Domenigoni Parkway in the city of Hemet and travels north through the city of San Jacinto until it merges with SR 79 at Ramona Expressway. The existing SJVRWRF is located along Sanderson Avenue.

- **State Street** – State Street is a north-south four-lane major highway with a two-way left-turn lane and raised landscaped medians north of Ramona Expressway. State Street traverses through the middle of the cities of San Jacinto and Hemet. The project alignment crosses State Street at its intersection with SR 79/Ramona Expressway.

- **San Jacinto Avenue** – The segment of San Jacinto Avenue near the project alignment (from Ramona Expressway to Main Street) is a north-south two-lane secondary highway with varying median types. Overall, San Jacinto Avenue travels from Ramona Expressway south to just past the southern limit of the city of Hemet. The project alignment crosses San Jacinto Avenue at its intersection with Ramona expressway.

- **Main Street** – The segment of Main Street near the project alignment (east of San Jacinto Avenue) is an east-west secondary highway that varies between two and three travel lanes and includes a two-way left-turn lane. Overall, it travels from Ramona Expressway west to 7th Street, just east of State Street in the middle of the city of San Jacinto. The project alignment crosses Main Street at its intersection with Ramona Expressway.

- **7th Street** – The segment of 7th Street near the project alignment (east of San Jacinto Avenue) is an east-west two-lane secondary highway with a painted median. Overall, it travels from Ramona Expressway west through the middle of the city of San Jacinto to near the western city limit. The project alignment crosses 7th Street at its intersection with Ramona Expressway.

- **Esplanade Avenue** – Esplanade Avenue is east-west four-lane major highway with a painted median near the project alignment. It travels from Ramona Expressway west through the middle of the city of San Jacinto to the western city limit. The Mountain Avenue West Recharge Basin is located at the intersection of Ramona Expressway and Esplanade Avenue.

4.10.1.3 Public Transportation

The Riverside Transit Agency (RTA) provides public transportation throughout Riverside County and operates fixed bus routes throughout a 2,000-square-mile service area. Bus routes that serve the city of San Jacinto and provide local and regional access include Routes 31, 32, 42, 74, and 217.

4.10.1.4 Bicycle and Pedestrian Facilities

The City includes a system of Class I and Class II bikeways on and adjacent to roadways. Class I bikeways are two-way bike paths on a right-of-way that is separated from the roadway right-of-way. Class II bikeways are one-way delineated bike lanes within the shoulder of the roadway right-of-way. Within the city, there is one Class I bikeway, which is located on the west side of Ramona Expressway between San Jacinto Avenue and Main Street. In the vicinity of the project alignment, Class II bikeways are present in both directions on Ramona Expressway between Lyon Avenue and San Jacinto Avenue.

Pedestrian facilities (sidewalks) in the vicinity of the project alignment are present along Ramona Expressway between Chase Street and San Jacinto Avenue, State Street, San Jacinto Avenue, Main Street, 7th Street, and Esplanade Avenue.

4.10.2 Regulatory Framework

4.10.2.1 Federal

Americans with Disabilities Act

The 1990 Americans with Disabilities Act (ADA) is a wide-ranging civil rights law that prohibits, under certain circumstances, discrimination based on disability. Pedestrian facility design must comply with the accessibility standards identified in the ADA, which applies to all projects involving new or altered pedestrian facilities. The scoping and technical provisions for new construction and alterations identified in the ADA Accessibility Guidelines can be used to help design pedestrian facilities that are ADA compliant. For example, Title II-6.600 of the Technical Assistance Manual states, "When streets, roads, or highways are newly built or altered, they must have ramps or sloped areas whenever there are curbs or other barriers to entry from a sidewalk or path."

4.10.2.2 State

California Department of Transportation Standards

Caltrans is responsible for planning, designing, building, operating, and maintaining California's state road system. Caltrans sets standards, policies, and strategic plans that aim to do the following: (1) provide the safest transportation system in the nation for users and workers, (2) maximize transportation system performance and accessibility, (3) efficiently deliver quality transportation projects and services, (4) preserve and enhance California's resources and assets, and (5) promote quality service. Caltrans has the discretionary authority to issue special permits for the use of state highways for other than normal transportation purposes. Caltrans also reviews all requests from utility companies, developers, volunteers, nonprofit organizations, and others desiring to conduct various activities within state highway rights-of-way. The Caltrans Highway Design Manual, prepared by the Office of Geometric Design Standards (Caltrans 2008), establishes uniform policies and procedures to carry out highway design functions. Caltrans has also prepared a Guide for the Preparation of Traffic Impact Studies (Caltrans 2002). Objectives for the preparation of this guide include providing consistency and uniformity in the identification of traffic impacts generated by local land use proposals.

4.10.2.3 Regional

Southern California Association of Governments 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy

SCAG is the designated Metropolitan Planning Organization for Imperial, Los Angeles, Orange, Riverside, Ventura, and San Bernardino Counties. On April 7, 2016, SCAG adopted its 2016-2040 RTP/SCS, which presents the transportation vision for the SCAG region through the year 2040 and provides a long-term investment framework for addressing the region's transportation and related challenges. The RTP/SCS focuses on maintaining and improving the transportation system through a balanced approach and considers economic, environmental, public health, improved coordination between land-use decisions

and transportation investments, and strategic expansion of the system to accommodate future growth (SCAG 2016).

4.10.2.4 Local

Riverside County Congestion Management Program

The Riverside County Transportation Commission (RCTC), with support from the County, prepares and implements the Riverside Congestion Management Program (CMP), created in compliance with Proposition 111 that aims to more directly link land use, transportation, and air quality to promote reasonable growth management programs. The CMP was most recently updated in 2011. The purpose of the state-mandated CMP is to monitor roadway congestion and assess the overall performance of the region's transportation system. Based upon this assessment, the CMP contains specific strategies and improvements to reduce traffic congestion and improve the performance of a multi-modal transportation system. Examples of strategies include increased emphasis on public transportation and rideshare programs, mitigating the impacts of new development, and better coordinating land use and transportation planning decisions.

City of San Jacinto General Plan Circulation Element

The Circulation Element of the City of San Jacinto's General Plan guides the continued development and improvement of the circulation system to support existing and planned development identified in the Land Use Element. While there are no goals and policies applicable to the proposed project, the Circulation Element identifies designated truck routes for the transportation of goods and freight within the city to decrease noise and congestion impacts cause by truck trips in urban areas. To avoid these impacts, truck routes are identified on Ramona Expressway and SR 79 and, where feasible, should be consolidated on arterial roadways through the city to minimize noise and congestion impacts to residential uses.

4.10.3 Thresholds of Significance

The following criteria from Appendix G of the *CEQA Guidelines* are used as thresholds of significance to determine the impacts of the proposed project as related to transportation. The proposed project would have a significant impact if it would:

1. Conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities;

2. Conflict or be inconsistent with *CEQA Guidelines* section 15064.3, subdivision (b);

3. Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment); or

4. Result in inadequate emergency access.

4.10.4 Project Impacts and Mitigation

4.10.4.1 Issue 1: Traffic Circulation

Would the proposed project conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?

Impact Analysis

Construction of the project's AWTF, brine management system, conveyance pipelines, and Alessandro Blending Station would result in increased vehicular traffic on regional and local roadways. Construction traffic would be generated by commuting construction workers and by trucks hauling material and equipment to and from the work areas. Because the project includes various components in different locations, not all construction traffic would occur on the same roadway segments or at the same time. Construction vehicles and trucks would use the regional circulation system and roadways in the city, primarily Sanderson Avenue, SR 79, and Ramona Expressway. The use of these roadways by project-generated haul trucks would be in accordance with the City's General Plan Circulation Element, which designates Ramona Expressway and SR 79 as the primary trucking routes that serve the city and surrounding area. While construction of the project would generate additional traffic, traffic levels would not substantially increase in a manner that would cause congestion or decrease the performance of the circulation system. In addition, project-generated construction traffic would be temporary. Following the completion of construction, the project's trip generation would be limited to up to five regular employees commuting to the AWTF, occasional chemical deliveries to the AWTF, and occasional trips made by the public for tours of the AWTF.

Construction of the project's proposed conveyance pipelines that would occur within and adjacent to roadways, specifically SR 79 and Ramona Expressway (refer to Figure 4.10-1a through f, *Pipeline Impacts within the Public Right-of-Way*), would have the potential to temporarily affect the circulation system, including that for motorists, bicyclists, and pedestrians. Construction of the conveyance pipelines within the roadway rights-of-way of SR 79 and Ramona Expressway would last less than one year and would not affect a given portion of the roadways for the entire construction duration, as construction of the pipelines would continuously move along the linear alignment. Construction would involve partial and/or full lane closures, bicycle lane closures, and sidewalk closures in areas where excavation would occur for the insertion and receiving pits that would be used for sliplining of the existing 18-inch pipeline and where trenching would occur for installation of the new 36-inch pipeline. It is possible that the at-grade paved median within Ramona Expressway could serve as a traffic lane, which would allow the full number of lanes in each direction to be maintained during construction. Regardless, the proposed project would potentially result in significant impacts to the circulation system during construction.

Upon the completion of construction, the conveyance pipelines would be located below ground and disturbed roadway and sidewalk areas would be restored to pre-existing conditions. In addition, the project's aboveground components, including the AWTF, brine management system, and Alessandro Blending Station, would not be located adjacent to public roadways or interfere with roadway functions.

Mitigation Measures

The following mitigation measure would be implemented during project construction to minimize traffic impacts:

MM-TRA-1 **Traffic Control Plan.** Prior to the start of construction of the portions of the conveyance facilities that would be located within roadway rights-of-way, the District shall require the construction contractor to prepare a Traffic Control Plan (TCP) and coordinate with the agency of jurisdiction (City of San Jacinto or County of Riverside), as applicable, to address vehicular traffic during construction of the project within the public rights-of-way of the affected jurisdiction(s), including bicycle, pedestrian, and transit facilities. The TCP shall show all signage, striping, delineated detours, flagging operations, and any other devices that will be used during construction to guide motorists, bicyclists, and pedestrians safely through the construction area and allow for adequate access and circulation. The TCP shall also ensure that congestion and traffic delay are not substantially increased as a result of the construction activities. Further, the TCP shall include detours and/or alternative routes for bicyclists using on-street bicycle lanes as well as for pedestrians using adjacent sidewalks. The District shall provide written notice at least two weeks prior to the start of construction to owners/occupants along roadways to be affected during construction.

During construction, the District shall maintain continuous vehicular and pedestrian access to affected residential driveways from the public right-of-way to the private property line, except where necessary construction precludes such continuous access for reasonable periods of time. Access shall be reestablished at the end of the workday. If a driveway needs to be closed or interfered with as described above, the District shall notify the owner or occupant of the closure of the driveway at least five working days prior to the closure. The TCP shall include provisions to ensure that the construction of the conveyance pipelines do not interfere unnecessarily with the work of other agencies such as mail delivery, school buses, and municipal waste services.

The District shall also notify local emergency responders of planned partial or full lane closures or blocked access to roadways or driveways required for project construction. Emergency responders include fire departments, police departments, and ambulances that have jurisdiction within the project area. Written notification and disclosure of lane closure location must be provided at least 30 days prior to the planned closure to allow for emergency response providers adequate time to prepare for lane closures.

Significance After Mitigation

Implementation of MM-TRA-1 would allow for continued adequate circulation during project construction; therefore, potential impacts to the circulation system would be less than significant.

4.10.4.2 Issue 2: Vehicle Miles Traveled

Would the proposed project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?

Impact Analysis

CEQA Guidelines Section 15064.3 subdivision (b) sets forth specific criteria for determining the significance of transportation impacts. Subdivision (b)(1) pertains to land use projects and describes factors that may indicate whether the amount of a land use project's VMT may be significant or not. Because project-related traffic would be limited to temporary construction traffic and a relatively small

number of operational trips, the project would not generate a substantial increase in VMT and would therefore not conflict or be inconsistent with *CEQA Guidelines* Section 15064.3. Impacts would be less than significant.

Mitigation Measures

Impacts associated with inconsistencies with *CEQA Guidelines* Section 15064.3 would be less than significant and no mitigation is necessary.

4.10.4.3 Issue 3: Hazardous Design Features

Would the proposed project substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

Impact Analysis

Construction of the project's proposed conveyance pipelines would occur within public roadway rights-of-way (refer to Figure 4.10-1a through f) and would therefore result in partial and/or full lane closures and the presence of construction equipment and workers, which could result in hazardous roadway conditions; therefore, project construction within roadway rights-of-way would result in potentially significant impacts related to traffic hazards. Construction of the other project components would occur away from public roadways and would not increase roadway hazards.

Following the completion of construction, the project's conveyance pipelines would be located below ground within the roadways and would not represent hazardous conditions. A new access road would be provided along the northern boundary of the SJVRWRF to provide access to the AWTF and brine management system. The access road would connect to North Sanderson Avenue. Ingress to and egress from the access road would be similar to the existing access road to the SJVRWRF, which is located approximately 500 feet south of the proposed new access road. As with the existing access road, safe movement for vehicles traveling north and entering the access road from North Sanderson Avenue would be achieved via an existing two-way left turn lane located within North Sanderson Avenue. Visibility in both directions for drivers exiting the access road onto North Sanderson Avenue would be provided. As such, the proposed access road's intersection with North Sanderson Avenue would not represent a substantial hazard for those accessing the AWTF or for drivers along North Sanderson Avenue. Impacts related to hazardous design features during project operation would be less than significant.

Mitigation Measures

MM-TRA-1 would be implemented during project construction to minimize potential impacts associated with hazardous traffic conditions.

Significance After Mitigation

With implementation of MM-TRA-1, potential impacts associated with hazardous traffic conditions would be less than significant.

4.10.4.4 Issue 4: Emergency Access

Would the proposed project result in inadequate emergency access?

Impact Analysis

Construction of the project's proposed conveyance pipelines would occur within public roadway rights-of-way (refer to Figure 4.10-1a through f) and would therefore result in partial and/or full lane closures, which could interfere with emergency access along SR 79 and Ramona Expressway and to connecting roadways; therefore, project construction within roadway rights-of-way would result in potentially significant impacts related to emergency access.

Following the completion of construction, the project facilities would not interfere with emergency access. The conveyance pipelines would be located below ground, and the additional project components, including the AWTF, brine management system, and Alessandro Blending Station, would be located away from roadways and other uses requiring emergency access and would not physically impede the movement of emergency vehicles. In addition, the project would not generate a high level of traffic on local roadways that would interfere with emergency response.

During project operations, emergency access to the AWTF site would be provided via an access road that would be constructed north of the SJVRWRF and connect to North Sanderson Avenue. The AWTF site would be designed and constructed to accommodate fire trucks around the Process and Control Building. Two access points would be provided along the south side of the AWTF site and would connect to a 24-foot-wide access road that would surround the site. The access road would include a 65-foot turning radius for fire trucks. The AWTF access road would also provide connection to the brine management system. The other project components, including the belowground conveyance pipelines and Alessandro Blending Station would not require emergency response, so access to these facilities is not required. The project's potential impacts associated with emergency access during project operations would be less than significant.

Mitigation Measures

MM-TRA-1 would be implemented during project construction to minimize potential impacts associated with inadequate emergency access.

Significance After Mitigation

With implementation of MM-TRA-1, potential impacts associated with emergency access during project construction would be less than significant.

Temporary Impact Footprint
- Asphalt Roadway
- Dirt Roadway

MISTY MEADOW LN
BUTTERMILK RD
BABBLING PL
COOL BREEZE CT
BUTTERMILK RD
BABBLING PL
NOBLEWOOD DR
NOBLEWOOD DR
RUSTIC GLEN WAY
RAMONA BLVD
RAMONA EXPY
79

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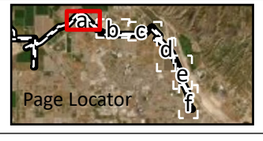
0 300 Feet

Source: Aerial (NearMap, 2020)



HELIX Environmental Planning

Pipeline Impacts within the Public Right-of-way

Figure 4.10-1a

Temporary Impact Footprint
Asphalt Roadway

STATE ST
79
RAMONA EXPY

0 300 Feet

N

Page Locator

Source: Aerial (NearMap, 2020)

HELIX
Environmental Planning

Pipeline Impacts within the Public Right-of-way

Figure 4.10-1b

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Temporary Impact Footprint
Dirt Roadway

RAMONA EXPY

SAN JACINTO AVE

I:\PROJECTS\E\EMW\EMW-20_PWR\Map\EIR.aprx Fig4.10-1_ROWImps : EMW-20 : 2/10/2021 - SAB

0 300 Feet

N

Page Locator

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Pipeline Impacts within the Public Right-of-way

Figure 4.10-1c

Temporary Impact Footprint
- Asphalt Roadway
- Dirt Roadway

RAMONA EXPY

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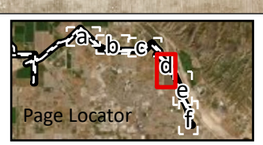

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Pipeline Impacts within the Public Right-of-way

Figure 4.10-1d

Temporary Impact Footprint
- Asphalt Roadway
- Dirt Roadway

LAKE PARK DR

RAMONA EXPY

MAIN ST

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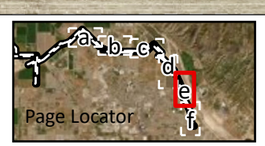
0 300 Feet



Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Pipeline Impacts within the Public Right-of-way

Figure 4.10-1e

Temporary Impact Footprint
- Asphalt Roadway
- Dirt Roadway

ESPLANADE AVE
BROOKMERE RD
BROOKMERE RD
SHANONDOAH RD
COURTLAND AVE
COURTLAND AVE
OAK KNOLL RD
OAK KNOLL RD
ST ALBAN RD
ST ALBAN RD
OLD MOUNTAIN AVE
MOUNTAIN AVE
RAMONA EXPY
7TH ST

I:\PROJECTS\E\EMW\EMW-20 PWR\Map\EIR aprx Fig4.10-1 ROWImps : EMW-20 : 2/10/2021 - SAB

0 300 Feet

Page Locator

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Pipeline Impacts within the Public Right-of-way

Figure 4.10-1f

5.0 ENVIRONMENTAL EFFECTS FOUND NOT TO BE SIGNIFICANT

Implementation of the proposed project would not result in significant impacts to aesthetics, hazards and hazardous materials, land use and planning, mineral resources, population and housing, public services, recreation, utilities and service systems, or wildfire, as discussed below.

5.1 AESTHETICS

Would the proposed project have a substantial adverse effect on a scenic vista?

The Resource Management Element of the City's General Plan identifies the mountains east of the city, specifically Mount San Jacinto and the associated Mount San Jacinto State Park, as major scenic resources in the vicinity of the project area (City of San Jacinto 2006). Views of Mount San Jacinto and Mount San Jacinto State Park are afforded from locations throughout the city. During project construction, construction equipment and vehicles could partially interfere with public views of the mountains. While this would result in minor alterations to scenic vistas for viewers in the immediate vicinity of the project's work areas, project construction activities would be temporary and relatively minor in extent. In addition, the project's construction activities that would be most visible to the public based on location, which would be those associated with the pipelines in roadways and adjacent to residences, would be mobile (i.e., they would progress down the alignment and would not stay in one location for an extended period of time). While construction activities and equipment associated with the AWTF and brine management system would remain stationary for the duration of the construction period, there are no public views in the immediate vicinity of these areas that would be obstructed.

Following the completion of construction, the AWTF, brine management system, and Alessandro Blending Station would be the visible components of the project, as the pipelines would be located below ground. While these project components could be visible to vehicular passengers driving on nearby roadways, they would not obstruct scenic views of the mountains based on distance from the roadways to the project components and the scale of the project components in relation to the mountains. As such, the proposed project would not have a substantial adverse effect on a scenic vista during construction or operation and impacts would be less than significant.

Would the proposed project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

Three officially designated state scenic highways are located in Riverside County. These include SR 62 from I-10 north to the San Bernardino County line, SR 74 from the western boundary of the San Bernardino National Forest east to SR 111 in the city of Palm Desert, and SR 243 from SR 74 north to the city of Banning (Caltrans 2020). These highways are located approximately 23 miles northeast, 8 miles southeast, and 10 miles east of the project, respectively. Based on these distances, the proposed project would not damage scenic resources within a state scenic highway; therefore, no impacts would occur.

In nonurbanized areas, would the proposed project substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from a publicly accessible vantage point.) If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?

As previously noted, the only permanent visible components of the project would be the AWTF, brine management system, and Alessandro Blending Station. While these project components could be visible to vehicular passengers driving on nearby roadways, they would not be highly visible due to the distance from the roadways to the project components. In addition, both the AWTF and Alessandro Blending Station would be located near existing facilities with similar visual character (refer to Figure 2-5 for elevations of the Process and Control Building at the AWTF). The brine management system, which would be constructed within ponds and located in an area surrounded by agricultural land, would also not represent a substantial change in visual character compared to the existing setting. As such, the proposed project would not substantially degrade the existing visual character or quality of public views, and impacts would be less than significant.

Would the proposed project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Construction of the project is anticipated to occur only during daytime hours (7:00 a.m. to 7:00 p.m.) and not require lighting. New permanent sources of light that would occur from implementation of the project would primarily be located at the AWTF site and would consist of typical operational building and parking lot lighting. Such lighting would be similar to the existing lighting located at the adjacent SJVRWRF. The project would implement lighting in a manner that complies with Riverside County Ordinance No. 655 to minimize nighttime lighting interference with operations of the Mount Palomar Observatory. No substantial sources of glare would be included as part of the project. As such, impacts associated with light and glare would be less than significant.

5.2 HAZARDS AND HAZARDOUS MATERIALS

Would the proposed project create a significant hazard to the public or environment through the routine transport, use, or disposal of hazardous materials?

The project's construction activities would require the use of routinely used hazardous materials including, but not limited to, petroleum products (e.g., oil, gasoline, and diesel fuels), automotive fluids (e.g., antifreeze and hydraulic fluids), and other chemicals (e.g., adhesives, solvents, paints, and thinners). No acutely hazardous materials would be used on site during construction and the materials that would be handled would not pose a significant risk to the public. In addition, the District and its construction contractor would comply with all applicable federal, state, and local regulations pertaining to hazardous materials use, handling, storage, and disposal. Impacts related to the use of hazardous materials during construction would be less than significant.

During project operations, chemicals would be used at the AWTF for the project's water treatment processes. Chemicals to be used include sodium bisulfate, ammonium sulfate, sodium hypochlorite, sulfuric acid, threshold inhibitor, sodium hydroxide, and citric acid. Chemicals would be contained within storage tanks located outside at the AWTF site and would be transferred to the process equipment located inside the AWTF via belowground pipelines. Chemicals would be stored in conformance with the California Fire Code and California Mechanical Code and would include approved storage containers, mechanical ventilation, spill control and secondary containment, and appropriate hazardous chemicals storage signage. Where required, the chemical storage areas would also include monitor control equipment, gas detection systems, and fire detection systems. Further, the project would prepare and comply with a Hazardous Materials Business Plan (HMBP) and Risk Management Plan (RMP), as managed and overseen by the Riverside County Department of Environmental Health Hazardous

Materials Branch, which would minimize potential hazards associated with the use of chemicals on site. As such, although potentially hazardous chemicals would be used at the proposed AWTF site, they be used and stored in accordance with applicable regulations such that the project would not create a significant hazard to the public or environment through the routine transport, use, or disposal of hazardous materials. Impacts would be less than significant.

Would the proposed project create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

As discussed above, potentially hazardous chemicals would be stored and used on site in compliance with applicable regulations which would minimize the potential for upset and accident conditions involving the release of hazardous materials into the environment. In the event of accident conditions involving hazardous materials, the District would coordinate appropriately with the Riverside County Department of Environmental Health Hazardous Materials Branch Emergency Response Team to address the accident and minimize potential effects. As such, impacts would be less than significant.

Would the proposed project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

Portions of Mt. San Jacinto College and North Mountain Middle School are within one-quarter mile of the project's proposed conveyance pipeline alignments. As such, typical construction-related hazardous materials (discussed above) are anticipated to be used within one-quarter mile of school. These materials, however, are not acutely hazardous materials and would be handled and used in accordance with applicable relations; therefore, the use of these materials would not pose a substantial risk to students at nearby schools and construction-related impacts would be less than significant.

During project operation, these pipelines, which would convey treated water and be the only component of the project located within one-quarter mile of a school, would be below ground and would not result in hazardous emissions. No operation-related impacts would occur.

Would the proposed project be located on a site which is included on a list of hazardous materials sites complied pursuant to Government Code § 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

Pursuant to Government Code § 65962.5 (Cortese List) requirements, the SWRCB GeoTracker database (SWRCB 2020) and the California Department of Toxic Substances Control (DTSC) EnviroStor database (DTSC 2020) were searched for hazardous materials sites along the project site/alignment and vicinity. The results of these searches indicated that no listed hazardous materials sites are located within or adjacent to the project site/alignment. One site, associated with gasoline contaminated soil, is mapped within North Sanderson Road approximately 300 feet north of the location of the existing pipeline that would be sliplined as part of the project. The case for this site was closed in 2001 (SWRCB 2020) and the site is therefore not anticipated to create a significant hazard. Impacts would be less than significant.

For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the proposed project result in a safety hazard or excessive noise for people residing or working in the project area?

The project alignment is not located with an airport land use plan or within two miles of a public airport or public use airport; therefore, the proposed project would not result in a safety hazard or excessive noise for people residing or working in the project area. No impacts would occur.

Would the proposed project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

Construction of the proposed project's conveyance pipelines would occur within SR 79 and Ramona Expressway, both of which are major roadways providing local and regional access in the project area. Project construction would likely involve temporary lane closures within SR 79 and Ramona Expressway and could therefore potentially interfere with emergency response and/or emergency evacuation. As detailed in Section 4.10, *Transportation*, the project would be required to implement MM-TRA-1, which is the implementation of a traffic control plan to maintain access along roadways and requires coordination with local emergency responders regarding lane closures to maintain appropriate emergency response capabilities. Impacts would be less than significant.

Following completion of construction, the project's conveyance pipelines would be located below ground; therefore, no operational impacts would occur.

Would the proposed project expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires?

The project alignment is not located within areas mapped as moderate, high, or very high fire hazard severity zones (California Department of Forestry and Fire Protection [CAL FIRE] 2020). The project components would be located within agricultural areas and roadway rights-of-way and would not be within wildland areas subject to wildland fires. While the project's proposed conveyance pipelines would be located relatively close (some portions within a mile) to wildlands associated with the San Jacinto Mountains, they would be below ground and would not be at exposed to fires. As such, the proposed project would not expose people or structures to a significant risk of loss, injury, or death involving wildland fires; impacts would be less than significant.

5.3 LAND USE AND PLANNING

Would the proposed project physically divide an established community?

The project's proposed permanent aboveground facilities, including the AWTF, brine management system, and Alessandro Blending Station, would be located on District-owned land that is currently undeveloped. Land surrounding these proposed facilities is either vacant, used for agriculture, or developed with existing District facilities. Based on location and surrounding uses, these permanent aboveground facilities would not divide an established community. The proposed conveyance pipelines would be located below ground and would also not divide an established community. No impacts would occur.

Would the proposed project cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?

The AWTF and brine management system would be constructed on a site within the city that has a land use and zoning designation of medium density residential; however, the land is owned by the District and is located immediately adjacent to the District's existing SJVRWRF. Based on these factors is unlikely

that, in the future, this land would be utilized for residential development, and the project is therefore not anticipated to affect the City's future housing stock.

The AWTF and brine management system would be very similar uses to the existing uses located at the SJVRWRF. Similarly, the Alessandro Blending Station would be located on District-owned land adjacent to the existing Alessandro Ponds. The project's conveyance pipelines would be located in areas designated as medium density residential and low density residential, as well as public rights-of-way. Construction would occur with public rights-of-way and within easements currently owned by the District, or that would be acquired by the District. Upon completion of construction, the pipelines would be located below ground and would not result in land use inconsistencies. The proposed conveyance pipelines are considered public utilities, which are exempt from the City's Zoning Ordinance.

In addition, as described in Section 3.4, Standard Regulatory Requirements, per Government Code Section 53091, building ordinances of local cities and counties do not apply to the location or construction of facilities used for the projection, generation, storage, treatment, or transmission of water or wastewater. As such, the AWTF and brine management system would not conflict with existing land use designations or be incompatible with surrounding land uses.

The project is within the Western Riverside MSHCP; however, the District is not a signatory to the MSHCP, and, as such, is not subject to the requirements of the MSHCP. Nevertheless, the project would not conflict with the conservation goals and objectives of the MSHCP for the local area, as discussed in Section 4.3, *Biological Resources.*

Impacts related to conflict with an applicable land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect would be less than significant.

5.4 MINERAL RESOURCES

Would the proposed project result in the loss of availability of a known mineral resource that would be a value to the region and the residents of the state or result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

The CGS classifies the regional significance of the state's mineral resources in accordance with the Surface Mining and Reclamation Act of 1975 to indicate the significance of mineral deposits based on geologic appraisal of the mineral resource potential of the land. The project area is classified by the CGS as Urban Area and Mineral Resource Zone 3, which is an area of known or inferred mineral occurrences of undetermined mineral resource significance. The project area is not currently used for mining or for production of mineral resources of value to the region or residents of California and is not planned to be used for such in the future based on land use designations. No impacts associated with mineral resources would occur as a result of implementation of the proposed project.

5.5 POPULATION AND HOUSING

Would the proposed project induce substantial unplanned population growth in an area, either directly (for example, by proposed new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

Implementation of the proposed project would not directly induce population growth because it does not propose new homes or businesses that would directly generate new growth. The potential for the proposed project to indirectly induce population growth is evaluated in Chapter 7.0, *Growth Inducement.*

Would the proposed project displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?

The proposed project would occur on vacant District-owned land, on other undeveloped land, and within roadway rights-of-way and would not displace people or housing. No impacts would occur.

5.6 PUBLIC SERVICES

Would the proposed project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for fire protection, police protection, schools, parks, or other public facilities?

The project does not propose new fire department, police station, school, or park facilities and does not propose the expansion of such existing facilities. In addition, the project would not induce substantial population growth in the project area that would necessitate a need for new fire department, police station, school, or park facilities. Construction of the project would require a temporary increase in employees and operation of the project would involve up to five permanent employees. The temporary construction jobs, anticipated to be filled by the local labor force, and small number of permanent operational jobs would not result in a substantial increase in demand for fire, police, school, or park services; therefore, the implementation of the project would not require the construction of new or expansion of existing fire department, police station, school, or park facilities in order to maintain service ratios, response times, or other performance objectives. In the event of a crime, fire, or other emergency at one of the project's proposed facilities, existing police and fire protection services within the project area would be able to sufficiently respond with existing facilities and staffing capacities. Therefore, no impacts associated with the construction of new or expansion of existing fire protection, police protection, school, park, or other public facilities would occur.

5.7 RECREATION

Would the proposed project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

There are numerous parks located in the vicinity of the proposed project. The proposed project would not induce population growth and would therefore not increase the use of existing parks or recreational facilities such that substantial physical deterioration would occur. No impacts would occur.

Does the proposed project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

The proposed project does not include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment. No impacts would occur.

5.8 UTILITIES AND SERVICE SYSTEMS

Would the proposed project require or result in the relocation or construction of new or expanded water, wastewater treatment or storm drainage, electric power, natural gas or telecommunications facilities, the construction of relocation of which could cause significant environmental effects?

The proposed project involves the construction of a new advanced water treatment facility and associated infrastructure, including conveyance pipelines. The environmental impacts of construction of the project are analyzed throughout this EIR. Because the proposed project components would be located in proximity to existing District facilities and associated existing infrastructure, the proposed project would not require the substantial relocation or construction of additional water, wastewater treatment or storm drainage, electric power, natural gas, or telecommunications facilities that could cause significant off-site environmental effects. The District would coordinate with other agencies and utility providers, as applicable, to avoid impacts to existing and/or planned utility infrastructure during project construction. Impacts would be less than significant.

Would the proposed project have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years?

The proposed project would produce advanced treated water from recycled water and combine it with tertiary recycled water for recharge into the groundwater table and eventual extraction for use as potable water. The project is designed to achieve a total recharge capacity of 15,000 AFY upon buildout. The project's annual recharge would result in an increased and more sustainable water supply for the District's service area and would provide increased water supply reliability during dry years. Therefore, no impacts would occur.

Would the proposed project result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

Project-related wastewater generation that would require treatment by a wastewater treatment provider would be limited to that associated with temporary construction workers and the small number (up to five) of operational employees at the AWTF. The amount of wastewater generated would be minimal and would not exceed treatment capacities. The waste product generated the advanced water treatment process would be disposed of on site at the project's proposed brine management system. As a result, impacts related to wastewater treatment requirements would be less than significant.

Would the proposed project generate solid waste in excess of state or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction needs; and would the project comply with federal, state, and local management and reduction statutes and regulations related to solid waste?

The project would generate minimal amounts of solid waste during construction (e.g., material packaging) and operation (e.g., typical office-related waste from the Process and Control Building), which would be disposed of at a permitted landfill. Although the project would involve excavation for the brine management system, the cut and fill would be balanced and off-site disposal would not be required. Moreover, AB 939, also known as the Integrated Waste Management Act, mandates the reduction of solid waste disposal in landfills by requiring a minimum 50 percent diversion rate. Potential impacts associated with solid waste generation and disposal would be less than significant.

5.9 WILDFIRE

Would the proposed project substantially impair an adopted emergency response plan or emergency evacuation plan?

Construction of the proposed project's conveyance pipelines would occur within SR 79 and Ramona Expressway, both of which are major roadways providing local and regional access in the project area. Project construction would likely involve temporary lane closures within SR 79 and Ramona Expressway and could therefore potentially interfere with emergency response and/or emergency evacuation. As detailed in Section 4.10, *Transportation*, the project would be required to implement MM-TRA-1, which would involve the implementation of a traffic control plan to maintain access along roadways and would require coordination with local emergency responders regarding lane closures to maintain appropriate emergency response capabilities. Impacts would be less than significant.

Following completion of construction, the project's conveyance pipelines would be located below ground; therefore, no operational impacts would occur.

Due to slope, prevailing winds, or other factors, would the proposed project exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?

The project component that would include regular occupants (i.e., staff members) would be the AWTF. The AWTF is not located in an area mapped be CAL FIRE as a moderate, high, or very high fire hazard severity zone. In addition, the project would not exacerbate fire risks. As such, the project would not expose project occupants to pollutant concentration from a wildfire or the uncontrolled spread of a wildfire. No impacts would occur.

Would the proposed project require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?

The proposed project's permanent aboveground facilities that would require infrastructure components would be located in areas adjacent to existing District facilities that are served by infrastructure. Though some of the existing infrastructure would be expanded for the project, this expansion would not be substantial and would not exacerbate fire risk or result in temporary or ongoing impacts to the environment. Impacts would be less than significant.

Would the proposed project expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?

The project's primary aboveground structure at which people would be located would be the Control Building at the AWTF site. Based on its location, it would not be exposed to downslope landslides or downstream flooding as a result of runoff, post-fire slope instability, or drainage changes. The project components that would be located in proximity to slopes and potential flood areas are the proposed conveyance pipelines that run near the base of the San Jacinto Mountains and adjacent to the San Jacinto River; however, the conveyance pipelines would be located below ground and would not be subject to landslides or flooding. Impacts would be less than significant.

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6.0 CUMULATIVE IMPACT ANALYSIS

6.1 INTRODUCTION

Cumulative impacts are defined in the *CEQA Guidelines* as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." Therefore, a cumulative impact is a change in the physical environment that results from the incremental effect of the project when added to other past, present, and reasonably foreseeable future projects. In determining whether a project's cumulative effects are significant, two determinations are required:

1. Is the combined impact of the project and other projects significant?

2. Cumulative impacts can result from individually minor but collectively significant project taking place over a period of time. Is the project's incremental effect cumulatively considerable? The *CEQA Guidelines* allow for a project's contribution to be rendered less than cumulatively considerable with implementation of mitigation measure(s) designed to alleviate the cumulative impacts.

An EIR's discussion of cumulative impacts must reflect the severity of the impacts and the likelihood of their occurrence. However, the discussion need not be as detailed as the discussion of environmental impacts attributable to a project alone and should be guided by the standards of practicality and reasonableness.

The geographic scope of the cumulative impact analysis varies depending upon the specific environmental topic being analyzed. In accordance with *CEQA Guidelines* Section 15130(b)(3), Table 6-1, *Geographic Scope of Cumulative Impact Analyses,* summarizes the geographic area within which past, present, and reasonably foreseeable future projects may contribute to a specific cumulative impact, when considered in conjunction with the impacts associated with implementation of the proposed project.

Table 6-1
GEOGRAPHIC SCOPE OF CUMULATIVE IMPACT ANALYSES

Environmental Topic	Geographic Scope of Cumulative Impact Analyses
Agricultural and Forestry Resources	The geographic scope for the cumulative analysis of agricultural resources is the agricultural land adjacent to and nearby the proposed project. There is no forest land in the project vicinity that could be cumulatively affected.
Air Quality	The geographic scope for the cumulative analysis of criteria pollutant emissions is the SCAB. The geographic scope for the cumulative analysis of sensitive receptors is the area in the immediate vicinity of the proposed project components. The geographic scope for the cumulative analysis of odors is the area immediately surrounding potential odor sources. Because odors rapidly disperse beyond their source, associated impacts are generally not cumulative in nature.

Table 6-1 (cont.)
GEOGRAPHIC SCOPE OF CUMULATIVE IMPACT ANALYSES

Environmental Topic	Geographic Scope of Cumulative Impact Analyses
Biological Resources	The geographic scope for the cumulative analysis of biological resources is the cities of San Jacinto and Hemet, nearby portions of unincorporated Riverside County, and surrounding lands that support native habitats, native plant and animal species, and potentially jurisdictional waters. The geographic scope for the cumulative analysis relative to conservation planning is land within the Western Riverside Multiple Species Habitat Conservation Plan area.
Cultural Resources and Tribal Cultural Resources	The geographic scope for the cumulative analysis of historic resources, archaeological resources, human remains, and tribal cultural resources is the cities of San Jacinto and Hemet, nearby portions of unincorporated Riverside County, and the traditional use areas of local tribes.
Energy	The geographic scope for the cumulative analysis relative to energy use is the service areas of the energy (electricity and natural gas) providers in the project area.
Geology and Soils	The geographic scope for the cumulative analysis of soil erosion is the watersheds downstream from the project's construction sites. The geographic scope for the cumulative analysis relative to seismic hazards and other geologic/soil conditions (e.g., fault rupture, groundshaking, ground failure, liquefaction/collapse, landslides, lateral spreading, subsidence, and expansive soils) are generally site-specific and not cumulative in nature. The geographic scope for the cumulative analysis of paleontological resources is the paleontologically sensitive geologic formations within cities of San Jacinto and Hemet, nearby portions of unincorporated Riverside County.
Greenhouse Gas Emissions	Due to the nature of assessment of GHG emissions and the effects of climate change, impacts can currently only be analyzed from a cumulative context; therefore, the geographic scope for the cumulative analysis of GHG emissions is the global atmosphere.
Hydrology and Water Quality	The geographic scope for the cumulative analysis of hydrology and water quality is the receiving waters downstream of the project alignment, the entire San Jacinto Groundwater Basin, and the floodplains within the cities of San Jacinto and Hemet, and nearby portions of unincorporated Riverside County.
Noise	The geographic scope for the cumulative analysis of noise and vibration would be only those cumulative projects in the immediate vicinity of the proposed project locations and any adjacent NSLUs. The area of cumulative impact that would be considered for aircraft impacts would be only those projects located within the mapped aircraft noise contours of the Hemet-Ryan Airport.
Transportation	The geographic scope for the cumulative analysis related to the circulation system, VMT, traffic hazards, and emergency access is the circulation network within and adjacent to the city of San Jacinto.

CEQA Guidelines Section 15130(b) indicates the following approaches for identifying cumulative projects:

- A list of past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the agency; or

- A summary of projections contained in an adopted general plan or related planning document, or in a prior environmental document which has been adopted or certified, which described or evaluated regional or area-wide conditions contributing to the cumulative impact.

The cumulative analysis for this EIR relies on the list approach.

6.2 CUMULATIVE PROJECTS

Cumulative effects could result when considering the effects of the proposed project in combination with the effects of other related projects in the area. Past, present, and reasonably foreseeable future related projects used in this analysis are shown on Figure 6-1, *Cumulative Projects,* and identified in Table 6-2, *List of Cumulative Projects*. Projects in Table 6-2 include active District projects within the San Jacinto Valley that involve physical construction work and active projects subject to CEQA review within the cities of San Jacinto and Hemet.

Table 6-2
LIST OF CUMULATIVE PROJECTS

Project Name	Location	Type of Development	Brief Description	Status
Eastern Municipal Water District				
1. 39 Inch Raw Water Feeder Cathodic Protection Improvements	Along Warren Road from just north of Cottonwood Avenue to Esplanade Avenue and along Esplanade Avenue from Warren Road to Sanderson Avenue in the cities of San Jacinto and Hemet.	Water	Cathodic protection (CP) system improvements on existing 39-inch San Jacinto Valley Raw Water Feeder.	In design phase; construction estimated to start spring 2021 and finish fall 2023.
2. Hemet Water Filtration Plan Hypochlorite Tanks Replacement	Southwest corner of intersection of Commonwealth Avenue and Kirby Street in the city of San Jacinto.	Water	Replacement of Hypochlorite Tanks at the Hemet Water Filtration Plant.	In planning phase; construction estimated to start winter 2020/2021 and finish summer 2021.
3. Grant Avenue Booster Electrical Replacement	44942 Palm Avenue in the city of Hemet.	Water	Replacement of electrical equipment at Grant Street Booster.	In design phase; construction estimated to start summer 2020 and finish fall 2021.
4. Corwin Booster Electrical Replacement	Approximately 500 feet east of the eastern terminus of Montara Way in the city of San Jacinto.	Water	Replacement of electrical equipment at Corwin Booster.	Under construction; construction estimated to finish spring 2021.
5. Mountain Avenue West Replenishment Ponds	Northwest corner of the intersection of Mountain Avenue and Esplanade Avenue in the city of San Jacinto.	Water	Construction of the Mountain Avenue West Recharge Facility and supporting infrastructure.	Under construction; construction estimated to finish winter 2020/2021.
6. San Jacinto Water Supply Pipeline – Phase I	Along Esplanade Avenue from Warren Road to Sanderson Avenue, along Sanderson Avenue from Esplanade Avenue to Commonwealth Avenue, and along Commonwealth Avenue from Sanderson Avenue to the Hemet Water Filtration Plant in the city of Hemet.	Water	Construction of a 66-inch feeder transmission pipeline, a booster pumping station, and a new turnout.	In design phase; construction estimated to start fall 2020 and finish summer 2023.

Table 6-2 (cont.)
LIST OF CUMULATIVE PROJECTS

Project Name	Location	Type of Development	Brief Description	Status
Eastern Municipal Water District	**(cont.)**			
7. Well 201 Equipping	794 E. Shaver Street in the city of San Jacinto.	Water	Well equipping.	In design phase; construction estimated to start winter 2020/2021 and finish fall 2022.
8. Well 202 Equipping	Northeast corner of Donna Way and 7th Street in the city of San Jacinto.	Water	Well equipping.	In design phase; construction estimated to start winter 2020/2021 and finish fall 2022.
9. Well 203 Equipping	1131 East Evans Street in the city of San Jacinto.	Water	Well equipping.	In design phase; construction estimated to start winter 2020/2021 and finish fall 2022.
10. Well 205 Equipping	North of the intersection of Old Mountain Avenue and Timothy Drive in the city of San Jacinto.	Water	Well equipping.	In design phase; construction estimated to start winter 2020/2021 and finish fall 2022.
11. Well 37 Equipping and Pipeline	Approximately 1,200 feet east of Mountain Avenue and approximately 2,000 feet north of the intersection of Esplanade Avenue and Mountain Avenue in the city of San Jacinto.	Water	Well equipping including the construction of a well building, pump and motor, piping, and other appurtenances.	In design phase; construction estimated to start spring 2021 and finish winter 2022/2023.
12. Well 38 Equipping (Well 28 Replacement)	Mountain Avenue and Meridian Channel in the city of San Jacinto.	Water	Well replacement.	Under construction; construction estimated to finish summer 2020.
13. San Jacinto Valley Regional Water Reclamation Facility Centrate Equalization	At the existing SJVRWRF in the city of San Jacinto.	Sewer	Conversion of one existing digester to a centrate equalization tank and construction of two new pump stations.	In design phase; construction estimated to start summer 2021 and finish summer 2022.

Table 6-2 (cont.)
LIST OF CUMULATIVE PROJECTS

Project Name	Location	Type of Development	Brief Description	Status
Eastern Municipal Water District	**(cont.)**			
14. San Jacinto Valley Regional Water Reclamation Facility Plant 1 Rehabilitation	At the existing SJVRWRF in the city of San Jacinto.	Sewer	Rehabilitation of the SJVRWRF Plant 1, including incorporating the Plant 2 primaries as the feed to the Plant 1 secondary process.	In design phase; construction estimated to start winter 2020/2021 and finish summer 2022.
15. San Jacinto Valley Regional Water Reclamation Facility Screw Conveyor in Dewatering Building	At the existing SJVRWRF in the city of San Jacinto.	Sewer	Replacement of old belt conveyors with screw conveyors for sludge dewatering.	Under construction; construction estimated to finish summer 2020.
16. Alessandro Ponds Erosion Mitigation	At the existing Alessandro Ponds located at Olmstead Street in the city of San Jacinto.	Recycled	Regrading of pond dikes where soil has built up and compromised security fencing. The project will also replace damage security fencing.	In planning phase; construction estimated to start fall 2021.
17. MSJC San Jacinto Campus Recycled Water Retrofit	Along Eagle Drive at Mt. San Jacinto College.	Recycled	Installation of approximately 1,370 feet of 8-inch recycled water pipeline. The project also includes the on-site retrofit of the irrigation system.	In planning phase; construction estimated to start fall 2021.
City of San Jacinto				
18. Esplanade Widening Project	Within Esplanade Avenue from Warren Road to Sanderson Avenue in the city of San Jacinto.	Road widening	Road, sidewalk, and drainage channel widening. Traffic signal installation.	Public hearing to adopt MND held February 18, 2020.
19. Luiseño Village	Southwest corner of Main Street and Ramona Expressway in the city of San Jacinto.	Commercial development	Commercial shopping center with gas station, 3,048-SF convenience store, and 1,105 car wash; 14,583-SF multi-tenant retail building; 9,360-SF multi-tenant retail building; 2,800-SF drive-thru restaurant; 3,200-SF drive-thru restaurant.	Public hearing to adopt MND held August 27, 2018.

Table 6-2 (cont.)
LIST OF CUMULATIVE PROJECTS

Project Name	Location	Type of Development	Brief Description	Status
City of San Jacinto (cont.)				
20. Rancho Estudillo Plaza	Northeast corner of 7th Street and Sanderson Avenue in the city of San Jacinto.	Commercial development	Subdivision and development of 2,940-SF convenience store, 2,720-SF canopy for gas station, 3,200-SF drive-thru restaurant, 5,100-SF retail building with 2,500-SF drive-thru restaurant and 2,600-SF retail space, 26,500-SF retail building, 16,900-SF retail building	Public hearing to adopt MND held September 17, 2018.
21. Tentative Tract 37495	116 feet east of the corner of Black Cherry Street and 7th Street, on the north side of 7th Street in the city of San Jacinto.	Residential subdivision	Subdivision into 42 lots for single-family residential development	Public hearing to adopt MND held April 23, 2019.
22. San Jacinto Retail Center	Northwest corner of State Street and Cottonwood Avenue in the city of San Jacinto.	Commercial development	Subdivision and development of 2,956-SF convenience store, 3,096-SF canopy for gas station, 7,869-SF auto repair building, and 2,934-SF drive-thru restaurant	Public hearing to adopt MND held April 23, 2019.
23. KPC Promenade	Northwest corner of Main Street and Ramona Expressway in the city of San Jacinto.	Commercial development	Construct and operate 120-room hotel, medical office building, sit-down restaurant, two drive-through restaurants, combination retail store and restaurant, combination service station car wash and convenience store, 114-room senior housing project.	Public hearing to adopt MND held March 18, 2019
24. San Jacinto Valley Academy Expansion	480 N. San Jacinto Avenue between Idyllwild Drive to the south and Shoal Reef Avenue to the north in the city of San Jacinto.	School expansion	Expansion to existing K-12 school, adding 40 classrooms and a 17,600-SF multi-purpose space	Public hearing to adopt MND held September 17, 2018

Table 6-2 (cont.)
LIST OF CUMULATIVE PROJECTS

Project Name	Location	Type of Development	Brief Description	Status
City of San Jacinto (cont.)				
25. Baypoint Preparatory Academy	1010 S. Lyon Avenue on the west side of Lyon Avenue, approximately 660 feet south of 7th Street in the city of San Jacinto.	School development	Development of a new K-12 school, consisting of 13 educational buildings totaling 120,000 SF with other ancillary buildings totaling 20,643 SF	Public hearing to adopt MND held September 17, 2018
26. Cottonwood Commons	Northwest corner of Sanderson Avenue and Cottonwood Avenue in the city of San Jacinto.	Commercial development	Subdivision and development of 3,800-SF convenience store, 4,395-SF canopy for gas station, 2,080-SF car wash, 2,080-SF drive-through restaurant, 3,200-SF drive-through restaurant with 2,300-SF retail space, two 2,400-SF sit down restaurants, and a 22,000-SF retail building	Public hearing to adopt MND held April 16, 2018
27. Commonwealth Crossing	West side of San Jacinto Avenue at the terminus of Commonwealth Avenue in the city of San Jacinto.	Commercial development	Subdivision and development of 2,720-SF drive-through restaurant, 3,062-SF convenience store, 3,600-SF canopy for gas station, 12,000-SF tire store, 3,590-SF car wash, and 24,000-SF office/retail building	Public hearing to adopt MND held April 16, 2018
City of Hemet				
28. Shop and Go Commercial Center	Southwest corner of West Fruitvale Avenue and N. Sanderson Avenue in the city of Hemet.	Commercial development	Tentative Parcel Map for subdivision; Conditional Use Permit for construction and operation of 3,607-SF convenience store, 1,500-SF service retail use, 4,859-SF fuel canopy with gas station, 3,278-SF drive-thru restaurant, and 17,500-SF retail building	Approved by planning commission on March 19, 2019.

Table 6-2 (cont.)
LIST OF CUMULATIVE PROJECTS

Project Name	Location	Type of Development	Brief Description	Status
City of Hemet (cont.)				
29. S^2A Modular	1321 N. State Street	Industrial	Construct and operate a TESLA-powered modular smart home factory with a showroom and model display area of seven buildings totaling approximately 250,000 SF	Environmental review in progress.
30. Girard Subdivision	800 N. Girard Street	Residential	Development of 51 single-family residential homes.	Development review committee April 9, 2020.
31. The Latham	South of Latham Avenue between Lyon Avenue and Elk Street	Residential	120-unit, 3-story apartment complex for seniors.	Approved by planning commission on June 16, 2020.
32. Horton Citrus Point	Northeast corner of the intersection of Florida Avenue and Lake Street	Residential	Construction of 80 single-family residential lots	Development review committee April 9, 2020
33. Stoney Mountain Ranch	Southeast corner of the intersection of Esplanade Avenue and Warren Road	Residential	Final build-out of remaining 92 lots of 395-lot residential subdivision.	Approved by planning commission on November 5, 2019.
34. Hideaway Tract	North of Fruitvale Avenue and west of State Street	Residential	Development of 193 single-family residences	Approved by planning commission on March 6, 2018. Currently under construction.

Source: City of Hemet 2020, City of San Jacinto 2020, District 2020.

6.3 IMPACT ANALYSIS

6.3.1 Agricultural Resources

The geographic scope for the cumulative analysis of agricultural resources is the agricultural land adjacent to and nearby the proposed project. Portions of land in the vicinity of the project alignment are mapped as Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, Urban and Built-up Land, and Other Land.

When combined, projects in the cumulative scenario listed above (Table 6-2) have the potential to affect agricultural resources in the geographic scope. The majority of projects in the cumulative scenario would not be located on farmland designated as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance; however, some projects, including projects 5 and 23, could be located on designated farmland and could therefore potentially result in impacts to farmland. If avoidance of agricultural land is incorporated into the planning process, impacts related to agricultural resources would be reduced. Although land proposed for development by some of the cumulative projects may be designated as farmland, it is not necessarily utilized for active agricultural use (i.e., it is vacant) and therefore development of the projects would not necessarily result in the conversion of land used for agriculture to a non-agriculture use.

As described in Section 4.1.4.2 (Issue 1) and Section 4.1.4.6 (Issue 5) development of the project's proposed AWTF site and brine management system would convert land mapped as Unique Farmland and Farmland of Statewide Importance from agricultural use to a non-agricultural use. The potential impact of this conversion was evaluated using the LESA model and determined to be less than significant. The project's other proposed components, which would generally occur within existing disturbed pipeline easements, roadway rights-of-way, and other vacant land, would not permanently convert agricultural land to non-agricultural use. The project would not conflict with Williamson Act contract (Issue 2). Forest land (Issue 3 and Issue 4) would not be impacted by the proposed project facilities.

Given the spread of projects and the fact that most would not be located on agricultural land or convert agricultural land to non-agricultural use, the combined agricultural effects from the projects within the geographic scope of the agricultural analysis, considered together with the proposed project, potential cumulative impacts to agricultural resources would be less than significant.

6.3.2 Air Quality

The geographic scope for the cumulative analysis of conflict with air quality plans and criteria pollutant emissions is the SCAB. The SCAB is a nonattainment area for PM_{10}, $PM_{2.5}$, and ozone, and therefore the baseline for the region is considered cumulatively significant. As evaluated in Section 4.2.4.1 (Issue 1), the project would not conflict with or obstruct implementation of the SCAQMD's AQMP. As evaluated in Section 4.2.4.2 (Issue 2), the project would not result in emissions of PM_{10}, $PM_{2.5}$, or the ozone precursors NO_X and VOCs during construction and operation that would exceed regional or local thresholds and would therefore not be cumulatively considerable. Further, because the project would not directly induce growth, indirectly accommodate unplanned growth, or generate high levels of VMT during operations, the project's contribution to the regional impact would not be considered cumulatively considerable.

The geographic scope for the cumulative analysis of sensitive receptors is the area in the vicinity of the proposed project components. Construction of multiple cumulative projects in addition to the proposed project could combine to generate emissions of criteria pollutants and TACs that could affect nearby sensitive receptors. This would only happen, however, if construction of one or more cumulative projects would emit substantial emissions, occur adjacent to and simultaneously with the proposed project construction activities, and occur in proximity to sensitive receptors. Based on the size, location, and phasing of the cumulative projects in Table 6-2 and the planned construction of the proposed project, such situations are unlikely to occur, and the baseline with respect to exposure of pollutants to sensitive receptors is not cumulatively significant.

In addition, as disclosed in Section 4.2.4.3 (Issue 3), the proposed project's emissions of criteria pollutants during construction would be below SCAQMD LSTs and would not expose sensitive receptors to substantial pollutant concentrations. Operationally, cumulative projects have the potential to combine to increase vehicular congestion on roadways and potentially result in CO hotspots; however, as discussed in Section 4.2.4.2 (Issue 3), the increase in vehicle trips associated with the proposed project would be negligible. Also, the potential for a CO hotspot is generally limited to the immediate vicinity of the affected roadway segment or intersection. As such, the proposed project in combination with cumulative projects would not result in a significant cumulative impact to sensitive receptors.

The geographic scope for the cumulative analysis of odors is the area immediately surrounding potential odor sources. Because odors rapidly disperse beyond their source, associated impacts are generally not cumulative in nature. Additionally, as discussed in Section 4.2.4.4 (Issue 4), the proposed project would not result in substantial odor generation during construction or operation and would therefore not combine with other cumulative projects to result in a cumulatively significant impact associated with objectionable odors.

6.3.3 Biological Resources

The geographic scope for the cumulative analysis of biological resources is the cities of San Jacinto and Hemet, nearby portions of unincorporated Riverside County, and surrounding lands that support native habitats, native plant and animal species, and potentially jurisdictional waters.

The project area is situated in the San Jacinto Valley west of the San Jacinto River and at the western base of the San Jacinto Mountains. As described in Section 4.3, *Biological Resources*, one sensitive vegetation community, southern willow scrub, occurs within the proposed project's study area. Two sensitive plant species, smooth tarplant and chaparral (foothill) sand-verbena, were observed in the study area and three special status animal species, least Bell's vireo, burrowing owl, and San Bernardino kangaroo rat, have high potential to occur in the study area. In addition, potentially jurisdictional waters are present in the study area.

Development in the proposed project area has substantially altered native habitats and adversely affected native plant and wildlife. Historic agricultural use and the expansion of urban areas in the region have resulted in the loss of open space and the degradation of natural areas that historically supported populations of unique and are species and habitats. The majority of projects included in Table 6-2 are located in areas that are already developed, or the sites have previously been altered due to grading or agricultural practices and would not contribute significantly to direct impacts to sensitive biological resources.

The proposed project in combination with the cumulative scenario described above would result in potentially significant cumulative impacts to special status plant and wildlife species (Issue 1). As mentioned above, two sensitive plant species, smooth tarplant and chaparral (foothill) sand-verbena, occur within the proposed project's study area and could be impacted by the proposed project. Cumulative projects would also have the potential to result in impacts to these species; however, as discussed in Section 4.3.4.1 (Issue 1), these species have a relatively low sensitivity and are abundant in the project area, and the project's potential impacts to such species would be reduced to less than significant with implementation of MM-BIO-1 and MM-BIO-2, which involve the installation of temporary construction fencing and biological monitoring in areas where work limits occur adjacent to known sensitive resources. Therefore, with implementation of mitigation measures, the project would not result in a cumulatively considerable contribution to sensitive plant species impacts (Issue 1).

Suitable habitat for sensitive wildlife species, including burrowing owl, least Bell's vireo, San Bernardino kangaroo rat, and nesting birds, occur in the vicinity of the proposed project and cumulative projects sites. Construction of the proposed project could interact with other nearby projects, such as projects 5, 19, and 23, to result in direct and indirect impacts to these sensitive wildlife species from habitat removal and/or noise generation that could be cumulatively significant; however, implementation of mitigation measures MM-BIO-1 through MM-BIO-3 would reduce the project's impact contribution to a less-than-significant level through fencing, monitoring, avoidance, and surveys. Furthermore, the project incorporates setbacks in excess of 500 feet from all potential least Bell's vireo habitat, thereby avoiding any potential direct or indirect impacts on the species. Therefore, with implementation of mitigation measures, the proposed project would not result in a cumulatively considerable contribution to sensitive wildlife species resources impacts (Issue 1).

Similarly, sensitive habitats (Issue 2) and potentially jurisdictional waters (Issue 3) occur in the area of the proposed project and cumulative projects sites and could be subject to a significant cumulative impact from the combined effects of the cumulative projects. Therefore, the baseline cumulative impact is potentially significant. The proposed project would not result in direct impacts, such as grading, fill, or removal of vegetation, to sensitive habitats or potentially jurisdictional waters and would therefore not have the potential to contribute to a cumulatively significant direct impact. The proposed project would, however, have the potential to indirectly impact potentially jurisdictional waters through the release of construction-related pollutants and could therefore have the potential to combine with other cumulative projects to result in cumulatively significant indirect impacts to potentially jurisdictional water. Through implementation of BMPs and mitigation measures MM-BIO-1 and MM-BIO-2, the proposed project would not result in a cumulatively considerable contribution to jurisdictional waters or wetlands impacts (Issue 3).

Through development on previously undeveloped land that supports wildlife habitats and species, the projects in the cumulative scenario could combine to restrict wildlife movement (Issue 4), which could result in a potentially significant cumulative impact. The proposed project, however, would include belowground components that would not affect wildlife movement and aboveground components that would be located in previously disturbed/developed area and would also not affect wildlife movement. The project's contribution to the impact would not be cumulatively considerable.

Cumulative projects would be subject to appropriate local ordinances (Issue 5) and conservation planning policies (Issue 6) on an individual basis. The project's implementation of mitigation measures MM-BIO-1 through MM-BIO-4 would ensure that biological resources are protected, consistent with the

goals of habitat conservation plans. No significant cumulative impact with respect to compliance with local ordinances would occur.

6.3.4 Cultural Resources and Tribal Cultural Resources

The geographic scope for the cumulative analysis of historic resources, archaeological resources, human remains, and tribal cultural resources is the cities of San Jacinto and Hemet, nearby portions of unincorporated Riverside County, and the traditional use areas of local tribes.

As described in Section 4.4, *Cultural Resources and Tribal Cultural Resources*, 90 cultural resources have been previously recorded within a one-mile radius of the proposed project limits, 8 of which are situated within or in immediate proximity to the project limits. In addition, there exists potential for previously unknown resources to be located below ground in the vicinity of the project and in the entire geographic scope.

The cumulative projects listed in the Table 6-2 include varying degrees of ground-disturbing activities, and, therefore, have the potential to impact historic resources (Issue 1), archaeological resources (Issue 2), human remains (Issue 3), and tribal cultural resources (Issue 4) to varying degrees. It is assumed that the cultural resources within the entire geographic scope would be similar to those in the proposed project area. It is also expected that these projects would be or have been subject to analysis and review under CEQA, and that the potential effects to cultural resources would be mitigated. However, due to the presence of known historic resources and the general cultural sensitivity in the area, potential combined cultural resources effects (Issues 1 through 4) from the projects in Table 6-2 within the geographic scope for the cultural resources analysis is considered cumulatively significant.

The proposed project could combine with cumulative projects to result in cumulatively significant impacts to historic resources (Issue 1); however, as discussed in Section 4.4.4.1, no historical resources would be affected by the proposed project; therefore, implementation of the project would not result in a cumulatively considerable contribution to historic resources impacts.

The proposed project has the potential to affect unknown archaeological resources (Issue 2) during ground-disturbing activities, such as clearing, trenching, and grading, and could potentially combine with cumulative projects requiring ground disturbance to result in cumulatively significant regional impact to archeological resources. However, mitigation measures MM-CUL-1 through MM-CUL-6, which comprise an archaeological and Native American monitoring program, would be implemented as part of the proposed project and through implementation of these mitigation measures, the proposed project's contribution to a regional impact to archaeological resources would not be cumulatively considerable.

The project's ground-disturbing activities could also affect buried human remains (Issue 3) and combine with cumulative projects to result in cumulatively significant impacts. Implementation of mitigation measure MM-CUL-7 during the project's construction activities would avoid potential impacts to human remains and the project would therefore not result in a cumulatively considerable contribution.

Similarly, the proposed project has the potential to affect TCRs (Issue 4) during ground-disturbing activities and could potentially combine with cumulative projects requiring ground disturbance to result in cumulatively significant impacts to TCRs; however, mitigation measures MM-CUL-1 through MM-CUL-6, which comprise an archaeological and Native American monitoring program, would be implemented as part of the proposed project and through implementation of these mitigation

measures, the proposed project's contribution to a regional impact to TCRs would not be cumulatively considerable.

6.3.5 Energy

The geographic scope for the cumulative analysis relative to energy is the service areas of the energy (electricity and natural gas) providers in the project area, which are SCE and SoCalGas. When combined, the projects identified in Table 6-2 could contribute to a regional increase in energy use through their use of gasoline and diesel, electricity, and/or natural gas during construction and/or operation. The projects, however, would be required to comply with regulatory requirements for energy use (e.g., Title 24 requirements, CalGreen energy requirements, and fuel efficiency standards for vehicles), which would ensure the cumulative projects would not use energy in a wasteful, inefficient, or unnecessary manner.

As described in Section 4.5.4.1 (Issue 1), the project would consume energy in the forms of gasoline and diesel fuel for off-road equipment, on-road haul trucks, and worker commute vehicles during construction and would consume energy primarily in the form of electricity for the AWTF during operations. Energy use would be limited to that which is necessary for the project; therefore, the project would not use energy in a wasteful, inefficient, or unnecessary manner. In addition, the project would provide a local source of potable water, which would reduce reliance on imported water, thereby reducing the energy used to pump water from the Sacramento-San Joaquin Bay Delta in northern California or from the Colorado River. The project, at full Phase II buildout, is anticipated to result in a net electricity reduction of approximately 24,207,794 kWh per year. As such, the combined effects from all projects within the geographic scope related to energy use would not be cumulatively significant.

In regard to consistency with applicable energy plans (Issue 2), cumulative new development would be required to comply with applicable plans and policies related to energy use, most notably the 2019 Title 24 Building Energy Efficiency Standards, CalGreen energy requirements, and fuel efficiency standards for vehicles, as mentioned above. The project would comply with applicable plans and would result in a net reduction in energy use. As such, the combined effects from cumulative projects within the geographic scope related to consistency with energy plans would not be cumulatively significant.

6.3.6 Geology and Soils

The geographic scope for the cumulative analysis relative to seismic hazards and other geologic/soil conditions (e.g., fault rupture, groundshaking, ground failure, liquefaction/collapse, landslides, lateral spreading, subsidence, and expansive soils) are generally site-specific and not cumulative in nature. The presence of one cumulative project in a seismic or geologic potential hazard area would not have an effect on potential hazards to a cumulative project in another location. The amount of damage caused by each of these events would be site-specific due to various factors such as the type of base rock, the soils each of the sites are located on, and the type of structure(s) each cumulative project might construct. Also due to the narrow focus of most seismic events, the amount of stress given to the various areas will vary from place to place. As a result, the amount of damage caused by a seismic or geologic event will vary between projects. As discussed in Section 4.6.4.1 (Issue 1), Section 4.6.4.3 (Issue 3), and Section 4.6.4.4 (Issue 4), the project would not result in significant impacts related to seismic hazards, geologic instability, or expansive soils. Therefore, the proposed project, in combination with other cumulative projects, would not result in a cumulatively significant increase in exposure to seismic and geologic hazards.

The geographic scope for the cumulative analysis of soil erosion (Issue 2) is the watersheds downstream from the project's construction sites. This is because rainfall erosion of soils exposed by land disturbance activities during construction can lead to downstream sedimentation effects, as sediment-laden runoff is carried along drainage facilities and natural water courses by stormwater flows. Some of the cumulative projects in Table 6-2 would involve ground disturbance activities, including vegetation clearing, grading, excavation, and trenching which could contribute, however incrementally, to the overall sedimentation issues in runoff flows that discharge into downstream watercourses. However, projects would be required to meet water quality standards and comply with water quality measures contained in federal, state, and regional requirements. This would entail obtaining a NPDES Construction General Permit and implementing a SWPPP during construction. Therefore, impacts to the local watersheds caused by downstream sedimentation effects from soil erosion associated with land disturbance activities would not be cumulatively significant.

The project would not include septic tanks or alternative wastewater disposal systems (Issue 5) and would therefore not have the potential to combine with cumulative projects to result in a cumulatively significant impact.

The geographic scope for the cumulative analysis of paleontological resources (Issue 6) is the paleontologically sensitive geologic formations within the cities of San Jacinto and Hemet, and nearby portions of unincorporated Riverside County. The cumulative projects listed in Table 6-2 include varying degrees of ground-disturbing activities, and, therefore, have the potential to impact paleontological resources to varying degrees. Due to the high paleontological sensitivity of the area, potential impacts to paleontological resources from the cumulative projects are considered cumulatively significant. As discussed in Section 4.6.4.6, the proposed project has the potential to affect unknown paleontological resources during excavation at depths greater than four feet, in which case the project could contribute to a cumulatively significant impact; however, mitigation measure MM-GEO-1, which includes implementation of a paleontological resources mitigation and monitoring plan, would reduce the project's contribution to a regional impact to paleontological resources to less than cumulatively considerable.

6.3.7 Greenhouse Gas Emissions

Due to the nature of assessment of GHG emissions and the effects of climate change, impacts can currently only be analyzed from a cumulative context; therefore, the geographic scope for the cumulative analysis of GHG emissions is the global atmosphere. Refer to Section 4.7, *Greenhouse Gas Emissions*, for a cumulative analysis of GHG impacts.

6.3.8 Hydrology and Water Quality

The geographic scope for the cumulative analysis of hydrology and water quality is the receiving waters downstream of the project alignment, the entire San Jacinto Groundwater Basin, and nearby floodplains.

When combined, the projects in the cumulative scenario listed above in Table 6-2 have the potential to affect and hydrology and water quality in the geographic scope. All the projects listed in Table 6-2 would be located in the same watershed and groundwater basin as the proposed project and would be located within or near the same floodplains as the proposed project. Construction and operation of the cumulative projects could result in erosion and sedimentation and the release of hazardous materials,

debris, and other pollutants to surface waters or groundwater and thus impact water quality (Issue 1) and conflict with water quality control plans (Issue 5). The projects would have the potential to disrupt existing drainage patterns in a manner that would result in erosion, sedimentation, flooding, increased runoff rates, and increased amounts of polluted runoff (Issue 3). In addition, the cumulative projects would be at risk of releasing pollutants due to project inundation from a flood event (Issue 4). However, projects would be required to meet water quality standards and comply with water quality measures contained in federal, state, and regional requirements. This would entail obtaining a NPDES Construction General Permit and implementing a SWPPP during construction and complying with the MS4 permit, which addresses water quality on a regional basis, during operations. Such regionally based water quality measures are developed on a watershed-wide basis to ensure that individual projects do not combine with others to become cumulatively considerable. As such, the cumulative impact related to water quality (Issue 1), drainage (Issue 3), and flood hazards (Issue 4), and conflict with water quality control plans (Issue 5) is less than significant.

In regard to groundwater supply (Issue 2), some of the cumulative projects would result in increased water demand, which in part may be met by the local groundwater supply. Other projects, including project number 5 in Table 6-2, would result in increased groundwater recharge and therefore increased groundwater supply. Overall, however, the potential for the cumulative projects within the geographic scope to rely on high levels of groundwater supply during operation results in a potentially significant cumulative impact.

The proposed project would function to produce a combination of advanced treated and tertiary recycled water for rechange in the groundwater table. Such recharge would enhance the existing groundwater quality and would offset potential impacts to groundwater supply that could occur from the increased local water demand from cumulative projects. Therefore, when considered in addition to the potential impacts of other projects in the cumulative scenario, the proposed project's contribution to groundwater impacts (Issue 2) would not be cumulatively considerable.

6.3.9 Noise

The geographic scope for the cumulative analysis of noise and vibration would be only those cumulative projects in the immediate vicinity of the proposed project locations and any adjacent NSLUs. Generally, noise and vibration impacts are limited to the area directly surrounding the source, as noise and vibration attenuate with distance, and only have the potential to combined with other noise and vibration sources occurring simultaneously in the immediate vicinity. The proposed project would generate noise during construction of its various components; therefore, cumulative effects in these areas are considered. The project's operational noise would be limited to the AWTF site, which is not located in proximity to NSLUs.

Projects in the cumulative scenario listed in Table 6-2 could generate noise during construction and operation that would have the potential to temporarily increase ambient noise levels in the vicinity of NSLUs. Construction noise would be localized, affecting areas in the immediate vicinity of the construction sites. Though the timing for the cumulative projects is currently not confirmed, if construction of projects 5, 19, 23, occur concurrently with the proposed project, the noise levels would combine to potentially create a significant noise impact to the nearby residences. As such, the combined effects of the project in the geographic scope for noise is conservatively considered to be cumulatively significant.

When considered with the cumulative projects, the noise effects (Issue 1) of the proposed project could contribute incrementally to cumulative impacts related to noise. The combined construction of the project components and cumulative projects mentioned above would occur within the city of San Jacinto. Per mitigation measure MM-NOI-1, the proposed project construction would occur within the allowable hours of the City of San Jacinto's municipal code when in close proximity to NSLUs. While cumulative projects located in the immediate vicinity of the proposed project components could occur outside of the allowable construction hours and potentially result in significant impacts, the proposed project would not generate noise during these hours and would therefore not contribute to a cumulatively significant impact. In addition, the proposed project components that would involve noise-generating construction activities in proximity to NSLUs would the proposed conveyance pipelines. Construction work for the pipelines would continuously progress along the alignments and would not be located at any one location, or adjacent to any one type of NSLU, for an extended period of time; therefore, the likelihood of construction of the cumulative projects occurring at the same time and location as construction for the proposed project's pipelines is not high. As such, the proposed project's contribution to cumulative noise-related impacts would not be cumulatively considerable with mitigation measure MM-NOI-1.

Groundborne vibration attenuates rapidly with distance and is therefore not generally cumulative in nature. In addition, as discussed in Section 4.9.4.2 (Issue 2), the project would generate minimal groundborne vibration during construction and vibration; therefore, in combination with cumulative projects, the proposed project would not result in a cumulatively significant impact associated with excessive groundborne vibration.

The area of cumulative impact that would be considered for aircraft impacts would be only those projects located within the mapped aircraft noise contours of the Hemet-Ryan Airport. As discussed, in Section 4.9.4.3 (Issue 3), no portion of the project alignment is within either the existing or future mapped noise contours of the Hemet-Ryan Airport, and while distant aircraft activity may be audible, neither the project's temporary construction workers nor permanent facility workers would be exposed to excessive aircraft noise. As such, the proposed project would not combine with cumulative projects to result in a cumulatively significant impact related to aircraft noise.

6.3.10 Transportation

The geographic scope for the cumulative analysis related to the circulation system, VMT, traffic hazards, and emergency access is the circulation network within and adjacent to the city of San Jacinto. This includes roadways, bike paths/lanes, and pedestrian facilities (i.e., sidewalks). Roadways included in the geographic scope consist of regional roadways including SR 79, SR 74, and Ramona Expressway, and local roadways including, but not limited to, Sanderson Avenue, State Street, and Esplanade Avenue.

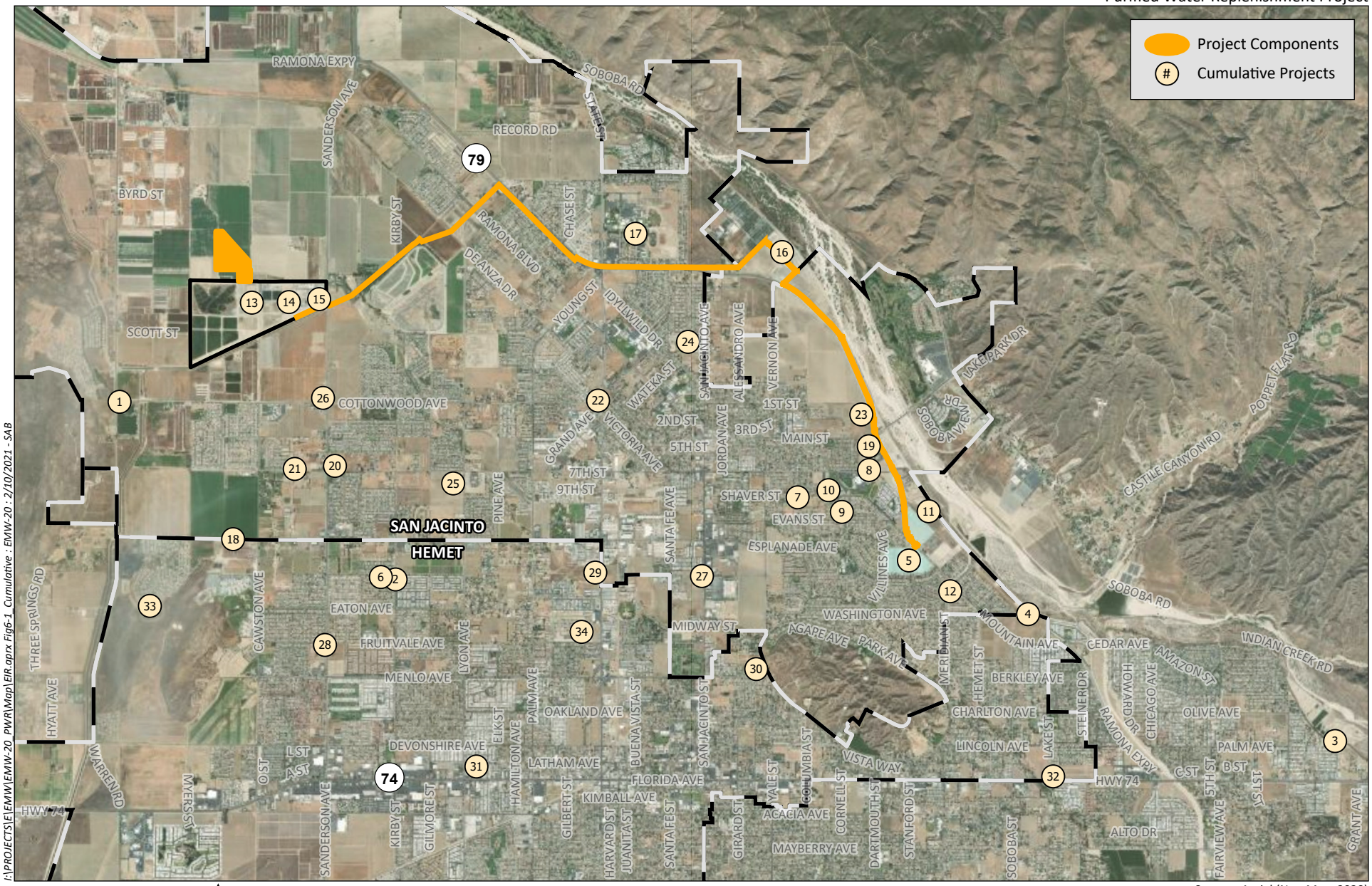
Cumulative projects listed Table 6-2 would have the capability to generate additional vehicular traffic on the regional and local roadway systems within the geographic scope. The amount of traffic generated depends on the type and size of the project. Residential projects, such as projects 21, 30, 31, 32, 33, and 34, listed in Table 6-2, would consistently contribute large amounts of additional vehicles to regional and local roadways. Commercial projects, such as projects 19, 20, 22, 23, 26, 27, and 28, listed in Table 6-2, would generate high amounts of additional vehicles during daytime peak hours and on the weekends. Given the different types and sizes of the projects included in the cumulative scenario, it is reasonable to assume that the cumulative projects could combine to generate vehicular traffic that could affect regional and local roadways. In addition, infrastructure projects, such as projects 1, 6, and 11, would

involve the installation and/or maintenance of pipelines within public rights-of-way, which would require partial for full lane closures. In combination, cumulative projects generating increased traffic and/or resulting in lane closures could result in cumulatively considerable impacts to the local and regional roadway systems as related to traffic circulation, VMT, traffic hazards, and emergency access. As such, the combined effects from the construction and/or operation of projects within the geographic scope related to transportation would be cumulatively significant.

When added to the cumulative scenario described above, construction and operation of the proposed project would not substantially increase traffic volumes (Issue 1 and Issue 2) within the geographic scope. Project construction would result in an increased in vehicles, primary haul trucks; however, the increase would be temporary. Following construction, operation of the project would generate minimal traffic, and the effects on the surrounding circulation system would be negligible and would not cause the existing roadways levels of operation to decrease. While the project would involve construction within the roadway right-of-way which would require partial or full lane closures, the project would implement MM-TRA-1 that requires the preparation and implementation of a TCP. The TCP would include measures and devices, such as signage, striping, delineated detours, and flagging operations, to allow for continued roadway operations and traffic circulation (Issue 1). The TCP would also minimize traffic-related hazards (Issue 3) and ensure adequate emergency access (Issue 4) during project construction. Following construction, affected roadways would be restored to pre-existing conditions and no long-term impacts would occur. As such, with implementation of MM-TRA-1, the proposed project's contribution to cumulative transportation-related impacts would not be cumulatively considerable.

6.4 CONCLUSION

The proposed project's cumulative impacts would be less than significant and/or the project's contribution would be less than cumulatively considerable with implementation of the mitigation measures referenced above and provided in Sections 4.1 through 4.10 of this EIR.



I:\PROJECTS\E\EMW\EMW-20_PWR\Map\EIR.aprx Fig6-1_Cumulative : EMW-20 : 2/10/2021 - SAB

0 1 Miles

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Cumulative Projects

Figure 6-1

7.0 OTHER CEQA-RELATED SECTIONS

This chapter includes a discussion of other CEQA considerations related to the following: the potential for growth inducement; issue areas where impacts would be significant and unavoidable; and significant, irreversible environmental effects related to implementation of the proposed project.

7.1 GROWTH INDUCEMENT

7.1.1 Introduction

Induced growth is characterized by the construction of new housing or accelerated economic and/or population growth that exceeds planned growth and results either directly or indirectly from implementation of a project.

In accordance with Section 15126.2(e) of the *CEQA Guidelines,* an EIR must include an analysis of the growth-inducing impact of a proposed project. The growth inducement analysis must address: (1) the ways in which a proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly in the surrounding environment; and (2) the potential for a project to encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. This second issue involves the potential for a project to induce growth by the expansion or extension of existing services, utilities, or infrastructure. The *CEQA Guidelines* further state that "[i]t must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment" (Section 15126.2[e]).

A project can have direct and/or indirect growth inducement potential. An example of a project that is directly growth-inducing is one that involves construction of new housing. An example of an indirectly growth-inducing project is one that requires a substantial permanent or temporary new employment demand that would then stimulate the need for additional housing and services. A project would also indirectly induce growth if it would remove an obstacle to additional growth and development, including a constraint on a required public service.

Water supply availability and service is one of the primary, though not the only, public services needed to support development. The proposed project would produce a combination of advanced treated water and tertiary recycled water for recharge and storage in the SJUPMZ. This water would eventually be extracted and used as a supply for potable water demand. The District is proposing to implement the proposed project in two phases. Phase I would achieve a recharge capacity of 4,000 AFY and Phase II would achieve an additional 11,000 AFY for a total project recharge capacity of 15,000 AFY. The proposed project would therefore increase water supply availability and reliability within the District's service area. While a more available and reliable water supply would play a role in supporting projected growth in the District's service area, it would not be the only impetus to such growth. Other factors, including general plans and policies, the availability of wastewater disposal capacity, public schools, transportation services, and other necessary public infrastructure, also influence development and population growth. In addition, economic factors greatly influence development rates and locations.

Growth itself is not necessarily detrimental to the environment and is therefore not necessarily an adverse impact. Rather, it is the potential consequences of growth (e.g., increased traffic and noise, degradation of air quality, loss of habitat) which may result in environmental impacts. Growth

inducement may result in adverse impacts if the growth is not consistent with local land use plans and/or growth management plans and policies for the area; such inconsistent and unplanned growth, which may be considered "disorderly," could indirectly result in additional adverse environmental impacts. Thus, it is important to assess the degree to which the potential growth induced by a project would or would not be consistent with applicable plans.

7.1.2 Project Area Population Projections

The proposed project area is located within the District's service area within the city of San Jacinto and a portion of unincorporated Riverside County. Each jurisdiction's General Plan guides the type and location of land uses and the intensity of development in response to projected population growth and associated housing needs. Each jurisdiction has assessed the growth-related impacts associated with planned land use and build-out scenarios allowed under their General Plans.

The proposed project and the District's service area are located within the jurisdiction of SCAG. SCAG provides population, housing, and employment growth forecasts for each region, subregion, and city within its jurisdiction, which includes Orange, Ventura, San Bernardino, Los Angeles, Riverside, and Imperial Counties. In 2016, SCAG adopted the 2016-2040 RTP/SCS, which acts as a long-term planning and management plan for the regional transportation system, providing mitigation measures to offset the impacts of population growth. The 2016-2040 RTP/SCS provides population, housing, and employment growth forecasts by jurisdiction. Population forecasts for San Jacinto and unincorporated County are shown in Table 7-1, *Population Projections*. Also included in Table 7-1 are population projections for the District's service area as provided in the District's 2015 Urban Water Management Plan (UWMP; District 2016). As shown in the table, the City, County, and District's service area are projected to experience population increases of 64.4 percent, 29.4 percent, and 48.8 percent, respectively, from 2020 to 2040.

Table 7-1
POPULATION PROJECTIONS

Jurisdiction	2020*	2035*	2040*	% Change 2020-2040*
City of San Jacinto	48,600	73,300	79,900	64.4
Unincorporated Riverside County	385,600	471,200	499,200	29.4
District's Service Area	856,500	1,178,600	1,274,600	48.8

Source: SCAG 2016, District 2016
* Projected Population

7.1.3 Water Supply and Demand

The District is one of 29 water agencies that have a State Water Project (SWP) Water Supply Contract with DWR. The majority of the District's water supply consists of imported water purchased through the Metropolitan Water District of Southern California from the SWP and the Colorado River Aqueduct. The availability of these imports is dependent on the amount of precipitation in the watershed, the amount of that precipitation that runs off into the watershed, water use by others in the watershed, and the amount of water in storage in the SWP's Lake Oroville at the beginning of the year. Variability in the location, timing, amount, and form (rain or snow) of precipitation, as well as how wet or dry the previous year was, produces variability from year to year in the amount of water that is available for the SWP. The District's local supply sources include groundwater, desalinated groundwater, and recycled

water. Groundwater is pumped from the Hemet/San Jacinto and West San Jacinto areas of the San Jacinto Groundwater Basin. The District owns and operates two desalination plants that convert brackish groundwater from the West San Jacinto Basin into potable water. The District also owns, operates, and maintains its own recycled water system that consists of four regional water reclamation facilities and several storage ponds spread throughout the District's service area that are connected through the recycled water system (District 2016).

Water demand (including retail and wholesale) and supply projections for the District's service area were obtained from the District's 2015 UWMP and are shown below in Table 7-2, *District Projected Water Supply and Demand (AFY)*. As shown in the table, total water demand and supply for the District's service area through 2040 is estimated at 268,200 AFY, which represents an 83.6 increase over 2015 demand and supply (District 2016).

Table 7-2
DISTRICT PROJECTED WATER SUPPLY AND DEMAND (AFY)

Sources	2015	2020	2025	2030	2035	2040
Water Demand						
Potable and Raw Water Demand	100,705	151,000	165,600	180,600	195,200	209,300
Recycled Water Demand	45,385	46,901	53,100	55,200	57,400	58,900
Total Demand	146,090	197,901	218,700	535,800	252,600	268,200
Water Supply						
Imported Water	78,165	131,697	143,197	158,197	172,797	186,897
Groundwater	15,252	12,303	12,303	12,303	12,303	12,303
Desalinated Groundwater	7,288	7,000	10,100	10,100	10,100	10,100
Recycled Water	45,385	46,901	53,100	55,200	57,400	58,900
Total Supply	146,090	197,901	218,700	535,800	252,600	268,200

Source: District 2016
AFY = acre-feet per year

In 2011, the District completed its IRP to address future water supply challenges and develop an overall strategy for future water supply. The IRP recommended strategies for both expanded local water supplies and imported water supplies. The proposed project, which would use recycled water to recharge groundwater basins for eventual potable use, was recommended as a key local water supply for the District's future water supply portfolio. Implementation of the proposed project would provide the District with greater reassurance that groundwater supplies could be more reliably available during normal and dry years when imported water supply is less abundant to meet the demands within its service area.

7.1.4 Growth Inducement Potential

Implementation of the proposed project would not directly induce population growth, as it does not propose development of new housing that would attract additional population to the area. Further, the proposed project would not result in substantial permanent employment that could indirectly induce population growth. Although construction activities would create some short-term employment opportunities over the duration of the project's construction period, the number of jobs created would not be substantial and would be expected to be filled by the local labor pool/work force. Operation of the project is anticipated to require up to five full-time employees, which are also anticipated to be supplied by the local labor pool/work force.

The objectives of the proposed project are to produce advanced treated water and combine it with tertiary recycled water for recharge into, and replenishment of, the SJUPMZ; contribute to establishing a local, long-term sustainable water supply for the District's service area; provide increased water supply reliability during droughts and emergencies; increase the amount of groundwater that can be pumped seasonally through recharge and storage of a combination of advanced treated water and tertiary recycled water; and utilize recycled water in an environmentally responsible manner (i.e., no recycled water is discharged outside of the District's service area). The project aims to achieve these objectives by implementing the project in phases to enhance future water supplies by recharging a combination of advanced treated water and tertiary recycled water into the local groundwater basin. While the proposed project would increase the availability and reliability of future water supplies in the District's service area, the project would not create a new water supply that could create an indirect growth inducement potential, as the project would utilize recycled water.

The local jurisdictions that govern land use and development within the proposed project area include the City and the County. Numerous other cities within the District's service area govern land use and development within their respective jurisdictions. These jurisdictions have adopted General Plan documents that guide the type, location, and level of land use and development and have assessed the growth-related impacts associated with planned land use and growth allowed under the General Plans and associated EIRs. In addition, SCAG, the regional authority charged with providing a framework for coordination and orderly regional growth and development, prepared the Regional Comprehensive Plan (RCP), which combines regional planning efforts into a single focused document. The RCP addresses growth management as well as core elements including housing, transportation, air quality and water. The principal objectives of the RCP are to coordinate regional and local decisions with respect to future growth and development and to minimize future environmental impacts. SCAG also prepared the 2016-2040 RTP/SCS, which acts as a long-term planning and management plan for the regional transportation system, providing mitigation measures to off-set the impacts of growth projected in the RCP.

The District does not have the authority to make land use decisions to halt or alter growth and development plans or approvals, nor does it have the authority to address potential significant, secondary effects of planned growth. Authority to implement those measures lies within the individual jurisdictions within the District's service area. The District does, however, have the authority to take actions and implement projects to help mitigate the secondary effects of growth on water resources and water supply services within its service area.

While the proposed project would increase water supply availability and reliability within the District's service area by producing a combination of advanced treated water and tertiary recycled water for recharge into the groundwater basin and eventual extraction to be used as a source to supply potable water demand, it would support planned population growth that has been identified for its service area. By using recycled water, the proposed project would not create a new water supply that would induce future growth; rather, it would increase groundwater supply availability and reliability and would accommodate growth already planned by SCAG and the District within the service area such that water reliability would not be an impediment to already-planned growth. In addition, the project would be constructed in phases, and would not support or encourage growth within its service area to an extent greater than that planned by local jurisdictions and SCAG. As such, implementation of the proposed project would not be indirectly growth-inducing because it would not remove an impediment to growth. The project's growth-inducing impacts would be less than significant.

7.2 SIGNIFICANT AND UNAVOIDABLE ENVIRONMENTAL IMPACTS

Section 15126.2(c) of the *CEQA Guidelines* requires the identification of significant impacts that would not be avoided, even with the implementation of feasible mitigation/performance measures. The final determination of significance of impacts and of the feasibility of mitigation/performance measures will be made by the District as part of their certification of this EIR. Sections 4.1 through 4.10 of this EIR provide an evaluation of the potentially significant environmental effects and corresponding mitigation/performance measures associated with implementation of the project to avoid or substantially reduce the environmental effect. According to this evaluation, potentially significant environmental effects would be reduced to less-than-significant levels with implementation of identified feasible and enforceable mitigation measures. The project would not result in significant and unavoidable environmental impacts.

7.3 SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL EFFECTS

Section 15126.2(d) of the *CEQA Guidelines* requires a discussion of significant irreversible environmental changes that would be caused by a proposed project, as: "Uses of nonrenewable resources during the initial and continued phases of the project may be irreversible, since a large commitment of such resources makes removal or nonuse thereafter unlikely. Primary impacts and, particularly, secondary impacts (such as highway improvement which provides access to a previously inaccessible area) generally commit future generations to similar uses. Also, irreversible damage can result from environmental accidents associated with the project. Irretrievable commitments of resources should be evaluated to assure that such current consumption is justified." Generally, a project would result in significant irreversible environmental changes if:

- The primary and secondary impacts would generally commit future generations to similar uses;
- The project would involve a large commitment of nonrenewable resources;
- The project involves uses in which irreversible damage would result from any potential environmental accidents associated with the project; or
- The proposed consumption of resources is not justified (e.g., the project involves the wasteful use of energy).

Implementation of the project would allow the District to provide increased water supply availability and reliability to its current and projected future users within the District's service area. In this regard, the project would commit future users to a local and sustainable water supply, which is considered a beneficial effect. Resources that would be permanently and continually consumed by operation of the proposed project include water and electricity, and, to a lesser extent, fossil fuels. The water used, however, would be recycled water. As evaluated in Section 4.5, *Energy*, the project would not use energy resources in an unnecessary, inefficient, or wasteful manner. In addition, the project has the potential to result in substantial energy savings by providing a locally available potable water source, which could reduce future water imports and the energy required to transport the imported water. As such, the project would not involve a large commitment of nonrenewable resources or consume resources in a manner that is not justified.

The *CEQA Guidelines* also require a discussion of the potential for irreversible environmental damage caused by an accident. Generally, the proposed project, as a water treatment and conveyance project, does not involve activities that are dangerous or at high risk of accidents. As discussed in Section 5.2, *Hazards and Hazardous Materials,* chemicals used during project operations at the AWTF site would be stored in conformance with the California Fire Code and California Mechanical Code and would include approved storage containers, mechanical ventilation, spill control and secondary containment, and appropriate hazardous chemicals storage signage. Where required, the chemical storage areas would also include monitor control equipment, gas detection systems, and fire detection systems. Further, the project would prepare and comply with a HMBP and RMP, as managed and overseen by the Riverside County Department of Health Hazardous Materials Branch, which would minimize potential hazards associated with the use of chemicals on site. The project's potential impacts associated with accident conditions would be less than significant and would not result in irreversible damage.

8.0 ALTERNATIVES

8.1 SCOPE OF ALTERNATIVES ANALYSIS

The CEQA statutes require an EIR to describe and evaluate a range of reasonable alternatives to the proposed project, or alternatives to the location of a proposed project. The purpose of the alternatives analysis is to explore ways that most of the basic objectives of a project could be attained while reducing or avoiding significant environmental impacts of the project as proposed. This approach is intended to foster informed decision-making and public participation in the environmental process.

This chapter evaluates alternatives to the project and examines the potential environmental impacts associated with each alternative. The *CEQA Guidelines* indicate that EIRs are required to evaluate a "…range of reasonable alternatives to the project, or to the location of the project, which could feasibly attain the basic objectives of the project" (Section 15126.6[a] *CEQA Guidelines*). According to the *CEQA Guidelines,* not every conceivable alternative must be addressed, nor do infeasible alternatives need be considered. Section 15126.6 of the *CEQA Guidelines* lists the factors that may be taken into account when addressing the feasibility of alternatives: site suitability, economic viability, availability of infrastructure, other plans or regulatory limitations, and jurisdictional boundaries. The Guidelines also state that the discussion of alternatives should focus on "…alternatives capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives could impede to some degree the attainment of the project objectives or would be more costly" (Section 15166.6[b] *CEQA Guidelines*). CEQA further directs that "…the significant effects of the alternatives shall be discussed, but in less detail than the significant effects of the project as proposed" (Section 15126.6[d] *CEQA Guidelines*).

8.2 PROJECT OBJECTIVES

The project includes a list of key objectives that clarify the intent of implementation of the project, as stated in Section 2.3 of this EIR. The objectives of the project are as follows:

- Produce advanced treated water and combine it with tertiary recycled water for recharge into, and replenishment of, the SJUPMZ;
- Contribute to establishing a local, long-term sustainable water supply for the District's service area;
- Provide increased water supply reliability during droughts and emergencies;
- Increase the amount of groundwater that can be pumped seasonally through recharge and storage of a combination of advanced treated water and tertiary recycled water; and
- Utilize recycled water in an environmentally responsible manner (i.e., no recycled water is discharged outside of the District's service area).

8.3 ALTERNATIVES CONSIDERED BUT REJECTED

8.3.1 24-inch Advanced Treated Water Conveyance Pipeline

Instead of sliplining the existing 18-inch pipeline with a 16-inch HDPE pipe as described in the proposed project, this alternative would construct a new 24-inch HDPE pipe to convey advanced treated water from the SJVRWRF to the Alessandro Blending Station. The new 24-inch pipeline would follow a similar route to the existing 18-inch pipeline that would be sliplined under the proposed project. With the larger diameter, the 24-inch pipe would have a greater flow volume capability. However, this alternative would involve a much greater disturbance footprint than sliplining the 18-inch pipeline, which would likely result in greater environmental impacts and require more easements and encroachment permits. As a result, this alternative was rejected from further consideration.

8.3.2 36-inch Conveyance Pipeline Along the San Jacinto River

Under this alternative, the 36-inch pipeline that would convey the combined advanced treated water and tertiary recycled water from the Alessandro Blending Station to the Mountain Avenue West Recharge Basin would follow a route along an earthen channel located adjacent to the raised roadway that runs along the San Jacinto River instead of along the shoulder of Ramona Expressway. Whereas the 36-inch pipeline along Ramona Expressway would primarily be within the existing road right-of-way, the alignment under this alternative would run mainly through private properties and existing easements, thus requiring extensive coordination to determine regulatory feasibility. Therefore, the alternative for the pipeline along the San Jacinto River was rejected.

8.4 ALTERNATIVES ANALYZED

The section presents an evaluation of three alternatives to the proposed project:

- Alternative 1: No Project
- Alternative 2: Brine Discharge Pipeline

For each alternative, a brief description is included, followed by a summary impact analysis relative to the project, and an assessment of the degree to which the alternative would meet the goals and objectives of the project.

8.4.1 Alternative 1: No Project

Section 15126.6(e) of the *CEQA Guidelines* requires a "No Project" alternative be addressed in an EIR. Under this alternative, the proposed project would not be implemented. The land for the AWTF and brine management system would remain undeveloped and the conveyance pipelines would not be installed. The additional recharge of 4,000 AFY during Phase I and 15,000 AFY during Phase II into the Mountain Avenue West Recharge Basin would not occur.

8.4.1.1 Impact Analysis

The No Project Alternative would avoid the potentially significant environmental impacts identified for the project. Compared to the proposed project, all currently identified potentially significant impacts

related to biological resources, cultural resources and tribal cultural resources, hydrology and water quality, noise, and transportation would not occur under the No Project Alternative. In addition, although the proposed project would not result in potentially significant impacts associated with air pollutant emissions, GHG emissions, or energy use during construction, emissions and energy usage would be reduced under the No Project Alternative. Long-term impacts related to energy and GHG emissions, however, would increase under the No Project Alternative as water demand in the District's service area would increase, and without the additional recharge of water that would occur under the proposed project, energy and GHG emissions would increase from the increased conveyance of imported water. In addition, under the No Project Alternative, groundwater quality would not be improved; impacts related to groundwater quality would therefore increase compared to the proposed project.

8.4.1.2 Ability to Accomplish Project Objectives

The No Project Alternative would meet none of the project objectives. Without the proposed project, advanced treated water would not be produced and would not be combined with tertiary recycled water for recharge into, and replenishment of, the SJUPMZ. A long-term sustainable water supply for the District's service area would not be bolstered and water supply reliability during droughts and emergencies would not be increased. The amount of groundwater that can be pumped seasonally would not be increased through recharge and storage of a combination of advanced treated water and tertiary recycled water. This alternative would also not support the objectives of utilized recycled water in an environmentally responsible manner.

8.4.2 Alternative 2: Brine Discharge Pipeline

The Brine Discharge Pipeline Alternative would include the installation of a new approximately 7,350-linear-foot, 6-inch force main for the disposal of brine waste generated at the AWTF as part of the advanced water treatment process. The force main would connect from the AWTF south within the Sanderson Avenue right-of-way to the existing Sanderson Lift Station located on the west side of Sanderson Avenue, approximately 500 feet north of Cottonwood Avenue (see Figure 8-1, *Brine Discharge Pipeline Alternative*). From the Sanderson Lift Station, brine discharge flows would be conveyed south to the Cawston Lift Station located near the intersection of Cawston Avenue and Walden Weaver Road. From here, flows would be conveyed to the Perris Valley Regional Water Reclamation Facility (PVRWRF) via an existing gravity sewer. The brine management system proposed as part of the project would not be constructed. All other proposed facilities, including the AWTF, sliplined 18-inch pipeline, Alessandro Blending Station, and new 36-inch pipeline would remain the same under this alternative as the proposed project.

8.4.2.1 Impact Analysis

Agriculture and Forestry Resources

The Brine Discharge Pipeline Alternative would not include the brine management system and therefore would permanently convert less land mapped as Unique Farmland and Farmland of Statewide Importance and that is currently utilized for agricultural purposes to non-agricultural use compared to the proposed project. Impacts under the Brine Discharge Pipeline Alternative would be reduced but would remain less than significant.

Air Quality

The Brine Discharge Pipeline Alternative would avoid air pollutant emissions associated with grading and construction of the brine management system. Air pollutant emissions would still occur from installation of the force main, which would involve the use of heavy equipment for trenching, pipe install, trench backfilling, and repaving. Overall construction air pollutant emissions are anticipated to be less under the Brine Discharge Pipeline Alternative than the proposed project. Impacts to sensitive receptors could increase as construction of the force main under the Brine Discharge Pipeline Alternative would occur near a potential sensitive receptor (a single-family residence located on the east side of Sanderson Avenue), whereas construction of the brine management system would not occur in proximity to sensitive receptors. Due to the limited number of pieces of construction equipment anticipated to be required simultaneously for installation of the force main, impacts to sensitive receptors would likely remain less than significant. Odor impacts would be similar to the proposed project and would be less than significant.

Biological Resources

The Brine Discharge Pipeline Alternative would result in similar impacts to biological resources as the proposed project. While the brine management system would not be constructed, there are no potential impacts to sensitive vegetation communities associated with the brine management system that would be avoided under the Brine Discharge Pipeline Alternative. Impacts to sensitive vegetation communities would also not be increased as the force main proposed under the Brine Discharge Pipeline would be located within the roadway and would only impact developed land (refer to Table 3 and Figure 9 in Appendix C for a comparison of vegetation community/land cover impacts under the proposed project and under this alternative). Potential construction-related impacts to smooth tarplant, chaparral sand-verbena, nesting birds and raptors, and burrowing owl under the Brine Discharge Pipeline Alternative would remain the same as those under the proposed project, and mitigation would still be required, as project facilities would continue to be located proximate to habitat suitable for these sensitive wildlife species. Similarly, potential indirect impacts to jurisdictional features under the Brine Discharge Pipeline Alternative would be the same as those under the proposed project, and mitigation would still be required, because the project components in close proximity to potentially jurisdictional features (the 18-inch pipeline to be sliplined and the 36-inch pipeline) would continue to be included as part of the project under the Brine Discharge Pipeline Alternative. Similar to the proposed project, the Brine Discharge Pipeline Alternative would not result in significant impacts related to wildlife movement, local policies and ordinances, and adopted conservation plans (the MSHCP).

Cultural Resources

The Brine Discharge Pipeline Alternative would likely result in reduced potential impacts to unknown archaeological resources. The Brine Discharge Pipeline Alternative would not include the brine management system and therefore would avoid potential impacts to unknown resources that may be located at the brine management system site, which was unable to be surveyed due to active agricultural use. In addition, the force main proposed under the Brine Pipeline Discharge Alternative would be located within in roadway, where there is a lower likelihood that unknown resources are present due to prior disturbance; however, mitigation related to archaeological monitoring would still be required under this alternative. The force main proposed under the Brine Discharge Pipeline Alternative would intersect two known cultural resources, both of which are NRHP/CRHR eligible: the Casa Loma Siphon/Canal of the Colorado River Aqueduct (CA-RIV-6726H) and the San Diego Aqueduct

and San Diego Canal (CA-RIV-8195); however, because the force main would be located within the roadway, it is not anticipated to directly affect these resources. As with the proposed project, no impacts to historic resources are likely to occur under the Brine Discharge Pipeline Alternative.

Energy

The Brine Discharge Pipeline Alternative would avoid energy use associated with grading and construction of the brine management system. Energy would still be required for the installation of the force main, which would involve the use of heavy equipment for trenching, pipe install, trench backfilling, and repaving. Overall construction energy use is anticipated to be less under the Brine Discharge Pipeline Alternative than the proposed project. Operational energy use would vary slightly (associated with energy used for the force main instead of energy used for the pumps at the brine management system) but is anticipated to be similar to the proposed project. Energy savings associated with the reduced reliance on imported water conveyance would be the same as the proposed project as the annual recharge would be the remain the same under the Brine Discharge Pipeline Alternative.

Geology and Soils

The Brine Discharge Pipeline Alternative would result in similar impacts related to exposure to seismic hazards and geologic instability because the force main proposed under this alternative would be located in the same general area as the other project components (all of which except the brine management system would remain) and would be exposed to similar seismic hazards and geologic instability. As with the proposed project, construction under this alternative would implement project-specific geotechnical measures and conform with applicable regulatory/industry standards, in which case impacts would remain less than significant. Because the substantial amount of grading that would be required for the brine management system under the proposed project would not occur under the Brine Discharge Pipeline Alternative, potential impacts related to erosion and sedimentation would be reduced and would remain less than significant. Potential impacts to paleontological resources would also be reduced due to the reduced grading, but paleontological monitoring mitigation would still be required under this alternative.

Greenhouse Gas Emissions

The Brine Discharge Pipeline Alternative would avoid GHG emissions associated with grading and construction of the brine management system. GHG emissions would still occur from installation of the force main, which would involve the use of heavy equipment for trenching, pipe install, trench backfilling, and repaving. Overall construction GHG emissions are anticipated to be less under the Brine Discharge Pipeline Alternative than the proposed project. Operational GHG emissions would vary slightly (associated with energy used for the force main instead of energy used for the pumps at the brine management system) but are anticipated to be similar to the proposed project. GHG emissions savings associated with the reduced reliance on imported water conveyance would be the same as the proposed project as the annual recharge would be the remain the same under the Brine Discharge Pipeline Alternative.

Hydrology and Water Quality

The Brine Discharge Pipeline Alternative would result in similar potential impacts to water quality during construction as related to the use of hazardous materials (e.g., fuels, lubricants, and solvents); however, potential impacts to water quality as related to erosion and sedimentation would be reduced because

the substantial amount of grading that would be required for the brine management system under the proposed project would not occur under the Brine Discharge Pipeline Alternative. Similarly, because the brine management system would not be constructed under this alternative, impacts related to drainage would be reduced and would remain less than significant. Impacts associated with groundwater would remain the same because the Brine Discharge Pipeline Alternative would involve the same level of recharge into the groundwater table as the proposed project. Impacts would continue to be less than significant.

Noise

The Brine Discharge Pipeline Alternative would result in slightly increased potential noise impacts when compared to the proposed project. While no noise would be generated for construction of the brine management system under this alternative, no significant noise impacts were previously identified associated with construction of the brine management system due to the lack of NSLUs in the area. Construction activities associated with installation of the force main in Sanderson Avenue under this alternative would include trenching, pipeline installation, trench backfilling, and repaving, all of which would require heavy construction equipment that would generate noise. The single-family residence located along Sanderson Avenue adjacent to the force main alignment would be exposed to such noise. Mitigation to ensure construction occurs within the allowable hours specified in the City's Municipal Code would still be required. Impacts would be less than significant with the mitigation, as with the proposed project. Potential construction noise impacts to other NSLUs that would occur under the proposed project, specifically to the single-family residences along Ramona Expressway/SR 79, would remain the same under the Brine Discharge Pipeline Alternative. Similarly, operational noise generation would the same and would be less than significant.

Transportation

The Brine Discharge Pipeline Alternative would involve the same operational trip generation as the proposed project; therefore, operational impacts would be the same and would be less than significant. On-road haul truck activity during construction would also be similar to the proposed project under this alternative. The Brine Discharge Pipeline Alternative would, however, result in increased impacts to roadway circulation, traffic hazards, and emergency access due to the increased amount of construction work that would occur within the roadway right-of-way. In addition to the work within Ramona Expressway/SR 79 that would result in potentially significant impacts and require mitigation (as under the proposed project), installation of the force main included as part of the Brine Discharge Pipeline Alternative would occur within Sanderson Avenue and would require partial or full lane closures. As with the work in Ramona Expressway/SR 79, work within Sanderson Avenue would require mitigation in the form of a TCP to allow for continued roadway function and emergency access, as well as to avoid traffic-related hazards. With mitigation, impacts are anticipated to be less than significant, as under the proposed project.

8.4.2.2 Ability to Accomplish Project Objectives

The Brine Discharge Pipeline Alternative would accomplish all the objectives of the project. It would produce advanced treated water and combine it with tertiary recycled water for recharge into, and replenishment of, the SJUPMZ, thereby contributing to establishing a long-term sustainable water supply for the District's service area. Through this recharge it would provide increased water supply reliability during droughts and emergencies and it would increase the amount of groundwater that can

be pumped seasonally through recharge and storage of a combination of advanced treated water and tertiary recycled water. It would also utilize recycled water in an environmentally responsible manner by not discharging recycled water outside of the District's service area.

8.4.3 Summary

Table 8-1, *Summary of Analysis for Alternatives to the Project,* provides a summary of the impacts of the alternatives compared to the proposed project. A summary of how each alternative fulfills each of the project objectives is provided in Table 8-2, *Summary of the Project Objectives.*

Table 8-1
SUMMARY OF ANALYSIS FOR ALTERNATIVES TO THE PROJECT

Issue Area	Proposed Project Without Mitigation	Proposed Project With Mitigation	No Project Alternative	Brine Discharge Pipeline Alternative
4.1 Agricultural and Forestry Resources				
Prime Farmland, Unique Farmland, or Farmland of Statewide Importance	LS	LS	▼	▼
Williamson Act Contract	NI	NI	=	=
Zoning for Forest Land	NI	NI	=	=
Loss or Conversion of Forest Land	NI	NI	=	=
Conversion to Non-agricultural or Non-forest Use	LS	LS	▼	▼
4.2 Air Quality				
Conflicts with Air Quality Plans	LS	LS	▼	=
Air Quality Standards	LS	LS	▼	▼
Sensitive Receptors	LS	LS	▼	▲
Odors	LS	LS	▼	=
4.3 Biological Resources				
Sensitive Species	PS	LS	▼	=
Sensitive Habitats	NI	NI	=	=
Wetlands	PS	LS	▼	=
Wildlife Movement	LS	LS	▼	=
Local Policies	NI	NI	▼	=
Conservation Planning	NI	NI	▼	=
4.4 Cultural Resources and Tribal Cultural Resources				
Historical Resources	NI	NI	=	=
Archaeological Resources	PS	LS	▼	■
Human Remains	PS	LS	▼	■
Tribal Cultural Resources	PS	LS	▼	■
4.5 Energy				
Wasteful, Inefficient, or Unnecessary Energy Consumption	LS	LS	▲	▼
Conflict with Renewable Energy Plans	LS	LS	▲	▼

Table 8-1 (cont.)
SUMMARY OF ANALYSIS FOR ALTERNATIVES TO THE PROJECT

Issue Area	Proposed Project Without Mitigation	Proposed Project With Mitigation	No Project Alternative	Brine Discharge Pipeline Alternative
4.6 Geology and Soils				
Seismic Hazards	LS	LS	▼	=
Erosion and Sedimentation	LS	LS	▼	▼
Geologic Instability	LS	LS	▼	=
Expansive Soil	LS	LS	▼	=
Septic Tanks	NI	NI	=	=
Paleontological Resources	PS	LS	▼	■
4.7 Greenhouse Gas Emissions				
Greenhouse Gas Emissions	LS	LS	▼/▲	▼
Conflict with Plans and Policies	LS	LS	▼/▲	=
4.8 Hydrology and Water Quality				
Water Quality	LS	LS	▲	▼
Groundwater Supply	LS	LS	▲	=
Drainage	LS	LS	▼	▼
Flood Hazard Areas	LS	LS	▼	=
Water Quality Plans	LS	LS	▲	=
4.9 Noise				
Increase in Ambient Noise	PS	LS	▼	▲
Vibration	LS	LS	▼	=
Aircraft Noise	LS	LS	▼	=
4.10 Transportation				
Traffic Circulation	PS	LS	▼	▲
Vehicle Miles Traveled	LS	LS	▼	=
Hazardous Design Features	PS	LS	▼	▲
Emergency Access	PS	LS	▼	▲

▲ Alternative would result in an increased level of impact when compared to the proposed project
= Alternative would result in a similar level of impact when compared to proposed project
■ Alternative would result in a reduced level of impact when compared to the proposed project, but impacts would remain significant without mitigation.
▼ Alternative would result in a reduced level of impact when compared to proposed project and would not require mitigation.

PS = Potentially significant impact; LS = Less than significant impact; NI = No impact

Table 8-2
SUMMARY OF PROJECT OBJECTIVES

Project Objective	No Project Alternative	Brine Discharge Pipeline Alternative
Produce advanced treated water and combine it with tertiary recycled water for recharge into, and replenishment of, the SJUPMZ.	No	Yes
Contribute to establishing a long-term sustainable water supply for the District's service area.	No	Yes
Provide increased water supply reliability during droughts and emergencies.	No	Yes
Increase the amount of groundwater that can be pumped seasonally through recharge and storage of a combination of advanced treated water and tertiary recycled water.	No	Yes
Utilize recycled water in an environmentally responsible manner (i.e., no recycled water is discharged outside of the District's service area).	No	Yes

8.5 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

CEQA Guidelines Section 15126.6(e)(2) requires that an EIR identify the environmentally superior alternative among the alternatives that are evaluated. Under the No Project Alternative, the proposed project would not be implemented, and the alternative would therefore avoid potentially significant environmental impacts to biological resources, cultural resources and tribal cultural resources, geology and soils (paleontological resources), noise, and transportation identified for the proposed project. In the short term, the No Project alternative would result in reduced impacts related to construction with respect to air quality, energy, GHG emissions (despite impacts related to air quality, energy, and GHG emissions being less than significant under the proposed project), and hydrology and water quality. However, in the long term, regional benefits related to energy use and reduction in indirect GHG emissions from lowering the amount of water needed to be transported from Northern California would not be realized. Further, long-term benefits from improving groundwater quality would also not be achieved. In addition, the No Project Alternative would not meet any of the project objectives.

CEQA Guidelines Section 15126.6(e)(2) also requires that an EIR identify another alternative as environmentally superior, besides the No Project Alternative. In this case, the next environmentally superior alternative is the Brine Discharge Pipeline Alternative. The Brine Discharge Pipeline Alternative would still incur impacts related to construction and operation; however, impacts related to air quality, GHGs, and noise would be reduced due to less grading, which would result in reduced use of off-road heavy equipment and dust generation. While some impacts would occur closer to residences, such impacts are anticipated to be less than significant.

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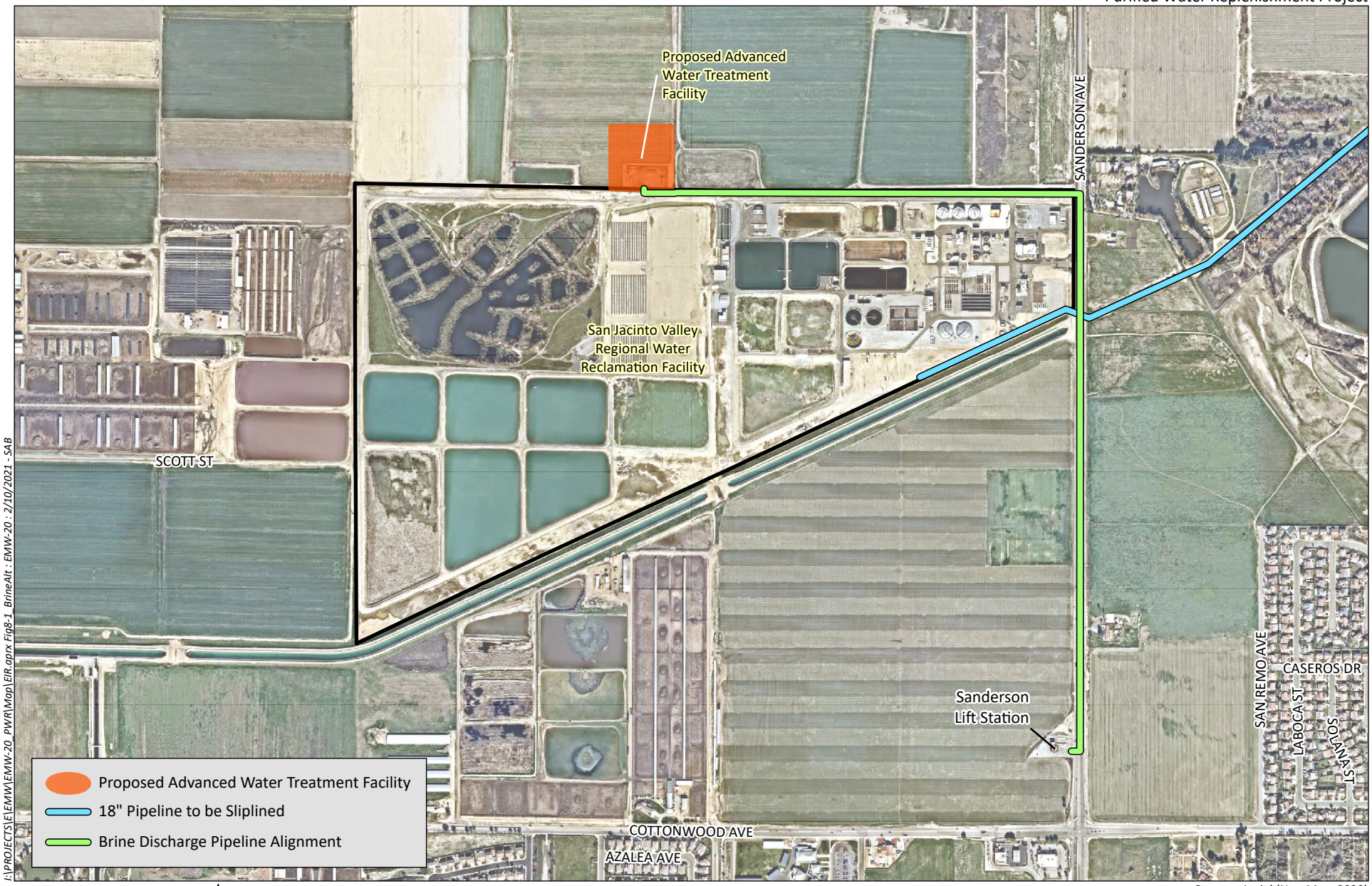

I:\PROJECTS\E\EMW\EMW-20_PWR\Map\EIR.aprx Fig8-1_BrineAlt : EMW-20 : 2/10/2021 - SAB

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Brine Discharge Pipeline Alternative

Figure 8-1

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Fermin Balvaneda, P.E.	Civil Engineer II

HELIX Environmental Planning, Inc.

EIR Preparation and Management

Andrea Bitterling	Principal-in-Charge
Joanne Dramko, AICP	Project Manager
Amy Mila de la Roca	Contract Manager, QA/QC
Hunter Stapp	Environmental Planner
Brendan Sullivan	Environmental Planner
Sean Bohac	GIS Specialist
Ana Topete	Document Specialist

Cultural Resources Survey

Mary Robbins-Wade, RPA	Cultural Resources Group Manager, QA/QC
Theodore G. Cooley, RPA	Senior Archaeologist
Julie Roy	Field Director

Biological Resources Technical Report

Karl Osmundson	Principal Biologist, QA/QC
Benjamin Rosenbaum	Biology Assistant Project Manager
Sean Bohac	GIS Specialist

Air Quality/Greenhouse Gas Technical Report

Victor Ortiz	Senior Air Quality Specialist
Martin Rolph	Air Quality Specialist
Hunter Stapp	Air Quality Analyst
Joanne Dramko, AICP	Senior Technical Specialist, QA/QC

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EIR Appendix A

NOP and Comments

Eastern Municipal Water District
2270 Trumble Road
P.O. Box 8300
Perris, CA 92572-8300

Notice of Preparation

Date:	**April 2, 2020**
To:	**State Clearinghouse; Responsible and Trustee Agencies; and Other Interested Parties**
Subject:	**Notice of Preparation of an Environmental Impact Report**
Project:	**Purified Water Replenishment Project**
Lead Agency:	**Eastern Municipal Water District**

Eastern Municipal Water District (District) intends to prepare an Environmental Impact Report (EIR) for the proposed Purified Water Replenishment Project (project). The District is the Lead Agency for the California Environmental Quality Act (CEQA). The District invites written comments on the scope of the environmental analysis and identification of potential environmental issues to be included in the EIR.

Notice of Preparation: This Notice of Preparation (NOP) has been sent to the Office of Planning and Research, responsible and trustee agencies, organizations, and interested parties, as well as adjacent property owners. The purpose of the NOP is to inform recipients that the District is beginning preparation of an EIR and to solicit information that will be helpful in the environmental review process. This notice includes information on how to provide comments to the District and a description of the project.

Comments: The District is requesting input from all CEQA responsible and trustee agencies, all other public agencies with jurisdiction by law over resources potentially affected by the proposed project, and public input regarding the scope and content of environmental information to be included in the EIR. Agency responses should identify the issues to be considered in the EIR, including significant environmental issues, alternatives, mitigation measures, and whether the responding agency will be a responsible or trustee agency, and the basis for that determination. State law mandates that responses must be sent at the earliest possible date but postmarked within 30 days from receipt of this notice; however, in light of the COVID-19 pandemic, which may limit ability for NOP review and comment and which has resulted in the District not being able to hold a scoping meeting, responses postmarked within 60 days from receipt of this notice, or no later than June 1, 2020, will be accepted. Please send your comments to:

Eastern Municipal Water District
Attn: Joseph Broadhead
2270 Trumble Road
Perris, CA 92570

or

EMWD_comments@helixepi.com

Location of the Proposed Project: The proposed project would occur at multiple locations predominantly within the city of San Jacinto, with one location just outside the eastern city limits in unincorporated Riverside County (Figure 1). The project's proposed aboveground facilities would be located adjacent to the northern boundary of the District's existing San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) at 770 North Sanderson Avenue and at the District's existing Alessandro Ponds site near the intersection of West Ramona Parkway and North Vernon Avenue. The project's belowground pipelines would follow a route northeast from the SJVRWRF in an unpaved roadway, northeast along North Lyon Avenue, and southeast along Ramona Expressway to the District's existing Mountain Avenue West Recharge Basin at the intersection of Ramona Expressway and East Esplanade Court (Figure 2).

Overview of the Proposed Project: The District is proposing to implement the project that would replenish the San Jacinto Upper Pressure Groundwater Management Zone aquifer with recycled water and advanced treated water to reduce reliance on imported water sources, provide improved drought resiliency, and potentially improve the quality of the groundwater basin utilized by the District's Integrated Recharge and Recovery Program (IRRP). The proposed project would include: (1) construction of Advanced Water Treatment (AWT) facilities; (2) construction of a brine management system; (3) construction of Alessandro Blending Station facilities; (4) modification of an existing 18-inch-diameter conveyance pipeline; and (5) construction of a new 36-inch-diameter conveyance pipeline.

The project's proposed AWT facilities would be constructed on an approximately 5-acre site located adjacent to the northern boundary of the existing SJVRWRF. The AWT site would include an approximately 30,300-square foot (SF) Process Control Center that would be divided into two main areas: a control area/visitor center and a process area. The control area/visitor center would include conference/meeting rooms, office space, an education room, and restrooms. The process area would house a membrane filtration (MF) facility and a high-recovery reverse osmosis (RO) facility that would be used for the advanced treatment of recycled water. Other proposed facilities at the AWT site outside of the Process Control Center building include a chemical facility, emergency generator, transformer, four new pump stations, paved access with parking, and two stormwater bioretention basins.

During operation of the AWT facilities, a portion of the tertiary treated recycled water produced at the SJVRWRF would be further treated through the new MF/RO process, which would reduce total organic carbon (TOC), totaled dissolved solids (TDS), and nitrogen concentrations creating advanced treated water, or what is referred to as *RO permeate*.

Concentrated brine generated during the RO process would be managed and stored using a system of five interconnected evaporation ponds that would be constructed on approximately 20 acres located north of the proposed AWT site. The ponds would be lined with a containment and monitoring system to prevent leaks and would include the use of mechanical spray evaporators to enhance natural evaporation.

Advanced treated water from the AWT site and tertiary treated recycled water from the SJVRWRF would be conveyed, via two separate pipelines, to the Alessandro Blending Station where they would be blended in-pipe before the combined flow is conveyed to the Mountain Avenue West Recharge Basin. The blending facility pipes, including the two inflow pipes, connection pipes, and one outflow pipe, would be located on a concrete equipment pad southeast of the existing pressure regulating station downstream of the Alessandro Pump Station. A pressure regulating valve would be provided at the blending facility for the option to discharge advanced treated water into the adjacent existing Alessandro Ponds forebay for operational storage.

The project would require pipelines to convey advanced treated water from the AWT site to the Alessandro Blending Station as well as blended water from the Alessandro Blending Station to the Mountain Avenue West Recharge Basin. Advanced treated water would be conveyed from the AWT site to the Alessandro Blending Station via an existing 4.1-mile (21,700-linear foot) 18-inch-diameter recycled water pipeline that extends east from the SJVRWRF to approximately the intersection of Alessandro Avenue North and Ramona Expressway. The existing cement-mortar-lined steel pipeline would be sliplined with new 16-inch-diameter high density polyethylene (HDPE) pipe. Blended water from the Alessandro Blending Station would be conveyed to the Mountain Avenue West Recharge Basin via a new approximately 2.7-mile (14,200-linear foot) 36-inch-diameter HDPE pipeline that would be located within the eastern shoulder of Ramona Expressway.

At the existing Mountain Avenue West Recharge Basin, the blended water would be stored, would percolate into the belowground aquifer, and would eventually be recovered for use as potable water.

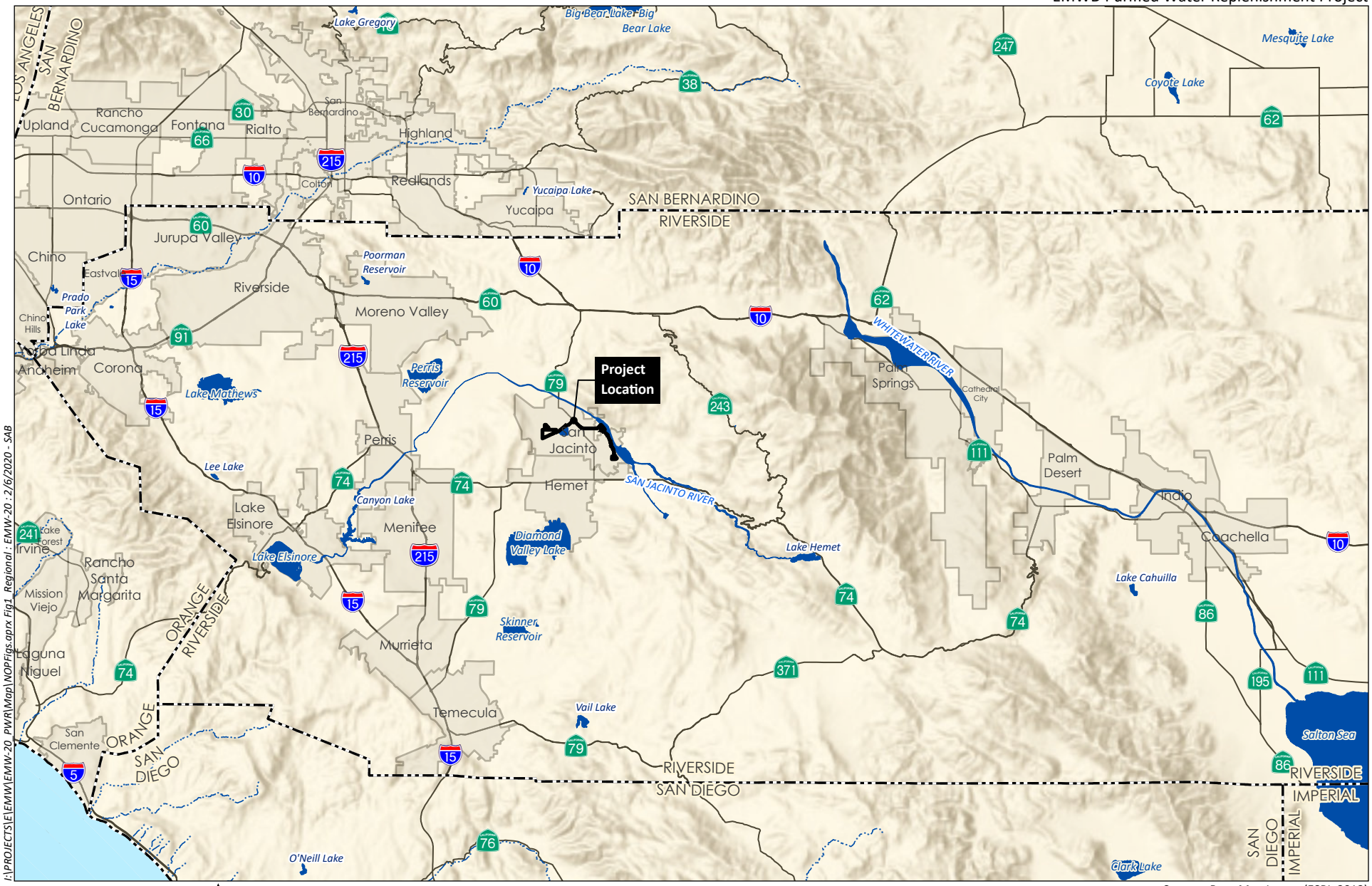
Potential Environmental Effects of the Proposed Project: In accordance with Section 15126 of the CEQA Guidelines, the EIR will assess the physical changes to the environment that would likely result from the construction and operation of the project, including direct, indirect, and cumulative impacts and growth-inducing

impacts. The EIR will provide an assessment of impacts for facilities and activities associated with project implementation (CEQA Guidelines Section 15161).

The District has determined that the proposed project may have the potential to significantly impact agricultural and forestry resources, air quality, biological resources, cultural resources and tribal cultural resources, energy, geology and soils, greenhouse gas (GHG) emissions, hydrology and water quality, noise, and transportation. These issue areas will be evaluated in detail in the Draft EIR. It is anticipated that all other issue areas will be discussed in the *Environmental Effects Found Not to be Significant* section of the Draft EIR. The EIR will identify mitigation measures if necessary and feasible to reduce potentially significant impacts of the proposed project. The EIR will also discuss alternatives to the proposed project, including the CEQA-required "No Project" alternative.

Attachments:

Figure 1: Regional Vicinity
Figure 2: Project Location

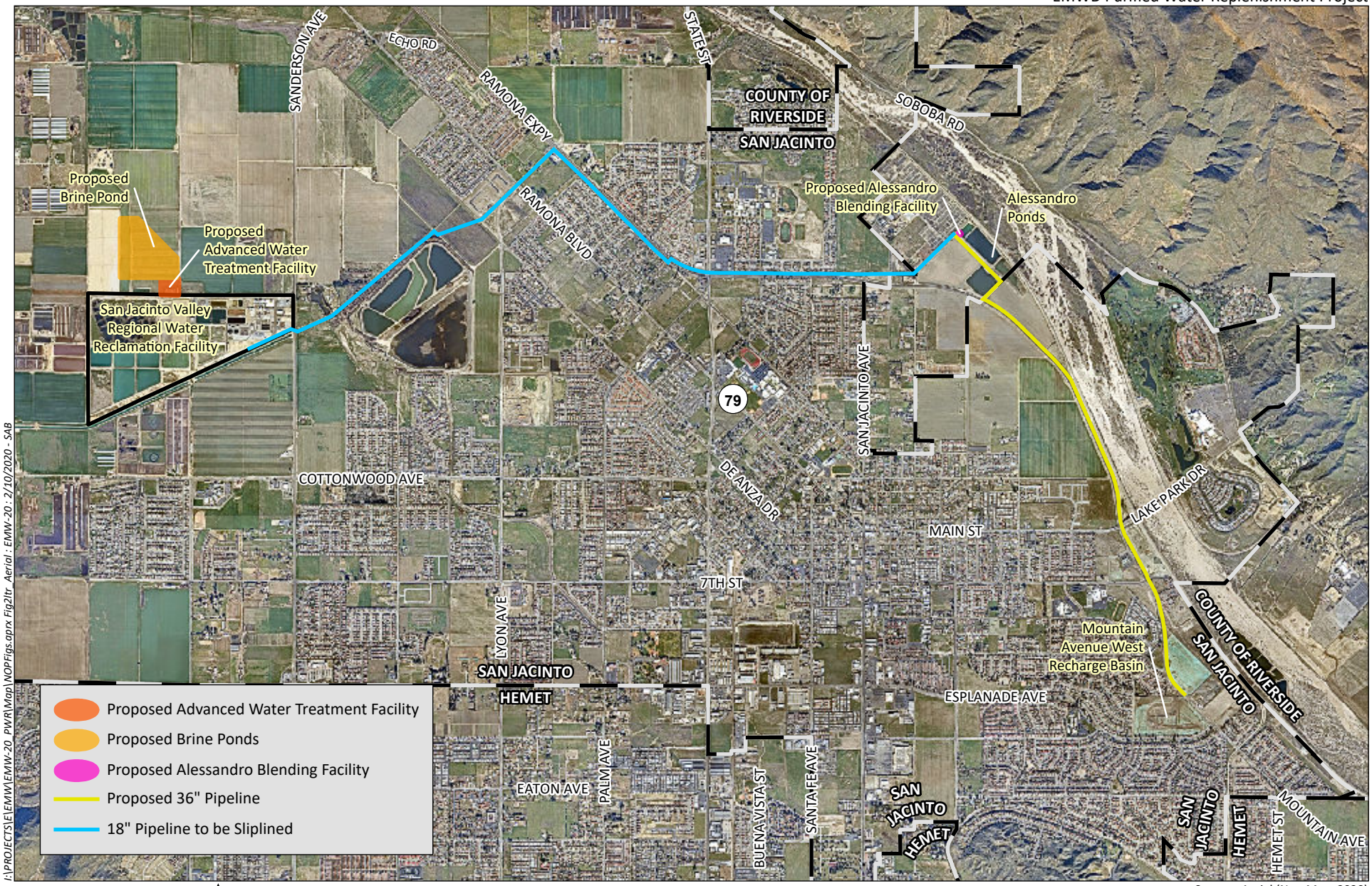


Source: Base Map Layers (ESRI, 2013)

HELIX Environmental Planning

Regional Location

Figure 1



I:\PROJECTS\E\EMW\EMW-20_PWR\Map\NOPFigs.aprx Fig2ltr_Aerial : EMW-20 : 2/10/2020 - SAB

0 3,500 Feet

N

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Project Location

Figure 2

Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH #

Project Title: Purified Water Replenishment Project

Lead Agency: Eastern Municipal Water District — Contact Person: Joseph Broadhead

Mailing Address: 2270 Trumble Road — Phone: 951-928-3777

City: Perris — Zip: 92570 — County: Riverside

Project Location: County: Riverside — City/Nearest Community: San Jacinto

Cross Streets: Facilities near Sanderson Avenue and Cottonwood Avenue; Pipelines within North Lyon Avenue, State Route 79, Ramona Expressway — Zip Code: 92582/92583

Longitude/Latitude (degrees, minutes and seconds): 117 ° 01 ′ 06 ″ N / 33 ° 48 ′ 02 ″ W Total Acres: 25

Assessor's Parcel No.: 432-030-009 — Section: 19 — Twp.: 4 South — Range: 1 West — Base: Lakeview

Within 2 Miles: State Hwy #: State Route 74; State Route 79 — Waterways: San Jacinto River

Airports: N/A — Railways: N/A — Schools: Numerous

Document Type:

CEQA: ☒ NOP ☐ Draft EIR — NEPA: ☐ NOI — Other: ☐ Joint Document
☐ Early Cons ☐ Supplement/Subsequent EIR ☐ EA ☐ Final Document
☐ Neg Dec (Prior SCH No.) ☐ Draft EIS ☐ Other:
☐ Mit Neg Dec Other: ☐ FONSI

Local Action Type:

☐ General Plan Update ☐ Specific Plan ☐ Rezone ☐ Annexation
☐ General Plan Amendment ☐ Master Plan ☐ Prezone ☐ Redevelopment
☐ General Plan Element ☐ Planned Unit Development ☐ Use Permit ☐ Coastal Permit
☐ Community Plan ☐ Site Plan ☐ Land Division (Subdivision, etc.) ☐ Other:

Development Type:

☐ Residential: Units ____ Acres ____
☐ Office: Sq.ft. ____ Acres ____ Employees ____
☐ Commercial: Sq.ft. ____ Acres ____ Employees ____
☐ Industrial: Sq.ft. ____ Acres ____ Employees ____
☐ Educational: ____
☐ Recreational: ____
☒ Water Facilities: Type Treatment facility/pipelines MGD 7.5
☐ Transportation: Type ____
☐ Mining: Mineral ____
☐ Power: Type ____ MW ____
☐ Waste Treatment: Type ____ MGD ____
☐ Hazardous Waste: Type ____
☐ Other: ____

Project Issues Discussed in Document:

☐ Aesthetic/Visual ☐ Fiscal ☐ Recreation/Parks ☒ Vegetation
☒ Agricultural Land ☐ Flood Plain/Flooding ☐ Schools/Universities ☒ Water Quality
☒ Air Quality ☐ Forest Land/Fire Hazard ☐ Septic Systems ☒ Water Supply/Groundwater
☒ Archeological/Historical ☒ Geologic/Seismic ☐ Sewer Capacity ☒ Wetland/Riparian
☒ Biological Resources ☐ Minerals ☒ Soil Erosion/Compaction/Grading ☒ Growth Inducement
☐ Coastal Zone ☒ Noise ☐ Solid Waste ☐ Land Use
☒ Drainage/Absorption ☐ Population/Housing Balance ☐ Toxic/Hazardous ☒ Cumulative Effects
☐ Economic/Jobs ☐ Public Services/Facilities ☒ Traffic/Circulation ☒ Other: Energy; GHG emssions

Present Land Use/Zoning/General Plan Designation:

Medium Density Residential; Low Density Residential; Public Institutional; Rural Residential; Public right-of-way

Project Description: *(please use a separate page if necessary)*

Please see attached document.

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

Reviewing Agencies Checklist

Lead Agencies may recommend State Clearinghouse distribution by marking agencies below with and "X".
If you have already sent your document to the agency please denote that with an "S".

X	Air Resources Board	S	Office of Historic Preservation
	Boating & Waterways, Department of		Office of Public School Construction
	California Emergency Management Agency		Parks & Recreation, Department of
	California Highway Patrol		Pesticide Regulation, Department of
S	Caltrans District # 8		Public Utilities Commission
	Caltrans Division of Aeronautics	S	Regional WQCB # 8
	Caltrans Planning	X	Resources Agency
	Central Valley Flood Protection Board		Resources Recycling and Recovery, Department of
	Coachella Valley Mtns. Conservancy		S.F. Bay Conservation & Development Comm.
	Coastal Commission		San Gabriel & Lower L.A. Rivers & Mtns. Conservancy
	Colorado River Board		San Joaquin River Conservancy
	Conservation, Department of		Santa Monica Mtns. Conservancy
	Corrections, Department of		State Lands Commission
	Delta Protection Commission	X	SWRCB: Clean Water Grants
	Education, Department of	X	SWRCB: Water Quality
	Energy Commission		SWRCB: Water Rights
S	Fish & Game Region # 6		Tahoe Regional Planning Agency
	Food & Agriculture, Department of		Toxic Substances Control, Department of
	Forestry and Fire Protection, Department of	X	Water Resources, Department of
	General Services, Department of		
	Health Services, Department of		Other:
	Housing & Community Development		Other:
S	Native American Heritage Commission		

Local Public Review Period (to be filled in by lead agency)

Starting Date April 2, 2020 Ending Date June 1, 2020

Lead Agency (Complete if applicable):

Consulting Firm: HELIX Environmental Planning, Inc.
Address: 7578 El Cajon Blvd.
City/State/Zip: La Mesa, CA 91942
Contact: Joanne Dramko
Phone: 619-462-1515

Applicant: Eastern Municipal Water District
Address: 2270 Trumble Road
City/State/Zip: Perris, CA 92570
Phone: 951-928-3777

Signature of Lead Agency Representative: _____ **Date:** 4/2/20

Authority cited: Section 21083, Public Resources Code. Reference: Section 21161, Public Resources Code.

Purified Water Replenishment Project

Summary

SCH Number	2020049002
Lead Agency	Eastern Municipal Water District
Document Title	Purified Water Replenishment Project
Document Type	NOP - Notice of Preparation
Received	4/1/2020
Project Applicant	Eastern Municipal Water District
Present Land Use	Medium Density Residential; Low Density Residential; Public Institutional; Rural Residential; Public right-of-way
Document Description	See attached
Contact Information	Joseph Broadhead Eastern Municipal Water District 2270 Trumble Road Perris , CA 92570 Phone : (951) 928-3777

Location

Coordinates	33°48'2"N 117°1'6"W
Cities	San Jacinto
Counties	Riverside
Cross Streets	Sanderson Avenue,Cottonwood Avenue, North Lyon Avenue, SR 79, Ramona Expressway
Zip	92582, -3
Total Acres	25
Parcel #	432-030-009
State Highways	SR 74, 79
Schools	Numerous
Waterways	San Jacinto River
Township	4S
Range	1W
Section	19
Base	Lakeview

Notice of Completion

Review Period Start 4/1/2020

Review Period End 4/30/2020

Development Type Water Facilities (Treatment Facility/Pipelines)(7.5 MGD)

Project Issues Agricultural Land, Air Quality, Archaeologic-Historic, Biological Resources, Drainage/Absorption, Geologic/Seismic, Noise, Soil Erosion/Compaction/Grading, Traffic/Circulation, Vegetation, Water Quality, Water Supply, Wetland/Riparian, Growth Inducing, Cumulative Effects, Energy; GHG emssions

Reviewing Agencies California Air Resources Board, California Coachella Valley Mountains Conservancy, California Department of Conservation, California Department of Fish and Wildlife, Inland Deserts Region 6, California Department of Forestry and Fire Protection, California Department of Parks and Recreation, California Department of Transportation, District 8, California Department of Water Resources, California Highway Patrol, California Native American Heritage Commission, California Natural Resources Agency, California Regional Water Quality Control Board, Santa Ana Region 8, California State Lands Commission, Office of Historic Preservation, State Water Resources Control Board, Division of Drinking Water, State Water Resources Control Board, Division of Drinking Water, District 20, State Water Resources Control Board, Division of Water Quality, State Water Resources Control Board, Divison of Financial Assistance

Attachments

Environmental Document NOP PDF 3898 K

NOC NOC PDF 1469 K

Disclaimer: The Governor's Office of Planning and Research (OPR) accepts no responsibility for the content or accessibility of these documents. To obtain an attachment in a different format, please contact the lead agency at the contact information listed above. You may also contact the OPR via email at state.clearinghouse@opr.ca.gov or via phone at (916) 445-0613 . For more information, please visit OPR's Accessibility Site .

THE PRESS-ENTERPRISE

1825 Chicago Ave, Suite 100
Riverside, CA 92507
951-684-1200
951-368-9018 FAX

PROOF OF PUBLICATION
(2010, 2015.5 C.C.P)

Publication(s): The Press-Enterprise

PROOF OF PUBLICATION OF

Ad Desc.: / EMW-20

I am a citizen of the United States. I am over the age of eighteen years and not a party to or interested in the above entitled matter. I am an authorized representative of THE PRESS-ENTERPRISE, a newspaper in general circulation, printed and published daily in the County of Riverside, and which newspaper has been adjudicated a newspaper of general circulation by the Superior Court of the County of Riverside, State of California, under date of April 25, 1952, Case Number 54446, under date of March 29, 1957, Case Number 65673, under date of August 25, 1995, Case Number 267864, and under date of September 16, 2013, Case Number RIC 1309013; that the notice, of which the annexed is a printed copy, has been published in said newspaper in accordance with the instructions of the person(s) requesting publication, and not in any supplement thereof on the following dates, to wit:

04/02/2020

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Date: April 02, 2020
At: Riverside, California

Legal Advertising Representative, The Press-Enterprise

EASTERN MUNICIPAL WATER DIST
PO BOX 8300
PERRIS, CA 92572

Ad Number: 0011376673-01

P.O. Number: EMW-20

Ad Copy:

Eastern Municipal Water District (District) intends to prepare an Environmental Impact Report (EIR) for the proposed Purified Water Replenishment Project (project). The District is the Lead Agency for the California Environmental Quality Act (CEQA). The District invites written comments on the scope of the environmental analysis and identification of potential environmental issues to be included in the EIR.

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Comments: The District is requesting input from all CEQA responsible and trustee agencies, all other public agencies with jurisdiction by law over resources potentially affected by the proposed project, and public input regarding the scope and content of environmental information to be included in the EIR. Agency responses should identify the issues to be considered in the EIR, including significant environmental issues, alternatives, mitigation measures, and whether the responding agency will be a responsible or trustee agency, and the basis for that determination. State law mandates that your responses must be sent at the earliest possible date but postmarked within 30 days from receipt of this notice; however, in light of the COVID-19 pandemic, which may limit ability for NOP review and comment and which has resulted in the District not being able to hold a scoping meeting, responses postmarked within 60 days from receipt of this notice, or no later than June 1, 2020, will be accepted. Please submit email comments to EMWD_comments@helixepi.com and written comments by mail to Eastern Municipal Water District, Attn: Joseph Broadhead, 2270 Trumble Road, Perris, CA 92570.
Project Location: The proposed project would occur at multiple locations predominantly within the city of San Jacinto, with one location just outside the eastern city limits in unincorporated Riverside County. The project's proposed aboveground facilities would be located adjacent to the northern boundary of the District's existing San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) at 770 North Sanderson Avenue and at the District's existing Alessandro Ponds site near the intersection of West Ramona Parkway and North Vernon Avenue. The project's belowground pipelines would follow a route northeast from the SJVRWRF in an unpaved roadway, northeast along North Lyon Avenue, and southeast along Ramona Expressway to the District's existing Mountain Avenue West Recharge Basin at the intersection of Ramona Expressway and East Esplanade Court.

Project Description: The District is proposing to implement the project that would replenish the San Jacinto Upper Pressure Groundwater Management Zone aquifer with recycled water and advanced treated water to reduce reliance on imported water sources, provide improved drought resiliency, and potentially improve the quality of the groundwater basin utilized by the District's Integrated Recharge and Recovery Program (IRRP). The proposed project would include: (1) construction of Advanced Water Treatment (AWT) facilities; (2) construction of a brine management system; (3) construction of Alessandro Blending Station facilities; (4) modification of an existing 18-inch-diameter conveyance pipeline; and (5) construction of a new 36-inch-diameter conveyance pipeline.

Potential Environmental Effects of the Proposed Project: In accordance with Section 15126 of the CEQA Guidelines, the EIR will assess the physical changes to the environment that would likely result from the construction and operation of the project, including direct, indirect, and cumulative impacts and growth-inducing impacts. The EIR will provide an assessment of impacts for facilities and activities associated with project implementation (CEQA Guidelines Section 15161).

The District has determined that the proposed project may have the potential to significantly impact agricultural and forestry resources, air quality, biological resources, cultural resources and tribal cultural resources, energy, geology and soils, greenhouse gas (GHG) emissions, hydrology and water quality, noise, and transportation. These issue areas will be evaluated in detail in the Draft EIR. It is anticipated that all other issue areas will be discussed in the Environmental Effects Found Not to be Significant section of the Draft EIR. The EIR will identify mitigation measures if necessary and feasible to reduce potentially significant impacts of the proposed project. The EIR will also discuss alternatives to the proposed project, including the CEQA-required "No Project" alternative.

4/02

NATIVE AMERICAN HERITAGE COMMISSION

4/30/2020 NOP

April 6, 2020

Governor's Office of Planning & Research

APR 10 2020

STATE CLEARINGHOUSE

Joseph Broadhead
Eastern Municipal Water District
2270 Trumble Road
Perris, CA 92570

Re: 2020049002, Purified Water Replenishment Project, Riverside County

Dear Mr. Broadhead:

The Native American Heritage Commission (NAHC) has received the Notice of Preparation (NOP), Draft Environmental Impact Report (DEIR) or Early Consultation for the project referenced above. The California Environmental Quality Act (CEQA) (Pub. Resources Code §21000 et seq.), specifically Public Resources Code §21084.1, states that a project that may cause a substantial adverse change in the significance of a historical resource, is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.1; Cal. Code Regs., tit.14, §15064.5 (b) (CEQA Guidelines §15064.5 (b)). If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, an Environmental Impact Report (EIR) shall be prepared. (Pub. Resources Code §21080 (d); Cal. Code Regs., tit. 14, § 5064 subd.(a)(1) (CEQA Guidelines §15064 (a)(1)). In order to determine whether a project will cause a substantial adverse change in the significance of a historical resource, a lead agency will need to determine whether there are historical resources within the area of potential effect (APE).

CEQA was amended significantly in 2014. Assembly Bill 52 (Gatto, Chapter 532, Statutes of 2014) (AB 52) amended CEQA to create a separate category of cultural resources, "tribal cultural resources" (Pub. Resources Code §21074) and provides that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment. (Pub. Resources Code §21084.2). Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource. (Pub. Resources Code §21084.3 (a)). **AB 52 applies to any project for which a notice of preparation, a notice of negative declaration, or a mitigated negative declaration is filed on or after July 1, 2015.** If your project involves the adoption of or amendment to a general plan or a specific plan, or the designation or proposed designation of open space, on or after March 1, 2005, it may also be subject to Senate Bill 18 (Burton, Chapter 905, Statutes of 2004) (SB 18). **Both SB 18 and AB 52 have tribal consultation requirements**. If your project is also subject to the federal National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (NEPA), the tribal consultation requirements of Section 106 of the National Historic Preservation Act of 1966 (154 U.S.C. 300101, 36 C.F.R. §800 et seq.) may also apply.

The NAHC recommends consultation with California Native American tribes that are traditionally and culturally affiliated with the geographic area of your proposed project as early as possible in order to avoid inadvertent discoveries of Native American human remains and best protect tribal cultural resources. Below is a brief summary of portions of AB 52 and SB 18 as well as the NAHC's recommendations for conducting cultural resources assessments.

Consult your legal counsel about compliance with AB 52 and SB 18 as well as compliance with any other applicable laws.

CHAIRPERSON
Laura Miranda
Luiseño

VICE CHAIRPERSON
Reginald Pagaling
Chumash

SECRETARY
Merri Lopez-Keifer
Luiseño

PARLIAMENTARIAN
Russell Attebery
Karuk

COMMISSIONER
Marshall McKay
Wintun

COMMISSIONER
William Mungary
Paiute/White Mountain Apache

COMMISSIONER
Joseph Myers
Pomo

COMMISSIONER
Julie Tumamait-Stenslie
Chumash

COMMISSIONER
[**Vacant**]

EXECUTIVE SECRETARY
Christina Snider
Pomo

NAHC HEADQUARTERS
1550 Harbor Boulevard
Suite 100
West Sacramento,
California 95691
(916) 373-3710
nahc@nahc.ca.gov
NAHC.ca.gov

AB 52

AB 52 has added to CEQA the additional requirements listed below, along with many other requirements:

1. Fourteen Day Period to Provide Notice of Completion of an Application/Decision to Undertake a Project: Within fourteen (14) days of determining that an application for a project is complete or of a decision by a public agency to undertake a project, a lead agency shall provide formal notification to a designated contact of, or tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, to be accomplished by at least one written notice that includes:

- **a.** A brief description of the project.
- **b.** The lead agency contact information.
- **c.** Notification that the California Native American tribe has 30 days to request consultation. (Pub. Resources Code §21080.3.1 (d)).
- **d.** A "California Native American tribe" is defined as a Native American tribe located in California that is on the contact list maintained by the NAHC for the purposes of Chapter 905 of Statutes of 2004 (SB 18). (Pub. Resources Code §21073).

2. Begin Consultation Within 30 Days of Receiving a Tribe's Request for Consultation and Before Releasing a Negative Declaration, Mitigated Negative Declaration, or Environmental Impact Report: A lead agency shall begin the consultation process within 30 days of receiving a request for consultation from a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project. (Pub. Resources Code §21080.3.1, subds. (d) and (e)) and prior to the release of a negative declaration, mitigated negative declaration or Environmental Impact Report. (Pub. Resources Code §21080.3.1(b)).

- **a.** For purposes of AB 52, "consultation shall have the same meaning as provided in Gov. Code §65352.4 (SB 18). (Pub. Resources Code §21080.3.1 (b)).

3. Mandatory Topics of Consultation If Requested by a Tribe: The following topics of consultation, if a tribe requests to discuss them, are mandatory topics of consultation:

- **a.** Alternatives to the project.
- **b.** Recommended mitigation measures.
- **c.** Significant effects. (Pub. Resources Code §21080.3.2 (a)).

4. Discretionary Topics of Consultation: The following topics are discretionary topics of consultation:

- **a.** Type of environmental review necessary.
- **b.** Significance of the tribal cultural resources.
- **c.** Significance of the project's impacts on tribal cultural resources.
- **d.** If necessary, project alternatives or appropriate measures for preservation or mitigation that the tribe may recommend to the lead agency. (Pub. Resources Code §21080.3.2 (a)).

5. Confidentiality of Information Submitted by a Tribe During the Environmental Review Process: With some exceptions, any information, including but not limited to, the location, description, and use of tribal cultural resources submitted by a California Native American tribe during the environmental review process shall not be included in the environmental document or otherwise disclosed by the lead agency or any other public agency to the public, consistent with Government Code §6254 (r) and §6254.10. Any information submitted by a California Native American tribe during the consultation or environmental review process shall be published in a confidential appendix to the environmental document unless the tribe that provided the information consents, in writing, to the disclosure of some or all of the information to the public. (Pub. Resources Code §21082.3 (c)(1)).

6. Discussion of Impacts to Tribal Cultural Resources in the Environmental Document: If a project may have a significant impact on a tribal cultural resource, the lead agency's environmental document shall discuss both of the following:

- **a.** Whether the proposed project has a significant impact on an identified tribal cultural resource.
- **b.** Whether feasible alternatives or mitigation measures, including those measures that may be agreed to pursuant to Public Resources Code §21082.3, subdivision (a), avoid or substantially lessen the impact on the identified tribal cultural resource. (Pub. Resources Code §21082.3 (b)).

7. Conclusion of Consultation: Consultation with a tribe shall be considered concluded when either of the following occurs:

a. The parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource; or

b. A party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached. (Pub. Resources Code §21080.3.2 (b)).

8. Recommending Mitigation Measures Agreed Upon in Consultation in the Environmental Document: Any mitigation measures agreed upon in the consultation conducted pursuant to Public Resources Code §21080.3.2 shall be recommended for inclusion in the environmental document and in an adopted mitigation monitoring and reporting program, if determined to avoid or lessen the impact pursuant to Public Resources Code §21082.3, subdivision (b), paragraph 2, and shall be fully enforceable. (Pub. Resources Code §21082.3 (a)).

9. Required Consideration of Feasible Mitigation: If mitigation measures recommended by the staff of the lead agency as a result of the consultation process are not included in the environmental document or if there are no agreed upon mitigation measures at the conclusion of consultation, or if consultation does not occur, and if substantial evidence demonstrates that a project will cause a significant effect to a tribal cultural resource, the lead agency shall consider feasible mitigation pursuant to Public Resources Code §21084.3 (b). (Pub. Resources Code §21082.3 (e)).

10. Examples of Mitigation Measures That, If Feasible, May Be Considered to Avoid or Minimize Significant Adverse Impacts to Tribal Cultural Resources:

a. Avoidance and preservation of the resources in place, including, but not limited to:

i. Planning and construction to avoid the resources and protect the cultural and natural context.

ii. Planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.

b. Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:

i. Protecting the cultural character and integrity of the resource.

ii. Protecting the traditional use of the resource.

iii. Protecting the confidentiality of the resource.

c. Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.

d. Protecting the resource. (Pub. Resource Code §21084.3 (b)).

e. Please note that a federally recognized California Native American tribe or a non-federally recognized California Native American tribe that is on the contact list maintained by the NAHC to protect a California prehistoric, archaeological, cultural, spiritual, or ceremonial place may acquire and hold conservation easements if the conservation easement is voluntarily conveyed. (Civ. Code §815.3 (c)).

f. Please note that it is the policy of the state that Native American remains and associated grave artifacts shall be repatriated. (Pub. Resources Code §5097.991).

11. Prerequisites for Certifying an Environmental Impact Report or Adopting a Mitigated Negative Declaration or Negative Declaration with a Significant Impact on an Identified Tribal Cultural Resource: An Environmental Impact Report may not be certified, nor may a mitigated negative declaration or a negative declaration be adopted unless one of the following occurs:

a. The consultation process between the tribes and the lead agency has occurred as provided in Public Resources Code §21080.3.1 and §21080.3.2 and concluded pursuant to Public Resources Code §21080.3.2.

b. The tribe that requested consultation failed to provide comments to the lead agency or otherwise failed to engage in the consultation process.

c. The lead agency provided notice of the project to the tribe in compliance with Public Resources Code §21080.3.1 (d) and the tribe failed to request consultation within 30 days. (Pub. Resources Code §21082.3 (d)).

The NAHC's PowerPoint presentation titled, "Tribal Consultation Under AB 52: Requirements and Best Practices" may be found online at: http://nahc.ca.gov/wp-content/uploads/2015/10/AB52TribalConsultation_CalEPAPDF.pdf

SB 18

SB 18 applies to local governments and requires local governments to contact, provide notice to, refer plans to, and consult with tribes prior to the adoption or amendment of a general plan or a specific plan, or the designation of open space. (Gov. Code §65352.3). Local governments should consult the Governor's Office of Planning and Research's "Tribal Consultation Guidelines," which can be found online at: https://www.opr.ca.gov/docs/09_14_05_Updated_Guidelines_922.pdf.

Some of SB 18's provisions include:

1. Tribal Consultation: If a local government considers a proposal to adopt or amend a general plan or a specific plan, or to designate open space it is required to contact the appropriate tribes identified by the NAHC by requesting a "Tribal Consultation List." If a tribe, once contacted, requests consultation the local government must consult with the tribe on the plan proposal. **A tribe has 90 days from the date of receipt of notification to request consultation unless a shorter timeframe has been agreed to by the tribe.** (Gov. Code §65352.3 (a)(2)).

2. No Statutory Time Limit on SB 18 Tribal Consultation. There is no statutory time limit on SB 18 tribal consultation.

3. Confidentiality: Consistent with the guidelines developed and adopted by the Office of Planning and Research pursuant to Gov. Code §65040.2, the city or county shall protect the confidentiality of the information concerning the specific identity, location, character, and use of places, features and objects described in Public Resources Code §5097.9 and §5097.993 that are within the city's or county's jurisdiction. (Gov. Code §65352.3 (b)).

4. Conclusion of SB 18 Tribal Consultation: Consultation should be concluded at the point in which:

- **a.** The parties to the consultation come to a mutual agreement concerning the appropriate measures for preservation or mitigation; or
- **b.** Either the local government or the tribe, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached concerning the appropriate measures of preservation or mitigation. (Tribal Consultation Guidelines, Governor's Office of Planning and Research (2005) at p. 18).

Agencies should be aware that neither AB 52 nor SB 18 precludes agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52 and SB 18. For that reason, we urge you to continue to request Native American Tribal Contact Lists and "Sacred Lands File" searches from the NAHC. The request forms can be found online at: http://nahc.ca.gov/resources/forms/.

NAHC Recommendations for Cultural Resources Assessments

To adequately assess the existence and significance of tribal cultural resources and plan for avoidance, preservation in place, or barring both, mitigation of project-related impacts to tribal cultural resources, the NAHC recommends the following actions:

1. Contact the appropriate regional California Historical Research Information System (CHRIS) Center (http://ohp.parks.ca.gov/?page_id=1068) for an archaeological records search. The records search will determine:

- **a.** If part or all of the APE has been previously surveyed for cultural resources.
- **b.** If any known cultural resources have already been recorded on or adjacent to the APE.
- **c.** If the probability is low, moderate, or high that cultural resources are located in the APE.
- **d.** If a survey is required to determine whether previously unrecorded cultural resources are present.

2. If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.

- **a.** The final report containing site forms, site significance, and mitigation measures should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum and not be made available for public disclosure.
- **b.** The final written report should be submitted within 3 months after work has been completed to the appropriate regional CHRIS center.

3. Contact the NAHC for:

a. A Sacred Lands File search. Remember that tribes do not always record their sacred sites in the Sacred Lands File, nor are they required to do so. A Sacred Lands File search is not a substitute for consultation with tribes that are traditionally and culturally affiliated with the geographic area of the project's APE.

b. A Native American Tribal Consultation List of appropriate tribes for consultation concerning the project site and to assist in planning for avoidance, preservation in place, or, failing both, mitigation measures.

4. Remember that the lack of surface evidence of archaeological resources (including tribal cultural resources) does not preclude their subsurface existence.

a. Lead agencies should include in their mitigation and monitoring reporting program plan provisions for the identification and evaluation of inadvertently discovered archaeological resources per Cal. Code Regs., tit. 14, §15064.5(f) (CEQA Guidelines §15064.5(f)). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American with knowledge of cultural resources should monitor all ground-disturbing activities.

b. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the disposition of recovered cultural items that are not burial associated in consultation with culturally affiliated Native Americans.

c. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the treatment and disposition of inadvertently discovered Native American human remains. Health and Safety Code §7050.5, Public Resources Code §5097.98, and Cal. Code Regs., tit. 14, §15064.5, subdivisions (d) and (e) (CEQA Guidelines §15064.5, subds. (d) and (e)) address the processes to be followed in the event of an inadvertent discovery of any Native American human remains and associated grave goods in a location other than a dedicated cemetery.

If you have any questions or need additional information, please contact me at my email address: Andrew.Green@nahc.ca.gov.

Sincerely,



Andrew Green
Staff Services Analyst

cc: State Clearinghouse

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STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY **GAVIN NEWSOM,** *Governor*

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

Governor's Office of Planning & Research

APR 15 2020

STATE CLEARINGHOUSE

April 14, 2020

Mr. Joseph Broadhead
Eastern Municipal Water District
2270 Trumble Road
Perris, California 92570

Notice of Completion and Environmental Document Transmittal for the Purified Water Replenishment Project
SCH# 2020049002
Riverside County

Dear Mr. Broadhead:

The Division of Safety of Dams (DSOD) has reviewed the Notice of Completion and Environmental Document Transmittal for Purified Water Replenishment Project. This project includes the construction of the Advanced Water Treatment facilities, a brine management system, the Alessandro Blending Station facilities, a new 36-inch-diameter conveyance pipeline, two stormwater bioretention basins, five evaporation ponds, and modification of an existing 18-in-diameter conveyance pipeline.

The project description does not provide enough information to make an accurate jurisdictional determination for the bioretention basins or evaporation ponds. Furthermore, it is unclear whether part or all the work will be subject to State jurisdiction for dam safety. Therefore, the Eastern Municipal Water District must submit preliminary plans for each of the proposed bioretention basins and evaporation ponds so that DSOD can make an accurate jurisdictional determination.

As defined in Sections 6002 and 6003, Division 3, of the California Water Code, dams 25 feet or higher with a storage capacity of more than 15 acre-feet, and dams higher than 6 feet with a storage capacity of 50 acre-feet or more are subject to State jurisdiction. The dam height is the vertical distance measured from the maximum possible water storage level to the downstream toe of the barrier.

If any of the dams are subject to State jurisdiction, a construction application, together with plans, specifications, and the appropriate filing fee, must be filed with DSOD for this project. All dam safety-related issues must be resolved prior to the approval of the application, and the work must be performed under the direction of a Civil Engineer registered in California. Erik Malvick, our Design Engineering Branch Chief, is responsible for the application process and can be reached at (916) 565-7840.

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If you have any questions or need additional information, you may contact Area Engineer Brandon Cruz at (916) 565-7829 or me at (916) 565-7827.

Sincerely,

Rick Draeger

Richard Draeger, Southern Regional Engineer
Field Engineering Branch
Division of Safety of Dams

cc: Governor's Office of Planning and Research
State Clearinghouse
state.clearinghouse.opr.ca.gov

JASON E. UHLEY
General Manager-Chief Engineer

1995 MARKET STREET
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www.rcflood.org

RIVERSIDE COUNTY FLOOD CONTROL
AND WATER CONSERVATION DISTRICT

April 30, 2020

Emailed this date to: EMWD_comments@helixepi.com

Mr. Joseph Broadhead
Eastern Municipal Water District
2270 Trumble Road
Perris, CA 92570

Dear Mr. Broadhead:

Re: Notice of Preparation of an Environmental Impact Report for the Purified Water Replenishment Project

This letter is written in response to the Notice of Preparation of an Environmental Impact Report (EIR) for the Purified Water Replenishment Project (project) received by the Riverside County Flood Control and Water Conservation District (District). The proposed project consists of the construction of new facilities including an advanced water treatment plant, a brine management system, a blending station, and extensive pipelaying throughout the city of San Jacinto and parts of unincorporated Riverside County. Eastern Municipal Water District is the Lead Agency for this project under the California Environmental Quality Act (CEQA). The District is tasked with effectively managing flood hazards to protect life and property within Western Riverside County.

The District has reviewed the environmental documents provided and has the following comments regarding this project:

1. Please be advised that the proposed project is located within the area of the District's San Jacinto Valley Master Drainage Plan (MDP). When fully implemented, these MDP facilities will provide adequate drainage and flood protection to critical parts of the San Jacinto Valley. The District's MDP facility maps can be viewed online at http://content.rcflood.org/MDPADP/. To obtain further information on the MDP and proposed facilities, please contact Mike Wong of the District's Planning Section at 951.955.1345. Some portions of the proposed project which may conflict with the MDP are, but are not limited to, Ramona Expressway (SJV Line J3), State Street (SJV Line H), Olmstead Street (SJV Line K), Casa Loma Canal at San Jacinto Reservoir (SJV North Line E), and at the proposed Brine Storage Ponds (SJV Y-9, Y-11).

2. The proposed project may impact existing District facilities including easements. Any work that involves District rights of way, easements, or facilities will require an encroachment permit from the District. Therefore, the District will likely be a CEQA Responsible Agency, and any potential impacts to District facilities should be considered in the EIR. To obtain further information on District encroachment permits and to find an application form, please refer to https://rcflood.org/I-Want-To/Services/Obtain-Encroachment-or-Access-Permit, or contact the District at 951.955.1200 and speak with encroachment permit staff to help confirm permit requirements.

3. The District is a permittee under the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). For purposes of procuring an encroachment permit or other District approval, the project proponent will need to demonstrate that all project related activities within District right of way/easement is consistent with the MSHCP. To accomplish this, the CEQA document should include an MSHCP consistency report with all of its supporting documents and provide mitigation, as needed, in accordance with all applicable MSHCP requirements. The MSHCP consistency report should address, at a minimum, Sections 6.1.2, 6.1.3, 6.1.4, 6.3.2, 7.3.7, 7.5.3, and Appendix C of the MSHCP. It should be noted that portions of the proposed project would be constructed and operated within survey areas currently included in the MSHCP.

If you have any questions or need additional information regarding the comments on this letter, please contact Sean Berriman at 951.955.1242 or me at 951.955.1526.

Very truly yours,

KEVIN CUNNINGHAM
Senior Flood Control Planner

SB:mcv
P8\231067

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Inland Deserts Region
3602 Inland Empire Blvd., Suite C-220
Ontario, CA 91764
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director

June 1, 2020
Sent via email

Mr. Joseph Broadhead
Eastern Municipal Water District
2270 Trumble Road
Perris, CA 92570
EMWD_comments@helixepi.com

Subject: Notice of Preparation of a Draft Program Environmental Impact Report
Eastern Municipal Water District
Purified Water Replenishment Project
State Clearinghouse No. 2020049002

Dear Mr. Broadhead:

The California Department of Fish and Wildlife (CDFW) received a Notice of Preparation (NOP) of a Draft Program Environmental Impact Report (DPEIR) from Eastern Municipal Water District (EMWD) for the Purified Water Replenishment Project (Project) pursuant the California Environmental Quality Act (CEQA) and CEQA Guidelines.[1]

Thank you for the opportunity to provide comments and recommendations regarding those activities involved in the Project that may affect California fish and wildlife. Likewise, we appreciate the opportunity to provide comments regarding those aspects of the Project that CDFW, by law, may be required to carry out or approve through the exercise of its own regulatory authority under the Fish and Game Code.

CDFW ROLE

CDFW is California's Trustee Agency for fish and wildlife resources, and holds those resources in trust by statute for all the people of the State. (Fish & G. Code, §§ 711.7, subd. (a) & 1802; Pub. Resources Code, § 21070; CEQA Guidelines § 15386, subd. (a).) CDFW, in its trustee capacity, has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species. (*Id.*, § 1802.) Similarly, for purposes of CEQA, CDFW is charged by law to provide, as available, biological expertise during

[1] CEQA is codified in the California Public Resources Code in section 21000 et seq. The "CEQA Guidelines" are found in Title 14 of the California Code of Regulations, commencing with section 15000.

public agency environmental review efforts, focusing specifically on projects and related activities that have the potential to adversely affect fish and wildlife resources.

CDFW is also submitting comments as a Responsible Agency under CEQA. (Pub. Resources Code, § 21069; CEQA Guidelines, § 15381.) CDFW expects that it may need to exercise regulatory authority as provided by the Fish and Game Code. As proposed, for example, the Project may be subject to CDFW's lake and streambed alteration regulatory authority. (Fish & G. Code, § 1600 et seq.) Likewise, to the extent implementation of the Project as proposed may result in "take" as defined by State law of any species protected under the California Endangered Species Act (CESA) (Fish & G. Code, § 2050 et seq.), the Project proponent may seek related take authorization as provided by the Fish and Game Code.

PROJECT DESCRIPTION SUMMARY

The Project proposes to replenish the San Jacinto Upper Pressure Groundwater Management Zone aquifer with recycled water and advanced treated water to reduce reliance on imported water, provide improved drought resiliency, and potentially improve the quality of the groundwater basin. Project elements will include: (1) construction of advanced water treatment facilities, (2) construction of a brine management system, (3) construction of Alessandro blending station facilities, (4) modification of an existing 18-inch diameter conveyance pipeline, and (5) construction of a new 36-inch diameter conveyance pipeline. The Project will occur at multiple locations predominately within the City of San Jacinto, and in unincorporated Riverside County. Aboveground facilities will be constructed at two of EMWD's existing facilities (San Jacinto Valley Regional Water Reclamation Facility and the Alessandro Ponds). Belowground pipelines will be constructed under existing roadways to the maximum extent practicable.

COMMENTS AND RECOMMENDATIONS

CDFW offers the comments and recommendations below to assist EMWD in adequately identifying and/or mitigating the Project's significant, or potentially significant, direct and indirect impacts on fish and wildlife (biological) resources. The comments and recommendations are also offered to enable CDFW to adequately review and comment on the proposed Project with respect to the Project's consistency with the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP).

CDFW recommends that the forthcoming DEIR address the following:

Assessment of Biological Resources

Section 15125(c) of the CEQA Guidelines states that knowledge of the regional setting of a project is critical to the assessment of environmental impacts and that special emphasis should be placed on environmental resources that are rare or unique to the

region. To enable CDFW staff to adequately review and comment on the Project, the DEIR should include a complete assessment of the flora and fauna within and adjacent to the Project footprint, with particular emphasis on identifying rare, threatened, endangered, and other sensitive species and their associated habitats.

CDFW recommends that the DEIR specifically include:

1. An assessment of the various habitat types located within the Project footprint, and a map that identifies the location of each habitat type. CDFW recommends that floristic, alliance- and/or association-based mapping and assessment be completed following *The Manual of California Vegetation*, second edition (Sawyer et al. 2009[2]). Adjoining habitat areas should also be included in this assessment where site activities could lead to direct or indirect impacts offsite. Habitat mapping at the alliance level will help establish baseline vegetation conditions.

2. A general biological inventory of the fish, amphibian, reptile, bird, and mammal species that are present or have the potential to be present within each habitat type onsite and within adjacent areas that could be affected by the Project. CDFW's California Natural Diversity Database (CNDDB) in Sacramento should be contacted at (916) 322-2493 or CNDDB@wildlife.ca.gov to obtain current information on any previously reported sensitive species and habitat, including Significant Natural Areas identified under Chapter 12 of the Fish and Game Code, in the vicinity of the proposed Project.

   Please note that CDFW's CNDDB is not exhaustive in terms of the data it houses, nor is it an absence database. CDFW recommends that it be used as a starting point in gathering information about the *potential presence* of species within the general area of the Project site.

3. A complete, *recent* inventory of rare, threatened, endangered, and other sensitive species located within the Project footprint and within offsite areas with the potential to be effected, including California Species of Special Concern (CSSC) and California Fully Protected Species (Fish and Game Code § 3511). Species to be addressed should include all those which meet the CEQA definition (CEQA Guidelines § 15380). The inventory should address seasonal variations in use of the Project area and should not be limited to resident species. Focused species-specific surveys, completed by a qualified biologist and conducted at the appropriate time of

[2] Sawyer, J. O., T. Keeler-Wolf, and J. M. Evens. 2009. A manual of California Vegetation, 2nd ed. California Native Plant Society Press, Sacramento, California. http://vegetation.cnps.org/

year and time of day when the sensitive species are active or otherwise identifiable, are required. Acceptable species-specific survey procedures should be developed in consultation with CDFW and the U.S. Fish and Wildlife Service (USFWS), where necessary. Note that CDFW generally considers biological field assessments for wildlife to be valid for a one-year period, and assessments for rare plants may be considered valid for a period of up to three years. Some aspects of the proposed Project may warrant periodic updated surveys for certain sensitive taxa, particularly if the Project is proposed to occur over a protracted time frame, or in phases, or if surveys are completed during periods of drought.

4. A thorough, recent, floristic-based assessment of special status plants and natural communities, following CDFW's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (CDFW 2018)[3];

5. Information on the regional setting that is critical to an assessment of environmental impacts, with special emphasis on resources that are rare or unique to the region (CEQA Guidelines § 15125[c]).

6. A full accounting of all mitigation/conservation lands within and adjacent to the Project.

Analysis of Direct, Indirect, and Cumulative Impacts to Biological Resources

The DEIR should provide a thorough discussion of the direct, indirect, and cumulative impacts expected to affect biological resources as a result of the Project. To ensure that project impacts to biological resources are fully analyzed, the following information should be included in the DEIR:

1. A discussion of potential impacts from lighting, noise, human activity (e.g., recreation), defensible space, and wildlife-human interactions created by Project activities adjacent to natural areas, exotic and/or invasive species, and drainage. The latter subject should address Project-related changes on drainage patterns and water quality within, upstream, and downstream of the Project site, including: volume, velocity, and frequency of existing and post-Project surface flows; polluted runoff; soil erosion and/or sedimentation in streams and water bodies; and post-Project fate of runoff from the Project site.

2. A discussion of potential indirect Project impacts on biological resources, including resources in areas adjacent to the Project footprint, such as adjacent natural habitats,

[3] California Department of Fish and Wildlife (CDFW). 2018. Protocols for Surveying and Evaluating Impacts to Special Status Native Plan Populations and Sensitive Natural Communities. State of California, Natural Resources Agency. Available for download at: https://wildlife.ca.gov/Conservation/Plants

riparian ecosystems, wildlife corridors, and any designated and/or proposed reserve or conservation/mitigation lands (e.g., preserved lands associated with a Natural Community Conservation Plan, or other conserved lands).

3. An evaluation of impacts to adjacent open space/conserved lands from both the Project and long-term operational and maintenance needs.

4. A cumulative effects analysis developed as described under CEQA Guidelines § 15130. CDFW recommends that the DEIR analyze the cumulative effects of the Project on the environment. Please include all potential direct and indirect Project related impacts to riparian areas, wetlands, vernal pools, alluvial fan habitats, wildlife corridors or wildlife movement areas, aquatic habitats, sensitive species and other sensitive habitats, open lands, open space, and adjacent natural habitats in the cumulative effects analysis.

Alternatives Analysis

CDFW recommends that the DEIR describe and analyze a range of reasonable alternatives to the Project that are potentially feasible, would "feasibly attain most of the basic objectives of the Project," and would avoid or substantially lessen any of the Project's significant effects (CEQA Guidelines § 15126.6[a]).

Mitigation Measures for Project Impacts to Biological Resources

CDFW recommends that the DEIR identify mitigation measures and alternatives that are appropriate and adequate to avoid or minimize potential impacts, to the extent feasible. EMWD should assess all direct, indirect, and cumulative impacts that are expected to occur as a result of the implementation of the Project and its long-term operation and maintenance. When proposing measures to avoid, minimize, or mitigate impacts, CDFW recommends consideration of the following:

1. *Fully Protected Species*: Fully protected species may not be taken or possessed at any time. Project activities described in the DEIR should be designed to completely avoid any fully protected species that have the potential to be present within or adjacent to the Project area. CDFW also recommends that the DEIR fully analyze potential adverse impacts to fully protected species due to habitat modification, loss of foraging habitat, and/or interruption of migratory and breeding behaviors. CDFW recommends that EMWD include in the analysis how appropriate avoidance, minimization, and mitigation measures will reduce indirect impacts to fully protected species.

2. *Sensitive Plant Communities*: CDFW considers sensitive plant communities to be imperiled habitats having both local and regional significance. Plant communities, alliances, and associations with a statewide ranking of S-1, S-2, S-3, and S-4 should

be considered sensitive and declining at the local and regional level. These ranks can be obtained by querying the CNDDB and are included in *The Manual of California Vegetation* (Sawyer et al. 2009). The DEIR should include measures to fully avoid and otherwise protect sensitive plant communities from Project-related direct and indirect impacts.

3. *California Species of Special Concern* (CSSC): CSSC status applies to animals generally not listed under the federal Endangered Species Act or the CESA, but which nonetheless are declining at a rate that could result in listing, or historically occurred in low numbers and known threats to their persistence currently exist. CSSCs should be considered during the environmental review process.

4. *Mitigation*: CDFW considers adverse Project-related impacts to sensitive species and habitats to be significant to both local and regional ecosystems, and the DEIR should include mitigation measures for adverse Project-related impacts to these resources. Mitigation measures should emphasize avoidance and reduction of project impacts. For unavoidable impacts, habitat restoration and/or enhancement, and preservation should be evaluated and discussed in detail.

   The DEIR should include measures to perpetually protect the targeted habitat values within mitigation areas from direct and indirect adverse impacts in order to meet mitigation objectives to offset Project-induced qualitative and quantitative losses of biological values. Specific issues that should be addressed include restrictions on access, proposed land dedications, long-term monitoring and management programs, control of illegal dumping, water pollution, increased human intrusion, etc.

   If sensitive species and/or their habitat may be impacted from the Project, CDFW recommends the inclusion of specific mitigation in the DEIR. CEQA Guidelines §15126.4, subdivision (a)(1)(8) states that formulation of feasible mitigation measures should not be deferred until some future date. The Court of Appeal in *San Joaquin Raptor Rescue Center* v. *County* of *Merced* (2007) 149 Cal.App.4th 645 struck down mitigation measures which required formulating management plans developed in consultation with State and Federal wildlife agencies after Project approval. Courts have also repeatedly not supported conclusions that impacts are mitigable when essential studies, and therefore impact assessments, are incomplete *(Sundstrom* v. *County* of *Mendocino* (1988) 202 Cal. App. 3d. 296; *Gentry* v. *City* of *Murrieta (1995)* 36 Cal. App. 4th 1359; *Endangered Habitat League, Inc.* v. *County* of *Orange* (2005) 131 Cal. App. 4th 777).

   CDFW recommends that the DEIR specify mitigation that is roughly proportional to the level of impacts, in accordance with the provisions of CEQA (CEQA Guidelines, §§ 15126.4(a)(4)(B), 15064, 15065, and 16355). The mitigation should provide long-term conservation value for the suite of species and habitat being impacted by the Project. Furthermore, for mitigation measures to be effective, they should be

specific, enforceable, and feasible actions that will improve environmental conditions.

5. *Habitat Revegetation/Restoration Plans*: Plans for restoration and revegetation should be prepared by persons with expertise in southern California ecosystems and native plant restoration techniques. Plans should identify the assumptions used to develop the proposed restoration strategy. Each plan should include, at a minimum: (a) the location of restoration sites and assessment of appropriate reference sites; (b) the plant species to be used, sources of local propagules, container sizes, and seeding rates; (c) a schematic depicting the mitigation area; (d) a local seed and cuttings and planting schedule; (e) a description of the irrigation methodology; (f) measures to control exotic vegetation on site; (g) specific success criteria; (h) a detailed monitoring program; (i) contingency measures should the success criteria not be met; and (j) identification of the party responsible for meeting the success criteria and providing for conservation of the mitigation site in perpetuity. Monitoring of restoration areas should extend across a sufficient time frame to ensure that the new habitat is established, self-sustaining, and capable of surviving drought.

   CDFW recommends that local onsite propagules from the Project area and nearby vicinity be collected and used for restoration purposes. Onsite seed collection should be initiated in the near future in order to accumulate sufficient propagule material for subsequent use in future years. Onsite vegetation mapping at the alliance and/or association level should be used to develop appropriate restoration goals and local plant palettes. Reference areas should be identified to help guide restoration efforts. Specific restoration plans should be developed for various Project components as appropriate.

   Restoration objectives should include protecting special habitat elements or re-creating them in areas affected by the Project.

6. *Nesting Birds and Migratory Bird Treaty Act:* Please note that it is the Project proponent's responsibility to comply with all applicable laws related to nesting birds and birds of prey. Fish and Game Code sections 3503, 3503.5, and 3513 afford protective measures as follows: Fish and Game Code section 3503 makes it unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by Fish and Game Code or any regulation made pursuant thereto. Fish and Game Code section 3503.5 makes it unlawful to take, possess, or destroy any birds in the orders Falconiformes or Strigiformes (birds-of-prey) to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by Fish and Game Code or any regulation adopted pursuant thereto. Fish and Game Code section 3513 makes it unlawful to take or possess any migratory nongame bird as designated in the Migratory Bird Treaty Act or any part of such migratory nongame bird except as provided by rules and regulations adopted by the Secretary of the Interior under provisions of the Migratory Treaty Act.

CDFW recommends that the DEIR include specific avoidance and minimization measures to ensure that impacts to nesting birds do not occur. Avoidance and minimization measures may include, but not be limited to: project phasing and timing, monitoring of project-related noise (where applicable), sound walls, and buffers, where appropriate. The DEIR should also include specific avoidance and minimization measures that will be implemented should a nest be located within the Project site. If pre-construction surveys are proposed in the DEIR, CDFW recommends that they be required no more than three (3) days prior to vegetation clearing or ground disturbance activities, as instances of nesting could be missed if surveys are conducted sooner.

California Endangered Species Act

CDFW is responsible for ensuring appropriate conservation of fish and wildlife resources including threatened, endangered, and/or candidate plant and animal species, pursuant to CESA. CDFW recommends that a CESA Incidental Take Permit (ITP) be obtained if the Project has the potential to result in "take" (California Fish and Game Code Section 86 defines "take" as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill") of State-listed CESA species, either through construction or over the life of the Project; unless this Project is proposed to be a covered activity under the MSHCP. CESA ITPs are issued to conserve, protect, enhance, and restore State-listed CESA species and their habitats.

Please note that San Bernardino kangaroo rat (*Dipodomys merriami parvus*, SBKR) has been documented within and/or adjacent to the Project alignment and footprint areas. SBKR is a candidate species (Fish & G. Code, § 2068) for listing under CESA and is therefore currently afforded the full protection of CESA. Because SBKR has been documented from within/adjacent to the Project area, CDFW recommends that EMWD obtain a CESA ITP prior to Project initiation.

CDFW encourages early consultation, as significant modification to the proposed Project and avoidance, minimization, and mitigation measures may be necessary to obtain a CESA ITP. The California Fish and Game Code requires that CDFW comply with CEQA for issuance of a CESA ITP. CDFW therefore recommends that the DEIR addresses all Project impacts to listed species and specifies a mitigation monitoring and reporting program that will meet the requirements of CESA.

Western Riverside County Multiple Species Habitat Conservation Plan

CDFW issued Natural Community Conservation Plan Approval and Take Authorization for the Western Riverside County MSHCP per Section 2800, *et seq*., of the California Fish and Game Code on June 22, 2004. The MSHCP establishes a multiple species conservation program to minimize and mitigate habitat loss and provides for the

incidental take of covered species in association with activities covered under the permit.

Compliance with approved habitat plans, such as the MSHCP, is discussed in CEQA. Specifically, Section 15125(d) of the CEQA Guidelines requires that the CEQA document discuss any inconsistencies between a proposed Project and applicable general plans and regional plans, including habitat conservation plans and natural community conservation plans. An assessment of the impacts to the MSHCP as a result of this Project is necessary to address CEQA requirements. To obtain additional information regarding the MSHCP please go to: http://rctlma.org/epd/WR-MSHCP.

The proposed Project occurs within the MSHCP area. EMWD is the lead agency but is not signatory to the MSHCP, therefore, in order to participate in the MSHCP EMWD will need to act as a Participating Special Entity (PSE). If EMWD chooses to act as a PSE and obtain take through the MSHCP then the following MSHCP policies and procedures may apply to this Project: Protection of Species Associated with Riparian/Riverine Areas and Vernal Pools (MSHCP Section 6.1.2), Protection of the Narrow Endemic Plant Species (MSHCP Section 6.1.3), Additional Survey Needs and procedures (MSHCP section 6.3.2), and Urban/Wildland Interface Guidelines (MSHCP section 6.1.4). If the Project is not processed through the MSHCP for covered species, then the Project may be subject to the Federal Endangered Species Act (FESA) and/or CESA for threatened, endangered, and/or candidate species.

Regardless of whether take of threatened and/or endangered species is obtained through the MSHCP or through a CESA ITP, the DEIR needs to address how the proposed Project will affect the policies and procedures of the MSHCP.

Lake and Streambed Alteration Program

Based on review of the Project alignment, CDFW is uncertain if the Project will be subject to Notification to CDFW pursuant to Fish and Game Code section 1602. To ensure compliance with Fish and Game Code section 1602 CDFW recommends that EMWD condition the DEIR to include a mitigation measure for consultation with CDFW to determine if Fish and Game Code section 1600 *et seq*. resources may occur within a proposed Project alignment. Fish and Game Code section 1602 requires an entity to notify CDFW prior to commencing any activity that may do one or more of the following: substantially divert or obstruct the natural flow of any river, stream or lake; substantially change or use any material from the bed, channel or bank of any river, stream, or lake; or deposit debris, waste or other materials that could pass into any river, stream or lake. Please note that "any river, stream or lake" includes those that are episodic (i.e., those that are dry for periods of time) as well as those that are perennial (i.e., those that flow year-round). This includes ephemeral streams, desert washes, and watercourses with a subsurface flow. It may also apply to work undertaken within the flood plain of a body of water.

Upon receipt of a complete notification, CDFW determines if the proposed Project activities may substantially adversely affect existing fish and wildlife resources and whether a Lake and Streambed Alteration (LSA) Agreement is required. An LSA Agreement includes measures necessary to protect existing fish and wildlife resources. CDFW may suggest ways to modify the project that would eliminate or reduce harmful impacts to fish and wildlife resources.

CDFW's issuance of an LSA Agreement is a "project" subject to CEQA (see Pub. Resources Code, § 21065). To facilitate issuance of an LSA Agreement, if necessary, the DEIR should fully identify the potential impacts to the lake, stream, or riparian resources, and provide adequate avoidance, mitigation, and monitoring and reporting commitments. Early consultation with CDFW is recommended, since modification of the proposed Project may be required to avoid or reduce impacts to fish and wildlife resources. To obtain a Lake or Streambed Alteration notification package, please go to https://www.wildlife.ca.gov/Conservation/LSA/Forms.

ENVIRONMENTAL DATA

CEQA requires that information developed in environmental impact reports and negative declarations be incorporated into a database which may be used to make subsequent or supplemental environmental determinations. (Pub. Resources Code, § 21003, subd. (e).) Accordingly, please report any special status species and natural communities detected during Project surveys to the California Natural Diversity Database (CNDDB). The CNNDB field survey form can be found at the following link: http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/CNDDB_FieldSurveyForm.pdf. The completed form can be mailed electronically to CNDDB at the following email address: CNDDB@wildlife.ca.gov. The types of information reported to CNDDB can be found at the following link: http://www.dfg.ca.gov/biogeodata/cnddb/plants_and_animals.asp.

FILING FEES

The Project, as proposed, would have an impact on fish and/or wildlife, and assessment of filing fees is necessary. Fees are payable upon filing of the Notice of Determination by the Lead Agency and serve to help defray the cost of environmental review by CDFW. Payment of the fee is required in order for the underlying project approval to be operative, vested, and final. (Cal. Code Regs, tit. 14, § 753.5; Fish & G. Code, § 711.4; Pub. Resources Code, § 21089.).

CONCLUSION

CDFW appreciates the opportunity to comment on the NOP of a DEIR for EMWD's Purified Water Replenishment Project (SCH No. 2020049002) and recommends that EMWD address CDFW's comments and concerns in the forthcoming DEIR. If you

should have any questions pertaining to the comments provided in this letter, please contact Joanna Gibson, Senior Environmental Scientist, Specialist, at (909) 987-7449 or at joanna.gibson@wildlife.ca.gov.

Sincerely,

DocuSigned by:
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EIR Appendix B

Air Quality/Greenhouse Gas Emissions Technical Report

HELIX Environmental Planning

Purified Water Replenishment Project

Air Quality/Greenhouse Gas Emissions Technical Report

February 2021 | EMW-20

Prepared for:

Eastern Municipal Water District
2270 Trumble Road
Perris, CA 92572

Prepared by:

HELIX Environmental Planning, Inc.
7578 El Cajon Boulevard
La Mesa, CA 91942

Purified Water Replenishment Project

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February 2021 | EMW-20

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ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
AFY	acre-feet per year
APCD	air pollution control district
AQMP	Air Quality Management Plan
AWTF	Advanced Water Treatment Facility
BACM	best available dust control measures
BOR	Bureau of Reclamation
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CAFE	Corporate Average Fuel Economy
CalEEMod	California Emissions Estimator Model
CalEPA	California Environmental Protection Agency
CALGreen	California Green Building Standards Code
CalRecycle	California Department of Resources Recycling and Recovery
Caltrans	California Department of Transportation
CAP	Climate Action Plan
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CCR	California Code of Regulations
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CH_4	methane
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
County	County of Riverside
District	Eastern Municipal Water District
DOI	U.S. Department of the Interior
DPM	diesel particulate matter
EO	Executive Order
ERRP	Enhanced Recharge and Recovery Program
F	Fahrenheit
GHG	greenhouse gas
GRP	Groundwater Reliability Plus
GSF	gross square feet/foot
GWP	global warming potential
H_2S	hydrogen sulfide
HAP	hazardous air pollutants
HDPE	high density polyethylene

ACRONYMS AND ABBREVIATIONS (cont.)

HFC	hydrofluorocarbons
HIC	hazard index chronic
HRA	health risk assessment
HVAC	heating, ventilation, and air conditioning
IPCC	Intergovernmental Panel on Climate Change
kV	kilovolt
kW	kilowatt
kWh	kilowatt hours
LCFS	Low Carbon Fuel Standard
LCRS	Leachate Collection and Removal System
LOS	level of service
LST	Localized Significance Threshold
MF	membrane filtration
MGD	million gallons per day
MMT	million metric tons
mph	miles per hour
MPO	Metropolitan Planning Organization
MT	metric ton
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NHTSA	National Highway Traffic Safety Administration
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_X	nitrogen oxides
O_3	ozone
OPR	Office of Planning and Research
Pb	lead
PFC	perfluorocarbon
PM	particulate matter
PM_{10}	respirable particulate matter
$PM_{2.5}$	fine particulate matter
ppm	parts per million
PWR	Purified Water Replenishment
RAQS	Regional Air Quality Strategies
RO	reverse osmosis
RTP	Regional Transportation Plan

ACRONYMS AND ABBREVIATIONS (cont.)

SAFE	Safer Affordable Fuel-Efficient
SB	Senate Bill
SCAB	South Coast Air Basin
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCS	Sustainable Communities Strategy
SF_6	sulfur hexafluoride
SIP	State Implementation Plan
SJUPMZ	San Jacinto Upper Pressure Management Zone
SJVRWRF	San Jacinto Valley Regional Water Reclamation Facility
SO_2	sulfur dioxide
SR	State Route
SRA	source receptor area
SRF	State Revolving Fund
TACs	toxic air contaminants
TDS	total dissolved solids
TOC	total organic carbon
tpy	tons per year
USEPA	U.S. Environmental Protection Agency
VMT	vehicle miles traveled
VOC	volatile organic compound
VZMS	Vadose Zone Monitoring System
WRCC	Western Regional Climate Center
WRCOG	Western Riverside Council of Governments
ZEV	zero emissions vehicle

EXECUTIVE SUMMARY

This report presents an assessment of potential air quality and greenhouse gas (GHG) emission impacts during construction and operation of Eastern Municipal Water District's (District's) proposed Purified Water Replenishment (PWR) project (project), which would occur at multiple locations predominantly within the city of San Jacinto, with one location just outside the eastern city limits in unincorporated Riverside County. The project's proposed primary aboveground facilities (an Advanced Water Treatment Facility [AWTF] and brine management system) would be located adjacent to the northern boundary of the District's existing San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) at 770 North Sanderson Avenue. One of the project's belowground pipelines would follow a route northeast from the SJVRWRF in an unpaved roadway, northeast along North Lyon Avenue, and southeast along Ramona Expressway, where it would turn off northeast to near the District's existing Alessandro Ponds site. The project's second pipeline would run from near the Alessandro Ponds site southeast along Ramona Expressway to the District's existing Mountain Avenue West Recharge Basin at the intersection of Ramona Expressway and East Esplanade Court.

The project would result in emissions of criteria air pollutants during construction and operation. Construction emissions include those from fugitive dust, exhaust from off-road equipment, and exhaust from vehicle trips associated with workers commuting to and from the site and trucks transporting materials. The project would comply with South Coast Air Quality Management District (SCAQMD) Rule 403, Fugitive Dust, by watering during grading and limiting vehicle speeds on unpaved surfaces to 15 miles per hour (mph). Operational emissions associated with the project would include pollutants associated with energy use and vehicular traffic associated with staff activities, public visitors, and chemical deliveries. Project emissions of criteria pollutants during general construction activities and during operations would not exceed SCAQMD significance thresholds. In addition, the project would be consistent with air quality policies set forth by the SCAQMD as presented in the most recent Regional Air Quality Strategies (RAQS).

Project-generated traffic would be minimal and would not result in a carbon monoxide hot spot. Construction and operation of the project would not result in exposure of sensitive receptors to significant quantities of criteria pollutants or toxic air contaminants (TACs).

Construction sources of GHG emissions include heavy construction equipment and worker vehicle and material transport truck trips. Operational sources of GHG emissions sources include energy, transportation, stationary, water use, and solid waste. Project-generated GHG emissions during construction and operation would be below applicable thresholds. In addition, the project would provide a local supply of potable water and would result in a reduction of GHG emissions associated with energy used to import water to the District's service area.

Project emissions of criteria pollutants during construction and operations would also be below General Conformity de minimis thresholds.

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1.0 INTRODUCTION

1.1 PROJECT LOCATION

Eastern Municipal Water District's (District's) proposed Purified Water Replenishment (PWR) project (project) would occur at multiple locations predominantly within the city of San Jacinto, with one location just outside the eastern city limits in unincorporated Riverside County (Figure 1, *Regional Location*). The project's proposed aboveground facilities would be located adjacent to the northern boundary of the District's existing San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) at 770 North Sanderson Avenue and at the District's existing Alessandro Ponds site near the intersection of West Ramona Parkway and North Vernon Avenue. One of the project's belowground pipelines would follow a route northeast from the SJVRWRF in an unpaved roadway, northeast along North Lyon Avenue, and southeast along Ramona Expressway, where it would turn off northeast to near the District's existing Alessandro Ponds site. The project's second pipeline would run from near the Alessandro Ponds site southeast along Ramona Expressway to the District's existing Mountain Avenue West Recharge Basin at the intersection of Ramona Expressway and East Esplanade Court (see Figure 2, *Project Components*).

The area is characterized by agriculture, single-family residential development, and undeveloped lands, with additional land uses adjacent to or nearby the project alignment including small areas of commercial development, parks, Mt. San Jacinto College, and the Soboba Springs Golf Course.

1.2 PROJECT DESCRIPTION

The proposed project would occur as part of the District's Groundwater Reliability Plus (GRP) initiative. GRP encompasses the District's actions and investments aimed at improving the quality and quantity of water in local groundwater basins, also called aquifers. The benefits of GRP include improved groundwater quality and reduced water salinity, higher groundwater levels resulting in lower pumping costs, increased groundwater availability, and drought-resilient supply reliability. The District previously initiated the San Jacinto Valley Water Banking – Enhanced Recharge and Recovery Program (ERRP) as part of the GRP initiative.

The proposed project would replenish the San Jacinto Upper Pressure Management Zone (SJUPMZ) aquifer with a combination of recycled water and advanced treated water to reduce reliance on imported water sources, provide improved drought resiliency, and potentially improve the quality of the groundwater basin utilized by the District. The project would work in conjunction with the San Jacinto Valley Water Banking – ERRP by utilizing the existing Mountain Avenue West Recharge Basin, which was developed as part of the San Jacinto Valley Water Banking – ERRP, for recharge of the proposed project's combined tertiary recycled water and advanced treated water.

1.2.1 Description of Proposed Project Components

The proposed project would include the following components:

- Construction of an Advanced Water Treatment Facility (AWTF) near the District's existing SJVRWRF;

- Construction of a brine management system north of the AWTF site that would include five interconnected evaporation ponds with a total evaporation surface area of approximately 20 acres;

- Construction of Alessandro Blending Station facilities that would blend advanced treated water and tertiary recycled water;

- Reline an existing 18-inch-diameter pipeline that would convey advanced treated water from the AWT site to the proposed Alessandro Blending Station; and

- Construction of a new 36-inch-diameter pipeline that would convey blended water from the Alessandro Blending Station to the existing Mountain Avenue West Recharge Basin.

Project components are shown on Figure 2 and are described in detail below.

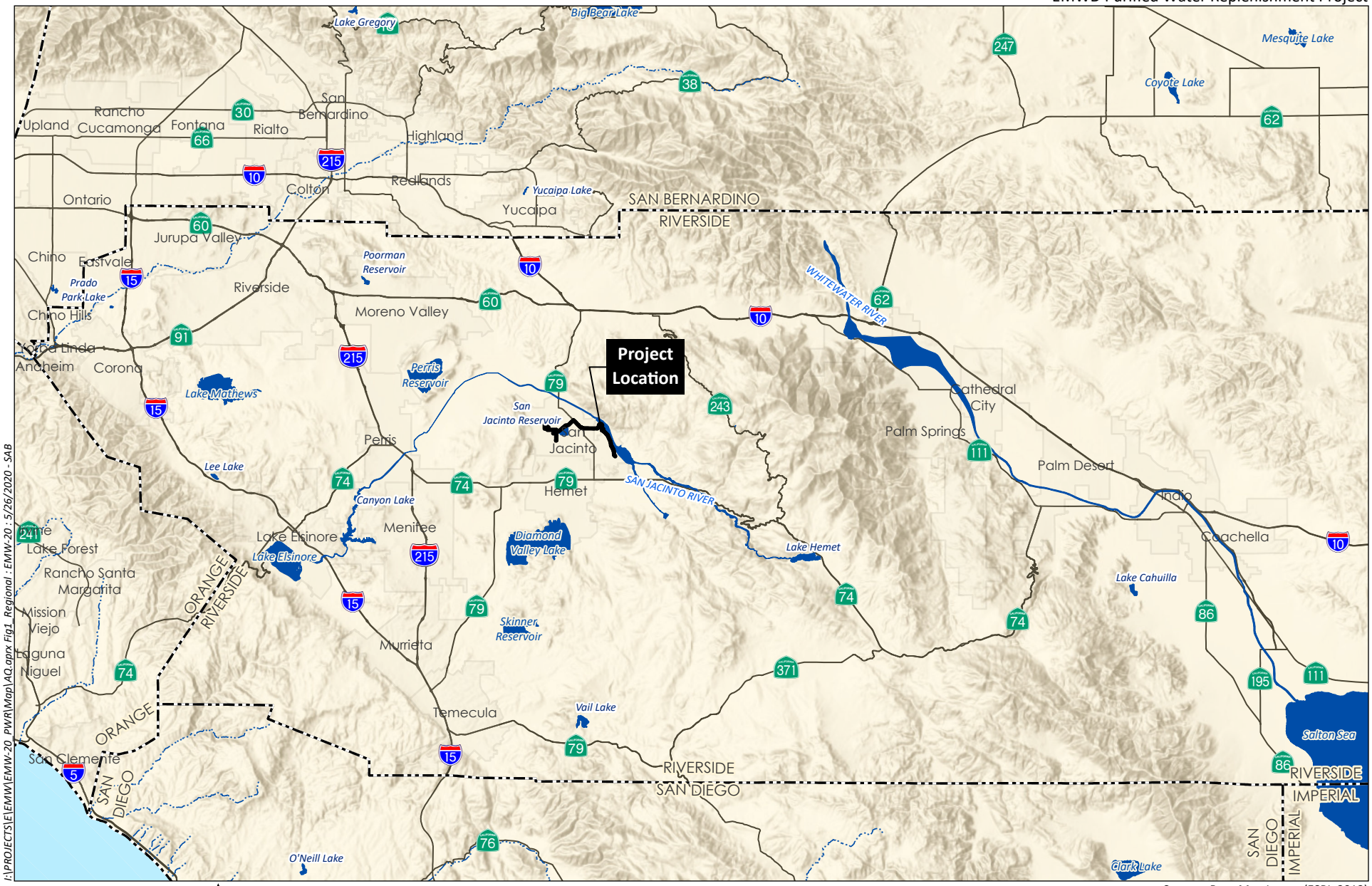
1.2.1.1 Advanced Water Treatment Facility

The proposed AWTF would be constructed on a portion of an approximately five-acre site located adjacent to the northern boundary of the existing SJVRWRF (see Figure 3, *Advanced Water Treatment Facility Conceptual Site Plan*). The AWTF site would initially (during Phase I) include an approximately 20,800-gross square foot (GSF) Process and Control Building that would be divided into two main areas: a control area and a process area.

The control area would contain a public area and a District administrative staff area. The public area would include an entry lobby, an education/exhibit area, a conference and public meeting room, restrooms, and a private District outreach staff person's office. The administrative staff area would contain an operations supervisor's office, control room, break room, server, room, storage room, and mechanical/rise room. Within the process area, the major process area would house a membrane filtration (MF) system and a high-recovery reverse osmosis (RO) facility that would be used for the advanced treatment of recycled water. The ancillary facilities area would contain the electrical, MF compressor, and building mechanical rooms. The chemical pump area would include the AWTF's chemical pumps. Upon implementation of Phase II of the project, the process area would accommodate a 10,400 GSF expansion. Other proposed facilities at the AWTF site outside of the Process and Control Building would include a chemical storage facility, emergency generator, transformer, four new pump stations, paved access with parking, and two stormwater bioretention basins.

During operation of the AWTF, the tertiary recycled water produced at the SJVRWRF would be further treated through the new MF/RO process, which would reduce total organic carbon (TOC), totaled dissolved solids (TDS), and nitrogen concentrations creating advanced treated water, or what is referred to as "RO permeate." The tertiary recycled water would first be pumped from the existing chlorine contact basins located at the SJVRWRF site via an influent pump station to automatic strainers at the AWTF. Before reaching the strainers, the water would undergo pretreatment chemical injections to remove free chlorine and control biological fouling[1] of the MF system. The automatic strainers would further protect the downstream MF system by removing large particles from the water. Once at the MF system, water would be treated utilizing microfiltration or ultrafiltration membrane systems and stored

[1] As related to the proposed project, biological fouling, also known as biofouling, is the accumulation of microorganisms on a membrane surface, which reduces membrane permeability and function.



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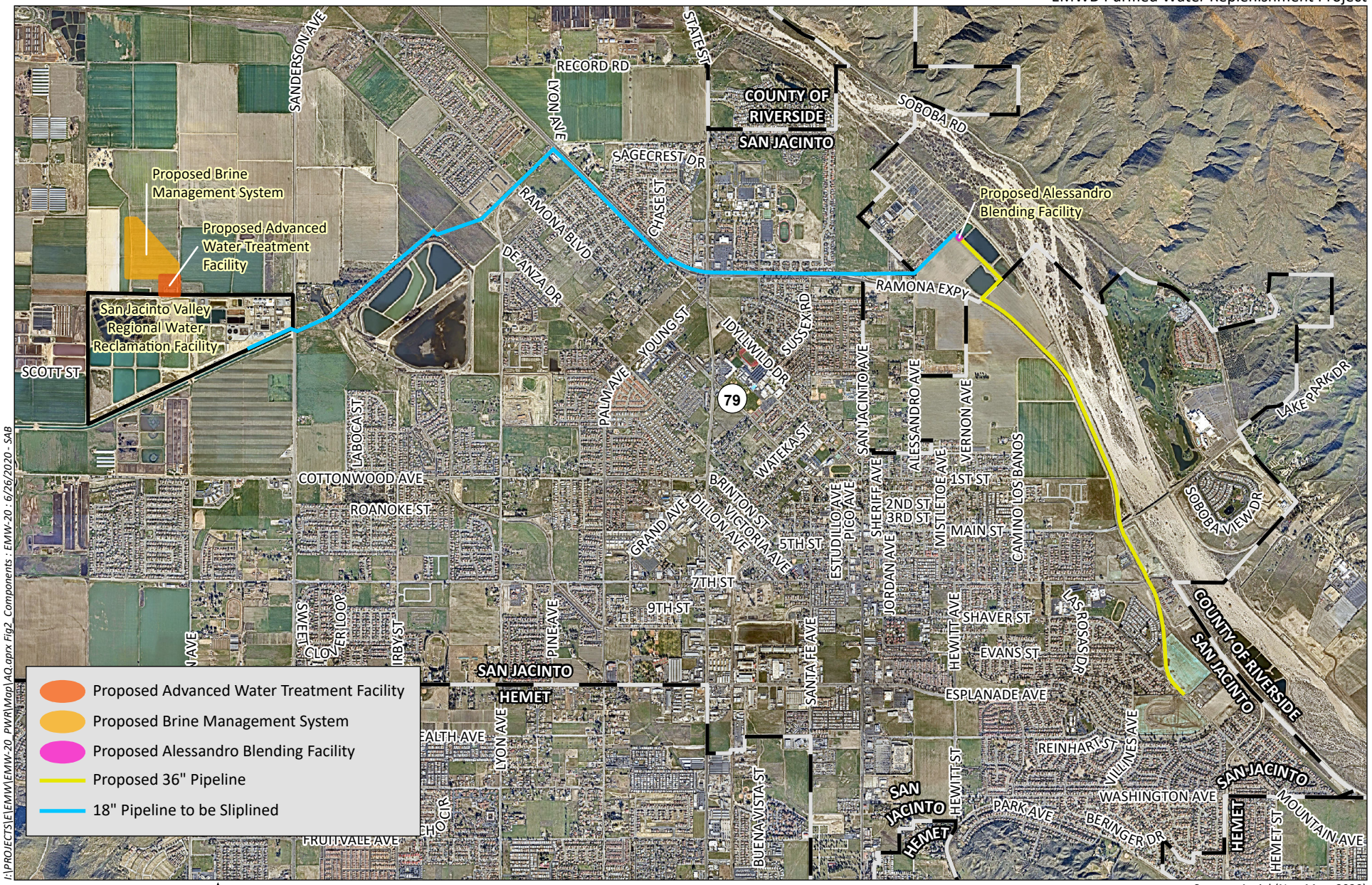
Source: Base Map Layers (ESRI, 2013)

HELIX Environmental Planning

Regional Location

Figure 1



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Source: Aerial (NearMap, 2020)

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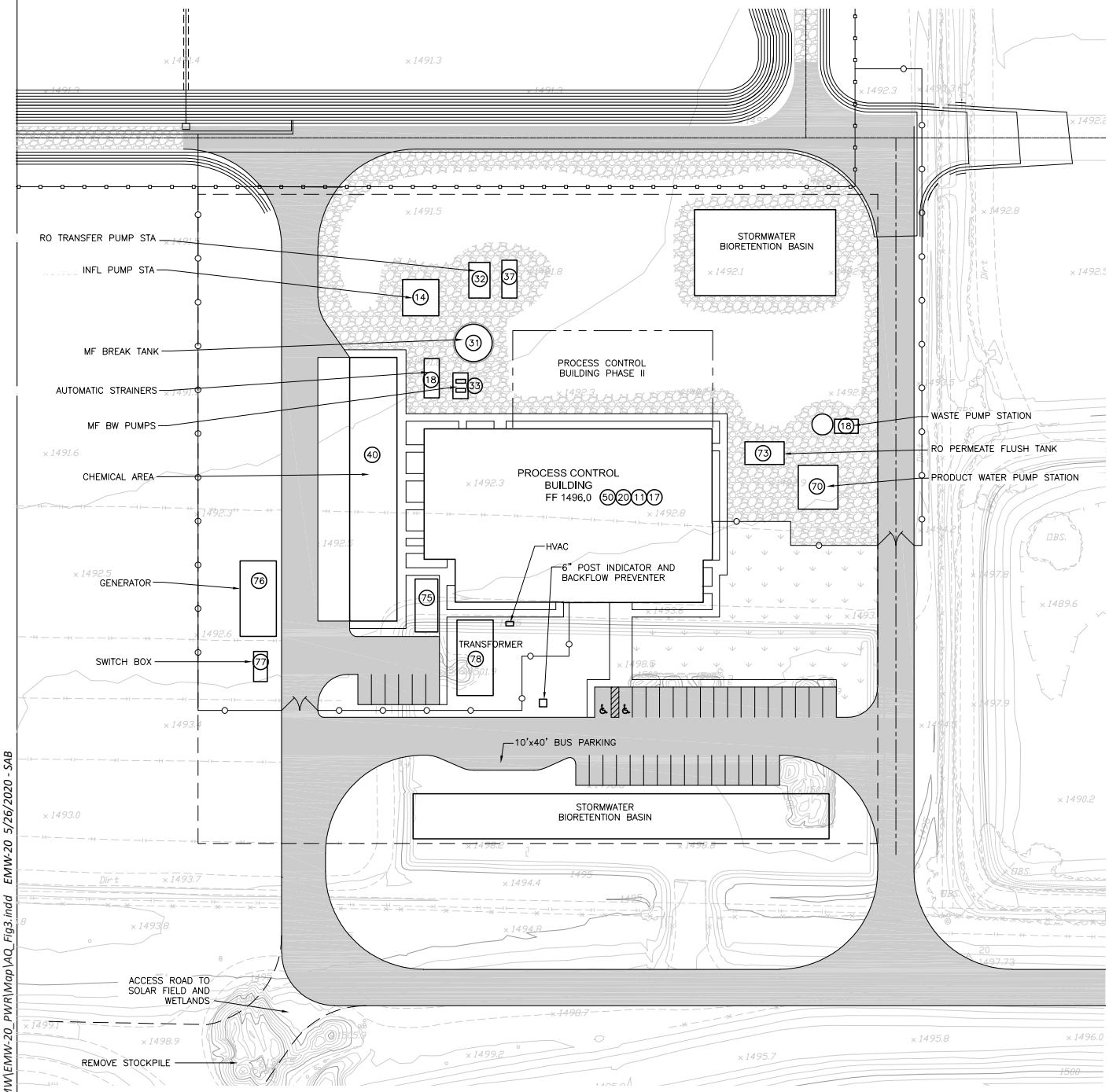
Project Components

Figure 2



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Source: CDMSmith (2020)

Advanced Water Treatment Facility Conceptual Site Plan

Figure 3

HELIX Environmental Planning

in a MF break tank. Water from the tank would then be transferred to the RO system where dissolved organic material would be removed via the RO process.

1.2.1.2 Brine Management System

Concentrated brine generated during the RO process would be managed and stored using a system of five interconnected evaporation ponds that would have a total surface area of approximately 20 acres and be located north of the proposed AWTF site (see Figure 4, *Brine Management System Conceptual Site Plan*).

The brine solution would be pumped from the AWTF to the brine management system where it would be managed by evaporating out the water and leaving the concentrated brine for storage in the ponds. Floating mechanical spray evaporators would be used within Ponds B, D, and E to enhance natural evaporation. Spray evaporators work by pumping water from a pond through a series of nozzles into an air flow stream that generate and discharges a fine mist plume into the air. The fine composition of the mist increases the surface area of the water stream, which substantially accelerates the evaporation rate of the water droplets. Drift from the mechanical spray evaporators would be contained within the ponds and access roads that would be constructed between the individual ponds. Additional access roads would be provided on the perimeter of the ponds and would be elevated higher than the inner access roads to capture drift, retain on-site stormwater water runoff within the brine evaporation pond facility, and prevent off-site stormwater runoff from inundating the ponds.

The three semi-enhanced evaporation ponds (Ponds B, D, and E) would be the primary ponds receiving brine concentrate from the AWTF. The water level in each pond would be monitored and the selection of the ponds to be filled would be based on the water level in each of the ponds. Because Ponds B, D, and E would be the primary ponds receiving brine concentrate and would evaporate pond water faster than Ponds A and C, they would accumulate salts more rapidly than Ponds A and C. When the salt concentration in the pond water of Ponds B, D, and E reaches a desired level, inter-pond transfer pumps would be used to transfer highly concentrated salt water from Ponds B, D, and E to Ponds A and C, where the highly concentrated salt water would continue evaporating to achieve a slurry-like brine solution.

Each of the five ponds would include a leak detection monitoring system with a Leachate Collection and Removal System (LCRS), a Vadose Zone Monitoring System (VZMS), and a groundwater detection monitoring program. The LCRS would consist of an upper layer primary liner, a bottom layer drain liner, and a sump to collect any liquid that leaks through the upper primary liner. The VZMS would consist of a gravel layer and lined sump directly below the LCRS sump and along the centerline of each pond where leaks are most likely to occur. The VZMS would be designed for moisture detection and monitoring, collection, and removal. Additional monitoring would occur for groundwater at various nearby monitoring stations.

1.2.1.3 Alessandro Blending Station

Advanced treated water from the AWTF and tertiary recycled water from the SJVRWRF would be conveyed, via two separate pipelines, to the Alessandro Blending Station where they would be blended in-pipe before the combined flow is conveyed to the Mountain Avenue West Recharge Basin. The blending facility pipes, including the two inflow pipes, connection pipes, and one outflow pipe, would be located on an approximately 48-foot by 34-foot concrete equipment pad southeast of the existing

pressure regulating station downstream of the Alessandro Pump Station (see Figure 5, *Alessandro Blending Station Conceptual Site Plan*). A pressure regulating valve would be provided at the blending facility for the option to discharge advanced treated water into the adjacent existing Alessandro Ponds forebay for operational storage.

1.2.1.4 Conveyance Pipelines

The project would require pipelines to convey advanced treated water from the AWTF to the Alessandro Blending Station as well as blended water from the Alessandro Blending Station to the Mountain Avenue West Recharge Basin (see Figure 2). Advanced treated water would be conveyed from the AWTF to the Alessandro Blending Station via an existing 4.1-mile (21,700-linear foot) 18-inch-diameter recycled water pipeline that extends east from the SJVRWRF to approximately the intersection of Alessandro Avenue North and Ramona Expressway. The existing cement-mortar-lined steel pipeline would be sliplined with new 16-inch-diameter high density polyethylene (HDPE) pipe. The space between the existing 18-inch diameter pipe and the new 16-inch-diameter HDPE pipe would be grouted. The advanced treated water would be conveyed from the AWTF to the start of the 18-inch-diameter pipeline to be sliplined (located on the southern side of the SJVRWRF) via a pipeline that would be installed within the SJVRWRF.

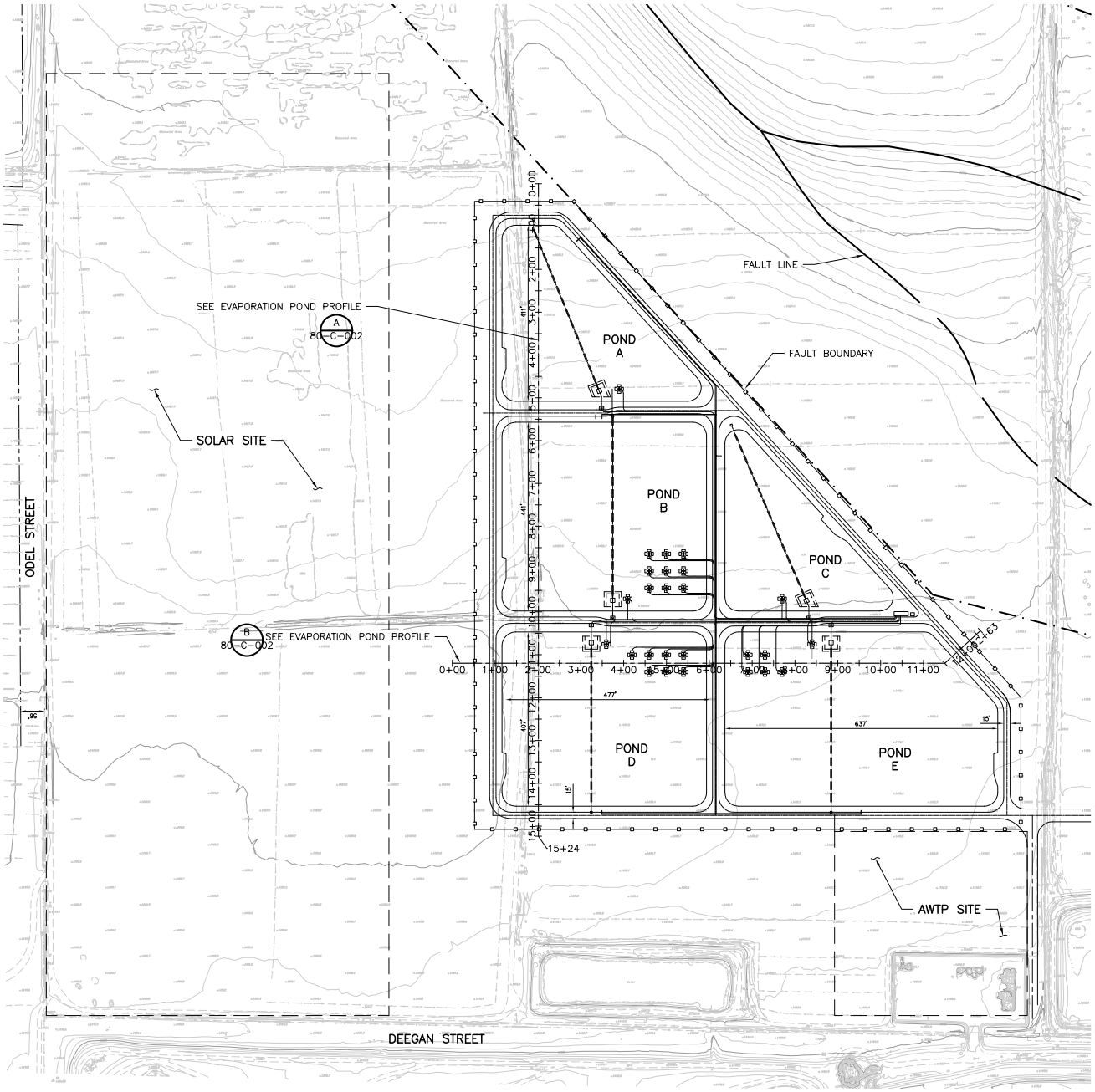
Blended water from the Alessandro Blending Station would be conveyed to the Mountain Avenue West Recharge Basin via a new approximately 2.7-mile (14,200-linear foot) 36-inch-diameter HDPE pipeline that would be located within the eastern shoulder of Ramona Expressway. The new pipeline would be located under four feet of cover. Isolation valves, air valves, and blow-offs would be included along the new pipeline per District standards.

1.2.1.5 Mountain Avenue West Recharge Basin

Combined flows from the Alessandro Blending Facility would be conveyed, via the above-mentioned proposed 36-inch-diameter pipeline, to the District's existing Mountain Avenue West Recharge Basin, where the water would be stored, would percolate into the belowground aquifer, and would eventually be recovered for use as potable water.

1.2.2 Project Phasing

The District established a goal of a two-phase implementation program with a Phase I recharge capacity of 4,000 acre-feet per year (AFY) and a Phase II expansion of 11,000 AFY for a 15,000-AFY total recharge project. With design flows of a 50 percent advanced treated water and 50 percent tertiary recycled water blend, Phase I would involve 2,000 AFY for both advanced treated water and tertiary recycled water, and Phase II would involve 7,500 AFY for both. Accordingly, the AWTF would be sized to accommodate 2.0 million gallons per day (MGD) for Phase I and 7.5 MGD for Phase II. Phase I of the project is anticipated to be operational in 2023 and Phase II of the project is anticipated to be operational in 2035.



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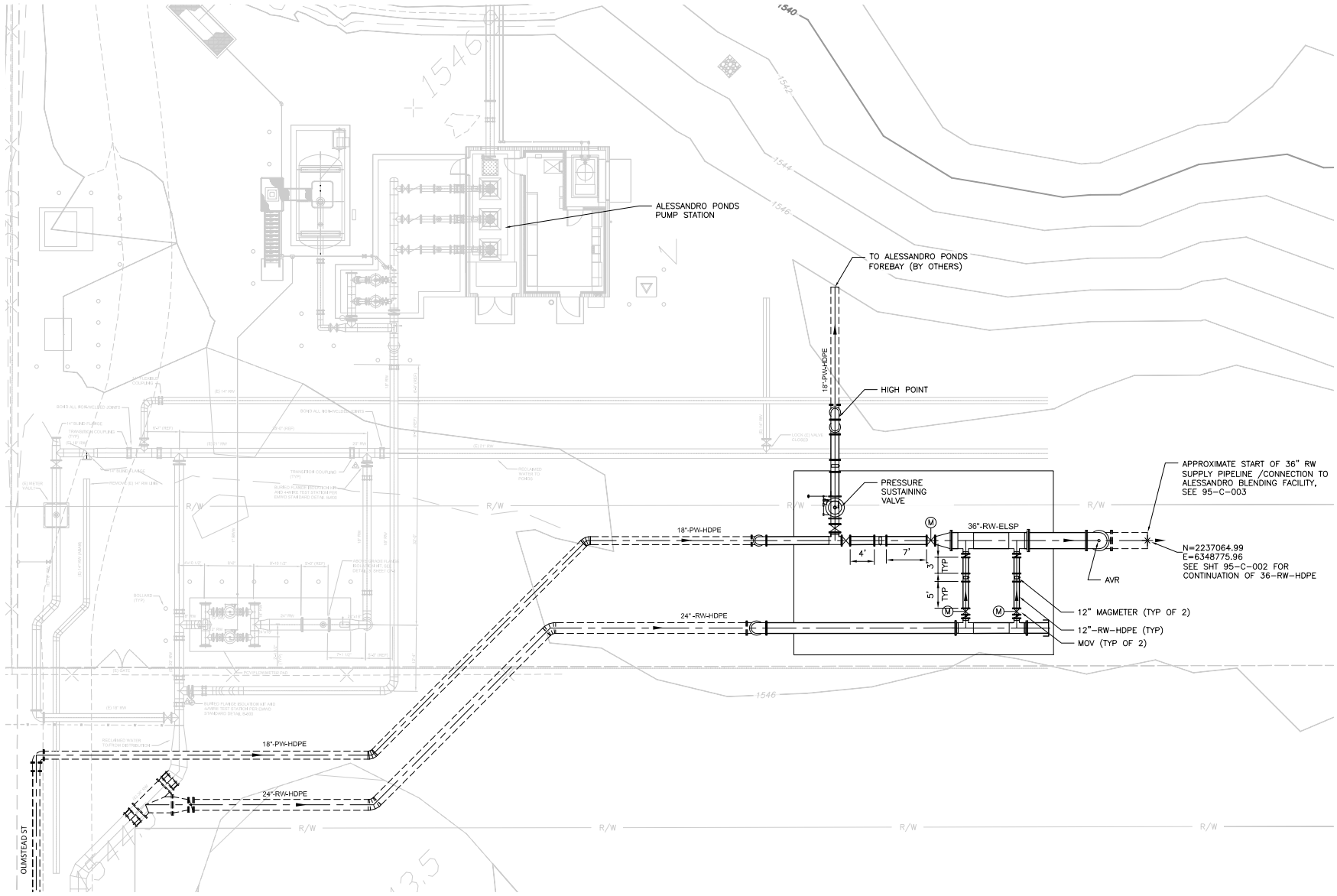
Source: CDMSmith (2020)

Brine Management System Conceptual Site Plan

Figure 4

HELIX Environmental Planning



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Source: CDMSmith (2020)

HELIX Environmental Planning

Alessandro Blending Station Conceptual Site Plan

Figure 5

2.0 REGULATORY SETTING

2.1 AIR QUALITY

2.1.1 Criteria Pollutants

Six air pollutants have been identified by the U.S. Environmental Protection Agency (USEPA) and the California Air Resources Board (CARB) as being of concern both on a nationwide and statewide level: ground-level ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead, and particulate matter (PM), which is subdivided into two classes based on particle size: coarse PM equal to or less than 10 micrometers in diameter (PM_{10}) and fine PM equal to or less than 2.5 micrometers in diameter ($PM_{2.5}$). These air pollutants are commonly referred to as "criteria air pollutants" because air quality standards are regulated using human health and environmentally based criteria. Criteria pollutants can be emitted directly from sources (primary pollutants; e.g., CO, SO_2, PM_{10}, $PM_{2.5}$, and lead), or they may be formed through chemical and photochemical reactions of precursor pollutants (secondary pollutants; e.g., ozone, NO_2, PM_{10}, and $PM_{2.5}$) in the atmosphere. PM_{10} and $PM_{2.5}$ can be both primary pollutants emitted directly from a source and secondary pollutants formed through chemical reactions in the atmosphere. The principal precursor pollutants of concern are reactive organic gasses ([ROGs] also known as volatile organic compounds [VOCs])[2] and nitrogen oxides (NO_X).

The descriptions of sources and general health effects for each of the criteria air pollutants are shown in Table 1, *Summary of Common Sources and Human Health Effects of Criteria Air Pollutants,* based on information provided by the California Air Pollution Control Officers Association ([CAPCOA] 2019). Specific adverse health effects to individuals or population groups induced by criteria pollutant emissions are highly dependent on a multitude of interconnected variables (e.g., cumulative concentrations, local meteorology and atmospheric conditions, and the number and character of exposed individuals [e.g., age, gender]). Criteria pollutant precursors (ROG and NO_X) affect air quality on a regional scale, typically after significant delay and distance from the pollutant source emissions. Health effects related to ozone and NO_2 are, therefore, the product of emissions generated by numerous sources throughout a region. As such, specific health effects from these criteria pollutant emissions cannot be directly correlated to the incremental contribution from a single project.

[2] CARB defines and uses the term ROGs while the USEPA defines and uses the term VOCs. The compounds included in the lists of ROGs and VOCs and the methods of calculation are slightly different. However, for the purposes of estimating criteria pollutant precursor emissions, the two terms are often used interchangeably.

Table 1
SUMMARY OF COMMON SOURCES AND HUMAN HEALTH EFFECTS OF CRITERIA AIR POLLUTANTS

Pollutant	Major Man-Made Sources	Human Health Effects
Carbon Monoxide (CO)	An odorless, colorless gas formed when carbon in fuel is not burned completely; a component of motor vehicle exhaust.	Reduces the ability of blood to deliver oxygen to vital tissues, affecting the cardiovascular and nervous system. Impairs vision, causes dizziness, and can lead to unconsciousness or death.
Nitrogen Dioxide (NO_2)	A reddish-brown gas formed during fuel combustion for motor vehicles and industrial sources. Sources include motor vehicles, electric utilities, and other sources that burn fuel.	Respiratory irritant; aggravates lung and heart problems. Precursor to ozone and acid rain. Contributes to climate change and nutrient overloading which deteriorates water quality. Causes brown discoloration of the atmosphere.
Ozone (O_3)	Formed by a chemical reaction between reactive organic gases (ROGs) and nitrogen oxides (NO_X) in the presence of sunlight. Common sources of these precursor pollutants include motor vehicle exhaust, industrial emissions, gasoline storage and transport, solvents, paints, and landfills.	Irritates and causes inflammation of the mucous membranes and lung airways; causes wheezing, coughing, and pain when inhaling deeply; decreases lung capacity; aggravates lung and heart problems. Damages plants; reduces crop yield. Damages rubber, some textiles and dyes.
Particulate Matter (PM_{10} and $PM_{2.5}$)	Produced by power plants, steel mills, chemical plants, unpaved roads and parking lots, wood-burning stoves and fireplaces, automobiles, and other sources.	Increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing; aggravated asthma; development of chronic bronchitis; irregular heartbeat; nonfatal heart attacks; and premature death in people with heart or lung disease. Impairs visibility (haze).
Sulfur Dioxide (SO_2)	A colorless, nonflammable gas formed when fuel containing sulfur is burned, when gasoline is extracted from oil, or when metal is extracted from ore. Examples are petroleum refineries, cement manufacturing, metal processing facilities, locomotives, and ships.	Respiratory irritant. Aggravates lung and heart problems. In the presence of moisture and oxygen, sulfur dioxide converts to sulfuric acid which can damage marble, iron and steel. Damages crops and natural vegetation. Impairs visibility. Precursor to acid rain.
Lead	Metallic element emitted from metal refineries, smelters, battery manufacturers, iron and steel producers, use of leaded fuels by racing and aircraft industries.	Anemia, high blood pressure, brain and kidney damage, neurological disorders, cancer, lowered IQ. Affects animals, plants, and aquatic ecosystems.

Source: CAPCOA 2019

2.1.2 Toxic Air Contaminants

Toxic air contaminants (TACs) are a diverse group of air pollutants that may cause or contribute to an increase in deaths or in serious illness or that may pose a present or potential hazard to human health. TACs can cause long-term health effects such as cancer, birth defects, neurological damage, asthma, bronchitis, or genetic damage, or short-term acute effects such as eye watering, respiratory irritation (a cough), runny nose, throat pain, and headaches. TACs are considered either carcinogenic or noncarcinogenic based on the nature of the health effects associated with exposure to the pollutant. For carcinogenic TACs, there is no level of exposure that is considered safe and impacts are evaluated in

terms of overall relative risk expressed as excess cancer cases per one million exposed individuals. Noncarcinogenic TACs differ in that there is generally assumed to be a safe level of exposure below which no negative health impact is believed to occur. These levels are determined on a pollutant-by-pollutant basis.

2.1.3 Federal Air Quality Regulations

2.1.3.1 Federal Clean Air Act

Air quality is defined by ambient air concentrations of specific pollutants identified by the USEPA to be of concern with respect to health and welfare of the public. The USEPA is responsible for enforcing the Federal Clean Air Act (CAA), first enacted in 1963 and amended numerous times in subsequent years (1965, 1967, 1970, 1977, and 1990). The CAA mandates the USEPA to establish National Ambient Air Quality Standards (NAAQS), which identify concentrations of pollutants in the ambient air below which no adverse effects on the public health and welfare are anticipated. In response, the USEPA established both primary and secondary standards for several criteria pollutants, which are introduced above. Table 2, *Ambient Air Quality Standards*, shows the federal and state ambient air quality standards for these pollutants.

Table 2
AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	California Standards	Federal Standards	
			Primary[1]	Secondary[2]
O_3	1 Hour	0.09 ppm (180 µg/m^3)	–	–
	8 Hour	0.070 ppm (137 µg/m^3)	0.070 ppm (137 µg/m^3)	Same as Primary
PM_{10}	24 Hour	50 µg/m^3	150 µg/m^3	Same as Primary
	AAM	20 µg/m^3	–	Same as Primary
$PM_{2.5}$	24 Hour	–	35 µg/m^3	Same as Primary
	AAM	12 µg/m^3	12.0 µg/m^3	15.0 µg/m^3
CO	1 Hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	–
	8 Hour	9.0 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	–
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)	–	–
NO_2	1 Hour	0.18 ppm (339 µg/m^3)	0.100 ppm (188 µg/m^3)	–
	AAM	0.030 ppm (57 µg/m^3)	0.053 ppm (100 µg/m^3)	Same as Primary
SO_2	1 Hour	0.25 ppm (655 µg/m^3)	0.075 ppm (196 µg/m^3)	–
	3 Hour	–	–	0.5 ppm (1,300 µg/m^3)
	24 Hour	0.04 ppm (105 µg/m^3)	–	–

Table 2 (cont.)
AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	California Standards	Federal Standards	
			Primary[1]	Secondary[2]
Visibility Reducing Particles	8 Hour	Extinction coefficient of 0.23 per km – visibility ≥ 10 miles (0.07 per km – ≥30 miles for Lake Tahoe)	**No Federal Standards**	
Sulfates	24 Hour	25 µg/m^3		
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)		
Vinyl Chloride	24 Hour	0.01 ppm (26 µg/m^3)		

Source: CARB 2020

[1] National Primary Standards: The levels of air quality necessary, within an adequate margin of safety, to protect the public health.

[2] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

AAM: Annual Arithmetic Mean; CO: carbon monoxide; km: kilometer; mg/m^3: milligrams per cubic meter; NO_2 nitrogen dioxide; O_3: ozone; ppm: parts per million; PM_{10}: coarse particulate matter with an aerodynamic diameter of 10 microns or less; $PM_{2.5}$: fine particulate matter with an aerodynamic diameter of 2.5 microns or less; SO_2: sulfur dioxide; –: No Standard; µg/m^3: micrograms per cubic meter

The CAA allows states to adopt ambient air quality standards and other regulations provided they are at least as stringent as federal standards. CARB has established the more stringent California Ambient Air Quality Standards (CAAQS) for the six criteria pollutants described in Table 1 through the California Clean Air Act of 1988, and also has established CAAQS for additional pollutants, including sulfates, hydrogen sulfide (H_2S), vinyl chloride, and visibility-reducing particles. Areas that do not meet the NAAQS or the CAAQS for a particular pollutant are considered to be "nonattainment areas" for that pollutant.

The USEPA has classified air basins (or portions thereof) as being in "attainment," "nonattainment," or "unclassified" for each criteria air pollutant, based on whether or not the NAAQS have been achieved. If an area is designated unclassified, it is because inadequate air quality data were available as a basis for a nonattainment or attainment designation. The project site is located within the South Coast Air Basin (SCAB) and, as such, is in an area designated a nonattainment area for certain pollutants that are regulated under the CAA. Table 3, *South Coast Air Basin Attainment Status*, in Section 2.1.5.1 lists the federal and state attainment status of the SCAB for the criteria pollutants. The USEPA classifies the SCAB as in attainment for CO, PM_{10}, NO_2, SO_2, and lead; in extreme nonattainment for 8-hour ozone; and in serious nonattainment for $PM_{2.5}$ with respect to federal air quality standards.

Table 3
SOUTH COAST AIR BASIN ATTAINMENT STATUS

Criteria Pollutant	Federal Designation	State Designation
O_3 (1-hour)	(No federal standard)	Nonattainment
O_3 (8-hour)	Extreme Nonattainment	Nonattainment
CO	Attainment (Maintenance)	Attainment
PM_{10}	Attainment (Maintenance)	Nonattainment
$PM_{2.5}$	Serious Nonattainment	Nonattainment
NO_2	Attainment (Maintenance)	Attainment
SO_2	Attainment	Attainment
Lead	Attainment	Attainment
Sulfates	(No federal standard)	Attainment
Hydrogen Sulfide	(No federal standard)	Attainment
Visibility	(No federal standard)	Attainment

Source: SCAQMD 2016
O_3 = ozone; CO = carbon monoxide; PM_{10} = particulate matter 10 micrometers or less in diameter; $PM_{2.5}$ = particulate matter 2.5 micrometers or less in diameter; NO_2 = nitrogen dioxide; SO_2 = sulfur dioxide

The CAA (and its subsequent amendments) requires each state to prepare an air quality control plan referred to as the State Implementation Plan (SIP). The CAA Amendments dictate that states containing areas violating the NAAQS revise their SIPs to include extra control measures to reduce air pollution. The SIP includes strategies and control measures to attain the NAAQS by deadlines established by the CAA. The SIP is periodically modified to reflect the latest emissions inventories, plans, and rules and regulations of air basins as reported by the agencies with jurisdiction over them. The USEPA has the responsibility to review all SIPs to determine whether they conform to the requirements of the CAA.

2.1.4 California Air Quality Regulations

2.1.4.1 California Clean Air Act

The federal CAA allows states to adopt ambient air quality standards and other regulations provided that they are at least as stringent as federal standards. CARB, a part of the California Environmental Protection Agency (CalEPA), is responsible for the coordination and administration of both federal and state air pollution control programs within California, including setting the CAAQS. CARB also conducts research, compiles emission inventories, develops suggested control measures, and provides oversight of local programs. CARB establishes emissions standards for motor vehicles sold in California, consumer products (such as hairspray, aerosol paints, and barbecue lighter fluid), and various types of commercial equipment. It also sets fuel specifications to further reduce vehicular emissions. CARB also has primary responsibility for the development of California's SIP, for which it works closely with the federal government and the local air districts.

Table 3 lists the state attainment status of the SCAB for the criteria pollutants. Under state designation, the SCAB is currently in attainment for CO, NO_2, SO_2, and lead; and in nonattainment for ozone, PM_{10}, and $PM_{2.5}$.

2.1.4.2 Toxic Air Contaminants

California's air toxics control program began in 1983 with the passage of the Toxic Air Contaminant Identification and Control Act, better known as AB 1807 or the Tanner Bill. When a compound becomes listed as a TAC under the Tanner process, CARB normally establishes minimum statewide emission control measures to be adopted by local air pollution control districts (APCDs). Later legislative amendments (Assembly Bill [AB] 2728) required CARB to incorporate all 189 federal hazardous air pollutants (HAPs) into the state list of TACs.

Supplementing the Tanner process, AB 2588 – the Air Toxics "Hot Spots" Information and Assessment Act of 1987 – currently regulates over 600 air compounds, including all of the Tanner-designated TACs. Under AB 2588, specified facilities must quantify emissions of regulated air toxics and report them to the local APCD. If the APCD determines that a potentially significant public health risk is posed by a given facility, the facility is required to perform a health risk assessment (HRA) and notify the public in the affected area if the calculated risks exceed specified criteria.

Diesel engines emit a complex mixture of air pollutants, including both gaseous and solid material. The solid material in diesel exhaust is known as diesel particulate matter (DPM). Almost all DPM is 10 microns or less in diameter, and 90 percent of DPM is less than 2.5 microns in diameter. Because of their extremely small size, these particles can be inhaled and eventually trapped in the bronchial and alveolar regions of the lung. In 1998, the CARB identified DPM as a toxic air contaminant based on published evidence of a relationship between diesel exhaust exposure and lung cancer and other adverse health effects. DPM has a significant impact on California's population—it is estimated that about 70 percent of total known cancer risk related to air toxics in California is attributable to DPM (CARB 2018).

In September 2000, CARB approved the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles* (Diesel Risk Reduction Plan; CARB 2000). The Diesel Risk Reduction Plan outlined a comprehensive and ambitious program that included the development of numerous new control measures over the next several years aimed at substantially reducing emissions from new and existing on-road vehicles (e.g., heavy-duty trucks and buses), off-road equipment (e.g., graders, tractors, forklifts, sweepers, and boats), portable equipment (e.g., pumps), and stationary engines (e.g., stand-by power generators). These requirements are now in force on a statewide basis.

2.1.5 Local Regulations

2.1.5.1 South Coast Air Quality Management District

The project is located in western Riverside County (County). Air quality in the western portion of the County is regulated by the South Coast Air Quality Management District (SCAQMD). As a regional agency, the SCAQMD works directly with the Southern California Association of Governments (SCAG), County transportation commissions, and local governments and cooperates actively with all federal and state government agencies. The SCAQMD develops rules and regulations; establishes permitting requirements for stationary sources; inspects emissions sources; and enforces such measures through educational programs or fines, when necessary.

The SCAQMD is directly responsible for reducing emissions from stationary (area and point), mobile, and indirect sources. It has responded to this requirement by preparing a sequence of Air Quality Management Plans (AQMP).

On March 3, 2017, the SCAQMD adopted the 2016 AQMP, which is a regional and multi-agency effort (SCAQMD, CARB, SCAG, and USEPA). The 2016 AQMP represents a comprehensive analysis of emissions, meteorology, atmospheric chemistry, regional growth projections, and the impact of existing control measures. The plan seeks to achieve multiple goals in partnership with other entities promoting reductions in criteria pollutant, greenhouse gases, and toxic risk, as well as efficiencies in energy use, transportation, and goods movement (SCAQMD 2017a).

The AQMP, in combination with those from all other California nonattainment areas with serious (or worse) air quality problems, is submitted to CARB for inclusion in the SIP. The SIP relies on the same information from SCAG to develop emission inventories and emission reduction strategies that are included in the attainment demonstration for the air basin. The current federal and state attainment status for the SCAB is presented in Table 3.

The SCAQMD Rule 403, *Fugitive Dust,* requires the implementation of best available dust control measures (BACM) during active operations capable of generating fugitive dust. Rule 403 prohibits the emissions of fugitive dust from any active operation, open storage pile, or disturbed surface area such that the dust remains visible in the atmosphere beyond the property line of the emission source; or the dust emission exceeds 20 percent opacity, if the dust emission is the result of movement of a motorized vehicle (SCAQMD 2005).

2.2 GREENHOUSE GASES

2.2.1 Climate Change Overview

Global climate change refers to changes in average climatic conditions on Earth including temperature, wind patterns, precipitation, and storms. Global temperatures are moderated by atmospheric gases. These gases are commonly referred to as greenhouse gases (GHGs) because they function like a greenhouse by letting sunlight in but preventing heat from escaping, thus warming the Earth's atmosphere. These gases allow solar radiation (sunlight) into the Earth's atmosphere but prevent radiative heat from escaping, thus warming the Earth's atmosphere.

GHGs are emitted by natural processes and human (anthropogenic) activities. Anthropogenic GHG emissions are primarily associated with: (1) the burning of fossil fuels during motorized transport, electricity generation, natural gas consumption, industrial activity, manufacturing, and other activities; (2) deforestation; (3) agricultural activity; and (4) solid waste decomposition.

The temperature record shows a decades-long trend of warming, with 2016 global surface temperatures ranking as the warmest year on record since 1880 and 2017 as the second warmest. The 2017 global average surface temperatures were 0.9 degrees Celsius warmer than the 1951 to 1980 mean temperature (National Aeronautics and Space Administration [NASA] 2018). GHG emissions from human activities are the most significant driver of observed climate change since the mid-20th century (Intergovernmental Panel on Climate Change [IPCC] 2013). The IPCC constructed several emission trajectories of GHGs needed to stabilize global temperatures and climate change impacts. The statistical models show a "high confidence" that temperature increase caused by anthropogenic GHG emissions could be kept to less than two degrees Celsius relative to pre-industrial levels if atmospheric concentrations are stabilized at about 450 parts per million (ppm) carbon dioxide equivalent (CO_2e) by the year 2100 (IPCC 2014).

2.2.2 Types of Greenhouse Gases

The GHGs defined under California's AB 32 include CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

Carbon dioxide. CO_2 is the most important and common anthropogenic GHG. CO_2 is an odorless, colorless GHG. Natural sources include the decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungi; evaporation from oceans; and volcanic outgassing. Anthropogenic sources of CO_2 include burning fuels, such as coal, oil, natural gas, and wood. Data from ice cores indicate that CO_2 concentrations remained steady prior to the current period for approximately 10,000 years. The atmospheric CO_2 concentration in 2010 was 390 ppm, 39 percent above the concentration at the start of the Industrial Revolution (approximately 280 ppm in 1750). In May 2020, the CO_2 concentration was 417 ppm, a 49 percent increase since 1750 (National Oceanic and Atmospheric Administration [NOAA] 2020).

Methane. CH_4 is the main component of natural gas used in homes. Geological deposits known as natural gas fields contain methane, which is extracted for fuel. Other sources are from decay of organic material in landfills, fermentation of manure, and cattle digestion.

Nitrous oxide. N_2O is produced by both natural and human-related sources. N_2O is emitted during agricultural and industrial activities, as well as during the combustion of fossil fuels and solid waste. Primary human-related sources of N_2O are agricultural soil management, animal manure management, sewage treatment, mobile and stationary combustion of fossil fuel, adipic (fatty) acid production, and nitric acid production.

Hydrofluorocarbons. Fluorocarbons are gases formed synthetically by replacing all hydrogen atoms in methane or ethane with chlorine and/or fluorine atoms. Chlorofluorocarbons are nontoxic, nonflammable, insoluble, and chemically nonreactive in the troposphere (the level of air at Earth's surface). Chlorofluorocarbons were first synthesized in 1928 for use as refrigerants, aerosol propellants, and cleaning solvents. They destroy stratospheric ozone; therefore, their production was stopped as required by the 1989 Montreal Protocol.

Sulfur Hexafluoride. SF_6 is an inorganic, odorless, colorless, nontoxic, nonflammable gas. SF_6 is used for insulation in electric power transmission and distribution equipment, in the magnesium industry, in semi-conductor manufacturing, and as a tracer gas for leak detection.

GHGs have long atmospheric lifetimes that range from one year to several thousand years. Long atmospheric lifetimes allow for GHG emissions to disperse around the globe. Because GHG emissions vary widely in the power of their climatic effects, climate scientists have established a unit called global warming potential (GWP). The GWP of a gas is a measure of both potency and lifespan in the atmosphere as compared to CO_2. For example, because methane and N_2O are approximately 25 and 298 times more powerful than CO_2, respectively, in their ability to trap heat in the atmosphere, they have GWPs of 25 and 298, respectively (CO_2 has a GWP of 1). Estimates of GHG emissions are often presented in CO_2e, which weigh each gas by its GWP. Expressing GHG emissions in CO_2e takes the contribution of all GHG emissions to the greenhouse effect and converts them to a single unit equivalent to the effect that would occur if only CO_2 were being emitted. Emissions of CO_2e are commonly presented in metric tons (MT; 1 MT equals approximately 2,205 pounds). The atmospheric lifetime and

GWP of selected GHGs are summarized in Table 4, *Global Warming Potentials and Atmospheric Lifetimes*.

Table 4
GLOBAL WARMING POTENTIALS AND ATMOSPHERIC LIFETIMES

Greenhouse Gas	Atmospheric Lifetime (years)	Global Warming Potential (100-year time horizon)
Carbon Dioxide (CO_2)	50-200	1
Methane (CH_4)	12	25
Nitrous Oxide (N_2O)	114	298
HFC-134a	14	1,430
PFC: Tetraflouromethane (CF_4)	50,000	7,390
PFC: Hexafluoroethane (C_2F_6)	10,000	12,200
Sulfur Hexafluoride (SF_6)	3,200	22,800

Source: IPCC 2007
HFC: hydrofluorocarbon; PFC: perfluorocarbon

2.2.3 Federal Greenhouse Gas Regulations

2.2.3.1 Federal Clean Air Act

The U.S. Supreme Court ruled on April 2, 2007, in *Massachusetts v. U.S. Environmental Protection Agency* that CO_2 is an air pollutant, as defined under the CAA, and that the USEPA has the authority to regulate emissions of GHGs. The USEPA announced that GHGs (including CO_2, CH_4, N_2O, HFC, PFC, and SF_6) threaten the public health and welfare of the American people.

2.2.3.2 Light-Duty Vehicle Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standards

The USEPA and the Department of Transportation's National Highway Traffic Safety Administration (NHTSA) worked together on developing a national program of regulations to reduce GHG emissions and to improve fuel economy of light-duty vehicles. On April 1, 2010, the USEPA and NHTSA announced a joint Final Rulemaking establishing standards for 2012 through 2016 model year vehicles. This was followed up on October 15, 2012, when the agencies issued a Final Rulemaking with standards for model years 2017 through 2025. On August 2, 2018, the agencies released a notice of proposed rulemaking—the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks. The purpose of the SAFE Vehicles Rule is "to correct the national automobile fuel economy and GHG emissions standards to give the American people greater access to safer, more affordable vehicles that are cleaner for the environment." The direct effect of the rule is to eliminate the standards that were put in place to gradually raise average fuel economy for passenger cars and light trucks under test conditions from 37 miles per gallon in 2020 to 50 miles per gallon in 2025. By contrast, the new SAFE Vehicles Rule freezes the average fuel economy level standards indefinitely at the 2020 levels. The new SAFE Vehicles Rule also results in the withdraw of the waiver previously provided to California for that State's GHG and zero emissions vehicle (ZEV) programs under section 209 of the CAA. The combined USEPA GHG emission standards and NHTSA Corporate Average Fuel Economy (CAFE) standards resolve previously conflicting requirements under both federal programs and the standards of the State of California and other states that have adopted the California standards (USEPA and NHTSA 2018 and 2012).

2.2.4 California Greenhouse Gas Regulations

2.2.4.1 California Code of Regulations, Title 24, Part 6

California Code of Regulations (CCR) Title 24 Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings were first established in 1978 in response to a legislative mandate to reduce California's energy consumption. Energy-efficient buildings require less electricity, natural gas, and other fuels. Electricity production from fossil fuels and on-site fuel combustion (typically for water heating) results in GHG emissions.

The Title 24 standards are updated approximately every three years to allow consideration and possible incorporation of new energy efficiency technologies and methods. The latest update to the Title 24 standards occurred in 2019 and went into effect on January 1, 2020. The Building Energy Efficiency Standards focus on several key areas to improve the energy efficiency of newly constructed buildings and additions and alterations to existing buildings. The most significant efficiency improvements to the residential standards include improvements for attics, walls, water heating, and lighting. The standards are divided into three basic sets. First, there is a basic set of mandatory requirements that apply to all buildings. Second, there is a set of performance standards – the energy budgets – that vary by climate zone (of which there are 16 in California) and building type; thus, the standards are tailored to local conditions. Finally, the third set constitutes an alternative to the performance standards, which is a set of prescriptive packages that are basically a recipe or a checklist compliance approach.

2.2.4.2 California Green Building Standards Code

The California Green Building Standards Code (CALGreen; CCR Title 24, Part 11) is a code with mandatory requirements for new residential and nonresidential buildings (including industrial buildings) throughout California. The code is Part 11 of the California Building Standards Code in Title 24 of the CCR (California Building Standards Commission 2019). The current 2019 Standards for new construction of, and additions and alterations to, residential and nonresidential buildings went into effect on January 1, 2020.

The development of CALGreen is intended to (1) cause a reduction in GHG emissions from buildings; (2) promote environmentally responsible, cost-effective, healthier places to live and work; (3) reduce energy and water consumption; and (4) respond to the directives by the Governor. In short, the code is established to reduce construction waste; make buildings more efficient in the use of materials and energy; and reduce environmental impact during and after construction.

CALGreen contains requirements for storm water control during construction; construction waste reduction; indoor water use reduction; material selection; natural resource conservation; site irrigation conservation; and more. The code provides for design options allowing the designer to determine how best to achieve compliance for a given site or building condition. The code also requires building commissioning, which is a process for the verification that all building systems, like heating and cooling equipment and lighting systems, are functioning at their maximum efficiency.

2.2.4.3 Executive Order S-3-05

On June 1, 2005, Executive Order (EO) S-3-05 proclaimed that California is vulnerable to climate change impacts. It declared that increased temperatures could reduce snowpack in the Sierra Nevada, further exacerbate California's air quality problems, and potentially cause a rise in sea levels. To avoid or reduce

climate change impacts, EO S-3-05 calls for a reduction in GHG emissions to the year 2000 level by 2010, to year 1990 levels by 2020, and to 80 percent below 1990 levels by 2050. EOs are not laws and can only provide the governor's direction to state agencies to act within their authority. Legislation is required to enact the goals of EO S-3-05 and establish a framework for statewide implementation. AB 32, described below, mandates the 2020 GHG reduction goals of EO S-3-05. The 2050 GHG reduction goal of EO S-3-05 has not been enacted by any legislation and remains only a goal of the EO.

2.2.4.4 Executive Order B-30-15

On April 29, 2015, EO B-30-15 established a California GHG emission reduction target of 40 percent below 1990 levels by 2030. The EO aligns California's GHG emission reduction targets with those of leading international governments, including the 28-nation European Union. California is on track to meet or exceed the target of reducing greenhouse gas emissions to 1990 levels by 2020, as established in AB 32. California's new emission reduction target of 40 percent below 1990 levels by 2030 will make it possible to reach the goal established by EO S-3-05 of reducing emissions 80 percent under 1990 levels by 2050. Senate Bill (SB) 32, described below, mandates the 2030 GHG reduction goals of EO B-30-15.

2.2.4.5 Assembly Bill 32 – Global Warming Solutions Act of 2006

The California Global Warming Solutions Act of 2006 (Assembly Bill 32 and Health and Safety Code Sections 38500, 38501, 28510, 38530, 38550, 38560, 38561–38565, 38570, 38571, 38574, 38580, 38590, 38592–38599), widely known as AB 32, requires that the CARB develop and enforce regulations for the reporting and verification of statewide GHG emissions. CARB is directed to set a GHG emission limit, based on 1990 levels, to be achieved by 2020. The bill requires CARB to adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective GHG reductions. AB 32 enacts the goals of EO S-3-05.

2.2.4.6 Senate Bill 32

SB 32 (Amendments to the California Global Warming Solutions Action of 2006) extends California's GHG reduction programs beyond 2020. SB 32 amended the Health and Safety Code to include Section 38566, which contains language to authorize CARB to achieve a statewide GHG emission reduction of at least 40 percent below 1990 levels by no later than December 31, 2030. SB 32 codified the targets established by EO B-30-15 for 2030, which set the next interim step in the State's continuing efforts to pursue the long-term target expressed in EO B-30-15 of 80 percent below 1990 emissions levels by 2050.

2.2.4.7 Assembly Bill 197

A condition of approval for SB 32 was the passage of AB 197. AB 197 requires that CARB consider the social costs of GHG emissions and prioritize direct reductions in GHG emissions at mobile sources and large stationary sources. AB 197 also gives the California legislature more oversight over CARB through the addition of two legislatively appointed members to the CARB Board and the establishment a legislative committee to make recommendations about CARB programs to the legislature.

2.2.4.8 Assembly Bill 1493 – Vehicular Emissions of Greenhouse Gases

AB 1493 (Pavley) requires that CARB develop and adopt regulations that achieve "the maximum feasible reduction of GHGs emitted by passenger vehicles and light-duty truck and other vehicles determined by

CARB to be vehicles whose primary use is noncommercial personal transportation in the State." On September 24, 2009, CARB adopted amendments to the Pavley regulations that intend to reduce GHG emissions in new passenger vehicles from 2009 through 2016. The amendments bind California's enforcement of AB 1493 (starting in 2009), while providing vehicle manufacturers with new compliance flexibility. The amendments also prepare California to merge its rules with the federal CAFE rules for passenger vehicles (CARB 2013). In January 2012, CARB approved a new emissions-control program for model years 2017 through 2025. However, as described previously, the adoption of the new SAFE Vehicles Rule results in the withdrawal of the waiver previously provided to California for that State's GHG and ZEV programs, freezing the average fuel economy level standards indefinitely at the 2020 levels.

2.2.4.9 Assembly Bill 75

AB 75 was passed in 1999 and mandates state agencies to develop and implement an integrated waste management plan to reduce GHG emissions related to solid waste disposal. In addition, the bill mandates that community service districts providing solid waste services report the disposal and diversion information to the appropriate city, county, or regional jurisdiction. The bill requires diversion of at least 50 percent of the solid waste from landfills and transformation facilities, and submission to the California Department of Resources Recycling and Recovery (CalRecycle; formerly known as California Integrated Waste Management Board) of an annual report describing the diversion rates.

2.2.4.10 Assembly Bill 341

The state legislature enacted AB 341 (California Public Resource Code Section 42649.2), increasing the diversion target to 75 percent statewide. AB 341 requires all businesses and public entities that generate 4 cubic yards or more of waste per week to have a recycling program in place. The final regulation was approved by the Office of Administrative Law on May 7, 2012 and went into effect on July 1, 2012.

2.2.4.11 Executive Order S-01-07

EO S-01-07, signed by Governor Schwarzenegger on January 18, 2007, directs that a statewide goal be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by the year 2020. It orders that a Low Carbon Fuel Standard (LCFS) for transportation fuels be established for California and directs CARB to determine whether a LCFS can be adopted as a discrete early action measure pursuant to AB 32. CARB approved the LCFS as a discrete early action item with a regulation adopted and implemented in April 2010. Although challenged in 2011, the Ninth Circuit reversed the District Court's opinion and rejected arguments that implementing LCFS violates the interstate commerce clause in September 2013. CARB is therefore continuing to implement the LCFS statewide.

2.2.4.12 Senate Bill 350

Approved by Governor Brown on October 7, 2015, SB 350 increases California's renewable electricity procurement goal from 33 percent by 2020 to 50 percent by 2030. This will increase the use of Renewables Portfolio Standard eligible resources, including solar, wind, biomass, and geothermal. In addition, large utilities are required to develop and submit Integrated Resource Plans to detail how each entity will meet their customers resource needs, reduce greenhouse gas emissions, and increase the use of clean energy.

2.2.4.13 Senate Bill 100

Approved by Governor Brown on September 10, 2018, SB 100 increases the portion of California's electricity that must come from renewable sources from 50 percent (as mandated by SB 350) to 60 percent by 2030. The bill also establishes a goal of 100 percent of California's electricity sourced from renewable energy and other zero net GHG emissions resources (such as nuclear power) by 2045.

2.2.4.14 Senate Bill 97 – CEQA: Greenhouse Gas Emissions

SB 97 required the Governor's Office of Planning and Research (OPR) to prepare, develop, and transmit to the Resources Agency guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions, as required by CEQA, including but not limited to, effects associated with transportation or energy consumption. The Resources Agency certified and adopted the guidelines on December 31, 2009. The OPR guidance states that the lead agency can rely on qualitative or other performance-based standards for estimating the significance of GHG emissions, although the new CEQA Guidelines did not establish a threshold of significance.

2.2.4.15 Senate Bill 375

SB 375 aligns regional transportation planning efforts, regional GHG reduction targets, and affordable housing allocations. Metropolitan Planning Organizations (MPOs) are required to adopt a Sustainable Communities Strategy (SCS), which allocates land uses in the MPOs' Regional Transportation Plan (RTP). Qualified projects consistent with an approved SCS or Alternative Planning Strategy categorized as "transit priority projects" would receive incentives to streamline CEQA processing.

2.2.4.16 California Air Resources Board: Climate Change Scoping Plan

In December 2008, CARB adopted its first version of its Climate Change Scoping Plan (Scoping Plan), which contained the main strategies California will implement to achieve the mandate of AB 32 to reduce statewide GHG emissions to 1990 levels by 2020. The Scoping Plan establishes an overall framework for the measures that will be adopted to reduce California's GHG emissions. The Scoping Plan evaluates opportunities for sector-specific reductions, integrates all CARB and Climate Action Team early actions and additional GHG reduction measures by both entities, identifies additional measures to be pursued as regulations, and outlines the role of a cap-and-trade program.

On December 14, 2017, CARB adopted the 2017 Climate Change Scoping Plan (2017 Scoping Plan), which lays out the framework for achieving the mandate of SB 32 (2016) to reduce statewide GHG emissions to at least 40 percent below 1990 levels by the end of 2030 (CARB 2017).

The 2017 Scoping Plan includes guidance to local governments in Chapter 5, including plan-level GHG emissions reduction goals and methods to reduce communitywide GHG emissions. In its guidance, CARB recommends that "local governments evaluate and adopt robust and quantitative locally-appropriate goals that align with the statewide per capita targets and the State's sustainable development objectives and develop plans to achieve the local goals." CARB further states that "it is appropriate for local jurisdictions to derive evidence-based local per capita goals [or some other metric] that the local jurisdiction deems appropriate, such as mass emissions or per service population, based on local emissions sectors and population projections that are consistent with the framework used to develop the statewide per capita targets" (CARB 2017).

2.2.5 Local Regulations

2.2.5.1 Southern California Association of Governments

SCAG, of which the City of San Jacinto is a member agency, adopted the 2016-2040 RTP/SCS in April 2016. The RTP/SCS is a State- and federally required long-range plan for regional transportation and land use. The plan anticipates expenditures of $556.5 billion—of which $275.5 billion is budgeted for operations and maintenance of the regional transportation system and another $246.6 billion is reserved for transportation capital improvements. It is anticipated that implementation of the RTP/SCS would result in an eight percent reduction in GHG emissions per capita by 2020, an 18 percent reduction by 2035 and a 21 percent reduction by 2040, compared with 2005 levels (SCAG 2016).

2.2.5.2 County of Riverside

As part of the General Plan Air Quality Element, the County of Riverside adopted a Climate Action Plan (CAP) in 2015. The CAP "establishes goals and policies that incorporate environmental responsibility into its daily management of residential, commercial and industrial growth, education, energy and water use, air quality, transportation, waste, education, economic development and open space and natural habitats to further their commitment." The CAP identified an emissions reduction target for 2020.

The 2019 CAP Update was approved on December 17, 2019. The 2019 CAP Update refines the County's efforts to meet GHG reduction strategies, specifically for the years 2035 and 2050. The 2019 CAP Update builds upon the GHG reduction strategies in the 2015 CAP. The CAP Update addresses cumulative GHG emissions, presents reduction measures that achieve reduction targets, and provides an implementation plan to implement the reduction measures.

2.2.5.3 Western Riverside Council of Governments

The twelve cities of the Western Riverside Council of Governments (WRCOG), which includes the City of San Jacinto, adopted a Subregional Climate Action Plan (Subregional CAP) in September 2014. The Subregional CAP provides a 2010 baseline inventory of GHG emissions for the subregion cities of 5,834,400 MT of CO_2e. Approximately 57 percent of the GHG inventory was from transportation sources, 21 percent from commercial/industrial energy use, 20 percent from residential energy use, and the remaining from waste water and solid waste sources. The Subregional CAP established a target of reducing subregional GHG emissions 15 percent below 2010 levels by 2020 and 49 percent below 2010 levels by 2035. To achieve the 2020 reduction target, the Subregional CAP identifies 14 State and regional measures, 3 local energy sector measures, 18 local transportation sector measures, and 2 solid waste sector measures. The Subregional CAP does not identify GHG reduction measures for achieving goals beyond 2020 (WRCOG 2014). The Subregional CAP does not include thresholds for determining the significance of GHG emissions for new land development, nor does it include a checklist or other methodology for determining consistency of new development with the goals and measures in the Subregional CAP. Since adoption of the original Subregional CAP, WRCOG received grant funding from the California Department of Transportation (Caltrans) Sustainable Transportation Planning Grant Program to prepare an update and expansion to the Subregional CAP, which is termed the CAP Update. The CAP Update will include a comprehensive update to GHG inventories and GHG emissions reduction strategies for all sectors and will establish GHG targets for the year 2050 for WRCOG member jurisdictions.

3.0 EXISTING CONDITIONS

3.1 CLIMATE AND METEOROLOGY

The project site is in the SCAB, which consists of all or part of four counties: Los Angeles, San Bernardino, Riverside, and Orange. The distinctive climate of the SCAB is determined by its terrain and geographic location. The SCAB is a coastal plain with connecting broad valleys and low hills. It is bound by the Pacific Ocean to the southwest and high mountains around the rest of its perimeter. The general region lies in the semi-permanent high-pressure zone of the eastern Pacific, resulting in a mild climate tempered by cool sea breezes with light, average wind speeds.

The usually mild climatological pattern is interrupted occasionally by periods of extremely hot weather, winter storms, or Santa Ana winds. Winds in the Project area are usually driven by the dominant land/ sea breeze circulation system. Regional wind patterns are dominated by daytime onshore sea breezes. At night, the wind generally slows and reverses direction traveling toward the sea. Local canyons can also alter wind direction, with wind tending to flow parallel to the canyons. The vertical dispersion of air pollutants in the SCAB is hampered by the presence of persistent temperature inversions. High pressure systems, such as the semi-permanent high-pressure zone in which the SCAB is located, are characterized by an upper layer of dry air that warms as it descends, restricting the mobility of cooler marine-influenced air near the ground surface, and resulting in the formation of subsidence inversions. Such inversions restrict the vertical dispersion of air pollutants released into the marine layer and, together with strong sunlight, can produce worst-case conditions for the formation of photochemical smog.

The annual average maximum temperature as measured at the Hemet climatic station is 81.7° Fahrenheit (F). The highest monthly average maximum temperature (98.9°F) occurs in August, and the lowest monthly average minimum temperature (37.3°F) occurs in January (Western Regional Climate Center [WRCC] 2016). The average annual precipitation is approximately 11 inches (WRCC 2016).

3.2 EXISTING AIR QUALITY

3.2.1 Criteria Pollutants

3.2.1.1 Attainment Designations

Attainment designations are discussed in Section 2.1 and Table 3. The SCAB is a federal and state nonattainment area for ozone and $PM_{2.5}$. The SCAB is also a state nonattainment area for PM_{10}.

3.2.1.2 Monitored Air Quality

The SCAQMD maintains monitoring stations to measure ambient concentrations of pollutants in the SCAB. The nearest monitoring station to the project site is the Perris monitoring station, located approximately 12 miles east of the project site. The Perris station monitors ozone and PM_{10}. Data from the Lake Elsinore – W. Flint Street monitoring station, located approximately 20 miles southwest of the project site, was used for $PM_{2.5}$ and NO_2. Table 5, *Air Quality Monitoring Data*, presents a summary of the ambient pollutant concentrations monitored at the Perris and Lake Elsinore air quality monitoring stations during the years of 2017 through 2019 for which the SCAQMD has reported data. As shown in Table 5, the 1- and 8-hour ozone standards, as well as the state PM_{10} standard, were exceeded numerous times in each of the sample years.

Table 5
AIR QUALITY MONITORING DATA

Pollutant Standards	2017	2018	2019
Ozone (O_3)			
Maximum concentration 1-hour period (ppm)	0.120	0.117	0.118
Maximum concentration 8-hour period (ppm)	0.105	0.103	0.095
Days above 1-hour state standard (>0.09 ppm)	33	31	28
Days above 8-hour state/federal standard (>0.070 ppm)	80	67	64
Nitrogen Dioxide (NO_2)			
Maximum 1-hour concentration (ppm)	0.049	0.041	0.038
Days above state 1-hour standard (0.18 ppm)	0	0	0
Days above federal 1-hour standard (0.100 ppm)	0	0	0
Coarse Particulates (PM_{10})			
Maximum 24-hour concentration (µg/m^3)	75.4	64.4	97.0
Days above state standard (>50 µg/m^3)	11	2	4
Days above federal standard (>150 µg/m^3)	0	0	0
Fine Particulates ($PM_{2.5}$)			
Maximum 24-hour concentration (µg/m^3)	27.2	31.3	17.6
Days above federal standard (>35 µg/m^3)	*	*	*

Source: CARB 2021
ppm = parts per million
*Insufficient data available to determine the value

3.3 EXISTING GHG EMISSIONS

In an effort to evaluate and reduce the potential adverse impact of global climate change, international, state, and local organizations have conducted GHG inventories to estimate their levels of GHG emissions and removals. The following summarizes the results of these global, national, state, countywide, and local GHG inventories.

For 2016, total GHG emissions worldwide were estimated at 49,358 million metric tons (MMT) CO_2e (World Resources Institute 2020). The U.S. contributed the second largest portion of GHG emissions (behind China) at 12 percent of global emissions, with 5,833 MMT CO_2e in 2016. On a national level in 2013, approximately 27 percent of GHG emissions are associated with transportation and about 31 percent are associated with electricity generation (USEPA 2015).

3.3.1 California GHG Emissions

CARB performs statewide GHG inventories. The inventory is divided into six broad sectors; agriculture and forestry, commercial, electricity generation, industrial, residential, and transportation. Emissions are quantified in MMT CO_2e. Table 6, *California Greenhouse Gas Emissions by Sector*, shows the estimated statewide GHG emissions for the years 1990, 2000, 2010, and 2017.

Table 6
CALIFORNIA GREENHOUSE GAS EMISSIONS BY SECTOR
(MMT CO_2e)

Sector	1990	2000	2010	2017
Agriculture and Forestry	23.4 (5%)	31.0 (7%)	34.7 (8%)	32.4 (8%)
Commercial	14.4 (3%)	14.1 (3%)	20.1 (4%)	23.3 (5%)
Electricity Generation	110.6 (26%)	105.3 (22%)	90.6 (20%)	62.6 (15%)
Industrial	103.0 (24%)	105.8 (22%)	101.8 (23%)	101.1 (24%)
Residential	29.7 (7%)	31.7 (7%)	32.1 (7%)	30.4 (7%)
Transportation	150.7 (35%)	183.2 (39%)	170.2 (38%)	174.3 (41%)
TOTAL	**433.3**	**471.7**	**448.1**	**424.1**

Source: CARB 2007 and CARB 2019
MMT = million metric tons; CO_2e = carbon dioxide equivalent

As shown in Table 6, statewide GHG emissions totaled 433 MMT CO_2e in 1990, 472 MMT CO2e in 2000, 448 MMT CO_2e in 2010, and 424 MMT CO_2e in 2017. Transportation-related emissions consistently contribute the most GHG emissions, followed by industrial emissions and electricity generation.

3.3.2 Riverside County GHG Emissions

The County's CAP Update provides net 2017 County emissions of CO_2e as broken down by emissions category. Riverside County as a whole emitted 4,905,518 MT CO_2e in 2017. The largest portion of Riverside County's 2017 emissions were from transportation (36 percent), followed by agriculture (34 percent), and electricity and natural gas use in buildings (24 percent). Emissions by category are shown in Table 7, *County-wide GHG Emissions by Source.*

Table 7
2017 COUNTY-WIDE GHG EMISSIONS BY SOURCE

Emissions Category	MT CO_2e	Percentage of Total
On-road Transportation	1,766,784	36%
Agriculture	1,670,954	34%
Energy (Electricity and Natural Gas)	1,188,138	24%
Solid Waste	204,365	4%
Water and Wastewater	44,606	1%
Aviation	26,786	1%
Off-road Sources	3,883	<1%
TOTAL	**4,905,518**	**100%**

Source: County 2019
MT = metric tons; CO_2e = carbon dioxide equivalent

The WRCOG prepared an emissions inventory as part of their Subregional CAP. In 2010, Subregional CAP cities emitted approximately 5,834,400 metric tons of GHG emissions. The breakdown of emissions by sector is shown below in Table 8, *Western Riverside Council of Governments Greenhouse Gas Emissions by Sector*. With the exception of transportation, the sectors reported in the CAP inventory do not correspond directly to those reported in the statewide inventory.

Table 8
WESTERN RIVERSIDE COUNCIL OF GOVERNMENTS
GREENHOUSE GAS EMISSIONS BY SECTOR

Sector	MT CO_2e	Percentage of Total
Transportation	3,317,387	57%
Commercial/Industrial Energy	1,226,479	21%
Residential Energy	1,167,843)	20
Solid Waste	112,161)	2%
Wastewater	10,531)	<1%
TOTAL	**5,834,400**	**100%**

Source: WRCOG 2014
MT = metric tons; CO_2e = carbon dioxide equivalent

Similar to the statewide emissions, transportation-related GHG emissions for the Subregional CAP cities were the greatest contributor, followed by energy-related GHG emissions.

4.0 METHODOLOGY AND SIGNIFICANCE CRITERIA

4.1 METHODOLOGY

Criteria pollutant and GHG emissions were calculated using the California Emissions Estimator Model (CalEEMod), Version 2016.3.2 (SCAQMD 2017b). CalEEMod is a computer model used to estimate criteria air pollutant resulting from construction and operation of land development projects throughout the state of California. CalEEMod was developed by the SCAQMD with the input of several air quality management and pollution control districts. The model calculates emissions of CO, PM_{10}, $PM_{2.5}$, SO_2, the ozone precursors VOC and NO_X, and the GHG emissions for CO_2, CH_4, and N_2O. The input data and subsequent construction and operation emission estimates for the proposed project are discussed below. CalEEMod output files are included in Appendix A, *CalEEMod Outputs*.

4.2 ASSUMPTIONS

4.2.1 Construction

Construction of Phase I of the project would involve three general components: (1) construction of the AWTF; (2) construction of the brine management system; and (3) construction and modification of the conveyance pipelines and Alessandro Blending Station. Construction of Phase II of the project would involve expansion of the AWTF. Construction equipment would be used at the various sites and along the pipeline alignments. Excavators, loaders, forklifts, pavers, generators, rollers, air compressors, backhoes, dozers, graders, dump trucks, compactors, welders, pumps, and cranes would be the primary equipment used for project construction.

Phase I construction of the AWTF would generally consist of site preparation, grading, installing underground utilities, constructing the Process and Control Building and associated facilities, paving the roadway and parking lot, and applying architectural coatings. Phase II construction at the AWTF site would involve the 10,400-GSF expansion of the process area of the Process and Control Building.

The primary construction activity for the brine management system would be excavation and grading to construct the ponds, berms, and access roads. The ponds would be excavated to a depth of approximately five feet, resulting in 170,500 cubic yards (CY) of cut. The excavated material would be temporarily stockpiled on District-owned land northwest of the brine management system site. This material would then be used to construct the berms and access roads in between and around the ponds, resulting in balanced site cut/fill with no export of material required. During the temporary stockpile period, best management practices (BMPs) for dust control and erosion prevention would be implemented, such as covering the stockpile with erosion control blankets, installing fiber rolls, and/or applying soil binders.

Modification of the existing 18-inch-diameter pipeline would involve sliplining the existing pipeline with the new 16-inch-diameter pipeline. The sliplining process would require access pits at various locations along the pipeline alignment, including within the right-of-way of Ramona Expressway, for inserting and receiving the sliplining pipe. Depending on location, the insertion pits would range from 25 to 55 feet in length and 10 feet in width. The receiving pits are anticipated to be approximately 15 feet in length and 10 feet in width. The depth of the insertion and receiving pits would vary in depth based on the depth of the existing pipeline, the majority of which is located at a depth of approximately 5.5 feet.

The new 36-inch pipeline would be constructed via open trench methods, with an approximate trench width of five feet. The majority of the trench would be located within the dirt shoulder along the east side of Ramona Expressway. In general, open-cut trenches with laid back walls would be used. In areas that are confined due to existing utilities, roadway intersections, easements, or right-of-way where there is insufficient lateral space to allow for laid back trench walls, trench-box excavation would be used to keep the trench as narrow as possible. Approximately 80 feet of the 36-inch pipeline would be constructed per day on average.

The total duration for construction of Phase I is anticipated to be approximately one and a half years (April 2022 through August 2023), with the individual construction component durations anticipated to be 15 months for the AWTF, 12 months for the brine management system, and 12 months for the conveyance pipelines and Alessandro Blending Station. Construction of the three Phase I components would overlap. Construction of Phase II is anticipated to last approximately one year (January through December 2034). For the purposes of analysis, an anticipated construction schedule, duration, and equipment list for each project component is provided in Table 9, *Construction Schedule and Equipment*.

Table 9
CONSTRUCTION SCHEDULE AND EQUIPMENT

Project Component	Activity	Equipment	Construction Period	
			Start	End
PHASE I				
AWTF	Site Preparation	2 Tractor/Loader/Backhoe	June 2022	June 2022
	Grading	1 Dozer; 1 Grader; 1 Excavator; 1 Dump Truck	June 2022	July 2022
	Underground Utilities	2 Excavator; 2 Tractor/Loader/Backhoe	July 2022	August 2022
	Construction	1 Crane; 2 Excavator; 2 Tractor/Loader/Backhoe; 1 Boom Forklift; 1 Roller; 1 Dump Truck; 1 Plate Compactor	August 2022	July 2023
	Paving	2 Roller; 2 Paver	August 2023	August 2023
	Architectural Coatings	1 Air Compressor	August 2023	August 2023
Brine Management System	Site Preparation	2 Tractor/Loader/Backhoe	June 2022	July 2022
	Grading	2 Dozer; 2 Grader; 2 Excavator; 2 Tractor/Loader/Backhoe; 3 Dump Truck	July 2022	December 2022
	Underground utilities/infrastructure (lining system)	1 Crane; 2 Excavator; 2 Tractor/Loader/Backhoe	January 2023	May 2023
Conveyance Pipelines*	Insertion/Pulling Pits Excavation	1 Excavator; 1 Tractor/Loader/Backhoe	April 2022	March 2023
	Pipeline Sliplining	1 Excavator; 1 Generator; 1 Welder	April 2022	March 2023
	Trenching	1 Excavator; 1 Tractor/Loader/Backhoe	April 2022	March 2023
	Pipeline Installation	1 Excavator; 1 Tractor/Loader/Backhoe; 1 Generator; 1 Welder	April 2022	March 2023
PHASE II				
AWTF Expansion	Underground Utilities	1 Excavator; 1 Tractor/Loader/Backhoe	January 2034	February 2034
	Construction	1 Crane; 2 Excavator; 2 Tractor/Loader/Backhoe; 1 Boom Forklift; 1 Roller; 1 Dump Truck; 1 Plate Compactor	February 2034	November 2034
	Architectural Coatings	2 Air Compressor	December 2034	December 2034

*Based on the linear alignment, it is assumed that these activities are not phased, but rather occur simultaneously.

The quantity, duration, and the intensity of construction activity influence the amount of construction emissions and their related pollutant concentrations that occur at any one time. As such, the emission forecasts provided herein reflect a specific set of conservative assumptions based on the expected construction scenario wherein a relatively large amount of construction is occurring in a relatively intensive manner. Because of this conservative assumption, actual emissions could be less than those forecasted. If construction is delayed or occurs over a longer time period, emissions could be reduced because of (1) a more modern and cleaner-burning construction equipment fleet mix than incorporated

in the CalEEMod, and/or (2) a less intensive buildout schedule (i.e., fewer daily emissions occurring over a longer time interval). A complete listing of the assumptions used in the analysis and model output is provided in Appendix A of this report.

CalEEMod has the capability to calculate reductions in construction emissions from the effects of dust control, diesel-engine classifications, and other selected emissions reduction measures. Emissions calculations assume application of water twice per day during grading, a 15-miles per hour (mph) speed limit on unpaved surfaces, and a 12 percent moisture content on unpaved roads in compliance with SCAQMD Rule 403, Fugitive Dust.

4.2.2 Operation

Operational sources of emissions include transportation, energy, area, water use, solid waste, and stationary sources, such as generators. It was conservatively assumed that operation of Phase I would involve an average of 10 daily vehicle trips to the AWTF site, accounting for up to five staff members, occasional visitor tours, and 10 chemical deliveries per month. For Phase II, an average of 11 daily vehicle trips was assumed to account for an increase in monthly chemical deliveries. The emissions from mobile sources were calculated assuming CalEEMod default trip lengths.

The electricity use associated with Phase I project operation was estimated to be 2,971,470 kilowatt hours (kWh) per year at the AWTF, consisting of electricity for the process equipment in the Process Area and for heating, ventilation, and air conditioning (HVAC) systems and lighting in the Control Area. The electricity usage during operation of Phase II was estimated to be 10,764,116 kWh per year based on the increased treatment capacity and associated electricity requirements. Energy use associated with pumps operating at the brine ponds is estimated to be 1,303,842 kWh per year during both Phases I and II.

A 12.47 kilovolt (kV)/400 kilowatt (kW) standby diesel generator would be provided at the AWTF site to be used in the event of power failure. An additional emergency generator may also be provided at the site. The generators were assumed to be tested for 30 minutes once per month.

Model defaults were used for area, water use, and solid waste were used.

4.2.3 Localized Significance Threshold Methodology

As part of the SCAQMD's environmental justice program, more attention has been focused on localized air quality effects. In addition to the California Environmental Quality Act (CEQA) significance thresholds for mass daily emissions and regional conditions, the SCAQMD has established thresholds for ambient air quality to address localized impacts. Also, while regional impact analysis is based on attaining or maintaining regional emissions standards, localized impact analysis compares the concentration of a pollutant at a receptor site to a health-based standard.

SCAQMD staff then developed localized significance threshold (LST) methodology and mass rate look-up tables by source receptor area (SRA) that can be used by public agencies to determine whether a project may generate significant adverse localized air quality impacts. LSTs represent the maximum emissions from a project that will not cause or contribute to an exceedance of the most stringent applicable federal or state ambient air quality standard; they are developed based on the ambient concentrations of that pollutant for each SRA (SCAQMD 2009). The LST methodology translates the concentration standards into emissions thresholds that are a function of project site area, source to receptor distance,

and the location within the SCAB. The LST methodology is recommended to be limited to projects of 5 acres or less and to avoid the need for complex dispersion modeling. For projects that exceed 5 acres, the 5-acre LST look-up values can be used as a screening tool to determine which pollutants require detailed analysis. This approach is conservative as it assumes that all on-site emissions would occur within a five-acre area resulting in inflated potential localized impacts (i.e., more pollutant emissions occurring within a smaller area and within closer proximity to potential sensitive receptors). If a project exceeds the LST look-up values, then the SCAQMD recommends that project-specific localized air quality modeling be performed.

The proposed project would involve various components that would be constructed at different locations, thus affecting different receptors, and at different times (Phase I vs. Phase II); therefore, the following four construction components were assessed separately for localized air quality impacts: (1) Phase I combined AWTF and brine management system construction; (2) Phase I pipeline sliplining; (3) Phase I pipeline installation; and (4) Phase II AWTF expansion. For each component, the phase resulting in maximum emissions was analyzed. Note that although construction of the AWTF and brine management system would occur at set locations and have the potential to affect a given receptor for the entirety of the construction phase, construction associated with the pipelines would progress along the alignments (an average of 80 feet per day for the 36-inch pipeline) and would not affect a given receptor for the entirety of the construction phase.

For construction emissions, the LST look-up values are determined using the maximum area disturbed per day rather than the size of the project site. The maximum area disturbed per day was determined for the construction phase or concurrent phases of each project component resulting in the maximum pollutant emissions in accordance with the methodology in the SCAQMD's *Fact Sheet for Applying CalEEMod to Localized Significance Thresholds* (SCAQMD 2020). The construction phase or concurrent phases of each project component that would result in the maximum pollutant emissions are shown in Table 10, *Project Construction Components and Localized Significance Threshold Factors.* Table 10 also includes the maximum areas disturbed per day (one, two, or five acres) and the distances to receptors (25, 50, 100, 200, or 500 meters) for each component that were used to determine the appropriate LSTs associated with SRA 28, Hemet/San Jacinto Valley, within which the project is located.

Table 10
PROJECT CONSTRUCTION COMPONENTS AND LOCALIZED SIGNIFICANCE THRESHOLD FACTORS

Phase(s)	Maximum Area Disturbed Per Day	Nearest Receptor Type	Distance to Nearest Receptor
Phase I Combined AWTF and Brine Management System Construction			
AWTF Building Construction and Brine Management System Grading	5 acres	Single-family residences	500 meters
Phase I Pipeline Sliplining			
Insertion/Pulling Pits Excavation and Pipeline Sliplining	1 acre	Single-family residences	25 meters
Phase I Pipeline Installation			
Pipeline Trenching and Pipeline Installation	1 acre	Single-family residences	25 meters
Phase II AWTF Expansion			
Building Construction	1 acre	Single-family residences	500 meters

4.3 SIGNIFICANCE CRITERIA

4.3.1 Air Quality

The following significance thresholds are based on Appendix G of the state CEQA Guidelines. A significant impact is identified if the project would result in any of the following:

(1) Conflict with or obstruct implementation of the applicable air quality plan;

(2) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard;

(3) Expose sensitive receptors to substantial pollutant concentrations; or

(4) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.

Appendix G of the State CEQA Guidelines states that the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the above determinations. The SCAQMD has established significance thresholds to assess the regional and localized impacts of project-related air pollutant emissions. The significance thresholds are updated, as needed, to appropriately represent the most current technical information and attainment status in the SCAB. Table 11, *SCAQMD Air Quality Significance Thresholds*, presents the most current significance thresholds, including regional daily thresholds for short-term construction and long-term operational emissions; maximum incremental cancer risk and hazard indices for TACs; and maximum ambient concentrations for exposure of sensitive receptors to localized pollutants. If the project's criteria pollutant and precursor emissions are below the SCAQMD daily regional thresholds, the project would not result in a cumulatively considerable net increase of any criteria pollutant, contribute substantially to a project air quality violation, or have an adverse effect on human health. If the project's emissions of criteria pollutants, precursors, and TACs result in localized concentrations and/or risk values below the SCAQMD thresholds, the project's impacts to sensitive receptors would be less than significant.

Table 11
SCAQMD AIR QUALITY SIGNIFICANCE THRESHOLDS

Mass Daily Thresholds (pounds per day)		
Pollutant	**Construction**	**Operation**
VOC	75	55
NO_X	100	55
CO	550	550
PM_{10}	150	150
$PM_{2.5}$	55	55
SO_X	150	150
Lead	3	3
Toxic Air Contaminants		
TACs	Maximum Incremental Cancer Risk ≥ 10 in 1 million Cancer Burden > 0.5 excess cancer cases (in areas ≥ 1 in 1 million) Chronic & Acute Hazard Index ≥ 1.0 (project increment)	
Ambient Air Quality for Criteria Pollutants		
NO_2	1-hour average ≥ 0.18 ppm Annual average ≥ 0.03 ppm	
CO	1-hour average ≥ 20.0 ppm (state) 8-hour average ≥ 9.0 ppm (state/federal)	
PM_{10}	24-hour average ≥ 10.4 µg/m^3 (construction) 24-hour average ≥ 2.5 µg/m^3 (operation) Annual average ≥ 1.0 µg/m^3	
$PM_{2.5}$	24-hour average ≥ 10.4 µg/m^3 (construction) 24-hour average ≥ 2.5 µg/m^3 (operation)	
SO_2	24-hour average ≥ 25 µg/m^3	

Source: SCAQMD 2015
lbs/day: pounds per day; VOC: volatile organic compound; NO_X: nitrogen oxides; CO: carbon monoxide; PM_{10}: respirable particulate matter with a diameter of 10 microns or less; $PM_{2.5}$: fine particulate matter with a diameter of 2.5 microns or less; SO_X: sulfur oxides; TACs: toxic air contaminants; GHG: greenhouse gas emissions; MT/yr: metric tons per year; NO_2: nitrogen dioxide; ppm: parts per million; µg/m^3: micrograms per cubic meter

4.3.2 Greenhouse Gases

GHG impacts are the result of combined worldwide emissions over many years, and additional development would incrementally contribute to the significant adverse environmental impacts of global climate change. No single project could generate enough GHG emissions to contribute noticeably to a change in the global average temperature. However, the combination of GHG emissions from past, present, and future projects contribute substantially to the phenomenon of global climate change and its associated environmental impacts. Therefore, GHG emissions impacts are only evaluated cumulatively.

According to Appendix G of the State CEQA Guidelines, a project would have a significant air quality environmental impact if it would:

1. Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; or

2. Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs.

There are no established federal, state, or local quantitative thresholds, including in the County's CAP Update and WRCOG's Subregional CAP, applicable to the project to determine the quantity of GHG emissions that may have a significant effect on the environment. CARB, the SCAQMD, the County, WRCOG, and various cities and agencies have proposed, or adopted on an interim basis, thresholds of significance that require the implementation of GHG emission reduction measures. The proposed project is best categorized as an industrial project and is within the jurisdiction of the SCAQMD; therefore, for this analysis, the most appropriate screening threshold for determining GHG emissions impacts is the SCAQMD proposed Tier 3 screening threshold for industrial projects of 10,000 MT CO_2e (SCAQMD 2010). The SCAQMD's Tier 3 screening threshold was developed to meet the year 2020 statewide GHG emissions targets as mandated by AB 32 and implemented by the CARB Scoping Plan. The SCAQMD has not proposed revised thresholds to account for GHG reduction targets beyond 2020. Accordingly, a threshold reduced by 4.98 percent for each year between 2020 and 2030 would meet the mandates of SB 32 for a 40 percent reduction in emissions by 2030. A threshold then reduced by 5.35 percent for each year between 2030 and 2050 would meet the mandates of SB 32 for an 80 percent reduction in emissions by 2050. The first full year of operation for Phase I of the project is anticipated to be 2024; therefore, a threshold of 8,152 MT CO_2e per year for Phase I is used in this analysis. The first full year of operation for Phase II of the project is anticipated to be 2035; therefore, a threshold of 4,558 MT CO_2e per year for Phase II is used.

4.3.3 General Conformity

The District is seeking financing from the U.S. Department of the Interior (DOI) Bureau of Reclamation (BOR) WaterSMART Program; therefore, the project requires compliance not only with the CEQA, but also with the federal CAA. As such, the air quality analysis has been conducted to satisfy General Conformity requirements.

The USEPA General Conformity Rule applies to federal actions occurring in nonattainment or maintenance areas when the total direct and indirect emissions of nonattainment pollutants (or their precursors) exceed specified thresholds. The emissions thresholds that trigger requirements for a conformity analysis are called *de minimis* levels. *De minimis* levels (in tons per year [tpy]) vary by pollutant and also depend on the severity of the nonattainment status for the air quality management area in question.

A conformity applicability analysis is the first step of a conformity evaluation and assesses if a federal action must be supported by a conformity determination. This is typically done by quantifying applicable direct and indirect emissions that are projected to result due to implementation of the federal action. Indirect emissions are those emissions caused by the federal action and originating in the region of interest, but which can occur at a later time or in a different location from the action itself and are reasonably foreseeable. Reasonably foreseeable emissions are projected for future direct and indirect emissions that are identified at the time the conformity evaluation is performed. If the results of the applicability analysis indicate that the total emissions would not exceed the *de minimis* emissions thresholds, then the conformity evaluation process is completed. *De minimis* threshold emissions are presented in Table 12, *General Conformity De Minimis Levels*. The thresholds used for the general conformity analysis for this project are 10 tons per year for VOCs and NO_X and 70 tons per year for $PM_{2.5}$,

as the SCAB is classified as an extreme nonattainment area for the 8-hour NAAQS for ozone and a serious nonattainment for the NAAQS for $PM_{2.5}$.

Table 12
GENERAL CONFORMITY DE MINIMIS LEVELS FOR SCAB

Pollutant	Area Type	Tons per Year
Ozone (VOC)	Extreme nonattainment	10
Ozone (NO_X)	Extreme nonattainment	10
$PM_{2.5}$	Serious nonattainment	70

Source: USEPA 2020
VOC = volatile organic compound; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter

5.0 AIR QUALITY IMPACT ANALYSIS

This section evaluates potential direct impacts of the proposed project related to the air pollutant emissions. Project-level air quality modeling was completed as part of this analysis. Complete modeling results are included as Appendix A to this report.

5.1 CONSISTENCY WITH AIR QUALITY PLANS

SCAG is the regional planning agency for Los Angeles, Orange, Ventura, Riverside, San Bernardino, and Imperial Counties, and addresses regional issues relating to transportation, economy, community development, and environment. With regard to air quality planning, SCAG has prepared the RTP/SCS, a long-range transportation plan that uses growth forecasts to project trends over a 20-year period to identify regional transportation strategies to address mobility needs. These growth forecasts form the basis for the land use and transportation control portions of the AQMP. These documents are utilized in the preparation of the air quality forecasts and consistency analysis included in the AQMP. Both the RTP/SCS and AQMP are based, in part, on projections originating with County and City General Plans.[3]

The two principal criteria for determining conformance to the AQMP are:

1. Whether the project would result in an increase in the frequency or severity of existing air quality violations; cause or contribute to new violations; or delay timely attainment of air quality standards and

2. Whether the project would result in population or employment growth that exceeds the assumptions in the AQMP.

With respect to the first criterion, the analyses presented in Sections 5.2 through 5.4, below, demonstrate that the project would not generate short-term or long-term emissions that could potentially cause an increase in the frequency or severity of existing air quality violations; cause or contribute to new violations; or delay timely attainment of air quality standards. With respect to the second criterion, the purpose of the project is to implement the District's PWR project to increase local water supply reliability and decrease dependence on imported water. The project would manage the water system in accordance with expected population growth and would not result in population

[3] SCAG serves as the federally designated MPO for the Southern California region.

growth beyond estimates for the area. In addition, jobs associated with construction and operation of the project would likely be filled by the local labor pool and the project would not create conditions for employment growth that exceeds growth estimates for the area. Based on these considerations, the project would not exceed the projections of the RTP/SCS and AQMP. Therefore, the project would not obstruct implementation of the AQMP, and the impact would be less than significant.

5.2 CUMULATIVELY CONSIDERABLE NET INCREASE OF NONATTAINMENT CRITERIA POLLUTANTS

The project would generate criteria pollutants and precursors in the short-term during construction and the long-term during operation. To determine whether the project's emissions would result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment, contribute substantially to a projected air quality violation, or have an adverse effect on human health, the project's emissions were evaluated based on the quantitative emission thresholds established by the SCAQMD (as shown in Table 10). The project's emissions were estimated using CalEEMod as described in Section 4.1. Project-specific input was based on information provided in Sections 1.0 and 4.0 and default model settings to estimate reasonably conservative conditions. Additional details of phasing, selection of construction equipment, and other input parameters, including CalEEMod data, are included in Appendix A.

5.2.1 Phase I Construction

The project's Phase I construction would result in temporary increases in air pollutant emissions. These emissions would be generated in the form of fugitive dust emissions (PM_{10} and $PM_{2.5}$) and ozone precursor emissions (NO_X and VOCs). Operation of heavy equipment and vehicles during the construction phases would generate exhaust emissions from fuel combustion. Fugitive dust emissions would be generated from earth disturbance during site grading, as well as from construction vehicles operating on open fields or dirt roadways within or adjacent to construction sites. Maximum daily emissions of NO_X, CO, SO_2, PM_{10}, and $PM_{2.5}$ from Phase I construction are anticipated to occur when the following activities occur simultaneously in 2022: AWTF building construction, brine management system grading, insertion/pulling pits excavation, pipeline sliplining, pipeline trenching, and pipeline installation. Maximum daily emissions of VOCs from Phase I construction are anticipated to occur during architectural coating of the AWTF in 2023. The results of the emissions calculations for these activities are shown in Table 13, *Maximum Daily Phase I Construction Emissions*. The data are presented as the maximum anticipated daily emissions for comparison with the thresholds identified previously in Table 10.

Table 13
MAXIMUM DAILY PHASE I CONSTRUCTION EMISSIONS

Activity	Pollutant Emissions (pounds/day)					
	VOC	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
AWTF Building Construction – 2022	2	15	18	<0.5	10	2
Brine Management System Grading – 2022	4	34	24	<0.5	14	4
Insertion/Pulling Pit Excavation – 2022	<0.5	3	5	<0.5	<0.5	<0.5
Pipeline Sliplining – 2022	1	6	8	<0.5	<0.5	<0.5
Pipeline Trenching – 2022	<0.5	3	5	<0.5	<0.5	<0.5
Pipeline Installation – 2022	1	8	10	<0.5	1	<0.5
AWTF Architectural Coating – 2023	10	--	--	--	--	--
Total Maximum Daily Emissions	**10**	**69**	**70**	**<0.5**	**25**	**7**
Significance Thresholds	*75*	*100*	*550*	*150*	*150*	*55*
Significant Impact?	***No***	***No***	***No***	***No***	***No***	***No***

Source: CalEEMod (output data is provided in Appendix A)
VOC = volatile organic compound; NO_X = nitrogen oxides; CO = carbon monoxide; SO_X = sulfur oxides; PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter

As shown in Table 13, emissions from Phase I construction activities would not exceed the SCAQMD daily thresholds; therefore, the project's Phase I construction emissions would result in a less than significant impact.

5.2.2 Phase I Operations

Main operational emissions include those from area sources, such as landscaping equipment and consumer products, mobile sources associated with traffic, and on-site energy use. Table 14, *Maximum Daily Phase I (2024) Operational Emissions*, presents the summary of operational emissions for Phase I of the project in year 2024.

Table 14
MAXIMUM DAILY PHASE I (2024) OPERATIONAL EMISSIONS

Category	Pollutant Emissions (pounds per day)					
	VOC	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
Area	18	0.0	<0.5	0.0	0.0	0.0
Energy	0.0	0.0	0.0	0.0	0.0	0.0
Mobile	<0.5	<0.5	<0.5	0.0	<0.5	<0.5
Stationary	1	3	2	0.0	<0.5	<0.5
Total Daily Emissions	**19**	**3**	**3**	**0.0**	**<0.5**	**<0.5**
Significance Thresholds	*55*	*55*	*550*	*150*	*150*	*55*
Significant Impact?	***No***	***No***	***No***	***No***	***No***	***No***

Source: CalEEMod (output data is provided in Appendix A)
VOC = volatile organic compound;; NO_X = nitrogen oxides; CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter

As shown in Table 14, project emissions of all criteria pollutants during Phase I operation would be below the daily thresholds; therefore, the project's Phase I operational emissions would result in a less than significant impact.

5.2.3 Concurrent Phase I Operations and Phase II Construction

Due to the anticipated project phasing, Phase I operations would likely occur concurrently with Phase II construction in year 2034. Table 15, *Concurrent Phase I Operational and Phase II Construction Emissions*, shows the maximum daily emissions from this anticipated overlap.

Table 15
CONCURRENT PHASE I OPERATIONAL AND PHASE II CONSTRUCTION EMISSIONS

Category	Pollutant Emissions (pounds per day)					
	VOC	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
Phase I Operations (2034)	19	3	2	0.0	<0.5	<0.5
Phase II Construction	10	7	18	<0.5	1	<0.5
Total Daily Emissions	**29**	**10**	**20**	**<0.5**	**1**	**<0.5**
Screening-Level Thresholds	*55*	*55*	*550*	*150*	*150*	*55*
Significant Impact?	***No***	***No***	***No***	***No***	***No***	***No***

Source: CalEEMod (output data is provided in Appendix A)
VOC = volatile organic compound; NO_X = nitrogen oxides; CO = carbon monoxide; SO_2 = sulfur dioxide;
PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter

As shown in Table 15, the combined Phase I operational emissions and Phase II construction emissions would be below the significance threshold for all criteria pollutants; therefore, the project's concurrent Phase I operational and Phase II construction emissions would result in a less than significant impact.

5.2.4 Phase II Operations

Phase II (full) project operational emissions sources would be the same those from Phase I, including those from area sources, such as landscaping equipment and consumer products, mobile sources associated with traffic, and on-site energy use. Phase II involves an increase in vehicle trips associated with increased chemical deliveries and increased energy use associated with the increased treatment capacity. Table 16, *Maximum Daily Phase II Operational Emissions*, presents the summary of operational emissions for Phase II of the project in year 2035.

Table 16
MAXIMUM DAILY PHASE II OPERATIONAL EMISSIONS

Category	Pollutant Emissions (pounds per day)					
	VOC	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
Area	20	0.0	<0.5	0.0	0.0	0.0
Energy	0.0	0.0	0.0	0.0	0.0	0.0
Mobile	<0.5	<0.5	<0.5	0.0	<0.5	<0.5
Stationary	1	3	2	0.0	<0.5	<0.5
Total Daily Emissions	**21**	**3**	**3**	**0.0**	<0.5	<0.5
Screening-Level Thresholds	*55*	*55*	*550*	*150*	*150*	*55*
Significant Impact?	***No***	***No***	***No***	***No***	***No***	***No***

Source: CalEEMod (output data is provided in Appendix A)
Note: Total is the sum of the unrounded values.
VOC = volatile organic compound; NO_X = nitrogen oxides; CO = carbon monoxide; SO_2 = sulfur dioxide;
PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter

As shown in Table 16, project emissions of all criteria pollutants during full Phase II project operations would be below the daily thresholds; therefore, the project's Phase II operational emissions would result in a less than significant impact.

The region is a federal and/or state nonattainment area for PM_{10}, $PM_{2.5,}$ and ozone. As shown above and in Section 5.3 below, the project would not result in emissions of PM_{10}, $PM_{2.5}$, or the ozone precursors NO_X and VOCs during construction that would exceed regional or local thresholds and would therefore not be cumulatively considerable. Long-term emissions, as shown in Table 16, would be well below regional thresholds and, therefore, not cumulatively considerable. Impacts associated with emissions resulting in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment are assessed as less than significant.

5.3 IMPACTS TO SENSITIVE RECEPTORS

5.3.1 Construction Activities

5.3.1.1 Criteria Pollutants

The localized effects from the on-site portion of daily construction emissions were evaluated at sensitive receptor locations potentially impacted by the project according to the SCAQMD's LST method, described above in Section 4.2.3. Consistent with the LST guidelines, when quantifying mass emissions for localized analysis, only emissions that occur on-site are considered. Emissions related to off-site delivery/haul truck activity and construction worker trips are not considered in the evaluation of construction-related localized impacts, as these do not contribute to emissions generated on a project site. As detailed in Section 4.2.3, the LSTs being applied to the project are based on SRA 28, Hemet/San Jacinto Valley, as well as the factors included in Table 10 of the various project components. As shown in Table 17, *Maximum Localized Daily Construction Emissions*, localized emissions would not exceed the SCAQMD LSTs. Therefore, project construction would not expose sensitive receptors to substantial criteria pollutant concentrations, and impacts would be less than significant.

Table 17
MAXIMUM LOCALIZED DAILY CONSTRUCTION EMISSIONS

Phase(s)	Pollutant Emissions (pounds per day)			
	NO_X	CO	PM_{10}	$PM_{2.5}$
Phase I Combined AWTF and Brine Management System Construction				
AWTF Building Construction	34	23	5	3
Brine Management System Grading	13	17	1	1
Total Daily Emissions	**47**	**40**	**6**	**4**
Localized Significance Thresholds	*1,072*	*29,256*	*207*	*105*
Significant Impact?	***No***	***No***	***No***	***No***
Phase I Pipeline Sliplining				
Insertion/Pulling Pits Excavation	3	5	<0.5	<0.5
Pipeline Sliplining	5	8	<0.5	<0.5
Total Daily Emissions	**8**	**12**	**<0.5**	**<0.5**
Localized Significance Thresholds	*162*	*750*	*4*	*3*
Significant Impact?	***No***	***No***	***No***	***No***
Phase I Pipeline Installation				
Pipeline Trenching	3	5	<0.5	<0.5
Pipeline Installation	7	10	<0.5	<0.5
Total Daily Emissions	**10**	**15**	**<0.5**	**<0.5**
Localized Significance Thresholds	*162*	*750*	*4*	*3*
Significant Impact?	***No***	***No***	***No***	***No***
Phase II AWTF Expansion				
Building Construction	6	17	<0.5	<0.5
Total Daily Emissions	**6**	**17**	**<0.5**	**<0.5**
Localized Significance Thresholds	*896*	*23,866*	*178*	*86*
Significant Impact?	***No***	***No***	***No***	***No***

Note: Totals may not add up due to rounding.
NO_X = nitrogen oxides; CO = carbon monoxide; PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter

5.3.1.2 Toxic Air Contaminants

Construction activities would result in short-term, project-generated emissions of diesel PM from the exhaust of off-road, heavy-duty diesel equipment. CARB identified diesel PM as a TAC in 1998. The dose to which receptors are exposed is the primary factor used to determine health risk. Dose is a function of the concentration of a substance or substances in the environment and the duration of exposure to the substance. Thus, the risks estimated for a maximally exposed individual (MEI) are higher if a fixed exposure occurs over a longer time period. According to the Office of Environmental Health Hazard Assessment, Health Risk Assessments (HRAs), which determine the exposure of sensitive receptors to TAC emissions, should be based on a 30-year exposure period; however, such assessments should be limited to the period/duration of activities associated with the project.

The construction period would be relatively short when compared to a 30-year exposure period. In addition, the construction would occur at various locations over a large area, and a large amount of equipment would not occur near a single sensitive receptor for an extended period of time. As described

above, construction associated with the pipelines would progress along the alignments (an average of 80 feet per day for the 36-inch pipeline) and would not affect a given receptor for the entirety of the construction phase. Combined with the highly dispersive properties of diesel PM and additional reductions in exhaust emissions from improved equipment, construction-related emissions would not expose sensitive receptors to substantial emissions of diesel PM.

5.3.2 Operational Activities

5.3.2.1 Carbon Monoxide Hotspots

A CO hotspot is an area of localized CO pollution caused by severe vehicle congestion on major roadways, typically near intersections. A quantitative screening is required in two instances: (1) if a project increases the average delay at signalized intersections operating at Level of Service (LOS) E or F; or (2) if a project causes an intersection that would operate at LOS D or better without the project to operate at LOS E or F with the project. Vehicular traffic generated during operation of the proposed project would be limited to daily commute trips for up to five staff members at the AWTF site, chemical delivery trips (estimated at 10 trips per month during Phase I and 11 trips per month during Phase II), and occasional trips associated with public tours of the AWTF site. This would result in a low number of average daily vehicle trips and the project would neither cause new severe congestion nor significantly worsen existing congestion at nearby intersections. There would be no potential for a CO hotspot or exposure of sensitive receptors to substantial, project-generated, local CO emissions. The impact would be less than significant.

5.3.2.2 Toxic Air Contaminants

With regard to long-term operations, a new source of TACs includes two backup diesel generators. The backup generator would only be used for testing or emergency situations. It is anticipated to be tested for 30 minutes per month, equating to 6 hours of operation per year. At this length of operation, the generators would emit negligible TACs. As shown in Tables 14 and 16, above, operational emissions of PM from stationary sources (which include the generators) would be less one pound per day. The proposed pumps and other equipment at the AWTF would be electrically powered and would not generate on-site emissions of TACs.

5.4 ODORS AND OTHER EMISSIONS

Implementation of the proposed project could have the potential to generate objectionable odors through construction activities and during operation of some of the project components, as discussed below.

5.4.1 Construction

Construction activities are not a typical source of nuisance odors, although construction could result in minor amounts of odorous compounds associated with diesel heavy equipment exhaust or evaporation of volatile compounds within paint or other coatings. The smell of diesel exhaust is due in most part to the presence of sulfur and the creation of hydrocarbons during combustion (Nett Technologies 2018). As shown above, project construction would not result in significant emissions of sulfur oxides. Additionally, because project construction would occur at various locations for the different project components, use of construction equipment would not occur all at once or at the same location.

Odorous hydrocarbons emissions would also dissipate beyond the emissions sources and would only affect receptors in the immediate vicinity of the construction sites. Such would be limited to commercial and residential receptors adjacent to the conveyance pipelines construction along SR 79 and Ramona Expressway. Construction of the conveyance pipelines would occur in a linear manner and equipment would not operate, and odorous hydrocarbons would not be emitted, adjacent to a given receptor for extended periods of time. There are no receptors in the vicinity of the AWTF or brine ponds construction sites that would be affected by construction-related odors. Construction odor emissions would also be temporary and would cease upon completion of construction. Odor impacts associated with project construction would be less than significant.

5.4.2 Operation

CARB's Air Quality and Land Use Handbook includes a list of the most common sources of odor complaints received by local air districts. Typical sources of odor complaints include facilities such as sewage treatment plants, landfills, recycling facilities, petroleum refineries, and livestock operations.

While the proposed project would involve water treatment, the treatment process would use recycled water that has already undergone tertiary treatment. The primary odor associated with sewage water treatment is from the release odorous hydrogen sulfide from the anaerobic decomposition of organic compounds that occurs when treating the sewage. The tertiary recycled water that would be used in the advanced water treatment process would have already gone through this process in prior treatments. In other words, the water that would be used in the project's advanced water treatment process is relatively clean and would not involve the release of odors that a sewage treatment process would. In addition, the project's advanced water treatment process, including the use and storage of chemicals, would occur within closed tanks and pipes and would not emit vapors into the air.

The proposed brine management system would accommodate and store the waste product from the advanced water treatment process, which would be a brine (i.e., salt) concentrate. The main compounds in the brine concentrate would include the anions and cations of chloride, nitrate, sulfate, potassium, and sodium, which are non-odorous compounds that occur widely in everyday life. The brine management system would function by storing the waste product and evaporating out water, thus leaving behind the salt compounds. The evaporated water droplets would be contained within the brine management system, per state regulations. As such, the storage of the project's advanced water treatment process waste would not emit objectionable off site. In addition, there are no receptors within the vicinity of the proposed brine management system site.

The conveyance pipelines would be the only operational components of the project that would be located in proximity to receptors that could be affected by objectionable odors, as the pipelines would run adjacent to single-family residences located along Ramona Expressway. The conveyance pipelines, however, would convey advanced treated water and would be located belowground; therefore, they would not be a source of odors to nearby receptors.

As such, operation of the proposed project would not result in significant objectionable odors and impacts would be less than significant.

6.0 GREENHOUSE GAS IMPACT ANALYSIS

This section evaluates potential impacts of the proposed project related to the generation of GHG emissions. Complete modeling results are included as Appendix A of this report.

Emissions of GHGs are presented in MT CO_2e, which is a metric used to compare the emissions from various GHGs based on their global warming potential. The CO_2e of a gas is determined by multiplying the tons of that gas by its global warming potential.

6.1 GREENHOUSE GAS EMISSIONS

6.1.1 Phase I Construction

The project's Phase I construction would generate GHG emissions associated with exhaust from heavy off-road construction equipment, on-road haul trucks delivering material to and from the work sites, and construction worker vehicle trips to and from the work sites. The primary GHG emissions would be CO_2 from gasoline and diesel combustion, with more limited vehicle tailpipe emissions of N_2O and CH_4. Total GHG emissions during Phase I project construction are presented in Table 18, *Estimated Phase I Construction GHG Emissions*. As shown in Table 18, the project would result in GHG emissions from Phase I construction of 1,570 MT CO_2e. Amortized over 30 years, the proposed construction activities would contribute approximately 52 MT CO_2e emissions per year.

Table 18
ESTIMATED PHASE I CONSTRUCTION GHG EMISSIONS

Year	Emissions (MT CO_2e)
2022	1,026
2023	544
TOTAL PHASE I CONSTRUCTION EMISSIONS	**1,570**
Amortized Construction Emissions[2]	52

Source: CalEEMod (output data is provided in Appendix A)
[1] The total presented is the sum of the unrounded values.
[2] Construction emissions are amortized over 30 years.
MT = metric tons; CO_2e = carbon dioxide equivalent

6.1.2 Phase I Operations

Operational sources of emissions from the project include: (1) area sources; (landscape equipment and consumer products); (2) energy use (electricity); (3) vehicle use; (4) stationary sources (emergency generators); (5) solid waste generation; and (6) indoor and outdoor water use. The project would achieve an annual recharge of up to 4,000 acre-feet of potable water during Phase I, which would reduce reliance on imported water, thereby reducing GHG emissions associated with the conveyance of imported water. The project's GHG emissions estimates are presented below both with and without this savings.

6.1.2.1 Area Sources

Area sources include GHG emissions that would occur from the use of landscaping equipment and consumer products. Landscape equipment would occasionally be used for maintenance of formal landscaping at the AWTF site and likely for weed abatement near the brine management system. Due to the limited amount of equipment and time required for maintenance, area source GHG emissions would be negligible.

6.1.2.2 Energy Use

Projects that increase electricity consumption also result in an indirect increase in GHG emissions. The off-site generation of electricity through the combustion of fossil fuels typically yields CO_2, and to a much smaller extent, CH_4 and N_2O. Most of the project's electricity consumption would be associated with the advanced water treatment process equipment at the Process Center of the AWTF. Electricity would also be used, to a much lesser extent, for uses such as lighting and HVAC systems at the Control Center of the AWTF. The annual GHG emissions from energy usage are estimated to be 1,369 MT CO_2e per year.

6.1.2.3 Vehicular (Mobile) Sources

The project's mobile sources of GHG emissions would occur from an average of 10 daily vehicle trips to the AWTF site, accounting for up to five staff members, occasional visitor tours, and 10 chemical deliveries per month. The project would result in emissions of 21 MT CO_2e per year from mobile sources.

6.1.2.4 Stationary Sources (Emergency Generators)

Two diesel-powered standby/emergency generators would be used for backup power during electric power failures. Generator emissions were estimated using CalEEMod based on the monthly testing frequency and duration, as well as the power output of the engines. The project would result in emissions of 3 MT CO_2e from stationary sources.

6.1.2.5 Solid Waste

Solid waste generated by the project would also contribute to GHG emissions. Treatment and disposal of solid waste produces emissions of methane. The project is estimated to result in emissions of 9 MT CO_2e from solid waste.

6.1.2.6 Water Use

Water-related GHG emissions are from the conveyance and treatment of water. The California Energy Commission's 2006 Refining Estimates of Water-Related Energy Use in California defines average energy values for water in southern California. These values are used in CalEEMod to establish default water related emission factors. Model default indoor and outdoor water usage was used. A 20 percent outdoor water use reduction per CALGreen requirements was also incorporated into the model. The Project's annual GHG emissions from water sources are estimated to be 27 MT CO_2e.

6.1.2.7 Potable Water Savings

By providing a local source of potable water, the project would reduce reliance on imported water, thereby reducing GHG emissions associated with the energy used to pump water from the Sacramento-San Joaquin Bay Delta in northern California or from the Colorado River. The provision of potable water consumes large amounts of energy associated with regional source and conveyance, treatment, and local distribution. This type of energy use is known as embedded energy. While the project would result in a reduction in energy used for regional import, energy would still be required to locally pump water produced by the project that would be recharged into the groundwater table. As such, the electricity intensity factor associated with local pumping was subtracted from the electricity intensity factors for import to achieve a factor that represents the net savings electricity intensity factor associated with the provision of potable water that would result from the project. The electricity intensity factors are provided by the California Energy Commission's (CEC's) *California's Water – Energy Relationship Final Staff Report* (CEC 2005).

To then calculate GHG emissions associated with this embedded energy, the electricity intensity factors are multiplied by the utility intensity factors for the GHGs and are classified as indirect emissions. The GHG emissions associated with water use are calculated by multiplying the embedded energy in a gallon of potable water by the total number of gallons provided and then by the electricity generation GHG emissions factors. It is estimated that Phase I of the project would achieve a potable water recharge capacity of 4,000 AFY. After factoring in a minor loss from evaporation, Phase I of the project is estimated to save, and therefore reduce import of, 3,912 acre-feet, or 1,275 million gallons, of potable water per year. This would result in a GHG emissions reduction of approximately 2,063 MT CO_2e per year.

6.1.2.8 Emissions

Table 19, *Total Estimated Phase I Operational GHG Emissions*, includes the total annual emissions for Phase I operation of the project. The emissions include the amortized annual Phase I construction emissions anticipated for the project. Without considering potable water savings, the project would result in annual emissions of 1,480 MT CO_2e during Phase I operations. With potable water savings, the project would result in a net reduction in emissions of 583 MT CO_2e per year. Under both scenarios, the project's Phase I operational emissions would be below the annual threshold of 8,152 MT CO_2e calculated for year 2024. Impacts would be less than significant.

Table 19
TOTAL ESTIMATED PHASE I OPERATIONAL GHG EMISSIONS

Emission Sources	Emissions ($MT CO_2e$)
Area Sources	0
Energy Sources	1,369
Vehicular (Mobile) Sources	21
Stationary Sources	3
Solid Waste Sources	9
Water Sources	27
Phase I Operational Subtotal	1,428
Phase I Construction (amortized over 30 years)	52
TOTAL PHASE I OPERATIONAL EMISSIONS WITHOUT POTABLE WATER SAVINGS	**1,480**
Phase I Potable Water Savings	**2,063**
TOTAL PHASE I OPERATIONAL EMISSIONS WITH POTABLE WATER SAVINGS	**(583)**
Calculated Year 2024 Threshold	***8,152***
Exceed Threshold?	**No**

Source: CalEEMod output data is provided in Appendix A
Note: Totals may not add up exactly due to rounding.
MT = metric tons; CO_2e = carbon dioxide equivalent

6.1.3 Phase II Construction

As with Phase I construction, the project's Phase II construction would generate GHG emissions associated with exhaust from heavy off-road construction equipment, on-road haul trucks delivering material to and from the work sites, and construction worker vehicle trips to and from the work sites, although to a much lesser extent than Phase I construction. Total GHG emissions during the project's Phase II construction are presented in Table 20, *Estimated Phase II Construction GHG Emissions*. As shown in Table 20, the project would result in GHG emissions from Phase II construction of 517 MT CO_2e. Amortized over 30 years, the proposed construction activities would contribute approximately 17 MT CO_2e emissions per year.

Table 20
ESTIMATED PHASE II CONSTRUCTION GHG EMISSIONS

Year	Emissions ($MT CO_2e$)
2034	517
TOTAL PHASE I CONSTRUCTION EMISSIONS	**517**
Amortized Construction Emissions[2]	17

Source: CalEEMod (output data is provided in Appendix A)
[1] The total presented is the sum of the unrounded values.
[2] Construction emissions are amortized over 30 years.
MT = metric tons; CO_2e = carbon dioxide equivalent

6.1.4 Phase II Operations

As with Phase I operations, sources of emissions from the project's Phase II operations would include area sources, energy use, vehicle use, stationary sources, solid waste generation, and water use. Of these sources, area source emissions and stationary source emissions are not anticipated to increase. The primary increase in emissions would be associated with the increased electricity used for the increased treatment capacity of Phase II. Although Phase II would involve a slight increase in vehicle trips from increased chemical deliveries, emissions are calculated to decrease due to anticipated stricter emissions regulations for vehicles in the future. Solid waste source and water source emissions would slightly increase.

Phase II of the project is estimated to achieve an additional potable water recharge capacity of 11,000 AFY, for a total Phase II recharge capacity of 15,000 AFY. After factoring in a minor loss from evaporation, Phase II of the project is estimated to save, and therefore reduce import of, 14,670 acre-feet, or 4,780 million gallons, of potable water per year. This would result in a GHG emissions reduction of approximately 7,736 MT CO_2e per year.

Table 21, *Total Estimated Phase II Operational GHG Emissions*, includes the total annual emissions for Phase II operation of the project. The emissions include the amortized annual Phase I and Phase II construction emissions anticipated for the project. Without considering potable water savings, the project would result in annual emissions of 4,006 MT CO_2e during Phase II operations. With potable water savings, the project would result in a net reduction in emissions of 3,730 MT CO_2e per year. Under both scenarios, the project's Phase II operational emissions would be below the annual threshold of 4,558 MT CO_2e calculated for year 2035. Impacts would be less than significant.

Table 21
TOTAL ESTIMATED PHASE II OPERATIONAL GHG EMISSIONS

Emission Sources	Emissions (MT CO_2e)
Area Sources	0
Energy Sources	3,861
Vehicular (Mobile) Sources	19
Stationary Sources	3
Solid Waste Sources	14
Water Sources	40
Phase II Operational Subtotal	3,937
Phase I Construction (amortized over 30 years)	52
Phase II Construction (amortized over 30 years)	17
TOTAL PHASE II OPERATIONAL EMISSIONS WITHOUT POTABLE WATER SAVINGS	**4,006**
Phase II Potable Water Savings	**7,736**
TOTAL PHASE II OPERATIONAL EMISSIONS WITH POTABLE WATER SAVINGS	**(3,730)**
Calculated Year 2035 Threshold	***4,558***
Exceed Threshold?	**No**

Source: CalEEMod output data is provided in Appendix A
Note: Totals may not add up exactly due to rounding.
MT = metric tons; CO_2e = carbon dioxide equivalent

6.2 CONSISTENCY WITH LOCAL PLANS ADOPTED FOR THE PURPOSE OF REDUCING GHG EMISSIONS

There are numerous State plans, policies, and regulations adopted for the purpose of reducing GHG emissions. The principal overall State plan and policy is AB 32 and SB 32, the California Global Warming Solutions Act of 2006. The quantitative goal of AB 32 was to reduce GHG emissions to 1990 levels by 2020. SB 32 requires further reductions of 40 percent below 1990 levels by 2030 and 80 percent below 1990 levels by 2050. Statewide plans are regulations are being implemented at the statewide level, and compliance on a project-specific level is not addressed. Further, a number of prominent statewide plans and regulations (e.g., AB 1493 and the LCFS), as well as regional plans (e.g., SCAG's RTP/SCS), aimed at reducing GHG emissions focus on reducing transportation source emissions. The proposed project would generate minimal vehicle miles traveled (VMT) and would therefore not conflict with such policies and regulations.

As previously discussed, the increase in GHG emissions would be less than the reduced SCAQMD significance thresholds being applied to this analysis in accordance with SB 32 reduction targets. In addition, the project would implement a potable water replenishment program to provide the District's service area with a local, sustainable, and reliable drinking water supply. By providing a local, reliable source of potable water, the project would reduce GHG emissions associated with embedded energy required for the conveyance of water from the Sacramento-San Joaquin Bay Delta in northern California or from the Colorado River. This would aid in meeting the County's CAP Update and WRCOG's Subregional CAP GHG emissions reductions targets.

Given the aforementioned, implementation of the proposed project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. This would represent a less than significant impact.

7.0 GENERAL CONFORMITY

This section evaluates potential adverse effects of the proposed project as they relate to air pollutant emissions for the purposes of conformity with federal regulations. Project construction and operational emissions were estimated using the CalEEMod model as described in Section 4.0.

7.1 CONSTRUCTION EMISSIONS

Table 22, *Annual Construction Emissions,* below, shows a conservative estimate of the project's annual Phase I and Phase II construction emissions for comparison to the *de minimis* conformity thresholds. As shown therein, emissions from the project's construction would not exceed *de minimis* conformity thresholds.

Table 22
ANNUAL CONSTRUCTION EMISSIONS

Year	Pollutant Emissions (tons per year)					
	ROG	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
2022 (Phase I)	1	7	6	<0.5	5	1
2023 (Phase I)	<0.5	2	3	<0.5	1	<0.5
2034 (Phase II)	<0.5	1	2	<0.5	<0.5	<0.5
Maximum Annual Emissions	*1*	*7*	*6*	<0.5	*5*	*1*
De minimis Thresholds	*10*	*10*	-	-	-	*70*
Significant Impact?	***No***	***No***	***No***	***No***	***No***	***No***

Source: CalEEMod (output data is provided in Appendix A)
ROG = reactive organic gas; NO_X = nitrogen oxides; CO = carbon monoxide; SO_X = sulfur oxides;
PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter

7.2 OPERATIONAL EMISSIONS

Table 23, *Annual Phase I Operational Emissions*, below, shows a conservative estimate of the project's Phase I operational emissions for comparison to the *de minimis* conformity thresholds. As shown therein, emissions from Phase I operations would not exceed *de minimis* conformity thresholds.

Table 23
ANNUAL PHASE I OPERATIONAL EMISSIONS

Year	Pollutant Emissions (tons per year)					
	ROG	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
Area	3	<0.5	<0.5	0	<0.5	<0.5
Energy	0	0	0	0	0	0
Mobile	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Stationary	<0.5	2	3	<0.5	1	1
Total Annual Emissions	*3*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*
De minimis Thresholds	*10*	*10*	-	-	-	*70*
Significant Impact?	***No***	***No***	***No***	***No***	***No***	***No***

Source: CalEEMod (output data is provided in Appendix A)
ROG = reactive organic gas; NO_X = nitrogen oxides; CO = carbon monoxide; SO_X = sulfur oxides;
PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter

Table 24, *Annual Phase II Operational Emissions*, below, shows a conservative estimate of the project's Phase II operational emissions for comparison to the *de minimis* conformity thresholds. As shown therein, emissions from Phase II operations would not exceed *de minimis* conformity thresholds.

Table 24
ANNUAL PHASE II OPERATIONAL EMISSIONS

Year	Pollutant Emissions (tons per year)					
	ROG	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
Area	4	<0.5	<0.5	0	<0.5	<0.5
Energy	0	0	0	0	0	0
Mobile	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Stationary	<0.5	2	3	<0.5	1	1
Total Annual Emissions	*4*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*
De minimis Thresholds	*10*	*10*	-	-	-	*70*
Significant Impact?	***No***	***No***	***No***	***No***	***No***	***No***

Source: CalEEMod (output data is provided in Appendix A)
ROG = reactive organic gas; NO_X = nitrogen oxides; CO = carbon monoxide; SO_X = sulfur oxides;
PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter

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Appendix A

CalEEMod Outputs

EMW-20 Phase I Construction and Operation 2024

Riverside-South Coast County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	4.90	1000sqft	0.11	4,900.00	0
General Light Industry	15.90	1000sqft	0.37	15,900.00	0
User Defined Industrial	1.00	User Defined Unit	20.00	871,200.00	0
Other Asphalt Surfaces	140.90	1000sqft	3.23	140,900.00	0
Parking Lot	12.10	1000sqft	0.28	12,100.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.4	**Precipitation Freq (Days)**	28
Climate Zone	10			**Operational Year**	2024
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Phase I construction 2022 and 2023, operation for year 2024.

Land Use - General Office Building = Control Area
General Light Industrial = Process Area
User Defined Industrial = Brine Ponds

Construction Phase - Construction schedule per project engineers.

Off-road Equipment -

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - Construction equipment per project engineers.

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Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - Construction equipment per project engineers.

Trips and VMT - Crew sizes estimated from project description and equipment.
Minimum crew size of 5 (10 trips) for any single activity.

On-road Fugitive Dust - Unpaved access road during construction, 0.6 miles to AWTF site and 0.75 miles to Brine Ponds.

Grading - Soil cut and fill balanced on site, no import or export.

Architectural Coating - 50 g/L maximum VOC content per project eningeers.
Only the control/process building and parking lots to be paved.

Vehicle Trips - 10 ADT (5 workers) per project engineer.

Area Coating - 50 g/L maximum VOC content per project eningeers.
Only the control/process building and parking lots to be paved.

Energy Use - 2,971,470 kWh/year total electricty per year for the AWTF, no natural gas.
1,303,842 kWh/year total electricity for the brine system, no natural gas.

Construction Off-road Equipment Mitigation - Dust mitigation per SCAQMD Rule 403.

Water Mitigation - A 20% reduction in outdoor water use applied to account for CaLGreen requirements not included in model defaults.

Waste Mitigation - Additional 25% solid waste diversion mandated by AB 341 not accounted for in model defaults.

Stationary Sources - Emergency Generators and Fire Pumps - 2 ea. 400kW diesel emergency generators.

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	ConstArea_Nonresidential_Exterior	446,000.00	10,400.00

EMW-20 Phase I Construction and Operation 2024 - Riverside-South Coast County, Annual

tblArchitecturalCoating	ConstArea_Nonresidential_Interior	1,338,000.00	31,200.00
tblArchitecturalCoating	EF_Nonresidential_Exterior	100.00	50.00
tblArchitecturalCoating	EF_Nonresidential_Interior	100.00	50.00
tblArchitecturalCoating	EF_Parking	100.00	50.00
tblAreaCoating	Area_EF_Nonresidential_Exterior	100	50
tblAreaCoating	Area_EF_Nonresidential_Interior	100	50
tblAreaCoating	Area_EF_Parking	100	50
tblAreaCoating	Area_Nonresidential_Exterior	446000	10400
tblAreaCoating	Area_Nonresidential_Interior	1338000	31200
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	10.00	11.00
tblConstructionPhase	NumDays	10.00	33.00
tblConstructionPhase	NumDays	35.00	22.00
tblConstructionPhase	NumDays	35.00	120.00
tblConstructionPhase	NumDays	370.00	250.00
tblConstructionPhase	NumDays	20.00	11.00
tblConstructionPhase	NumDays	20.00	12.00
tblEnergyUse	LightingElect	2.93	0.00
tblEnergyUse	LightingElect	3.66	0.00
tblEnergyUse	NT24E	5.02	186.88
tblEnergyUse	NT24E	2.79	0.00
tblEnergyUse	NT24E	0.00	1.50
tblEnergyUse	NT24NG	17.13	0.00
tblEnergyUse	T24E	2.20	0.00
tblEnergyUse	T24E	3.07	0.00
tblEnergyUse	T24NG	15.36	0.00

tblEnergyUse	T24NG	3.47	0.00
tblLandUse	LandUseSquareFeet	0.00	871,200.00
tblLandUse	LotAcreage	0.00	20.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	7.00	5.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00

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tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	WorkerPercentPave	100.00	97.00
tblOnRoadDust	WorkerPercentPave	100.00	97.00
tblOnRoadDust	WorkerPercentPave	100.00	97.00
tblOnRoadDust	WorkerPercentPave	100.00	97.00

tblOnRoadDust	WorkerPercentPave	100.00	97.00
tblOnRoadDust	WorkerPercentPave	100.00	97.00
tblOnRoadDust	WorkerPercentPave	100.00	97.00
tblOnRoadDust	WorkerPercentPave	100.00	97.00
tblOnRoadDust	WorkerPercentPave	100.00	97.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblStationaryGeneratorsPumpsUse	HorsePowerValue	0.00	555.00
tblStationaryGeneratorsPumpsUse	HoursPerDay	0.00	0.50
tblStationaryGeneratorsPumpsUse	HoursPerYear	0.00	6.00
tblStationaryGeneratorsPumpsUse	NumberOfEquipment	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	VendorTripNumber	171.00	10.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	WorkerTripNumber	5.00	10.00
tblTripsAndVMT	WorkerTripNumber	8.00	10.00
tblTripsAndVMT	WorkerTripNumber	5.00	10.00
tblTripsAndVMT	WorkerTripNumber	5.00	10.00
tblTripsAndVMT	WorkerTripNumber	5.00	10.00
tblTripsAndVMT	WorkerTripNumber	438.00	20.00
tblTripsAndVMT	WorkerTripNumber	13.00	20.00
tblTripsAndVMT	WorkerTripNumber	88.00	10.00
tblVehicleTrips	ST_TR	1.32	0.63
tblVehicleTrips	ST_TR	2.46	0.00
tblVehicleTrips	SU_TR	0.68	0.63
tblVehicleTrips	SU_TR	1.05	0.00

tblVehicleTrips	WD_TR	6.97	0.63
tblVehicleTrips	WD_TR	11.03	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.5676	5.0986	5.4564	0.0116	3.6870	0.2203	3.9073	0.6182	0.2056	0.8238	0.0000	1,019.4583	1,019.4583	0.2543	0.0000	1,025.8147
2023	0.3161	2.2123	3.0532	6.1400e-003	3.5828	0.0950	3.6777	0.3704	0.0883	0.4587	0.0000	541.0134	541.0134	0.1343	0.0000	544.3697
Maximum	**0.5676**	**5.0986**	**5.4564**	**0.0116**	**3.6870**	**0.2203**	**3.9073**	**0.6182**	**0.2056**	**0.8238**	**0.0000**	**1,019.4583**	**1,019.4583**	**0.2543**	**0.0000**	**1,025.8147**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.5676	5.0986	5.4564	0.0116	1.3486	0.2203	1.5689	0.2581	0.2056	0.4636	0.0000	1,019.4573	1,019.4573	0.2543	0.0000	1,025.8137
2023	0.3161	2.2123	3.0532	6.1400e-003	1.2124	0.0950	1.3073	0.1334	0.0883	0.2217	0.0000	541.0129	541.0129	0.1343	0.0000	544.3691
Maximum	**0.5676**	**5.0986**	**5.4564**	**0.0116**	**1.3486**	**0.2203**	**1.5689**	**0.2581**	**0.2056**	**0.4636**	**0.0000**	**1,019.4573**	**1,019.4573**	**0.2543**	**0.0000**	**1,025.8137**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**64.77**	**0.00**	**62.08**	**60.41**	**0.00**	**46.56**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	4-1-2022	6-30-2022	0.8941	0.8941
2	7-1-2022	9-30-2022	2.2565	2.2565
3	10-1-2022	12-31-2022	2.5266	2.5266
4	1-1-2023	3-31-2023	1.4453	1.4453
5	4-1-2023	6-30-2023	0.7980	0.7980
6	7-1-2023	9-30-2023	0.2732	0.2732
		Highest	2.5266	2.5266

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	3.2392	2.0000e-005	2.2300e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.3400e-003	4.3400e-003	1.0000e-005	0.0000	4.6200e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1,364.4730	1,364.4730	0.0563	0.0117	1,369.3544
Mobile	2.9100e-003	0.0211	0.0438	2.2000e-004	0.0192	1.3000e-004	0.0193	5.1400e-003	1.2000e-004	5.2600e-003	0.0000	20.7032	20.7032	7.7000e-004	0.0000	20.7225
Stationary	5.4600e-003	0.0153	0.0139	3.0000e-005		8.0000e-004	8.0000e-004		8.0000e-004	8.0000e-004	0.0000	2.5361	2.5361	3.6000e-004	0.0000	2.5450
Waste						0.0000	0.0000		0.0000	0.0000	4.9286	0.0000	4.9286	0.2913	0.0000	12.2105
Water						0.0000	0.0000		0.0000	0.0000	1.4428	20.7572	22.2000	0.1491	3.6800e-003	27.0217
Total	**3.2476**	**0.0364**	**0.0600**	**2.5000e-004**	**0.0192**	**9.4000e-004**	**0.0201**	**5.1400e-003**	**9.3000e-004**	**6.0700e-003**	**6.3714**	**1,408.4738**	**1,414.8452**	**0.4978**	**0.0153**	**1,431.8587**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	3.2392	2.0000e-005	2.2300e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.3400e-003	4.3400e-003	1.0000e-005	0.0000	4.6200e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1,364.4730	1,364.4730	0.0563	0.0117	1,369.3544
Mobile	2.9100e-003	0.0211	0.0438	2.2000e-004	0.0192	1.3000e-004	0.0193	5.1400e-003	1.2000e-004	5.2600e-003	0.0000	20.7032	20.7032	7.7000e-004	0.0000	20.7225
Stationary	5.4600e-003	0.0153	0.0139	3.0000e-005		8.0000e-004	8.0000e-004		8.0000e-004	8.0000e-004	0.0000	2.5361	2.5361	3.6000e-004	0.0000	2.5450
Waste						0.0000	0.0000		0.0000	0.0000	3.6965	0.0000	3.6965	0.2185	0.0000	9.1578
Water						0.0000	0.0000		0.0000	0.0000	1.4428	20.3793	21.8221	0.1490	3.6700e-003	26.6424
Total	**3.2476**	**0.0364**	**0.0600**	**2.5000e-004**	**0.0192**	**9.4000e-004**	**0.0201**	**5.1400e-003**	**9.3000e-004**	**6.0700e-003**	**5.1393**	**1,408.0959**	**1,413.2351**	**0.4250**	**0.0153**	**1,428.4268**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**19.34**	**0.03**	**0.11**	**14.63**	**0.07**	**0.24**

3.0 Construction Detail

Construction Phase

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Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Pipeline Pits	Trenching	4/1/2022	3/31/2023	5	261	
2	Pipeline Slip Lining	Trenching	4/1/2022	3/31/2023	5	261	
3	Pipeline Trenching	Trenching	4/1/2022	3/31/2023	5	261	
4	Pipeline Installation	Trenching	4/1/2022	3/31/2023	5	261	
5	AWTF Site Preparation	Site Preparation	6/1/2022	6/15/2022	5	11	
6	Brine Site Preparation	Site Preparation	6/1/2022	7/15/2022	5	33	
7	AWTF Grading	Grading	6/16/2022	7/15/2022	5	22	
8	Brine Grading	Grading	7/16/2022	12/31/2022	5	120	
9	AWTF Underground Utilities	Trenching	7/16/2022	8/15/2022	5	21	
10	AWTF Building Construction	Building Construction	8/16/2022	7/31/2023	5	250	
11	Brine Underground Utilities/Infrastructure	Trenching	1/1/2023	6/30/2023	5	130	
12	AWTF Paving	Paving	8/1/2023	8/15/2023	5	11	
13	AWTF Architectural Coating	Architectural Coating	8/16/2023	8/31/2023	5	12	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 3.51

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 31,200; Non-Residential Outdoor: 10,400; Striped Parking Area: 9,180 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Pipeline Pits	Excavators	1	7.00	158	0.38
Pipeline Pits	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Pipeline Slip Lining	Excavators	1	7.00	158	0.38

Pipeline Slip Lining	Generator Sets	1	7.00	84	0.74
Pipeline Slip Lining	Welders	1	7.00	46	0.45
Pipeline Trenching	Excavators	1	7.00	158	0.38
Pipeline Trenching	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Pipeline Installation	Excavators	1	7.00	158	0.38
Pipeline Installation	Generator Sets	1	7.00	84	0.74
Pipeline Installation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Pipeline Installation	Welders	1	7.00	46	0.45
AWTF Site Preparation	Rubber Tired Dozers	0	7.00	247	0.40
AWTF Site Preparation	Tractors/Loaders/Backhoes	2	7.00	97	0.37
Brine Site Preparation	Rubber Tired Dozers	0	7.00	247	0.40
Brine Site Preparation	Tractors/Loaders/Backhoes	2	7.00	97	0.37
AWTF Grading	Excavators	1	7.00	158	0.38
AWTF Grading	Graders	1	7.00	187	0.41
AWTF Grading	Off-Highway Trucks	1	7.00	402	0.38
AWTF Grading	Rubber Tired Dozers	1	7.00	247	0.40
AWTF Grading	Scrapers	0	8.00	367	0.48
AWTF Grading	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Brine Grading	Excavators	2	7.00	158	0.38
Brine Grading	Graders	2	7.00	187	0.41
Brine Grading	Off-Highway Trucks	3	5.00	402	0.38
Brine Grading	Rubber Tired Dozers	2	5.00	247	0.40
Brine Grading	Scrapers	0	8.00	367	0.48
Brine Grading	Tractors/Loaders/Backhoes	2	7.00	97	0.37
AWTF Underground Utilities	Excavators	2	7.00	158	0.38
AWTF Underground Utilities	Tractors/Loaders/Backhoes	2	7.00	97	0.37
AWTF Building Construction	Cranes	1	5.00	231	0.29

AWTF Building Construction	Excavators	2	7.00	158	0.38
AWTF Building Construction	Forklifts	0	8.00	89	0.20
AWTF Building Construction	Generator Sets	0	8.00	84	0.74
AWTF Building Construction	Off-Highway Trucks	1	5.00	402	0.38
AWTF Building Construction	Plate Compactors	1	7.00	8	0.43
AWTF Building Construction	Rollers	1	7.00	80	0.38
AWTF Building Construction	Rough Terrain Forklifts	1	7.00	100	0.40
AWTF Building Construction	Tractors/Loaders/Backhoes	2	7.00	97	0.37
AWTF Building Construction	Welders	0	8.00	46	0.45
Brine Underground Utilities/Infrastructure	Cranes	1	5.00	231	0.29
Brine Underground Utilities/Infrastructure	Excavators	2	7.00	158	0.38
Brine Underground Utilities/Infrastructure	Tractors/Loaders/Backhoes	2	7.00	97	0.37
AWTF Paving	Pavers	2	7.00	130	0.42
AWTF Paving	Paving Equipment	0	8.00	132	0.36
AWTF Paving	Rollers	2	7.00	80	0.38
AWTF Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Pipeline Pits	2	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Slip Lining	3	10.00	10.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Trenching	2	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Installation	4	10.00	10.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
AWTF Site Preparation	2	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
Brine Site Preparation	2	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
AWTF Grading	4	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
Brine Grading	11	28.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
AWTF Underground Utilities	4	10.00	10.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
AWTF Building Construction	9	20.00	10.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
Brine Underground Utilities/Infrastructure	5	20.00	10.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
AWTF Paving	4	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
AWTF Architectural Coating	1	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

3.2 Pipeline Pits - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0315	0.2961	0.4710	7.1000e-004		0.0151	0.0151		0.0139	0.0139	0.0000	62.3304	62.3304	0.0202	0.0000	62.8344
Total	**0.0315**	**0.2961**	**0.4710**	**7.1000e-004**		**0.0151**	**0.0151**		**0.0139**	**0.0139**	**0.0000**	**62.3304**	**62.3304**	**0.0202**	**0.0000**	**62.8344**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.9800e-003	3.3500e-003	0.0370	1.2000e-004	0.0145	8.0000e-005	0.0146	3.8500e-003	8.0000e-005	3.9300e-003	0.0000	11.2407	11.2407	2.4000e-004	0.0000	11.2467
Total	**4.9800e-003**	**3.3500e-003**	**0.0370**	**1.2000e-004**	**0.0145**	**8.0000e-005**	**0.0146**	**3.8500e-003**	**8.0000e-005**	**3.9300e-003**	**0.0000**	**11.2407**	**11.2407**	**2.4000e-004**	**0.0000**	**11.2467**

3.2 Pipeline Pits - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0315	0.2961	0.4710	7.1000e-004		0.0151	0.0151		0.0139	0.0139	0.0000	62.3304	62.3304	0.0202	0.0000	62.8343
Total	**0.0315**	**0.2961**	**0.4710**	**7.1000e-004**		**0.0151**	**0.0151**		**0.0139**	**0.0139**	**0.0000**	**62.3304**	**62.3304**	**0.0202**	**0.0000**	**62.8343**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.9800e-003	3.3500e-003	0.0370	1.2000e-004	0.0145	8.0000e-005	0.0146	3.8500e-003	8.0000e-005	3.9300e-003	0.0000	11.2407	11.2407	2.4000e-004	0.0000	11.2467
Total	**4.9800e-003**	**3.3500e-003**	**0.0370**	**1.2000e-004**	**0.0145**	**8.0000e-005**	**0.0146**	**3.8500e-003**	**8.0000e-005**	**3.9300e-003**	**0.0000**	**11.2407**	**11.2407**	**2.4000e-004**	**0.0000**	**11.2467**

3.2 Pipeline Pits - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	9.6700e-003	0.0877	0.1561	2.4000e-004		4.3100e-003	4.3100e-003		3.9700e-003	3.9700e-003	0.0000	20.6819	20.6819	6.6900e-003	0.0000	20.8491
Total	**9.6700e-003**	**0.0877**	**0.1561**	**2.4000e-004**		**4.3100e-003**	**4.3100e-003**		**3.9700e-003**	**3.9700e-003**	**0.0000**	**20.6819**	**20.6819**	**6.6900e-003**	**0.0000**	**20.8491**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.5500e-003	1.0000e-003	0.0113	4.0000e-005	4.8100e-003	3.0000e-005	4.8400e-003	1.2800e-003	2.0000e-005	1.3000e-003	0.0000	3.5862	3.5862	7.0000e-005	0.0000	3.5880
Total	**1.5500e-003**	**1.0000e-003**	**0.0113**	**4.0000e-005**	**4.8100e-003**	**3.0000e-005**	**4.8400e-003**	**1.2800e-003**	**2.0000e-005**	**1.3000e-003**	**0.0000**	**3.5862**	**3.5862**	**7.0000e-005**	**0.0000**	**3.5880**

3.2 Pipeline Pits - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	9.6700e-003	0.0877	0.1561	2.4000e-004		4.3100e-003	4.3100e-003		3.9700e-003	3.9700e-003	0.0000	20.6818	20.6818	6.6900e-003	0.0000	20.8491
Total	**9.6700e-003**	**0.0877**	**0.1561**	**2.4000e-004**		**4.3100e-003**	**4.3100e-003**		**3.9700e-003**	**3.9700e-003**	**0.0000**	**20.6818**	**20.6818**	**6.6900e-003**	**0.0000**	**20.8491**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.5500e-003	1.0000e-003	0.0113	4.0000e-005	4.8100e-003	3.0000e-005	4.8400e-003	1.2800e-003	2.0000e-005	1.3000e-003	0.0000	3.5862	3.5862	7.0000e-005	0.0000	3.5880
Total	**1.5500e-003**	**1.0000e-003**	**0.0113**	**4.0000e-005**	**4.8100e-003**	**3.0000e-005**	**4.8400e-003**	**1.2800e-003**	**2.0000e-005**	**1.3000e-003**	**0.0000**	**3.5862**	**3.5862**	**7.0000e-005**	**0.0000**	**3.5880**

3.3 Pipeline Slip Lining - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0694	0.5289	0.7398	1.2300e-003		0.0254	0.0254		0.0249	0.0249	0.0000	103.5032	103.5032	0.0168	0.0000	103.9235
Total	**0.0694**	**0.5289**	**0.7398**	**1.2300e-003**		**0.0254**	**0.0254**		**0.0249**	**0.0249**	**0.0000**	**103.5032**	**103.5032**	**0.0168**	**0.0000**	**103.9235**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	2.3000e-003	0.0895	0.0171	2.7000e-004	7.0800e-003	1.7000e-004	7.2500e-003	2.0400e-003	1.6000e-004	2.2000e-003	0.0000	26.1610	26.1610	1.7600e-003	0.0000	26.2051
Worker	4.9800e-003	3.3500e-003	0.0370	1.2000e-004	0.0145	8.0000e-005	0.0146	3.8500e-003	8.0000e-005	3.9300e-003	0.0000	11.2407	11.2407	2.4000e-004	0.0000	11.2467
Total	**7.2800e-003**	**0.0929**	**0.0541**	**3.9000e-004**	**0.0216**	**2.5000e-004**	**0.0218**	**5.8900e-003**	**2.4000e-004**	**6.1300e-003**	**0.0000**	**37.4017**	**37.4017**	**2.0000e-003**	**0.0000**	**37.4517**

3.3 Pipeline Slip Lining - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0694	0.5289	0.7398	1.2300e-003		0.0254	0.0254		0.0249	0.0249	0.0000	103.5031	103.5031	0.0168	0.0000	103.9234
Total	**0.0694**	**0.5289**	**0.7398**	**1.2300e-003**		**0.0254**	**0.0254**		**0.0249**	**0.0249**	**0.0000**	**103.5031**	**103.5031**	**0.0168**	**0.0000**	**103.9234**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	2.3000e-003	0.0895	0.0171	2.7000e-004	7.0800e-003	1.7000e-004	7.2500e-003	2.0400e-003	1.6000e-004	2.2000e-003	0.0000	26.1610	26.1610	1.7600e-003	0.0000	26.2051
Worker	4.9800e-003	3.3500e-003	0.0370	1.2000e-004	0.0145	8.0000e-005	0.0146	3.8500e-003	8.0000e-005	3.9300e-003	0.0000	11.2407	11.2407	2.4000e-004	0.0000	11.2467
Total	**7.2800e-003**	**0.0929**	**0.0541**	**3.9000e-004**	**0.0216**	**2.5000e-004**	**0.0218**	**5.8900e-003**	**2.4000e-004**	**6.1300e-003**	**0.0000**	**37.4017**	**37.4017**	**2.0000e-003**	**0.0000**	**37.4517**

3.3 Pipeline Slip Lining - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0213	0.1617	0.2447	4.1000e-004		7.3700e-003	7.3700e-003		7.2000e-003	7.2000e-003	0.0000	34.3274	34.3274	5.4600e-003	0.0000	34.4640
Total	**0.0213**	**0.1617**	**0.2447**	**4.1000e-004**		**7.3700e-003**	**7.3700e-003**		**7.2000e-003**	**7.2000e-003**	**0.0000**	**34.3274**	**34.3274**	**5.4600e-003**	**0.0000**	**34.4640**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	5.8000e-004	0.0219	4.9500e-003	9.0000e-005	2.3500e-003	2.0000e-005	2.3700e-003	6.8000e-004	2.0000e-005	7.0000e-004	0.0000	8.4521	8.4521	4.5000e-004	0.0000	8.4634
Worker	1.5500e-003	1.0000e-003	0.0113	4.0000e-005	4.8100e-003	3.0000e-005	4.8400e-003	1.2800e-003	2.0000e-005	1.3000e-003	0.0000	3.5862	3.5862	7.0000e-005	0.0000	3.5880
Total	**2.1300e-003**	**0.0229**	**0.0163**	**1.3000e-004**	**7.1600e-003**	**5.0000e-005**	**7.2100e-003**	**1.9600e-003**	**4.0000e-005**	**2.0000e-003**	**0.0000**	**12.0384**	**12.0384**	**5.2000e-004**	**0.0000**	**12.0514**

3.3 Pipeline Slip Lining - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0213	0.1617	0.2447	4.1000e-004		7.3700e-003	7.3700e-003		7.2000e-003	7.2000e-003	0.0000	34.3273	34.3273	5.4600e-003	0.0000	34.4639
Total	**0.0213**	**0.1617**	**0.2447**	**4.1000e-004**		**7.3700e-003**	**7.3700e-003**		**7.2000e-003**	**7.2000e-003**	**0.0000**	**34.3273**	**34.3273**	**5.4600e-003**	**0.0000**	**34.4639**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	5.8000e-004	0.0219	4.9500e-003	9.0000e-005	2.3500e-003	2.0000e-005	2.3700e-003	6.8000e-004	2.0000e-005	7.0000e-004	0.0000	8.4521	8.4521	4.5000e-004	0.0000	8.4634
Worker	1.5500e-003	1.0000e-003	0.0113	4.0000e-005	4.8100e-003	3.0000e-005	4.8400e-003	1.2800e-003	2.0000e-005	1.3000e-003	0.0000	3.5862	3.5862	7.0000e-005	0.0000	3.5880
Total	**2.1300e-003**	**0.0229**	**0.0163**	**1.3000e-004**	**7.1600e-003**	**5.0000e-005**	**7.2100e-003**	**1.9600e-003**	**4.0000e-005**	**2.0000e-003**	**0.0000**	**12.0384**	**12.0384**	**5.2000e-004**	**0.0000**	**12.0514**

3.4 Pipeline Trenching - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0315	0.2961	0.4710	7.1000e-004		0.0151	0.0151		0.0139	0.0139	0.0000	62.3304	62.3304	0.0202	0.0000	62.8344
Total	**0.0315**	**0.2961**	**0.4710**	**7.1000e-004**		**0.0151**	**0.0151**		**0.0139**	**0.0139**	**0.0000**	**62.3304**	**62.3304**	**0.0202**	**0.0000**	**62.8344**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.9800e-003	3.3500e-003	0.0370	1.2000e-004	0.0145	8.0000e-005	0.0146	3.8500e-003	8.0000e-005	3.9300e-003	0.0000	11.2407	11.2407	2.4000e-004	0.0000	11.2467
Total	**4.9800e-003**	**3.3500e-003**	**0.0370**	**1.2000e-004**	**0.0145**	**8.0000e-005**	**0.0146**	**3.8500e-003**	**8.0000e-005**	**3.9300e-003**	**0.0000**	**11.2407**	**11.2407**	**2.4000e-004**	**0.0000**	**11.2467**

3.4 Pipeline Trenching - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0315	0.2961	0.4710	7.1000e-004		0.0151	0.0151		0.0139	0.0139	0.0000	62.3304	62.3304	0.0202	0.0000	62.8343
Total	**0.0315**	**0.2961**	**0.4710**	**7.1000e-004**		**0.0151**	**0.0151**		**0.0139**	**0.0139**	**0.0000**	**62.3304**	**62.3304**	**0.0202**	**0.0000**	**62.8343**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.9800e-003	3.3500e-003	0.0370	1.2000e-004	0.0145	8.0000e-005	0.0146	3.8500e-003	8.0000e-005	3.9300e-003	0.0000	11.2407	11.2407	2.4000e-004	0.0000	11.2467
Total	**4.9800e-003**	**3.3500e-003**	**0.0370**	**1.2000e-004**	**0.0145**	**8.0000e-005**	**0.0146**	**3.8500e-003**	**8.0000e-005**	**3.9300e-003**	**0.0000**	**11.2407**	**11.2407**	**2.4000e-004**	**0.0000**	**11.2467**

3.4 Pipeline Trenching - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	9.6700e-003	0.0877	0.1561	2.4000e-004		4.3100e-003	4.3100e-003		3.9700e-003	3.9700e-003	0.0000	20.6819	20.6819	6.6900e-003	0.0000	20.8491
Total	**9.6700e-003**	**0.0877**	**0.1561**	**2.4000e-004**		**4.3100e-003**	**4.3100e-003**		**3.9700e-003**	**3.9700e-003**	**0.0000**	**20.6819**	**20.6819**	**6.6900e-003**	**0.0000**	**20.8491**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.5500e-003	1.0000e-003	0.0113	4.0000e-005	4.8100e-003	3.0000e-005	4.8400e-003	1.2800e-003	2.0000e-005	1.3000e-003	0.0000	3.5862	3.5862	7.0000e-005	0.0000	3.5880
Total	**1.5500e-003**	**1.0000e-003**	**0.0113**	**4.0000e-005**	**4.8100e-003**	**3.0000e-005**	**4.8400e-003**	**1.2800e-003**	**2.0000e-005**	**1.3000e-003**	**0.0000**	**3.5862**	**3.5862**	**7.0000e-005**	**0.0000**	**3.5880**

3.4 Pipeline Trenching - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	9.6700e-003	0.0877	0.1561	2.4000e-004		4.3100e-003	4.3100e-003		3.9700e-003	3.9700e-003	0.0000	20.6818	20.6818	6.6900e-003	0.0000	20.8491
Total	**9.6700e-003**	**0.0877**	**0.1561**	**2.4000e-004**		**4.3100e-003**	**4.3100e-003**		**3.9700e-003**	**3.9700e-003**	**0.0000**	**20.6818**	**20.6818**	**6.6900e-003**	**0.0000**	**20.8491**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.5500e-003	1.0000e-003	0.0113	4.0000e-005	4.8100e-003	3.0000e-005	4.8400e-003	1.2800e-003	2.0000e-005	1.3000e-003	0.0000	3.5862	3.5862	7.0000e-005	0.0000	3.5880
Total	**1.5500e-003**	**1.0000e-003**	**0.0113**	**4.0000e-005**	**4.8100e-003**	**3.0000e-005**	**4.8400e-003**	**1.2800e-003**	**2.0000e-005**	**1.3000e-003**	**0.0000**	**3.5862**	**3.5862**	**7.0000e-005**	**0.0000**	**3.5880**

3.5 Pipeline Installation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0835	0.6726	0.9317	1.4900e-003		0.0332	0.0332		0.0320	0.0320	0.0000	126.9369	126.9369	0.0244	0.0000	127.5467
Total	**0.0835**	**0.6726**	**0.9317**	**1.4900e-003**		**0.0332**	**0.0332**		**0.0320**	**0.0320**	**0.0000**	**126.9369**	**126.9369**	**0.0244**	**0.0000**	**127.5467**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	2.3000e-003	0.0895	0.0171	2.7000e-004	7.0800e-003	1.7000e-004	7.2500e-003	2.0400e-003	1.6000e-004	2.2000e-003	0.0000	26.1610	26.1610	1.7600e-003	0.0000	26.2051
Worker	4.9800e-003	3.3500e-003	0.0370	1.2000e-004	0.0145	8.0000e-005	0.0146	3.8500e-003	8.0000e-005	3.9300e-003	0.0000	11.2407	11.2407	2.4000e-004	0.0000	11.2467
Total	**7.2800e-003**	**0.0929**	**0.0541**	**3.9000e-004**	**0.0216**	**2.5000e-004**	**0.0218**	**5.8900e-003**	**2.4000e-004**	**6.1300e-003**	**0.0000**	**37.4017**	**37.4017**	**2.0000e-003**	**0.0000**	**37.4517**

3.5 Pipeline Installation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0835	0.6726	0.9317	1.4900e-003		0.0332	0.0332		0.0320	0.0320	0.0000	126.9368	126.9368	0.0244	0.0000	127.5466
Total	**0.0835**	**0.6726**	**0.9317**	**1.4900e-003**		**0.0332**	**0.0332**		**0.0320**	**0.0320**	**0.0000**	**126.9368**	**126.9368**	**0.0244**	**0.0000**	**127.5466**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	2.3000e-003	0.0895	0.0171	2.7000e-004	7.0800e-003	1.7000e-004	7.2500e-003	2.0400e-003	1.6000e-004	2.2000e-003	0.0000	26.1610	26.1610	1.7600e-003	0.0000	26.2051
Worker	4.9800e-003	3.3500e-003	0.0370	1.2000e-004	0.0145	8.0000e-005	0.0146	3.8500e-003	8.0000e-005	3.9300e-003	0.0000	11.2407	11.2407	2.4000e-004	0.0000	11.2467
Total	**7.2800e-003**	**0.0929**	**0.0541**	**3.9000e-004**	**0.0216**	**2.5000e-004**	**0.0218**	**5.8900e-003**	**2.4000e-004**	**6.1300e-003**	**0.0000**	**37.4017**	**37.4017**	**2.0000e-003**	**0.0000**	**37.4517**

3.5 Pipeline Installation - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0256	0.2053	0.3082	5.0000e-004		9.5300e-003	9.5300e-003		9.1800e-003	9.1800e-003	0.0000	42.1075	42.1075	7.9800e-003	0.0000	42.3070
Total	**0.0256**	**0.2053**	**0.3082**	**5.0000e-004**		**9.5300e-003**	**9.5300e-003**		**9.1800e-003**	**9.1800e-003**	**0.0000**	**42.1075**	**42.1075**	**7.9800e-003**	**0.0000**	**42.3070**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	5.8000e-004	0.0219	4.9500e-003	9.0000e-005	2.3500e-003	2.0000e-005	2.3700e-003	6.8000e-004	2.0000e-005	7.0000e-004	0.0000	8.4521	8.4521	4.5000e-004	0.0000	8.4634
Worker	1.5500e-003	1.0000e-003	0.0113	4.0000e-005	4.8100e-003	3.0000e-005	4.8400e-003	1.2800e-003	2.0000e-005	1.3000e-003	0.0000	3.5862	3.5862	7.0000e-005	0.0000	3.5880
Total	**2.1300e-003**	**0.0229**	**0.0163**	**1.3000e-004**	**7.1600e-003**	**5.0000e-005**	**7.2100e-003**	**1.9600e-003**	**4.0000e-005**	**2.0000e-003**	**0.0000**	**12.0384**	**12.0384**	**5.2000e-004**	**0.0000**	**12.0514**

3.5 Pipeline Installation - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0256	0.2053	0.3082	5.0000e-004		9.5300e-003	9.5300e-003		9.1800e-003	9.1800e-003	0.0000	42.1074	42.1074	7.9800e-003	0.0000	42.3069
Total	**0.0256**	**0.2053**	**0.3082**	**5.0000e-004**		**9.5300e-003**	**9.5300e-003**		**9.1800e-003**	**9.1800e-003**	**0.0000**	**42.1074**	**42.1074**	**7.9800e-003**	**0.0000**	**42.3069**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	5.8000e-004	0.0219	4.9500e-003	9.0000e-005	2.3500e-003	2.0000e-005	2.3700e-003	6.8000e-004	2.0000e-005	7.0000e-004	0.0000	8.4521	8.4521	4.5000e-004	0.0000	8.4634
Worker	1.5500e-003	1.0000e-003	0.0113	4.0000e-005	4.8100e-003	3.0000e-005	4.8400e-003	1.2800e-003	2.0000e-005	1.3000e-003	0.0000	3.5862	3.5862	7.0000e-005	0.0000	3.5880
Total	**2.1300e-003**	**0.0229**	**0.0163**	**1.3000e-004**	**7.1600e-003**	**5.0000e-005**	**7.2100e-003**	**1.9600e-003**	**4.0000e-005**	**2.0000e-003**	**0.0000**	**12.0384**	**12.0384**	**5.2000e-004**	**0.0000**	**12.0514**

3.6 AWTF Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.5900e-003	0.0161	0.0215	3.0000e-005		8.7000e-004	8.7000e-004		8.0000e-004	8.0000e-004	0.0000	2.6303	2.6303	8.5000e-004	0.0000	2.6516
Total	**1.5900e-003**	**0.0161**	**0.0215**	**3.0000e-005**	**0.0000**	**8.7000e-004**	**8.7000e-004**	**0.0000**	**8.0000e-004**	**8.0000e-004**	**0.0000**	**2.6303**	**2.6303**	**8.5000e-004**	**0.0000**	**2.6516**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.8000e-004	1.9000e-004	2.0800e-003	1.0000e-005	0.0452	0.0000	0.0452	4.6400e-003	0.0000	4.6400e-003	0.0000	0.6309	0.6309	1.0000e-005	0.0000	0.6312
Total	**2.8000e-004**	**1.9000e-004**	**2.0800e-003**	**1.0000e-005**	**0.0452**	**0.0000**	**0.0452**	**4.6400e-003**	**0.0000**	**4.6400e-003**	**0.0000**	**0.6309**	**0.6309**	**1.0000e-005**	**0.0000**	**0.6312**

3.6 AWTF Site Preparation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.5900e-003	0.0161	0.0215	3.0000e-005		8.7000e-004	8.7000e-004		8.0000e-004	8.0000e-004	0.0000	2.6303	2.6303	8.5000e-004	0.0000	2.6516
Total	**1.5900e-003**	**0.0161**	**0.0215**	**3.0000e-005**	**0.0000**	**8.7000e-004**	**8.7000e-004**	**0.0000**	**8.0000e-004**	**8.0000e-004**	**0.0000**	**2.6303**	**2.6303**	**8.5000e-004**	**0.0000**	**2.6516**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.8000e-004	1.9000e-004	2.0800e-003	1.0000e-005	0.0152	0.0000	0.0152	1.6400e-003	0.0000	1.6400e-003	0.0000	0.6309	0.6309	1.0000e-005	0.0000	0.6312
Total	**2.8000e-004**	**1.9000e-004**	**2.0800e-003**	**1.0000e-005**	**0.0152**	**0.0000**	**0.0152**	**1.6400e-003**	**0.0000**	**1.6400e-003**	**0.0000**	**0.6309**	**0.6309**	**1.0000e-005**	**0.0000**	**0.6312**

3.7 Brine Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.7600e-003	0.0484	0.0646	9.0000e-005		2.6000e-003	2.6000e-003		2.3900e-003	2.3900e-003	0.0000	7.8909	7.8909	2.5500e-003	0.0000	7.9547
Total	**4.7600e-003**	**0.0484**	**0.0646**	**9.0000e-005**	**0.0000**	**2.6000e-003**	**2.6000e-003**	**0.0000**	**2.3900e-003**	**2.3900e-003**	**0.0000**	**7.8909**	**7.8909**	**2.5500e-003**	**0.0000**	**7.9547**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.4000e-004	5.6000e-004	6.2300e-003	2.0000e-005	0.1356	1.0000e-005	0.1356	0.0139	1.0000e-005	0.0139	0.0000	1.8926	1.8926	4.0000e-005	0.0000	1.8936
Total	**8.4000e-004**	**5.6000e-004**	**6.2300e-003**	**2.0000e-005**	**0.1356**	**1.0000e-005**	**0.1356**	**0.0139**	**1.0000e-005**	**0.0139**	**0.0000**	**1.8926**	**1.8926**	**4.0000e-005**	**0.0000**	**1.8936**

3.7 Brine Site Preparation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.7600e-003	0.0484	0.0646	9.0000e-005		2.6000e-003	2.6000e-003		2.3900e-003	2.3900e-003	0.0000	7.8909	7.8909	2.5500e-003	0.0000	7.9547
Total	**4.7600e-003**	**0.0484**	**0.0646**	**9.0000e-005**	**0.0000**	**2.6000e-003**	**2.6000e-003**	**0.0000**	**2.3900e-003**	**2.3900e-003**	**0.0000**	**7.8909**	**7.8909**	**2.5500e-003**	**0.0000**	**7.9547**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.4000e-004	5.6000e-004	6.2300e-003	2.0000e-005	0.0455	1.0000e-005	0.0456	4.9200e-003	1.0000e-005	4.9300e-003	0.0000	1.8926	1.8926	4.0000e-005	0.0000	1.8936
Total	**8.4000e-004**	**5.6000e-004**	**6.2300e-003**	**2.0000e-005**	**0.0455**	**1.0000e-005**	**0.0456**	**4.9200e-003**	**1.0000e-005**	**4.9300e-003**	**0.0000**	**1.8926**	**1.8926**	**4.0000e-005**	**0.0000**	**1.8936**

3.8 AWTF Grading - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0631	0.0000	0.0631	0.0324	0.0000	0.0324	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0191	0.1910	0.1147	3.2000e-004		7.8600e-003	7.8600e-003		7.2300e-003	7.2300e-003	0.0000	28.3544	28.3544	9.1700e-003	0.0000	28.5837
Total	**0.0191**	**0.1910**	**0.1147**	**3.2000e-004**	**0.0631**	**7.8600e-003**	**0.0709**	**0.0324**	**7.2300e-003**	**0.0396**	**0.0000**	**28.3544**	**28.3544**	**9.1700e-003**	**0.0000**	**28.5837**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.6000e-004	3.8000e-004	4.1500e-003	1.0000e-005	0.0904	1.0000e-005	0.0904	9.2800e-003	1.0000e-005	9.2900e-003	0.0000	1.2617	1.2617	3.0000e-005	0.0000	1.2624
Total	**5.6000e-004**	**3.8000e-004**	**4.1500e-003**	**1.0000e-005**	**0.0904**	**1.0000e-005**	**0.0904**	**9.2800e-003**	**1.0000e-005**	**9.2900e-003**	**0.0000**	**1.2617**	**1.2617**	**3.0000e-005**	**0.0000**	**1.2624**

3.8 AWTF Grading - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0284	0.0000	0.0284	0.0146	0.0000	0.0146	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0191	0.1910	0.1147	3.2000e-004		7.8600e-003	7.8600e-003		7.2300e-003	7.2300e-003	0.0000	28.3544	28.3544	9.1700e-003	0.0000	28.5837
Total	**0.0191**	**0.1910**	**0.1147**	**3.2000e-004**	**0.0284**	**7.8600e-003**	**0.0362**	**0.0146**	**7.2300e-003**	**0.0218**	**0.0000**	**28.3544**	**28.3544**	**9.1700e-003**	**0.0000**	**28.5837**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.6000e-004	3.8000e-004	4.1500e-003	1.0000e-005	0.0304	1.0000e-005	0.0304	3.2800e-003	1.0000e-005	3.2900e-003	0.0000	1.2617	1.2617	3.0000e-005	0.0000	1.2624
Total	**5.6000e-004**	**3.8000e-004**	**4.1500e-003**	**1.0000e-005**	**0.0304**	**1.0000e-005**	**0.0304**	**3.2800e-003**	**1.0000e-005**	**3.2900e-003**	**0.0000**	**1.2617**	**1.2617**	**3.0000e-005**	**0.0000**	**1.2624**

3.9 Brine Grading - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.5073	0.0000	0.5073	0.2543	0.0000	0.2543	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.2044	2.0256	1.4041	3.6900e-003		0.0838	0.0838		0.0771	0.0771	0.0000	324.2092	324.2092	0.1049	0.0000	326.8306
Total	**0.2044**	**2.0256**	**1.4041**	**3.6900e-003**	**0.5073**	**0.0838**	**0.5911**	**0.2543**	**0.0771**	**0.3313**	**0.0000**	**324.2092**	**324.2092**	**0.1049**	**0.0000**	**326.8306**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.5400e-003	5.7300e-003	0.0634	2.1000e-004	1.3802	1.4000e-004	1.3803	0.1418	1.3000e-004	0.1419	0.0000	19.2697	19.2697	4.1000e-004	0.0000	19.2800
Total	**8.5400e-003**	**5.7300e-003**	**0.0634**	**2.1000e-004**	**1.3802**	**1.4000e-004**	**1.3803**	**0.1418**	**1.3000e-004**	**0.1419**	**0.0000**	**19.2697**	**19.2697**	**4.1000e-004**	**0.0000**	**19.2800**

3.9 Brine Grading - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.2283	0.0000	0.2283	0.1144	0.0000	0.1144	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.2044	2.0256	1.4041	3.6900e-003		0.0838	0.0838		0.0771	0.0771	0.0000	324.2088	324.2088	0.1049	0.0000	326.8302
Total	**0.2044**	**2.0256**	**1.4041**	**3.6900e-003**	**0.2283**	**0.0838**	**0.3121**	**0.1144**	**0.0771**	**0.1915**	**0.0000**	**324.2088**	**324.2088**	**0.1049**	**0.0000**	**326.8302**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.5400e-003	5.7300e-003	0.0634	2.1000e-004	0.4637	1.4000e-004	0.4638	0.0501	1.3000e-004	0.0502	0.0000	19.2697	19.2697	4.1000e-004	0.0000	19.2800
Total	**8.5400e-003**	**5.7300e-003**	**0.0634**	**2.1000e-004**	**0.4637**	**1.4000e-004**	**0.4638**	**0.0501**	**1.3000e-004**	**0.0502**	**0.0000**	**19.2697**	**19.2697**	**4.1000e-004**	**0.0000**	**19.2800**

3.10 AWTF Underground Utilities - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.7500e-003	0.0634	0.1009	1.5000e-004		3.2300e-003	3.2300e-003		2.9800e-003	2.9800e-003	0.0000	13.3565	13.3565	4.3200e-003	0.0000	13.4645
Total	**6.7500e-003**	**0.0634**	**0.1009**	**1.5000e-004**		**3.2300e-003**	**3.2300e-003**		**2.9800e-003**	**2.9800e-003**	**0.0000**	**13.3565**	**13.3565**	**4.3200e-003**	**0.0000**	**13.4645**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	2.5000e-004	9.5900e-003	1.8300e-003	3.0000e-005	0.0864	2.0000e-005	0.0864	8.7600e-003	2.0000e-005	8.7700e-003	0.0000	2.8030	2.8030	1.9000e-004	0.0000	2.8077
Worker	5.3000e-004	3.6000e-004	3.9600e-003	1.0000e-005	0.0863	1.0000e-005	0.0863	8.8600e-003	1.0000e-005	8.8700e-003	0.0000	1.2044	1.2044	3.0000e-005	0.0000	1.2050
Total	**7.8000e-004**	**9.9500e-003**	**5.7900e-003**	**4.0000e-005**	**0.1726**	**3.0000e-005**	**0.1727**	**0.0176**	**3.0000e-005**	**0.0176**	**0.0000**	**4.0073**	**4.0073**	**2.2000e-004**	**0.0000**	**4.0127**

3.10 AWTF Underground Utilities - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.7500e-003	0.0634	0.1009	1.5000e-004		3.2300e-003	3.2300e-003		2.9800e-003	2.9800e-003	0.0000	13.3565	13.3565	4.3200e-003	0.0000	13.4645
Total	**6.7500e-003**	**0.0634**	**0.1009**	**1.5000e-004**		**3.2300e-003**	**3.2300e-003**		**2.9800e-003**	**2.9800e-003**	**0.0000**	**13.3565**	**13.3565**	**4.3200e-003**	**0.0000**	**13.4645**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	2.5000e-004	9.5900e-003	1.8300e-003	3.0000e-005	0.0285	2.0000e-005	0.0285	2.9700e-003	2.0000e-005	2.9800e-003	0.0000	2.8030	2.8030	1.9000e-004	0.0000	2.8077
Worker	5.3000e-004	3.6000e-004	3.9600e-003	1.0000e-005	0.0290	1.0000e-005	0.0290	3.1300e-003	1.0000e-005	3.1400e-003	0.0000	1.2044	1.2044	3.0000e-005	0.0000	1.2050
Total	**7.8000e-004**	**9.9500e-003**	**5.7900e-003**	**4.0000e-005**	**0.0575**	**3.0000e-005**	**0.0575**	**6.1000e-003**	**3.0000e-005**	**6.1200e-003**	**0.0000**	**4.0073**	**4.0073**	**2.2000e-004**	**0.0000**	**4.0127**

3.11 AWTF Building Construction - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0735	0.7025	0.8271	1.5900e-003		0.0321	0.0321		0.0296	0.0296	0.0000	138.9998	138.9998	0.0447	0.0000	140.1163
Total	**0.0735**	**0.7025**	**0.8271**	**1.5900e-003**		**0.0321**	**0.0321**		**0.0296**	**0.0296**	**0.0000**	**138.9998**	**138.9998**	**0.0447**	**0.0000**	**140.1163**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.1600e-003	0.0452	8.6500e-003	1.4000e-004	0.4072	8.0000e-005	0.4073	0.0413	8.0000e-005	0.0414	0.0000	13.2140	13.2140	8.9000e-004	0.0000	13.2362
Worker	5.0300e-003	3.3800e-003	0.0374	1.3000e-004	0.8133	8.0000e-005	0.8134	0.0835	8.0000e-005	0.0836	0.0000	11.3554	11.3554	2.4000e-004	0.0000	11.3614
Total	**6.1900e-003**	**0.0486**	**0.0460**	**2.7000e-004**	**1.2205**	**1.6000e-004**	**1.2207**	**0.1248**	**1.6000e-004**	**0.1250**	**0.0000**	**24.5693**	**24.5693**	**1.1300e-003**	**0.0000**	**24.5977**

3.11 AWTF Building Construction - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0735	0.7025	0.8271	1.5900e-003		0.0321	0.0321		0.0296	0.0296	0.0000	138.9997	138.9997	0.0447	0.0000	140.1161
Total	**0.0735**	**0.7025**	**0.8271**	**1.5900e-003**		**0.0321**	**0.0321**		**0.0296**	**0.0296**	**0.0000**	**138.9997**	**138.9997**	**0.0447**	**0.0000**	**140.1161**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.1600e-003	0.0452	8.6500e-003	1.4000e-004	0.1343	8.0000e-005	0.1344	0.0140	8.0000e-005	0.0141	0.0000	13.2140	13.2140	8.9000e-004	0.0000	13.2362
Worker	5.0300e-003	3.3800e-003	0.0374	1.3000e-004	0.2733	8.0000e-005	0.2733	0.0295	8.0000e-005	0.0296	0.0000	11.3554	11.3554	2.4000e-004	0.0000	11.3614
Total	**6.1900e-003**	**0.0486**	**0.0460**	**2.7000e-004**	**0.4075**	**1.6000e-004**	**0.4077**	**0.0435**	**1.6000e-004**	**0.0437**	**0.0000**	**24.5693**	**24.5693**	**1.1300e-003**	**0.0000**	**24.5977**

3.11 AWTF Building Construction - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1051	0.9713	1.2544	2.4200e-003		0.0431	0.0431		0.0397	0.0397	0.0000	212.1025	212.1025	0.0681	0.0000	213.8061
Total	**0.1051**	**0.9713**	**1.2544**	**2.4200e-003**		**0.0431**	**0.0431**		**0.0397**	**0.0397**	**0.0000**	**212.1025**	**212.1025**	**0.0681**	**0.0000**	**213.8061**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.3500e-003	0.0508	0.0115	2.1000e-004	0.6211	6.0000e-005	0.6212	0.0630	5.0000e-005	0.0630	0.0000	19.6350	19.6350	1.0500e-003	0.0000	19.6611
Worker	7.2200e-003	4.6500e-003	0.0526	1.8000e-004	1.2405	1.2000e-004	1.2406	0.1274	1.1000e-004	0.1275	0.0000	16.6622	16.6622	3.3000e-004	0.0000	16.6705
Total	**8.5700e-003**	**0.0554**	**0.0641**	**3.9000e-004**	**1.8616**	**1.8000e-004**	**1.8618**	**0.1904**	**1.6000e-004**	**0.1905**	**0.0000**	**36.2972**	**36.2972**	**1.3800e-003**	**0.0000**	**36.3316**

3.11 AWTF Building Construction - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1051	0.9713	1.2544	2.4200e-003		0.0431	0.0431		0.0397	0.0397	0.0000	212.1022	212.1022	0.0681	0.0000	213.8058
Total	**0.1051**	**0.9713**	**1.2544**	**2.4200e-003**		**0.0431**	**0.0431**		**0.0397**	**0.0397**	**0.0000**	**212.1022**	**212.1022**	**0.0681**	**0.0000**	**213.8058**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.3500e-003	0.0508	0.0115	2.1000e-004	0.2048	6.0000e-005	0.2049	0.0213	5.0000e-005	0.0214	0.0000	19.6350	19.6350	1.0500e-003	0.0000	19.6611
Worker	7.2200e-003	4.6500e-003	0.0526	1.8000e-004	0.4168	1.2000e-004	0.4169	0.0450	1.1000e-004	0.0452	0.0000	16.6622	16.6622	3.3000e-004	0.0000	16.6705
Total	**8.5700e-003**	**0.0554**	**0.0641**	**3.9000e-004**	**0.6216**	**1.8000e-004**	**0.6217**	**0.0664**	**1.6000e-004**	**0.0665**	**0.0000**	**36.2972**	**36.2972**	**1.3800e-003**	**0.0000**	**36.3316**

3.12 Brine Underground Utilities/Infrastructure - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0530	0.5059	0.6989	1.1800e-003		0.0237	0.0237		0.0218	0.0218	0.0000	103.3223	103.3223	0.0334	0.0000	104.1577
Total	**0.0530**	**0.5059**	**0.6989**	**1.1800e-003**		**0.0237**	**0.0237**		**0.0218**	**0.0218**	**0.0000**	**103.3223**	**103.3223**	**0.0334**	**0.0000**	**104.1577**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.1700e-003	0.0437	9.9000e-003	1.8000e-004	0.5347	5.0000e-005	0.5348	0.0542	5.0000e-005	0.0543	0.0000	16.9043	16.9043	9.0000e-004	0.0000	16.9268
Worker	6.2100e-003	4.0000e-003	0.0453	1.6000e-004	1.0680	1.1000e-004	1.0681	0.1097	1.0000e-004	0.1098	0.0000	14.3449	14.3449	2.9000e-004	0.0000	14.3521
Total	**7.3800e-003**	**0.0477**	**0.0552**	**3.4000e-004**	**1.6027**	**1.6000e-004**	**1.6029**	**0.1639**	**1.5000e-004**	**0.1640**	**0.0000**	**31.2492**	**31.2492**	**1.1900e-003**	**0.0000**	**31.2788**

3.12 Brine Underground Utilities/Infrastructure - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0530	0.5058	0.6989	1.1800e-003		0.0237	0.0237		0.0218	0.0218	0.0000	103.3222	103.3222	0.0334	0.0000	104.1576
Total	**0.0530**	**0.5058**	**0.6989**	**1.1800e-003**		**0.0237**	**0.0237**		**0.0218**	**0.0218**	**0.0000**	**103.3222**	**103.3222**	**0.0334**	**0.0000**	**104.1576**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.1700e-003	0.0437	9.9000e-003	1.8000e-004	0.1763	5.0000e-005	0.1764	0.0184	5.0000e-005	0.0184	0.0000	16.9043	16.9043	9.0000e-004	0.0000	16.9268
Worker	6.2100e-003	4.0000e-003	0.0453	1.6000e-004	0.3588	1.1000e-004	0.3589	0.0388	1.0000e-004	0.0389	0.0000	14.3449	14.3449	2.9000e-004	0.0000	14.3521
Total	**7.3800e-003**	**0.0477**	**0.0552**	**3.4000e-004**	**0.5351**	**1.6000e-004**	**0.5353**	**0.0571**	**1.5000e-004**	**0.0573**	**0.0000**	**31.2492**	**31.2492**	**1.1900e-003**	**0.0000**	**31.2788**

3.13 AWTF Paving - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	3.3300e-003	0.0336	0.0456	7.0000e-005		1.7100e-003	1.7100e-003		1.5700e-003	1.5700e-003	0.0000	6.1936	6.1936	2.0000e-003	0.0000	6.2437
Paving	4.6000e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**7.9300e-003**	**0.0336**	**0.0456**	**7.0000e-005**		**1.7100e-003**	**1.7100e-003**		**1.5700e-003**	**1.5700e-003**	**0.0000**	**6.1936**	**6.1936**	**2.0000e-003**	**0.0000**	**6.2437**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.6000e-004	1.7000e-004	1.9100e-003	1.0000e-005	0.0452	0.0000	0.0452	4.6400e-003	0.0000	4.6400e-003	0.0000	0.6069	0.6069	1.0000e-005	0.0000	0.6072
Total	**2.6000e-004**	**1.7000e-004**	**1.9100e-003**	**1.0000e-005**	**0.0452**	**0.0000**	**0.0452**	**4.6400e-003**	**0.0000**	**4.6400e-003**	**0.0000**	**0.6069**	**0.6069**	**1.0000e-005**	**0.0000**	**0.6072**

3.13 AWTF Paving - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	3.3300e-003	0.0336	0.0456	7.0000e-005		1.7100e-003	1.7100e-003		1.5700e-003	1.5700e-003	0.0000	6.1936	6.1936	2.0000e-003	0.0000	6.2437
Paving	4.6000e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**7.9300e-003**	**0.0336**	**0.0456**	**7.0000e-005**		**1.7100e-003**	**1.7100e-003**		**1.5700e-003**	**1.5700e-003**	**0.0000**	**6.1936**	**6.1936**	**2.0000e-003**	**0.0000**	**6.2437**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.6000e-004	1.7000e-004	1.9100e-003	1.0000e-005	0.0152	0.0000	0.0152	1.6400e-003	0.0000	1.6400e-003	0.0000	0.6069	0.6069	1.0000e-005	0.0000	0.6072
Total	**2.6000e-004**	**1.7000e-004**	**1.9100e-003**	**1.0000e-005**	**0.0152**	**0.0000**	**0.0152**	**1.6400e-003**	**0.0000**	**1.6400e-003**	**0.0000**	**0.6069**	**0.6069**	**1.0000e-005**	**0.0000**	**0.6072**

3.14 AWTF Architectural Coating - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0588					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.1500e-003	7.8200e-003	0.0109	2.0000e-005		4.2000e-004	4.2000e-004		4.2000e-004	4.2000e-004	0.0000	1.5320	1.5320	9.0000e-005	0.0000	1.5342
Total	**0.0600**	**7.8200e-003**	**0.0109**	**2.0000e-005**		**4.2000e-004**	**4.2000e-004**		**4.2000e-004**	**4.2000e-004**	**0.0000**	**1.5320**	**1.5320**	**9.0000e-005**	**0.0000**	**1.5342**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.9000e-004	1.8000e-004	2.0900e-003	1.0000e-005	0.0493	0.0000	0.0493	5.0600e-003	0.0000	5.0700e-003	0.0000	0.6621	0.6621	1.0000e-005	0.0000	0.6624
Total	**2.9000e-004**	**1.8000e-004**	**2.0900e-003**	**1.0000e-005**	**0.0493**	**0.0000**	**0.0493**	**5.0600e-003**	**0.0000**	**5.0700e-003**	**0.0000**	**0.6621**	**0.6621**	**1.0000e-005**	**0.0000**	**0.6624**

3.14 AWTF Architectural Coating - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0588					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.1500e-003	7.8200e-003	0.0109	2.0000e-005		4.2000e-004	4.2000e-004		4.2000e-004	4.2000e-004	0.0000	1.5320	1.5320	9.0000e-005	0.0000	1.5342
Total	**0.0600**	**7.8200e-003**	**0.0109**	**2.0000e-005**		**4.2000e-004**	**4.2000e-004**		**4.2000e-004**	**4.2000e-004**	**0.0000**	**1.5320**	**1.5320**	**9.0000e-005**	**0.0000**	**1.5342**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.9000e-004	1.8000e-004	2.0900e-003	1.0000e-005	0.0166	0.0000	0.0166	1.7900e-003	0.0000	1.7900e-003	0.0000	0.6621	0.6621	1.0000e-005	0.0000	0.6624
Total	**2.9000e-004**	**1.8000e-004**	**2.0900e-003**	**1.0000e-005**	**0.0166**	**0.0000**	**0.0166**	**1.7900e-003**	**0.0000**	**1.7900e-003**	**0.0000**	**0.6621**	**0.6621**	**1.0000e-005**	**0.0000**	**0.6624**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	2.9100e-003	0.0211	0.0438	2.2000e-004	0.0192	1.3000e-004	0.0193	5.1400e-003	1.2000e-004	5.2600e-003	0.0000	20.7032	20.7032	7.7000e-004	0.0000	20.7225
Unmitigated	2.9100e-003	0.0211	0.0438	2.2000e-004	0.0192	1.3000e-004	0.0193	5.1400e-003	1.2000e-004	5.2600e-003	0.0000	20.7032	20.7032	7.7000e-004	0.0000	20.7225

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Light Industry	10.02	10.02	10.02	50,230	50,230
General Office Building	0.00	0.00	0.00		
Other Asphalt Surfaces	0.00	0.00	0.00		
Parking Lot	0.00	0.00	0.00		
User Defined Industrial	0.00	0.00	0.00		
Total	10.02	10.02	10.02	50,230	50,230

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Light Industry	18.50	10.10	7.90	59.00	28.00	13.00	92	5	3
General Office Building	18.50	10.10	7.90	33.00	48.00	19.00	77	19	4
Other Asphalt Surfaces	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0
Parking Lot	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0
User Defined Industrial	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Light Industry	0.551648	0.035769	0.187848	0.110184	0.013450	0.004660	0.017552	0.070120	0.001413	0.001134	0.004476	0.000905	0.000840
General Office Building	0.551648	0.035769	0.187848	0.110184	0.013450	0.004660	0.017552	0.070120	0.001413	0.001134	0.004476	0.000905	0.000840
Other Asphalt Surfaces	0.551648	0.035769	0.187848	0.110184	0.013450	0.004660	0.017552	0.070120	0.001413	0.001134	0.004476	0.000905	0.000840
Parking Lot	0.551648	0.035769	0.187848	0.110184	0.013450	0.004660	0.017552	0.070120	0.001413	0.001134	0.004476	0.000905	0.000840
User Defined Industrial	0.551648	0.035769	0.187848	0.110184	0.013450	0.004660	0.017552	0.070120	0.001413	0.001134	0.004476	0.000905	0.000840

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

EMW-20 Phase I Construction and Operation 2024 - Riverside-South Coast County, Annual

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	1,364.4730	1,364.4730	0.0563	0.0117	1,369.3544
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	1,364.4730	1,364.4730	0.0563	0.0117	1,369.3544
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Light Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
General Office Building	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Light Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
General Office Building	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Light Industry	2.97139e+006	946.7492	0.0391	8.0900e-003	950.1362
General Office Building	0	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	4235	1.3494	6.0000e-005	1.0000e-005	1.3542
User Defined Industrial	1.3068e+006	416.3745	0.0172	3.5600e-003	417.8641
Total		**1,364.4730**	**0.0563**	**0.0117**	**1,369.3544**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Light Industry	2.97139e+006	946.7492	0.0391	8.0900e-003	950.1362
General Office Building	0	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	4235	1.3494	6.0000e-005	1.0000e-005	1.3542
User Defined Industrial	1.3068e+006	416.3745	0.0172	3.5600e-003	417.8641
Total		**1,364.4730**	**0.0563**	**0.0117**	**1,369.3544**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	3.2392	2.0000e-005	2.2300e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.3400e-003	4.3400e-003	1.0000e-005	0.0000	4.6200e-003
Unmitigated	3.2392	2.0000e-005	2.2300e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.3400e-003	4.3400e-003	1.0000e-005	0.0000	4.6200e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	5.8800e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.2331					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.1000e-004	2.0000e-005	2.2300e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.3400e-003	4.3400e-003	1.0000e-005	0.0000	4.6200e-003
Total	**3.2392**	**2.0000e-005**	**2.2300e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**4.3400e-003**	**4.3400e-003**	**1.0000e-005**	**0.0000**	**4.6200e-003**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	5.8800e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.2331					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.1000e-004	2.0000e-005	2.2300e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.3400e-003	4.3400e-003	1.0000e-005	0.0000	4.6200e-003
Total	**3.2392**	**2.0000e-005**	**2.2300e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**4.3400e-003**	**4.3400e-003**	**1.0000e-005**	**0.0000**	**4.6200e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

Apply Water Conservation Strategy

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	21.8221	0.1490	3.6700e-003	26.6424
Unmitigated	22.2000	0.1491	3.6800e-003	27.0217

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	3.67687 / 0	16.4210	0.1204	2.9600e-003	20.3139
General Office Building	0.870895 / 0.533775	5.7789	0.0286	7.2000e-004	6.7078
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**22.2000**	**0.1491**	**3.6800e-003**	**27.0217**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	3.67687 / 0	16.4210	0.1204	2.9600e-003	20.3139
General Office Building	0.870895 / 0.42702	5.4010	0.0286	7.1000e-004	6.3285
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**21.8221**	**0.1490**	**3.6700e-003**	**26.6424**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	3.6965	0.2185	0.0000	9.1578
Unmitigated	4.9286	0.2913	0.0000	12.2105

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Light Industry	19.72	4.0030	0.2366	0.0000	9.9172
General Office Building	4.56	0.9256	0.0547	0.0000	2.2932
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**4.9286**	**0.2913**	**0.0000**	**12.2105**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Light Industry	14.79	3.0022	0.1774	0.0000	7.4379
General Office Building	3.42	0.6942	0.0410	0.0000	1.7199
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**3.6965**	**0.2185**	**0.0000**	**9.1578**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
Emergency Generator	2	0.5	6	555	0.73	Diesel

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

10.1 Stationary Sources

Unmitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	tons/yr										MT/yr					
Emergency Generator - Diesel (300 - 600 HP)	5.4600e-003	0.0153	0.0139	3.0000e-005		8.0000e-004	8.0000e-004		8.0000e-004	8.0000e-004	0.0000	2.5361	2.5361	3.6000e-004	0.0000	2.5450
Total	**5.4600e-003**	**0.0153**	**0.0139**	**3.0000e-005**		**8.0000e-004**	**8.0000e-004**		**8.0000e-004**	**8.0000e-004**	**0.0000**	**2.5361**	**2.5361**	**3.6000e-004**	**0.0000**	**2.5450**

11.0 Vegetation

EMW-20 Phase I Construction and Operation 2024

Riverside-South Coast County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	4.90	1000sqft	0.11	4,900.00	0
General Light Industry	15.90	1000sqft	0.37	15,900.00	0
User Defined Industrial	1.00	User Defined Unit	20.00	871,200.00	0
Other Asphalt Surfaces	140.90	1000sqft	3.23	140,900.00	0
Parking Lot	12.10	1000sqft	0.28	12,100.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.4	**Precipitation Freq (Days)**	28
Climate Zone	10			**Operational Year**	2024
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Phase I construction 2022 and 2023, operation for year 2024.

Land Use - General Office Building = Control Area
General Light Industrial = Process Area
User Defined Industrial = Brine Ponds

Construction Phase - Construction schedule per project engineers.

Off-road Equipment -

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - Construction equipment per project engineers.

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Off-road Equipment - Construction equipment per project engineers.

Trips and VMT - Crew sizes estimated from project description and equipment.
Minimum crew size of 5 (10 trips) for any single activity.

On-road Fugitive Dust - Unpaved access road during construction, 0.6 miles to AWTF site and 0.75 miles to Brine Ponds.

Grading - Soil cut and fill balanced on site, no import or export.

Architectural Coating - 50 g/L maximum VOC content per project eningeers.
Only the control/process building and parking lots to be paved.

Vehicle Trips - 10 ADT (5 workers) per project engineer.

Area Coating - 50 g/L maximum VOC content per project eningeers.
Only the control/process building and parking lots to be paved.

Energy Use - 2,971,470 kWh/year total electricty per year for the AWTF, no natural gas.
1,303,842 kWh/year total electricity for the brine system, no natural gas.

Construction Off-road Equipment Mitigation - Dust mitigation per SCAQMD Rule 403.

Water Mitigation - A 20% reduction in outdoor water use applied to account for CaLGreen requirements not included in model defaults.

Waste Mitigation - Additional 25% solid waste diversion mandated by AB 341 not accounted for in model defaults.

Stationary Sources - Emergency Generators and Fire Pumps - 2 ea. 400kW diesel emergency generators.

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	ConstArea_Nonresidential_Exterior	446,000.00	10,400.00

EMW-20 Phase I Construction and Operation 2024 - Riverside-South Coast County, Winter

tblArchitecturalCoating	ConstArea_Nonresidential_Interior	1,338,000.00	31,200.00
tblArchitecturalCoating	EF_Nonresidential_Exterior	100.00	50.00
tblArchitecturalCoating	EF_Nonresidential_Interior	100.00	50.00
tblArchitecturalCoating	EF_Parking	100.00	50.00
tblAreaCoating	Area_EF_Nonresidential_Exterior	100	50
tblAreaCoating	Area_EF_Nonresidential_Interior	100	50
tblAreaCoating	Area_EF_Parking	100	50
tblAreaCoating	Area_Nonresidential_Exterior	446000	10400
tblAreaCoating	Area_Nonresidential_Interior	1338000	31200
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	10.00	11.00
tblConstructionPhase	NumDays	10.00	33.00
tblConstructionPhase	NumDays	35.00	22.00
tblConstructionPhase	NumDays	35.00	120.00
tblConstructionPhase	NumDays	370.00	250.00
tblConstructionPhase	NumDays	20.00	11.00
tblConstructionPhase	NumDays	20.00	12.00
tblEnergyUse	LightingElect	2.93	0.00
tblEnergyUse	LightingElect	3.66	0.00
tblEnergyUse	NT24E	5.02	186.88
tblEnergyUse	NT24E	2.79	0.00
tblEnergyUse	NT24E	0.00	1.50
tblEnergyUse	NT24NG	17.13	0.00
tblEnergyUse	T24E	2.20	0.00
tblEnergyUse	T24E	3.07	0.00
tblEnergyUse	T24NG	15.36	0.00

EMW-20 Phase I Construction and Operation 2024 - Riverside-South Coast County, Winter

tblEnergyUse	T24NG	3.47	0.00
tblLandUse	LandUseSquareFeet	0.00	871,200.00
tblLandUse	LotAcreage	0.00	20.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	7.00	5.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	5.00

tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	HaulingPercentPave	100.00	95.60
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	VendorPercentPave	100.00	92.40
tblOnRoadDust	WorkerPercentPave	100.00	97.00
tblOnRoadDust	WorkerPercentPave	100.00	97.00
tblOnRoadDust	WorkerPercentPave	100.00	97.00
tblOnRoadDust	WorkerPercentPave	100.00	97.00

tblOnRoadDust	WorkerPercentPave	100.00	97.00
tblOnRoadDust	WorkerPercentPave	100.00	97.00
tblOnRoadDust	WorkerPercentPave	100.00	97.00
tblOnRoadDust	WorkerPercentPave	100.00	97.00
tblOnRoadDust	WorkerPercentPave	100.00	97.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblStationaryGeneratorsPumpsUse	HorsePowerValue	0.00	555.00
tblStationaryGeneratorsPumpsUse	HoursPerDay	0.00	0.50
tblStationaryGeneratorsPumpsUse	HoursPerYear	0.00	6.00
tblStationaryGeneratorsPumpsUse	NumberOfEquipment	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	VendorTripNumber	171.00	10.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	WorkerTripNumber	5.00	10.00
tblTripsAndVMT	WorkerTripNumber	8.00	10.00
tblTripsAndVMT	WorkerTripNumber	5.00	10.00
tblTripsAndVMT	WorkerTripNumber	5.00	10.00
tblTripsAndVMT	WorkerTripNumber	5.00	10.00
tblTripsAndVMT	WorkerTripNumber	438.00	20.00
tblTripsAndVMT	WorkerTripNumber	13.00	20.00
tblTripsAndVMT	WorkerTripNumber	88.00	10.00
tblVehicleTrips	ST_TR	1.32	0.63
tblVehicleTrips	ST_TR	2.46	0.00
tblVehicleTrips	SU_TR	0.68	0.63
tblVehicleTrips	SU_TR	1.05	0.00

tblVehicleTrips	WD_TR	6.97	0.63
tblVehicleTrips	WD_TR	11.03	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	7.6550	69.2424	70.4885	0.1549	60.7736	2.9634	63.7370	9.7157	2.7567	12.4725	0.0000	14,995.4530	14,995.4530	3.9240	0.0000	15,093.5518
2023	10.0509	40.2282	57.2684	0.1126	54.1126	1.7308	55.8434	5.6506	1.6188	7.2694	0.0000	10,916.8226	10,916.8226	2.5546	0.0000	10,980.6875
Maximum	**10.0509**	**69.2424**	**70.4885**	**0.1549**	**60.7736**	**2.9634**	**63.7370**	**9.7157**	**2.7567**	**12.4725**	**0.0000**	**14,995.4530**	**14,995.4530**	**3.9240**	**0.0000**	**15,093.5518**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	7.6550	69.2424	70.4885	0.1549	21.7899	2.9634	24.7533	3.9515	2.7567	6.7083	0.0000	14,995.4530	14,995.4530	3.9240	0.0000	15,093.5518
2023	10.0509	40.2282	57.2684	0.1126	18.5341	1.7308	20.2649	2.0927	1.6188	3.7115	0.0000	10,916.8226	10,916.8226	2.5546	0.0000	10,980.6875
Maximum	**10.0509**	**69.2424**	**70.4885**	**0.1549**	**21.7899**	**2.9634**	**24.7533**	**3.9515**	**2.7567**	**6.7083**	**0.0000**	**14,995.4530**	**14,995.4530**	**3.9240**	**0.0000**	**15,093.5518**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**64.90**	**0.00**	**62.35**	**60.67**	**0.00**	**47.22**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	17.7497	1.6000e-004	0.0178	0.0000		6.0000e-005	6.0000e-005		6.0000e-005	6.0000e-005		0.0383	0.0383	1.0000e-004		0.0408
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0159	0.1140	0.2316	1.2000e-003	0.1071	7.1000e-004	0.1078	0.0287	6.6000e-004	0.0293		122.8781	122.8781	4.7700e-003		122.9973
Stationary	0.9108	2.5456	2.3223	4.3800e-003		0.1340	0.1340		0.1340	0.1340		465.9303	465.9303	0.0653		467.5634
Total	**18.6764**	**2.6598**	**2.5718**	**5.5800e-003**	**0.1071**	**0.1348**	**0.2418**	**0.0287**	**0.1347**	**0.1634**		**588.8467**	**588.8467**	**0.0702**	**0.0000**	**590.6015**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	17.7497	1.6000e-004	0.0178	0.0000		6.0000e-005	6.0000e-005		6.0000e-005	6.0000e-005		0.0383	0.0383	1.0000e-004		0.0408
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0159	0.1140	0.2316	1.2000e-003	0.1071	7.1000e-004	0.1078	0.0287	6.6000e-004	0.0293		122.8781	122.8781	4.7700e-003		122.9973
Stationary	0.9108	2.5456	2.3223	4.3800e-003		0.1340	0.1340		0.1340	0.1340		465.9303	465.9303	0.0653		467.5634
Total	**18.6764**	**2.6598**	**2.5718**	**5.5800e-003**	**0.1071**	**0.1348**	**0.2418**	**0.0287**	**0.1347**	**0.1634**		**588.8467**	**588.8467**	**0.0702**	**0.0000**	**590.6015**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

EMW-20 Phase I Construction and Operation 2024 - Riverside-South Coast County, Winter

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Pipeline Pits	Trenching	4/1/2022	3/31/2023	5	261	
2	Pipeline Slip Lining	Trenching	4/1/2022	3/31/2023	5	261	
3	Pipeline Trenching	Trenching	4/1/2022	3/31/2023	5	261	
4	Pipeline Installation	Trenching	4/1/2022	3/31/2023	5	261	
5	AWTF Site Preparation	Site Preparation	6/1/2022	6/15/2022	5	11	
6	Brine Site Preparation	Site Preparation	6/1/2022	7/15/2022	5	33	
7	AWTF Grading	Grading	6/16/2022	7/15/2022	5	22	
8	Brine Grading	Grading	7/16/2022	12/31/2022	5	120	
9	AWTF Underground Utilities	Trenching	7/16/2022	8/15/2022	5	21	
10	AWTF Building Construction	Building Construction	8/16/2022	7/31/2023	5	250	
11	Brine Underground Utilities/Infrastructure	Trenching	1/1/2023	6/30/2023	5	130	
12	AWTF Paving	Paving	8/1/2023	8/15/2023	5	11	
13	AWTF Architectural Coating	Architectural Coating	8/16/2023	8/31/2023	5	12	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 3.51

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 31,200; Non-Residential Outdoor: 10,400; Striped Parking Area: 9,180 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Pipeline Pits	Excavators	1	7.00	158	0.38
Pipeline Pits	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Pipeline Slip Lining	Excavators	1	7.00	158	0.38

Pipeline Slip Lining	Generator Sets	1	7.00	84	0.74
Pipeline Slip Lining	Welders	1	7.00	46	0.45
Pipeline Trenching	Excavators	1	7.00	158	0.38
Pipeline Trenching	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Pipeline Installation	Excavators	1	7.00	158	0.38
Pipeline Installation	Generator Sets	1	7.00	84	0.74
Pipeline Installation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Pipeline Installation	Welders	1	7.00	46	0.45
AWTF Site Preparation	Rubber Tired Dozers	0	7.00	247	0.40
AWTF Site Preparation	Tractors/Loaders/Backhoes	2	7.00	97	0.37
Brine Site Preparation	Rubber Tired Dozers	0	7.00	247	0.40
Brine Site Preparation	Tractors/Loaders/Backhoes	2	7.00	97	0.37
AWTF Grading	Excavators	1	7.00	158	0.38
AWTF Grading	Graders	1	7.00	187	0.41
AWTF Grading	Off-Highway Trucks	1	7.00	402	0.38
AWTF Grading	Rubber Tired Dozers	1	7.00	247	0.40
AWTF Grading	Scrapers	0	8.00	367	0.48
AWTF Grading	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Brine Grading	Excavators	2	7.00	158	0.38
Brine Grading	Graders	2	7.00	187	0.41
Brine Grading	Off-Highway Trucks	3	5.00	402	0.38
Brine Grading	Rubber Tired Dozers	2	5.00	247	0.40
Brine Grading	Scrapers	0	8.00	367	0.48
Brine Grading	Tractors/Loaders/Backhoes	2	7.00	97	0.37
AWTF Underground Utilities	Excavators	2	7.00	158	0.38
AWTF Underground Utilities	Tractors/Loaders/Backhoes	2	7.00	97	0.37
AWTF Building Construction	Cranes	1	5.00	231	0.29

AWTF Building Construction	Excavators	2	7.00	158	0.38
AWTF Building Construction	Forklifts	0	8.00	89	0.20
AWTF Building Construction	Generator Sets	0	8.00	84	0.74
AWTF Building Construction	Off-Highway Trucks	1	5.00	402	0.38
AWTF Building Construction	Plate Compactors	1	7.00	8	0.43
AWTF Building Construction	Rollers	1	7.00	80	0.38
AWTF Building Construction	Rough Terrain Forklifts	1	7.00	100	0.40
AWTF Building Construction	Tractors/Loaders/Backhoes	2	7.00	97	0.37
AWTF Building Construction	Welders	0	8.00	46	0.45
Brine Underground Utilities/Infrastructure	Cranes	1	5.00	231	0.29
Brine Underground Utilities/Infrastructure	Excavators	2	7.00	158	0.38
Brine Underground Utilities/Infrastructure	Tractors/Loaders/Backhoes	2	7.00	97	0.37
AWTF Paving	Pavers	2	7.00	130	0.42
AWTF Paving	Paving Equipment	0	8.00	132	0.36
AWTF Paving	Rollers	2	7.00	80	0.38
AWTF Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Pipeline Pits	2	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Slip Lining	3	10.00	10.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Trenching	2	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Installation	4	10.00	10.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
AWTF Site Preparation	2	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
Brine Site Preparation	2	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
AWTF Grading	4	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
Brine Grading	11	28.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
AWTF Underground Utilities	4	10.00	10.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
AWTF Building Construction	9	20.00	10.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
Brine Underground Utilities/Infrastructure	5	20.00	10.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
AWTF Paving	4	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
AWTF Architectural Coating	1	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

3.2 Pipeline Pits - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3212	3.0210	4.8065	7.2400e-003		0.1540	0.1540		0.1417	0.1417		701.0974	701.0974	0.2268		706.7662
Total	**0.3212**	**3.0210**	**4.8065**	**7.2400e-003**		**0.1540**	**0.1540**		**0.1417**	**0.1417**		**701.0974**	**701.0974**	**0.2268**		**706.7662**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0556	0.0330	0.3569	1.2400e-003	0.1505	8.4000e-004	0.1514	0.0399	7.8000e-004	0.0407		123.2500	123.2500	2.6100e-003		123.3152
Total	**0.0556**	**0.0330**	**0.3569**	**1.2400e-003**	**0.1505**	**8.4000e-004**	**0.1514**	**0.0399**	**7.8000e-004**	**0.0407**		**123.2500**	**123.2500**	**2.6100e-003**		**123.3152**

3.2 Pipeline Pits - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3212	3.0210	4.8065	7.2400e-003		0.1540	0.1540		0.1417	0.1417	0.0000	701.0974	701.0974	0.2268		706.7662
Total	**0.3212**	**3.0210**	**4.8065**	**7.2400e-003**		**0.1540**	**0.1540**		**0.1417**	**0.1417**	**0.0000**	**701.0974**	**701.0974**	**0.2268**		**706.7662**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0556	0.0330	0.3569	1.2400e-003	0.1505	8.4000e-004	0.1514	0.0399	7.8000e-004	0.0407		123.2500	123.2500	2.6100e-003		123.3152
Total	**0.0556**	**0.0330**	**0.3569**	**1.2400e-003**	**0.1505**	**8.4000e-004**	**0.1514**	**0.0399**	**7.8000e-004**	**0.0407**		**123.2500**	**123.2500**	**2.6100e-003**		**123.3152**

3.2 Pipeline Pits - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.2975	2.6988	4.8030	7.2500e-003		0.1327	0.1327		0.1221	0.1221		701.4719	701.4719	0.2269		707.1436
Total	**0.2975**	**2.6988**	**4.8030**	**7.2500e-003**		**0.1327**	**0.1327**		**0.1221**	**0.1221**		**701.4719**	**701.4719**	**0.2269**		**707.1436**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0523	0.0297	0.3291	1.1900e-003	0.1505	8.2000e-004	0.1513	0.0399	7.6000e-004	0.0407		118.5708	118.5708	2.3400e-003		118.6294
Total	**0.0523**	**0.0297**	**0.3291**	**1.1900e-003**	**0.1505**	**8.2000e-004**	**0.1513**	**0.0399**	**7.6000e-004**	**0.0407**		**118.5708**	**118.5708**	**2.3400e-003**		**118.6294**

3.2 Pipeline Pits - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.2975	2.6988	4.8030	7.2500e-003		0.1327	0.1327		0.1221	0.1221	0.0000	701.4719	701.4719	0.2269		707.1436
Total	**0.2975**	**2.6988**	**4.8030**	**7.2500e-003**		**0.1327**	**0.1327**		**0.1221**	**0.1221**	**0.0000**	**701.4719**	**701.4719**	**0.2269**		**707.1436**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0523	0.0297	0.3291	1.1900e-003	0.1505	8.2000e-004	0.1513	0.0399	7.6000e-004	0.0407		118.5708	118.5708	2.3400e-003		118.6294
Total	**0.0523**	**0.0297**	**0.3291**	**1.1900e-003**	**0.1505**	**8.2000e-004**	**0.1513**	**0.0399**	**7.6000e-004**	**0.0407**		**118.5708**	**118.5708**	**2.3400e-003**		**118.6294**

3.3 Pipeline Slip Lining - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.7080	5.3971	7.5485	0.0125		0.2596	0.2596		0.2536	0.2536		1,164.2116	1,164.2116	0.1891		1,168.9397
Total	**0.7080**	**5.3971**	**7.5485**	**0.0125**		**0.2596**	**0.2596**		**0.2536**	**0.2536**		**1,164.2116**	**1,164.2116**	**0.1891**		**1,168.9397**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0244	0.8993	0.1899	2.7300e-003	0.0733	1.7200e-003	0.0750	0.0211	1.6500e-003	0.0227		288.3170	288.3170	0.0211		288.8431
Worker	0.0556	0.0330	0.3569	1.2400e-003	0.1505	8.4000e-004	0.1514	0.0399	7.8000e-004	0.0407		123.2500	123.2500	2.6100e-003		123.3152
Total	**0.0800**	**0.9323**	**0.5468**	**3.9700e-003**	**0.2238**	**2.5600e-003**	**0.2264**	**0.0610**	**2.4300e-003**	**0.0634**		**411.5670**	**411.5670**	**0.0237**		**412.1583**

3.3 Pipeline Slip Lining - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.7080	5.3971	7.5485	0.0125		0.2596	0.2596		0.2536	0.2536	0.0000	1,164.2116	1,164.2116	0.1891		1,168.9397
Total	**0.7080**	**5.3971**	**7.5485**	**0.0125**		**0.2596**	**0.2596**		**0.2536**	**0.2536**	**0.0000**	**1,164.2116**	**1,164.2116**	**0.1891**		**1,168.9397**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0244	0.8993	0.1899	2.7300e-003	0.0733	1.7200e-003	0.0750	0.0211	1.6500e-003	0.0227		288.3170	288.3170	0.0211		288.8431
Worker	0.0556	0.0330	0.3569	1.2400e-003	0.1505	8.4000e-004	0.1514	0.0399	7.8000e-004	0.0407		123.2500	123.2500	2.6100e-003		123.3152
Total	**0.0800**	**0.9323**	**0.5468**	**3.9700e-003**	**0.2238**	**2.5600e-003**	**0.2264**	**0.0610**	**2.4300e-003**	**0.0634**		**411.5670**	**411.5670**	**0.0237**		**412.1583**

3.3 Pipeline Slip Lining - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6554	4.9742	7.5294	0.0125		0.2268	0.2268		0.2215	0.2215		1,164.2907	1,164.2907	0.1853		1,168.9235
Total	**0.6554**	**4.9742**	**7.5294**	**0.0125**		**0.2268**	**0.2268**		**0.2215**	**0.2215**		**1,164.2907**	**1,164.2907**	**0.1853**		**1,168.9235**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0186	0.6633	0.1631	2.6600e-003	0.0733	7.7000e-004	0.0740	0.0211	7.3000e-004	0.0218		280.9796	280.9796	0.0161		281.3828
Worker	0.0523	0.0297	0.3291	1.1900e-003	0.1505	8.2000e-004	0.1513	0.0399	7.6000e-004	0.0407		118.5708	118.5708	2.3400e-003		118.6294
Total	**0.0710**	**0.6930**	**0.4922**	**3.8500e-003**	**0.2238**	**1.5900e-003**	**0.2254**	**0.0610**	**1.4900e-003**	**0.0625**		**399.5504**	**399.5504**	**0.0185**		**400.0122**

3.3 Pipeline Slip Lining - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6554	4.9742	7.5294	0.0125		0.2268	0.2268		0.2215	0.2215	0.0000	1,164.2907	1,164.2907	0.1853		1,168.9235
Total	**0.6554**	**4.9742**	**7.5294**	**0.0125**		**0.2268**	**0.2268**		**0.2215**	**0.2215**	**0.0000**	**1,164.2907**	**1,164.2907**	**0.1853**		**1,168.9235**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0186	0.6633	0.1631	2.6600e-003	0.0733	7.7000e-004	0.0740	0.0211	7.3000e-004	0.0218		280.9796	280.9796	0.0161		281.3828
Worker	0.0523	0.0297	0.3291	1.1900e-003	0.1505	8.2000e-004	0.1513	0.0399	7.6000e-004	0.0407		118.5708	118.5708	2.3400e-003		118.6294
Total	**0.0710**	**0.6930**	**0.4922**	**3.8500e-003**	**0.2238**	**1.5900e-003**	**0.2254**	**0.0610**	**1.4900e-003**	**0.0625**		**399.5504**	**399.5504**	**0.0185**		**400.0122**

3.4 Pipeline Trenching - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3212	3.0210	4.8065	7.2400e-003		0.1540	0.1540		0.1417	0.1417		701.0974	701.0974	0.2268		706.7662
Total	**0.3212**	**3.0210**	**4.8065**	**7.2400e-003**		**0.1540**	**0.1540**		**0.1417**	**0.1417**		**701.0974**	**701.0974**	**0.2268**		**706.7662**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0556	0.0330	0.3569	1.2400e-003	0.1505	8.4000e-004	0.1514	0.0399	7.8000e-004	0.0407		123.2500	123.2500	2.6100e-003		123.3152
Total	**0.0556**	**0.0330**	**0.3569**	**1.2400e-003**	**0.1505**	**8.4000e-004**	**0.1514**	**0.0399**	**7.8000e-004**	**0.0407**		**123.2500**	**123.2500**	**2.6100e-003**		**123.3152**

3.4 Pipeline Trenching - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3212	3.0210	4.8065	7.2400e-003		0.1540	0.1540		0.1417	0.1417	0.0000	701.0974	701.0974	0.2268		706.7662
Total	**0.3212**	**3.0210**	**4.8065**	**7.2400e-003**		**0.1540**	**0.1540**		**0.1417**	**0.1417**	**0.0000**	**701.0974**	**701.0974**	**0.2268**		**706.7662**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0556	0.0330	0.3569	1.2400e-003	0.1505	8.4000e-004	0.1514	0.0399	7.8000e-004	0.0407		123.2500	123.2500	2.6100e-003		123.3152
Total	**0.0556**	**0.0330**	**0.3569**	**1.2400e-003**	**0.1505**	**8.4000e-004**	**0.1514**	**0.0399**	**7.8000e-004**	**0.0407**		**123.2500**	**123.2500**	**2.6100e-003**		**123.3152**

3.4 Pipeline Trenching - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.2975	2.6988	4.8030	7.2500e-003		0.1327	0.1327		0.1221	0.1221		701.4719	701.4719	0.2269		707.1436
Total	**0.2975**	**2.6988**	**4.8030**	**7.2500e-003**		**0.1327**	**0.1327**		**0.1221**	**0.1221**		**701.4719**	**701.4719**	**0.2269**		**707.1436**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0523	0.0297	0.3291	1.1900e-003	0.1505	8.2000e-004	0.1513	0.0399	7.6000e-004	0.0407		118.5708	118.5708	2.3400e-003		118.6294
Total	**0.0523**	**0.0297**	**0.3291**	**1.1900e-003**	**0.1505**	**8.2000e-004**	**0.1513**	**0.0399**	**7.6000e-004**	**0.0407**		**118.5708**	**118.5708**	**2.3400e-003**		**118.6294**

3.4 Pipeline Trenching - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.2975	2.6988	4.8030	7.2500e-003		0.1327	0.1327		0.1221	0.1221	0.0000	701.4719	701.4719	0.2269		707.1436
Total	**0.2975**	**2.6988**	**4.8030**	**7.2500e-003**		**0.1327**	**0.1327**		**0.1221**	**0.1221**	**0.0000**	**701.4719**	**701.4719**	**0.2269**		**707.1436**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0523	0.0297	0.3291	1.1900e-003	0.1505	8.2000e-004	0.1513	0.0399	7.6000e-004	0.0407		118.5708	118.5708	2.3400e-003		118.6294
Total	**0.0523**	**0.0297**	**0.3291**	**1.1900e-003**	**0.1505**	**8.2000e-004**	**0.1513**	**0.0399**	**7.6000e-004**	**0.0407**		**118.5708**	**118.5708**	**2.3400e-003**		**118.6294**

3.5 Pipeline Installation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8521	6.8633	9.5067	0.0152		0.3385	0.3385		0.3262	0.3262		1,427.7957	1,427.7957	0.2744		1,434.6550
Total	**0.8521**	**6.8633**	**9.5067**	**0.0152**		**0.3385**	**0.3385**		**0.3262**	**0.3262**		**1,427.7957**	**1,427.7957**	**0.2744**		**1,434.6550**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0244	0.8993	0.1899	2.7300e-003	0.0733	1.7200e-003	0.0750	0.0211	1.6500e-003	0.0227		288.3170	288.3170	0.0211		288.8431
Worker	0.0556	0.0330	0.3569	1.2400e-003	0.1505	8.4000e-004	0.1514	0.0399	7.8000e-004	0.0407		123.2500	123.2500	2.6100e-003		123.3152
Total	**0.0800**	**0.9323**	**0.5468**	**3.9700e-003**	**0.2238**	**2.5600e-003**	**0.2264**	**0.0610**	**2.4300e-003**	**0.0634**		**411.5670**	**411.5670**	**0.0237**		**412.1583**

3.5 Pipeline Installation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8521	6.8633	9.5067	0.0152		0.3385	0.3385		0.3262	0.3262	0.0000	1,427.7957	1,427.7957	0.2744		1,434.6550
Total	**0.8521**	**6.8633**	**9.5067**	**0.0152**		**0.3385**	**0.3385**		**0.3262**	**0.3262**	**0.0000**	**1,427.7957**	**1,427.7957**	**0.2744**		**1,434.6550**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0244	0.8993	0.1899	2.7300e-003	0.0733	1.7200e-003	0.0750	0.0211	1.6500e-003	0.0227		288.3170	288.3170	0.0211		288.8431
Worker	0.0556	0.0330	0.3569	1.2400e-003	0.1505	8.4000e-004	0.1514	0.0399	7.8000e-004	0.0407		123.2500	123.2500	2.6100e-003		123.3152
Total	**0.0800**	**0.9323**	**0.5468**	**3.9700e-003**	**0.2238**	**2.5600e-003**	**0.2264**	**0.0610**	**2.4300e-003**	**0.0634**		**411.5670**	**411.5670**	**0.0237**		**412.1583**

3.5 Pipeline Installation - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.7878	6.3179	9.4818	0.0152		0.2931	0.2931		0.2825	0.2825		1,428.1701	1,428.1701	0.2707		1,434.9366
Total	**0.7878**	**6.3179**	**9.4818**	**0.0152**		**0.2931**	**0.2931**		**0.2825**	**0.2825**		**1,428.1701**	**1,428.1701**	**0.2707**		**1,434.9366**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0186	0.6633	0.1631	2.6600e-003	0.0733	7.7000e-004	0.0740	0.0211	7.3000e-004	0.0218		280.9796	280.9796	0.0161		281.3828
Worker	0.0523	0.0297	0.3291	1.1900e-003	0.1505	8.2000e-004	0.1513	0.0399	7.6000e-004	0.0407		118.5708	118.5708	2.3400e-003		118.6294
Total	**0.0710**	**0.6930**	**0.4922**	**3.8500e-003**	**0.2238**	**1.5900e-003**	**0.2254**	**0.0610**	**1.4900e-003**	**0.0625**		**399.5504**	**399.5504**	**0.0185**		**400.0122**

3.5 Pipeline Installation - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.7878	6.3179	9.4818	0.0152		0.2931	0.2931		0.2825	0.2825	0.0000	1,428.1701	1,428.1701	0.2707		1,434.9366
Total	**0.7878**	**6.3179**	**9.4818**	**0.0152**		**0.2931**	**0.2931**		**0.2825**	**0.2825**	**0.0000**	**1,428.1701**	**1,428.1701**	**0.2707**		**1,434.9366**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0186	0.6633	0.1631	2.6600e-003	0.0733	7.7000e-004	0.0740	0.0211	7.3000e-004	0.0218		280.9796	280.9796	0.0161		281.3828
Worker	0.0523	0.0297	0.3291	1.1900e-003	0.1505	8.2000e-004	0.1513	0.0399	7.6000e-004	0.0407		118.5708	118.5708	2.3400e-003		118.6294
Total	**0.0710**	**0.6930**	**0.4922**	**3.8500e-003**	**0.2238**	**1.5900e-003**	**0.2254**	**0.0610**	**1.4900e-003**	**0.0625**		**399.5504**	**399.5504**	**0.0185**		**400.0122**

3.6 AWTF Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.2882	2.9324	3.9164	5.4400e-003		0.1577	0.1577		0.1451	0.1451		527.1682	527.1682	0.1705		531.4306
Total	**0.2882**	**2.9324**	**3.9164**	**5.4400e-003**	**0.0000**	**0.1577**	**0.1577**	**0.0000**	**0.1451**	**0.1451**		**527.1682**	**527.1682**	**0.1705**		**531.4306**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0556	0.0330	0.3569	1.2400e-003	8.8884	8.4000e-004	8.8892	0.9113	7.8000e-004	0.9120		123.2500	123.2500	2.6100e-003		123.3152
Total	**0.0556**	**0.0330**	**0.3569**	**1.2400e-003**	**8.8884**	**8.4000e-004**	**8.8892**	**0.9113**	**7.8000e-004**	**0.9120**		**123.2500**	**123.2500**	**2.6100e-003**		**123.3152**

3.6 AWTF Site Preparation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.2882	2.9324	3.9164	5.4400e-003		0.1577	0.1577		0.1451	0.1451	0.0000	527.1682	527.1682	0.1705		531.4306
Total	**0.2882**	**2.9324**	**3.9164**	**5.4400e-003**	**0.0000**	**0.1577**	**0.1577**	**0.0000**	**0.1451**	**0.1451**	**0.0000**	**527.1682**	**527.1682**	**0.1705**		**531.4306**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0556	0.0330	0.3569	1.2400e-003	2.9798	8.4000e-004	2.9807	0.3204	7.8000e-004	0.3212		123.2500	123.2500	2.6100e-003		123.3152
Total	**0.0556**	**0.0330**	**0.3569**	**1.2400e-003**	**2.9798**	**8.4000e-004**	**2.9807**	**0.3204**	**7.8000e-004**	**0.3212**		**123.2500**	**123.2500**	**2.6100e-003**		**123.3152**

3.7 Brine Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.2882	2.9324	3.9164	5.4400e-003		0.1577	0.1577		0.1451	0.1451		527.1682	527.1682	0.1705		531.4306
Total	**0.2882**	**2.9324**	**3.9164**	**5.4400e-003**	**0.0000**	**0.1577**	**0.1577**	**0.0000**	**0.1451**	**0.1451**		**527.1682**	**527.1682**	**0.1705**		**531.4306**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0556	0.0330	0.3569	1.2400e-003	8.8884	8.4000e-004	8.8892	0.9113	7.8000e-004	0.9120		123.2500	123.2500	2.6100e-003		123.3152
Total	**0.0556**	**0.0330**	**0.3569**	**1.2400e-003**	**8.8884**	**8.4000e-004**	**8.8892**	**0.9113**	**7.8000e-004**	**0.9120**		**123.2500**	**123.2500**	**2.6100e-003**		**123.3152**

3.7 Brine Site Preparation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.2882	2.9324	3.9164	5.4400e-003		0.1577	0.1577		0.1451	0.1451	0.0000	527.1682	527.1682	0.1705		531.4306
Total	**0.2882**	**2.9324**	**3.9164**	**5.4400e-003**	**0.0000**	**0.1577**	**0.1577**	**0.0000**	**0.1451**	**0.1451**	**0.0000**	**527.1682**	**527.1682**	**0.1705**		**531.4306**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0556	0.0330	0.3569	1.2400e-003	2.9798	8.4000e-004	2.9807	0.3204	7.8000e-004	0.3212		123.2500	123.2500	2.6100e-003		123.3152
Total	**0.0556**	**0.0330**	**0.3569**	**1.2400e-003**	**2.9798**	**8.4000e-004**	**2.9807**	**0.3204**	**7.8000e-004**	**0.3212**		**123.2500**	**123.2500**	**2.6100e-003**		**123.3152**

3.8 AWTF Grading - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					5.7335	0.0000	5.7335	2.9466	0.0000	2.9466			0.0000			0.0000
Off-Road	1.7351	17.3617	10.4279	0.0293		0.7144	0.7144		0.6572	0.6572		2,841.4005	2,841.4005	0.9190		2,864.3747
Total	**1.7351**	**17.3617**	**10.4279**	**0.0293**	**5.7335**	**0.7144**	**6.4479**	**2.9466**	**0.6572**	**3.6038**		**2,841.4005**	**2,841.4005**	**0.9190**		**2,864.3747**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0556	0.0330	0.3569	1.2400e-003	8.8884	8.4000e-004	8.8892	0.9113	7.8000e-004	0.9120		123.2500	123.2500	2.6100e-003		123.3152
Total	**0.0556**	**0.0330**	**0.3569**	**1.2400e-003**	**8.8884**	**8.4000e-004**	**8.8892**	**0.9113**	**7.8000e-004**	**0.9120**		**123.2500**	**123.2500**	**2.6100e-003**		**123.3152**

3.8 AWTF Grading - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.5801	0.0000	2.5801	1.3260	0.0000	1.3260			0.0000			0.0000
Off-Road	1.7351	17.3617	10.4279	0.0293		0.7144	0.7144		0.6572	0.6572	0.0000	2,841.4005	2,841.4005	0.9190		2,864.3747
Total	**1.7351**	**17.3617**	**10.4279**	**0.0293**	**2.5801**	**0.7144**	**3.2945**	**1.3260**	**0.6572**	**1.9832**	**0.0000**	**2,841.4005**	**2,841.4005**	**0.9190**		**2,864.3747**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0556	0.0330	0.3569	1.2400e-003	2.9798	8.4000e-004	2.9807	0.3204	7.8000e-004	0.3212		123.2500	123.2500	2.6100e-003		123.3152
Total	**0.0556**	**0.0330**	**0.3569**	**1.2400e-003**	**2.9798**	**8.4000e-004**	**2.9807**	**0.3204**	**7.8000e-004**	**0.3212**		**123.2500**	**123.2500**	**2.6100e-003**		**123.3152**

3.9 Brine Grading - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					8.4556	0.0000	8.4556	4.2380	0.0000	4.2380			0.0000			0.0000
Off-Road	3.4059	33.7606	23.4011	0.0615		1.3960	1.3960		1.2844	1.2844		5,956.3246	5,956.3246	1.9264		6,004.4846
Total	**3.4059**	**33.7606**	**23.4011**	**0.0615**	**8.4556**	**1.3960**	**9.8516**	**4.2380**	**1.2844**	**5.5223**		**5,956.3246**	**5,956.3246**	**1.9264**		**6,004.4846**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1556	0.0923	0.9992	3.4600e-003	24.8874	2.3600e-003	24.8898	2.5516	2.1700e-003	2.5537		345.1000	345.1000	7.3000e-003		345.2825
Total	**0.1556**	**0.0923**	**0.9992**	**3.4600e-003**	**24.8874**	**2.3600e-003**	**24.8898**	**2.5516**	**2.1700e-003**	**2.5537**		**345.1000**	**345.1000**	**7.3000e-003**		**345.2825**

3.9 Brine Grading - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					3.8050	0.0000	3.8050	1.9071	0.0000	1.9071			0.0000			0.0000
Off-Road	3.4059	33.7606	23.4011	0.0615		1.3960	1.3960		1.2844	1.2844	0.0000	5,956.3246	5,956.3246	1.9264		6,004.4845
Total	**3.4059**	**33.7606**	**23.4011**	**0.0615**	**3.8050**	**1.3960**	**5.2010**	**1.9071**	**1.2844**	**3.1915**	**0.0000**	**5,956.3246**	**5,956.3246**	**1.9264**		**6,004.4845**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1556	0.0923	0.9992	3.4600e-003	8.3435	2.3600e-003	8.3459	0.8972	2.1700e-003	0.8993		345.1000	345.1000	7.3000e-003		345.2825
Total	**0.1556**	**0.0923**	**0.9992**	**3.4600e-003**	**8.3435**	**2.3600e-003**	**8.3459**	**0.8972**	**2.1700e-003**	**0.8993**		**345.1000**	**345.1000**	**7.3000e-003**		**345.2825**

3.10 AWTF Underground Utilities - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6425	6.0421	9.6129	0.0145		0.3081	0.3081		0.2834	0.2834		1,402.1949	1,402.1949	0.4535		1,413.5323
Total	**0.6425**	**6.0421**	**9.6129**	**0.0145**		**0.3081**	**0.3081**		**0.2834**	**0.2834**		**1,402.1949**	**1,402.1949**	**0.4535**		**1,413.5323**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0244	0.8993	0.1899	2.7300e-003	8.9053	1.7200e-003	8.9070	0.9018	1.6500e-003	0.9035		288.3170	288.3170	0.0211		288.8431
Worker	0.0556	0.0330	0.3569	1.2400e-003	8.8884	8.4000e-004	8.8892	0.9113	7.8000e-004	0.9120		123.2500	123.2500	2.6100e-003		123.3152
Total	**0.0800**	**0.9323**	**0.5468**	**3.9700e-003**	**17.7936**	**2.5600e-003**	**17.7962**	**1.8131**	**2.4300e-003**	**1.8155**		**411.5670**	**411.5670**	**0.0237**		**412.1583**

3.10 AWTF Underground Utilities - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6425	6.0421	9.6129	0.0145		0.3081	0.3081		0.2834	0.2834	0.0000	1,402.1949	1,402.1949	0.4535		1,413.5323
Total	**0.6425**	**6.0421**	**9.6129**	**0.0145**		**0.3081**	**0.3081**		**0.2834**	**0.2834**	**0.0000**	**1,402.1949**	**1,402.1949**	**0.4535**		**1,413.5323**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0244	0.8993	0.1899	2.7300e-003	2.9331	1.7200e-003	2.9348	0.3046	1.6500e-003	0.3063		288.3170	288.3170	0.0211		288.8431
Worker	0.0556	0.0330	0.3569	1.2400e-003	2.9798	8.4000e-004	2.9807	0.3204	7.8000e-004	0.3212		123.2500	123.2500	2.6100e-003		123.3152
Total	**0.0800**	**0.9323**	**0.5468**	**3.9700e-003**	**5.9129**	**2.5600e-003**	**5.9155**	**0.6250**	**2.4300e-003**	**0.6275**		**411.5670**	**411.5670**	**0.0237**		**412.1583**

3.11 AWTF Building Construction - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4843	14.1911	16.7091	0.0321		0.6486	0.6486		0.5974	0.5974		3,095.3751	3,095.3751	0.9945		3,120.2372
Total	**1.4843**	**14.1911**	**16.7091**	**0.0321**		**0.6486**	**0.6486**		**0.5974**	**0.5974**		**3,095.3751**	**3,095.3751**	**0.9945**		**3,120.2372**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0244	0.8993	0.1899	2.7300e-003	8.9053	1.7200e-003	8.9070	0.9018	1.6500e-003	0.9035		288.3170	288.3170	0.0211		288.8431
Worker	0.1112	0.0659	0.7137	2.4700e-003	17.7767	1.6900e-003	17.7784	1.8225	1.5500e-003	1.8241		246.5000	246.5000	5.2100e-003		246.6304
Total	**0.1355**	**0.9653**	**0.9036**	**5.2000e-003**	**26.6820**	**3.4100e-003**	**26.6854**	**2.7244**	**3.2000e-003**	**2.7276**		**534.8170**	**534.8170**	**0.0263**		**535.4735**

3.11 AWTF Building Construction - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4843	14.1911	16.7091	0.0321		0.6486	0.6486		0.5974	0.5974	0.0000	3,095.3751	3,095.3751	0.9945		3,120.2372
Total	**1.4843**	**14.1911**	**16.7091**	**0.0321**		**0.6486**	**0.6486**		**0.5974**	**0.5974**	**0.0000**	**3,095.3751**	**3,095.3751**	**0.9945**		**3,120.2372**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0244	0.8993	0.1899	2.7300e-003	2.9331	1.7200e-003	2.9348	0.3046	1.6500e-003	0.3063		288.3170	288.3170	0.0211		288.8431
Worker	0.1112	0.0659	0.7137	2.4700e-003	5.9597	1.6900e-003	5.9614	0.6408	1.5500e-003	0.6424		246.5000	246.5000	5.2100e-003		246.6304
Total	**0.1355**	**0.9653**	**0.9036**	**5.2000e-003**	**8.8927**	**3.4100e-003**	**8.8962**	**0.9455**	**3.2000e-003**	**0.9486**		**534.8170**	**534.8170**	**0.0263**		**535.4735**

3.11 AWTF Building Construction - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.3918	12.8654	16.6140	0.0321		0.5709	0.5709		0.5260	0.5260		3,096.7278	3,096.7278	0.9949		3,121.6008
Total	**1.3918**	**12.8654**	**16.6140**	**0.0321**		**0.5709**	**0.5709**		**0.5260**	**0.5260**		**3,096.7278**	**3,096.7278**	**0.9949**		**3,121.6008**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0186	0.6633	0.1631	2.6600e-003	8.9053	7.7000e-004	8.9060	0.9018	7.3000e-004	0.9026		280.9796	280.9796	0.0161		281.3828
Worker	0.1047	0.0595	0.6582	2.3800e-003	17.7767	1.6400e-003	17.7784	1.8225	1.5100e-003	1.8241		237.1416	237.1416	4.6900e-003		237.2588
Total	**0.1233**	**0.7228**	**0.8212**	**5.0400e-003**	**26.6820**	**2.4100e-003**	**26.6844**	**2.7244**	**2.2400e-003**	**2.7266**		**518.1211**	**518.1211**	**0.0208**		**518.6416**

3.11 AWTF Building Construction - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.3918	12.8654	16.6140	0.0321		0.5709	0.5709		0.5260	0.5260	0.0000	3,096.7278	3,096.7278	0.9949		3,121.6008
Total	**1.3918**	**12.8654**	**16.6140**	**0.0321**		**0.5709**	**0.5709**		**0.5260**	**0.5260**	**0.0000**	**3,096.7278**	**3,096.7278**	**0.9949**		**3,121.6008**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0186	0.6633	0.1631	2.6600e-003	2.9331	7.7000e-004	2.9338	0.3046	7.3000e-004	0.3054		280.9796	280.9796	0.0161		281.3828
Worker	0.1047	0.0595	0.6582	2.3800e-003	5.9597	1.6400e-003	5.9613	0.6408	1.5100e-003	0.6424		237.1416	237.1416	4.6900e-003		237.2588
Total	**0.1233**	**0.7228**	**0.8212**	**5.0400e-003**	**8.8927**	**2.4100e-003**	**8.8952**	**0.9454**	**2.2400e-003**	**0.9477**		**518.1211**	**518.1211**	**0.0208**		**518.6416**

3.12 Brine Underground Utilities/Infrastructure - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8147	7.7822	10.7524	0.0181		0.3649	0.3649		0.3357	0.3357		1,752.2058	1,752.2058	0.5667		1,766.3732
Total	**0.8147**	**7.7822**	**10.7524**	**0.0181**		**0.3649**	**0.3649**		**0.3357**	**0.3357**		**1,752.2058**	**1,752.2058**	**0.5667**		**1,766.3732**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0186	0.6633	0.1631	2.6600e-003	8.9053	7.7000e-004	8.9060	0.9018	7.3000e-004	0.9026		280.9796	280.9796	0.0161		281.3828
Worker	0.1047	0.0595	0.6582	2.3800e-003	17.7767	1.6400e-003	17.7784	1.8225	1.5100e-003	1.8241		237.1416	237.1416	4.6900e-003		237.2588
Total	**0.1233**	**0.7228**	**0.8212**	**5.0400e-003**	**26.6820**	**2.4100e-003**	**26.6844**	**2.7244**	**2.2400e-003**	**2.7266**		**518.1211**	**518.1211**	**0.0208**		**518.6416**

3.12 Brine Underground Utilities/Infrastructure - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8147	7.7822	10.7524	0.0181		0.3649	0.3649		0.3357	0.3357	0.0000	1,752.2058	1,752.2058	0.5667		1,766.3732
Total	**0.8147**	**7.7822**	**10.7524**	**0.0181**		**0.3649**	**0.3649**		**0.3357**	**0.3357**	**0.0000**	**1,752.2058**	**1,752.2058**	**0.5667**		**1,766.3732**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0186	0.6633	0.1631	2.6600e-003	2.9331	7.7000e-004	2.9338	0.3046	7.3000e-004	0.3054		280.9796	280.9796	0.0161		281.3828
Worker	0.1047	0.0595	0.6582	2.3800e-003	5.9597	1.6400e-003	5.9613	0.6408	1.5100e-003	0.6424		237.1416	237.1416	4.6900e-003		237.2588
Total	**0.1233**	**0.7228**	**0.8212**	**5.0400e-003**	**8.8927**	**2.4100e-003**	**8.8952**	**0.9454**	**2.2400e-003**	**0.9477**		**518.1211**	**518.1211**	**0.0208**		**518.6416**

3.13 AWTF Paving - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6049	6.1126	8.2869	0.0128		0.3100	0.3100		0.2852	0.2852		1,241.3188	1,241.3188	0.4015		1,251.3555
Paving	0.8360					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.4409**	**6.1126**	**8.2869**	**0.0128**		**0.3100**	**0.3100**		**0.2852**	**0.2852**		**1,241.3188**	**1,241.3188**	**0.4015**		**1,251.3555**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0523	0.0297	0.3291	1.1900e-003	8.8884	8.2000e-004	8.8892	0.9113	7.6000e-004	0.9120		118.5708	118.5708	2.3400e-003		118.6294
Total	**0.0523**	**0.0297**	**0.3291**	**1.1900e-003**	**8.8884**	**8.2000e-004**	**8.8892**	**0.9113**	**7.6000e-004**	**0.9120**		**118.5708**	**118.5708**	**2.3400e-003**		**118.6294**

3.13 AWTF Paving - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6049	6.1126	8.2869	0.0128		0.3100	0.3100		0.2852	0.2852	0.0000	1,241.3188	1,241.3188	0.4015		1,251.3555
Paving	0.8360					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.4409**	**6.1126**	**8.2869**	**0.0128**		**0.3100**	**0.3100**		**0.2852**	**0.2852**	**0.0000**	**1,241.3188**	**1,241.3188**	**0.4015**		**1,251.3555**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0523	0.0297	0.3291	1.1900e-003	2.9798	8.2000e-004	2.9807	0.3204	7.6000e-004	0.3212		118.5708	118.5708	2.3400e-003		118.6294
Total	**0.0523**	**0.0297**	**0.3291**	**1.1900e-003**	**2.9798**	**8.2000e-004**	**2.9807**	**0.3204**	**7.6000e-004**	**0.3212**		**118.5708**	**118.5708**	**2.3400e-003**		**118.6294**

3.14 AWTF Architectural Coating - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	9.8069					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.1917	1.3030	1.8111	2.9700e-003		0.0708	0.0708		0.0708	0.0708		281.4481	281.4481	0.0168		281.8690
Total	**9.9986**	**1.3030**	**1.8111**	**2.9700e-003**		**0.0708**	**0.0708**		**0.0708**	**0.0708**		**281.4481**	**281.4481**	**0.0168**		**281.8690**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0523	0.0297	0.3291	1.1900e-003	8.8884	8.2000e-004	8.8892	0.9113	7.6000e-004	0.9120		118.5708	118.5708	2.3400e-003		118.6294
Total	**0.0523**	**0.0297**	**0.3291**	**1.1900e-003**	**8.8884**	**8.2000e-004**	**8.8892**	**0.9113**	**7.6000e-004**	**0.9120**		**118.5708**	**118.5708**	**2.3400e-003**		**118.6294**

3.14 AWTF Architectural Coating - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	9.8069					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.1917	1.3030	1.8111	2.9700e-003		0.0708	0.0708		0.0708	0.0708	0.0000	281.4481	281.4481	0.0168		281.8690
Total	**9.9986**	**1.3030**	**1.8111**	**2.9700e-003**		**0.0708**	**0.0708**		**0.0708**	**0.0708**	**0.0000**	**281.4481**	**281.4481**	**0.0168**		**281.8690**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0523	0.0297	0.3291	1.1900e-003	2.9798	8.2000e-004	2.9807	0.3204	7.6000e-004	0.3212		118.5708	118.5708	2.3400e-003		118.6294
Total	**0.0523**	**0.0297**	**0.3291**	**1.1900e-003**	**2.9798**	**8.2000e-004**	**2.9807**	**0.3204**	**7.6000e-004**	**0.3212**		**118.5708**	**118.5708**	**2.3400e-003**		**118.6294**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0159	0.1140	0.2316	1.2000e-003	0.1071	7.1000e-004	0.1078	0.0287	6.6000e-004	0.0293		122.8781	122.8781	4.7700e-003		122.9973
Unmitigated	0.0159	0.1140	0.2316	1.2000e-003	0.1071	7.1000e-004	0.1078	0.0287	6.6000e-004	0.0293		122.8781	122.8781	4.7700e-003		122.9973

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Light Industry	10.02	10.02	10.02	50,230	50,230
General Office Building	0.00	0.00	0.00		
Other Asphalt Surfaces	0.00	0.00	0.00		
Parking Lot	0.00	0.00	0.00		
User Defined Industrial	0.00	0.00	0.00		
Total	10.02	10.02	10.02	50,230	50,230

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Light Industry	18.50	10.10	7.90	59.00	28.00	13.00	92	5	3
General Office Building	18.50	10.10	7.90	33.00	48.00	19.00	77	19	4
Other Asphalt Surfaces	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0
Parking Lot	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0
User Defined Industrial	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Light Industry	0.551648	0.035769	0.187848	0.110184	0.013450	0.004660	0.017552	0.070120	0.001413	0.001134	0.004476	0.000905	0.000840
General Office Building	0.551648	0.035769	0.187848	0.110184	0.013450	0.004660	0.017552	0.070120	0.001413	0.001134	0.004476	0.000905	0.000840
Other Asphalt Surfaces	0.551648	0.035769	0.187848	0.110184	0.013450	0.004660	0.017552	0.070120	0.001413	0.001134	0.004476	0.000905	0.000840
Parking Lot	0.551648	0.035769	0.187848	0.110184	0.013450	0.004660	0.017552	0.070120	0.001413	0.001134	0.004476	0.000905	0.000840
User Defined Industrial	0.551648	0.035769	0.187848	0.110184	0.013450	0.004660	0.017552	0.070120	0.001413	0.001134	0.004476	0.000905	0.000840

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Light Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
General Office Building	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Light Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
General Office Building	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	17.7497	1.6000e-004	0.0178	0.0000		6.0000e-005	6.0000e-005		6.0000e-005	6.0000e-005		0.0383	0.0383	1.0000e-004		0.0408
Unmitigated	17.7497	1.6000e-004	0.0178	0.0000		6.0000e-005	6.0000e-005		6.0000e-005	6.0000e-005		0.0383	0.0383	1.0000e-004		0.0408

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0322					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	17.7158					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.6500e-003	1.6000e-004	0.0178	0.0000		6.0000e-005	6.0000e-005		6.0000e-005	6.0000e-005		0.0383	0.0383	1.0000e-004		0.0408
Total	**17.7497**	**1.6000e-004**	**0.0178**	**0.0000**		**6.0000e-005**	**6.0000e-005**		**6.0000e-005**	**6.0000e-005**		**0.0383**	**0.0383**	**1.0000e-004**		**0.0408**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0322					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	17.7158					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.6500e-003	1.6000e-004	0.0178	0.0000		6.0000e-005	6.0000e-005		6.0000e-005	6.0000e-005		0.0383	0.0383	1.0000e-004		0.0408
Total	**17.7497**	**1.6000e-004**	**0.0178**	**0.0000**		**6.0000e-005**	**6.0000e-005**		**6.0000e-005**	**6.0000e-005**		**0.0383**	**0.0383**	**1.0000e-004**		**0.0408**

7.0 Water Detail

7.1 Mitigation Measures Water

Apply Water Conservation Strategy

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
Emergency Generator	2	0.5	6	555	0.73	Diesel

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

10.1 Stationary Sources

Unmitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	lb/day										lb/day					
Emergency Generator - Diesel (300 - 600 HP)	0.9108	2.5456	2.3223	4.3800e-003		0.1340	0.1340		0.1340	0.1340		465.9303	465.9303	0.0653		467.5634
Total	**0.9108**	**2.5456**	**2.3223**	**4.3800e-003**		**0.1340**	**0.1340**		**0.1340**	**0.1340**		**465.9303**	**465.9303**	**0.0653**		**467.5634**

11.0 Vegetation

EMW-20 Phase I Operation 2034

Riverside-South Coast County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	4.90	1000sqft	0.11	4,900.00	0
General Light Industry	15.90	1000sqft	0.37	15,900.00	0
User Defined Industrial	1.00	User Defined Unit	20.00	871,200.00	0
Other Asphalt Surfaces	140.90	1000sqft	3.23	140,900.00	0
Parking Lot	12.10	1000sqft	0.28	12,100.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.4	**Precipitation Freq (Days)**	28
Climate Zone	10			**Operational Year**	2034
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

EMW-20 Phase I Operation 2034 - Riverside-South Coast County, Annual

Project Characteristics - Phase I operation emissions in 2034, no construction.

Land Use - General Office Building = Control Area
General Light Industrial = Process Area
User Defined Industrial = Brine Ponds

Construction Phase - No construction this model.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - No construction this model.

Trips and VMT - No construction this model.

On-road Fugitive Dust -

Grading -

Architectural Coating -

Vehicle Trips - 10 ADT (5 workers) per project engineer.

Area Coating - 50 g/L maximum VOC content per project eningeers.
Only the control/process building and parking lots to be paved.

Energy Use - 2,971,470 kWh/year total electricty per year for the AWTF, no natural gas.
1,303,842 kWh/year total electricity for the brine ponds, no natural gas.

Construction Off-road Equipment Mitigation -

Water Mitigation - A 20% reduction in outdoor water use applied to account for CaLGreen requirements not included in model defaults.

Waste Mitigation - Additional 25% solid waste diversion mandated by AB 341 not accounted for in model defaults.

Stationary Sources - Emergency Generators and Fire Pumps - 2 400kW diesel emergency generators.

Table Name	Column Name	Default Value	New Value
tblAreaCoating	Area_EF_Nonresidential_Exterior	100	50
tblAreaCoating	Area_EF_Nonresidential_Interior	100	50
tblAreaCoating	Area_EF_Parking	100	50
tblAreaCoating	Area_Nonresidential_Exterior	446000	10400
tblAreaCoating	Area_Nonresidential_Interior	1338000	31200
tblEnergyUse	LightingElect	2.93	0.00
tblEnergyUse	LightingElect	3.66	0.00

tblEnergyUse	NT24E	5.02	186.88
tblEnergyUse	NT24E	2.79	0.00
tblEnergyUse	NT24E	0.00	1.50
tblEnergyUse	NT24NG	17.13	0.00
tblEnergyUse	T24E	2.20	0.00
tblEnergyUse	T24E	3.07	0.00
tblEnergyUse	T24NG	15.36	0.00
tblEnergyUse	T24NG	3.47	0.00
tblLandUse	LandUseSquareFeet	0.00	871,200.00
tblLandUse	LotAcreage	0.00	20.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblStationaryGeneratorsPumpsEF	CH4_EF	0.07	0.07
tblStationaryGeneratorsPumpsEF	ROG_EF	2.2480e-003	2.2477e-003
tblStationaryGeneratorsPumpsUse	HorsePowerValue	0.00	555.00
tblStationaryGeneratorsPumpsUse	HoursPerDay	0.00	0.50
tblStationaryGeneratorsPumpsUse	HoursPerYear	0.00	6.00
tblStationaryGeneratorsPumpsUse	NumberOfEquipment	0.00	2.00
tblVehicleTrips	ST_TR	1.32	0.63
tblVehicleTrips	ST_TR	2.46	0.00
tblVehicleTrips	SU_TR	0.68	0.63
tblVehicleTrips	SU_TR	1.05	0.00
tblVehicleTrips	WD_TR	6.97	0.63
tblVehicleTrips	WD_TR	11.03	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
		Highest		

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	3.2392	2.0000e-005	2.2200e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.3400e-003	4.3400e-003	1.0000e-005	0.0000	4.6200e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1,364.4730	1,364.4730	0.0563	0.0117	1,369.3544
Mobile	1.9500e-003	0.0164	0.0286	1.9000e-004	0.0192	8.0000e-005	0.0192	5.1200e-003	7.0000e-005	5.2000e-003	0.0000	17.2769	17.2769	5.7000e-004	0.0000	17.2911
Stationary	5.4600e-003	0.0153	0.0139	3.0000e-005		8.0000e-004	8.0000e-004		8.0000e-004	8.0000e-004	0.0000	2.5361	2.5361	3.6000e-004	0.0000	2.5450
Waste						0.0000	0.0000		0.0000	0.0000	4.9286	0.0000	4.9286	0.2913	0.0000	12.2105
Water						0.0000	0.0000		0.0000	0.0000	1.4428	20.7572	22.2000	0.1491	3.6800e-003	27.0217
Total	**3.2466**	**0.0317**	**0.0448**	**2.2000e-004**	**0.0192**	**8.9000e-004**	**0.0200**	**5.1200e-003**	**8.8000e-004**	**6.0100e-003**	**6.3714**	**1,405.0475**	**1,411.4189**	**0.4976**	**0.0153**	**1,428.4272**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	3.2392	2.0000e-005	2.2200e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.3400e-003	4.3400e-003	1.0000e-005	0.0000	4.6200e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1,364.4730	1,364.4730	0.0563	0.0117	1,369.3544
Mobile	1.9500e-003	0.0164	0.0286	1.9000e-004	0.0192	8.0000e-005	0.0192	5.1200e-003	7.0000e-005	5.2000e-003	0.0000	17.2769	17.2769	5.7000e-004	0.0000	17.2911
Stationary	5.4600e-003	0.0153	0.0139	3.0000e-005		8.0000e-004	8.0000e-004		8.0000e-004	8.0000e-004	0.0000	2.5361	2.5361	3.6000e-004	0.0000	2.5450
Waste						0.0000	0.0000		0.0000	0.0000	3.6965	0.0000	3.6965	0.2185	0.0000	9.1578
Water						0.0000	0.0000		0.0000	0.0000	1.4428	20.3793	21.8221	0.1490	3.6700e-003	26.6424
Total	**3.2466**	**0.0317**	**0.0448**	**2.2000e-004**	**0.0192**	**8.9000e-004**	**0.0200**	**5.1200e-003**	**8.8000e-004**	**6.0100e-003**	**5.1393**	**1,404.6696**	**1,409.8089**	**0.4248**	**0.0153**	**1,424.9954**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**19.34**	**0.03**	**0.11**	**14.64**	**0.07**	**0.24**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	4/1/2022	4/14/2022	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 3.51

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Rubber Tired Dozers	0	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	0	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	0	0.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.2 Site Preparation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.9500e-003	0.0164	0.0286	1.9000e-004	0.0192	8.0000e-005	0.0192	5.1200e-003	7.0000e-005	5.2000e-003	0.0000	17.2769	17.2769	5.7000e-004	0.0000	17.2911
Unmitigated	1.9500e-003	0.0164	0.0286	1.9000e-004	0.0192	8.0000e-005	0.0192	5.1200e-003	7.0000e-005	5.2000e-003	0.0000	17.2769	17.2769	5.7000e-004	0.0000	17.2911

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Light Industry	10.02	10.02	10.02	50,230	50,230
General Office Building	0.00	0.00	0.00		
Other Asphalt Surfaces	0.00	0.00	0.00		
Parking Lot	0.00	0.00	0.00		
User Defined Industrial	0.00	0.00	0.00		
Total	10.02	10.02	10.02	50,230	50,230

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Light Industry	18.50	10.10	7.90	59.00	28.00	13.00	92	5	3
General Office Building	18.50	10.10	7.90	33.00	48.00	19.00	77	19	4
Other Asphalt Surfaces	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0
Parking Lot	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0
User Defined Industrial	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Light Industry	0.565101	0.033874	0.191947	0.100808	0.009356	0.004045	0.016769	0.069967	0.001424	0.001062	0.004328	0.000770	0.000549
General Office Building	0.565101	0.033874	0.191947	0.100808	0.009356	0.004045	0.016769	0.069967	0.001424	0.001062	0.004328	0.000770	0.000549
Other Asphalt Surfaces	0.565101	0.033874	0.191947	0.100808	0.009356	0.004045	0.016769	0.069967	0.001424	0.001062	0.004328	0.000770	0.000549
Parking Lot	0.565101	0.033874	0.191947	0.100808	0.009356	0.004045	0.016769	0.069967	0.001424	0.001062	0.004328	0.000770	0.000549
User Defined Industrial	0.565101	0.033874	0.191947	0.100808	0.009356	0.004045	0.016769	0.069967	0.001424	0.001062	0.004328	0.000770	0.000549

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

EMW-20 Phase I Operation 2034 - Riverside-South Coast County, Annual

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	1,364.4730	1,364.4730	0.0563	0.0117	1,369.3544
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	1,364.4730	1,364.4730	0.0563	0.0117	1,369.3544
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Light Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
General Office Building	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Light Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
General Office Building	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Light Industry	2.97139e+006	946.7492	0.0391	8.0900e-003	950.1362
General Office Building	0	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	4235	1.3494	6.0000e-005	1.0000e-005	1.3542
User Defined Industrial	1.3068e+006	416.3745	0.0172	3.5600e-003	417.8641
Total		**1,364.4730**	**0.0563**	**0.0117**	**1,369.3544**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Light Industry	2.97139e+006	946.7492	0.0391	8.0900e-003	950.1362
General Office Building	0	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	4235	1.3494	6.0000e-005	1.0000e-005	1.3542
User Defined Industrial	1.3068e+006	416.3745	0.0172	3.5600e-003	417.8641
Total		**1,364.4730**	**0.0563**	**0.0117**	**1,369.3544**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	3.2392	2.0000e-005	2.2200e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.3400e-003	4.3400e-003	1.0000e-005	0.0000	4.6200e-003
Unmitigated	3.2392	2.0000e-005	2.2200e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.3400e-003	4.3400e-003	1.0000e-005	0.0000	4.6200e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	5.8800e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.2331					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.0000e-004	2.0000e-005	2.2200e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.3400e-003	4.3400e-003	1.0000e-005	0.0000	4.6200e-003
Total	**3.2392**	**2.0000e-005**	**2.2200e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**4.3400e-003**	**4.3400e-003**	**1.0000e-005**	**0.0000**	**4.6200e-003**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	5.8800e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.2331					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.0000e-004	2.0000e-005	2.2200e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.3400e-003	4.3400e-003	1.0000e-005	0.0000	4.6200e-003
Total	**3.2392**	**2.0000e-005**	**2.2200e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**4.3400e-003**	**4.3400e-003**	**1.0000e-005**	**0.0000**	**4.6200e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

Apply Water Conservation Strategy

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	21.8221	0.1490	3.6700e-003	26.6424
Unmitigated	22.2000	0.1491	3.6800e-003	27.0217

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	3.67687 / 0	16.4210	0.1204	2.9600e-003	20.3139
General Office Building	0.870895 / 0.533775	5.7789	0.0286	7.2000e-004	6.7078
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**22.2000**	**0.1491**	**3.6800e-003**	**27.0217**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	3.67687 / 0	16.4210	0.1204	2.9600e-003	20.3139
General Office Building	0.870895 / 0.42702	5.4010	0.0286	7.1000e-004	6.3285
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**21.8221**	**0.1490**	**3.6700e-003**	**26.6424**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	3.6965	0.2185	0.0000	9.1578
Unmitigated	4.9286	0.2913	0.0000	12.2105

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Light Industry	19.72	4.0030	0.2366	0.0000	9.9172
General Office Building	4.56	0.9256	0.0547	0.0000	2.2932
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**4.9286**	**0.2913**	**0.0000**	**12.2105**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Light Industry	14.79	3.0022	0.1774	0.0000	7.4379
General Office Building	3.42	0.6942	0.0410	0.0000	1.7199
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**3.6965**	**0.2185**	**0.0000**	**9.1578**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
Emergency Generator	2	0.5	6	555	0.73	Diesel

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

10.1 Stationary Sources

Unmitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	tons/yr										MT/yr					
Emergency Generator - Diesel (300 - 600 HP)	5.4600e-003	0.0153	0.0139	3.0000e-005		8.0000e-004	8.0000e-004		8.0000e-004	8.0000e-004	0.0000	2.5361	2.5361	3.6000e-004	0.0000	2.5450
Total	**5.4600e-003**	**0.0153**	**0.0139**	**3.0000e-005**		**8.0000e-004**	**8.0000e-004**		**8.0000e-004**	**8.0000e-004**	**0.0000**	**2.5361**	**2.5361**	**3.6000e-004**	**0.0000**	**2.5450**

11.0 Vegetation

EMW-20 Phase I Operation 2034

Riverside-South Coast County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	4.90	1000sqft	0.11	4,900.00	0
General Light Industry	15.90	1000sqft	0.37	15,900.00	0
User Defined Industrial	1.00	User Defined Unit	20.00	871,200.00	0
Other Asphalt Surfaces	140.90	1000sqft	3.23	140,900.00	0
Parking Lot	12.10	1000sqft	0.28	12,100.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.4	**Precipitation Freq (Days)**	28
Climate Zone	10			**Operational Year**	2034
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

EMW-20 Phase I Operation 2034 - Riverside-South Coast County, Winter

Project Characteristics - Phase I operation emissions in 2034, no construction.

Land Use - General Office Building = Control Area
General Light Industrial = Process Area
User Defined Industrial = Brine Ponds

Construction Phase - No construction this model.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - No construction this model.

Trips and VMT - No construction this model.

On-road Fugitive Dust -

Grading -

Architectural Coating -

Vehicle Trips - 10 ADT (5 workers) per project engineer.

Area Coating - 50 g/L maximum VOC content per project eningeers.
Only the control/process building and parking lots to be paved.

Energy Use - 2,971,470 kWh/year total electricty per year for the AWTF, no natural gas.
1,303,842 kWh/year total electricity for the brine ponds, no natural gas.

Construction Off-road Equipment Mitigation -

Water Mitigation - A 20% reduction in outdoor water use applied to account for CaLGreen requirements not included in model defaults.

Waste Mitigation - Additional 25% solid waste diversion mandated by AB 341 not accounted for in model defaults.

Stationary Sources - Emergency Generators and Fire Pumps - 2 400kW diesel emergency generators.

Table Name	Column Name	Default Value	New Value
tblAreaCoating	Area_EF_Nonresidential_Exterior	100	50
tblAreaCoating	Area_EF_Nonresidential_Interior	100	50
tblAreaCoating	Area_EF_Parking	100	50
tblAreaCoating	Area_Nonresidential_Exterior	446000	10400
tblAreaCoating	Area_Nonresidential_Interior	1338000	31200
tblEnergyUse	LightingElect	2.93	0.00
tblEnergyUse	LightingElect	3.66	0.00

tblEnergyUse	NT24E	5.02	186.88
tblEnergyUse	NT24E	2.79	0.00
tblEnergyUse	NT24E	0.00	1.50
tblEnergyUse	NT24NG	17.13	0.00
tblEnergyUse	T24E	2.20	0.00
tblEnergyUse	T24E	3.07	0.00
tblEnergyUse	T24NG	15.36	0.00
tblEnergyUse	T24NG	3.47	0.00
tblLandUse	LandUseSquareFeet	0.00	871,200.00
tblLandUse	LotAcreage	0.00	20.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblStationaryGeneratorsPumpsEF	CH4_EF	0.07	0.07
tblStationaryGeneratorsPumpsEF	ROG_EF	2.2480e-003	2.2477e-003
tblStationaryGeneratorsPumpsUse	HorsePowerValue	0.00	555.00
tblStationaryGeneratorsPumpsUse	HoursPerDay	0.00	0.50
tblStationaryGeneratorsPumpsUse	HoursPerYear	0.00	6.00
tblStationaryGeneratorsPumpsUse	NumberOfEquipment	0.00	2.00
tblVehicleTrips	ST_TR	1.32	0.63
tblVehicleTrips	ST_TR	2.46	0.00
tblVehicleTrips	SU_TR	0.68	0.63
tblVehicleTrips	SU_TR	1.05	0.00
tblVehicleTrips	WD_TR	6.97	0.63
tblVehicleTrips	WD_TR	11.03	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	17.7497	1.6000e-004	0.0178	0.0000		6.0000e-005	6.0000e-005		6.0000e-005	6.0000e-005		0.0383	0.0383	1.0000e-004		0.0407
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0107	0.0886	0.1519	1.0000e-003	0.1070	4.3000e-004	0.1074	0.0286	4.0000e-004	0.0290		102.5748	102.5748	3.4900e-003		102.6621
Stationary	0.9107	2.5456	2.3223	4.3800e-003		0.1340	0.1340		0.1340	0.1340		465.9303	465.9303	0.0653		467.5634
Total	**18.6710**	**2.6344**	**2.4920**	**5.3800e-003**	**0.1070**	**0.1345**	**0.2414**	**0.0286**	**0.1344**	**0.1630**		**568.5434**	**568.5434**	**0.0689**	**0.0000**	**570.2662**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	17.7497	1.6000e-004	0.0178	0.0000		6.0000e-005	6.0000e-005		6.0000e-005	6.0000e-005		0.0383	0.0383	1.0000e-004		0.0407
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0107	0.0886	0.1519	1.0000e-003	0.1070	4.3000e-004	0.1074	0.0286	4.0000e-004	0.0290		102.5748	102.5748	3.4900e-003		102.6621
Stationary	0.9107	2.5456	2.3223	4.3800e-003		0.1340	0.1340		0.1340	0.1340		465.9303	465.9303	0.0653		467.5634
Total	**18.6710**	**2.6344**	**2.4920**	**5.3800e-003**	**0.1070**	**0.1345**	**0.2414**	**0.0286**	**0.1344**	**0.1630**		**568.5434**	**568.5434**	**0.0689**	**0.0000**	**570.2662**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	4/1/2022	4/14/2022	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 3.51

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Rubber Tired Dozers	0	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	0	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	0	0.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

3.2 Site Preparation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

3.2 Site Preparation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0107	0.0886	0.1519	1.0000e-003	0.1070	4.3000e-004	0.1074	0.0286	4.0000e-004	0.0290		102.5748	102.5748	3.4900e-003		102.6621
Unmitigated	0.0107	0.0886	0.1519	1.0000e-003	0.1070	4.3000e-004	0.1074	0.0286	4.0000e-004	0.0290		102.5748	102.5748	3.4900e-003		102.6621

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Light Industry	10.02	10.02	10.02	50,230	50,230
General Office Building	0.00	0.00	0.00		
Other Asphalt Surfaces	0.00	0.00	0.00		
Parking Lot	0.00	0.00	0.00		
User Defined Industrial	0.00	0.00	0.00		
Total	10.02	10.02	10.02	50,230	50,230

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Light Industry	18.50	10.10	7.90	59.00	28.00	13.00	92	5	3
General Office Building	18.50	10.10	7.90	33.00	48.00	19.00	77	19	4
Other Asphalt Surfaces	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0
Parking Lot	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0
User Defined Industrial	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Light Industry	0.565101	0.033874	0.191947	0.100808	0.009356	0.004045	0.016769	0.069967	0.001424	0.001062	0.004328	0.000770	0.000549
General Office Building	0.565101	0.033874	0.191947	0.100808	0.009356	0.004045	0.016769	0.069967	0.001424	0.001062	0.004328	0.000770	0.000549
Other Asphalt Surfaces	0.565101	0.033874	0.191947	0.100808	0.009356	0.004045	0.016769	0.069967	0.001424	0.001062	0.004328	0.000770	0.000549
Parking Lot	0.565101	0.033874	0.191947	0.100808	0.009356	0.004045	0.016769	0.069967	0.001424	0.001062	0.004328	0.000770	0.000549
User Defined Industrial	0.565101	0.033874	0.191947	0.100808	0.009356	0.004045	0.016769	0.069967	0.001424	0.001062	0.004328	0.000770	0.000549

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Light Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
General Office Building	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Light Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
General Office Building	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	17.7497	1.6000e-004	0.0178	0.0000		6.0000e-005	6.0000e-005		6.0000e-005	6.0000e-005		0.0383	0.0383	1.0000e-004		0.0407
Unmitigated	17.7497	1.6000e-004	0.0178	0.0000		6.0000e-005	6.0000e-005		6.0000e-005	6.0000e-005		0.0383	0.0383	1.0000e-004		0.0407

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0322					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	17.7158					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.6200e-003	1.6000e-004	0.0178	0.0000		6.0000e-005	6.0000e-005		6.0000e-005	6.0000e-005		0.0383	0.0383	1.0000e-004		0.0407
Total	**17.7497**	**1.6000e-004**	**0.0178**	**0.0000**		**6.0000e-005**	**6.0000e-005**		**6.0000e-005**	**6.0000e-005**		**0.0383**	**0.0383**	**1.0000e-004**		**0.0407**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0322					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	17.7158					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.6200e-003	1.6000e-004	0.0178	0.0000		6.0000e-005	6.0000e-005		6.0000e-005	6.0000e-005		0.0383	0.0383	1.0000e-004		0.0407
Total	**17.7497**	**1.6000e-004**	**0.0178**	**0.0000**		**6.0000e-005**	**6.0000e-005**		**6.0000e-005**	**6.0000e-005**		**0.0383**	**0.0383**	**1.0000e-004**		**0.0407**

7.0 Water Detail

7.1 Mitigation Measures Water

Apply Water Conservation Strategy

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
Emergency Generator	2	0.5	6	555	0.73	Diesel

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

10.1 Stationary Sources

Unmitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	lb/day										lb/day					
Emergency Generator - Diesel (300 - 600 HP)	0.9107	2.5456	2.3223	4.3800e-003		0.1340	0.1340		0.1340	0.1340		465.9303	465.9303	0.0653		467.5634
Total	**0.9107**	**2.5456**	**2.3223**	**4.3800e-003**		**0.1340**	**0.1340**		**0.1340**	**0.1340**		**465.9303**	**465.9303**	**0.0653**		**467.5634**

11.0 Vegetation

EMW-20 Phase II Construction 2034

Riverside-South Coast County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Light Industry	10.40	1000sqft	0.24	10,400.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.4	**Precipitation Freq (Days)**	28
Climate Zone	10			**Operational Year**	2035
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

EMW-20 Phase II Construction 2034 - Riverside-South Coast County, Annual

Project Characteristics - Phase II construction only, year 2034.

Land Use - General Light Industrial = Expanded building process area.

Construction Phase - Construction schedule per project enineers.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - Construction equipment per project engineers.

Trips and VMT - Crew sizes estimated from project description and equipment.
Minimum crew size of 5 (10 trips) for any single activity.

On-road Fugitive Dust -

Grading - 177,778 CY total soil exported during grading phases.

Architectural Coating - 50 g/L maximum VOC content per project eningeers.

Vehicle Trips - Construction only this model.

Area Coating - Construction only this model.

Energy Use - Construction only this model.

Water And Wastewater - Construction only this model.

Solid Waste - Construction only this model.

Construction Off-road Equipment Mitigation - Dust mitigation per SCAQMD Rule 403.

Water Mitigation -

Waste Mitigation - Additional 25% solid waste diversion mandated by AB 341 not accounted for in model defaults.

Stationary Sources - Emergency Generators and Fire Pumps -

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	100.00	50.00
tblArchitecturalCoating	EF_Nonresidential_Interior	100.00	50.00
tblArchitecturalCoating	EF_Parking	100.00	50.00
tblAreaCoating	ReapplicationRatePercent	10	0
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12

tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	100.00	207.00
tblEnergyUse	LightingElect	2.93	0.00
tblEnergyUse	NT24E	5.02	0.00
tblEnergyUse	NT24NG	17.13	0.00
tblEnergyUse	T24E	2.20	0.00
tblEnergyUse	T24NG	15.36	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	UsageHours	6.00	7.00
tblOffRoadEquipment	UsageHours	4.00	5.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblSolidWaste	SolidWasteGenerationRate	12.90	0.00
tblStationaryGeneratorsPumpsUse	HorsePowerValue	0.00	555.00
tblStationaryGeneratorsPumpsUse	HoursPerDay	0.00	0.25
tblStationaryGeneratorsPumpsUse	HoursPerYear	0.00	3.00
tblTripsAndVMT	VendorTripNumber	2.00	10.00
tblTripsAndVMT	WorkerTripNumber	5.00	10.00
tblTripsAndVMT	WorkerTripNumber	4.00	20.00
tblTripsAndVMT	WorkerTripNumber	1.00	10.00
tblVehicleTrips	ST_TR	1.32	0.00
tblVehicleTrips	SU_TR	0.68	0.00
tblVehicleTrips	WD_TR	6.97	0.00
tblWater	IndoorWaterUseRate	2,405,000.00	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2034	0.2004	0.7421	1.9303	4.5200e-003	0.0409	0.0198	0.0607	0.0110	0.0198	0.0308	0.0000	406.2221	406.2221	0.0149	0.0000	406.5956
Maximum	**0.2004**	**0.7421**	**1.9303**	**4.5200e-003**	**0.0409**	**0.0198**	**0.0607**	**0.0110**	**0.0198**	**0.0308**	**0.0000**	**406.2221**	**406.2221**	**0.0149**	**0.0000**	**406.5956**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2034	0.2004	0.7421	1.9303	4.5200e-003	0.0409	0.0198	0.0607	0.0110	0.0198	0.0308	0.0000	406.2217	406.2217	0.0149	0.0000	406.5951
Maximum	**0.2004**	**0.7421**	**1.9303**	**4.5200e-003**	**0.0409**	**0.0198**	**0.0607**	**0.0110**	**0.0198**	**0.0308**	**0.0000**	**406.2217**	**406.2217**	**0.0149**	**0.0000**	**406.5951**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

EMW-20 Phase II Construction 2034 - Riverside-South Coast County, Annual

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	1-1-2034	3-31-2034	0.1657	0.1657
2	4-1-2034	6-30-2034	0.2777	0.2777
3	7-1-2034	9-30-2034	0.2807	0.2807
		Highest	0.2807	0.2807

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0376	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6000e-004	2.6000e-004	0.0000	0.0000	2.7000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Stationary	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0376**	**0.0000**	**1.3000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**2.6000e-004**	**2.6000e-004**	**0.0000**	**0.0000**	**2.7000e-004**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0376	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6000e-004	2.6000e-004	0.0000	0.0000	2.7000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Stationary	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0376**	**0.0000**	**1.3000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**2.6000e-004**	**2.6000e-004**	**0.0000**	**0.0000**	**2.7000e-004**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Underground Utilities	Trenching	1/1/2034	2/14/2034	5	32	
2	Building Construction	Building Construction	2/15/2034	11/30/2034	5	207	
3	Architectural Coating	Architectural Coating	12/1/2034	12/7/2034	5	5	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 15,600; Non-Residential Outdoor: 5,200; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Underground Utilities	Excavators	1	7.00	158	0.38
Underground Utilities	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Building Construction	Cranes	1	5.00	231	0.29
Building Construction	Excavators	2	7.00	158	0.38
Building Construction	Forklifts	0	6.00	89	0.20
Building Construction	Off-Highway Trucks	1	5.00	402	0.38
Building Construction	Plate Compactors	1	7.00	8	0.43
Building Construction	Rollers	1	7.00	80	0.38
Building Construction	Rough Terrain Forklifts	1	7.00	100	0.40
Building Construction	Tractors/Loaders/Backhoes	2	7.00	97	0.37
Architectural Coating	Air Compressors	2	7.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Underground Utilities	2	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	20.00	10.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	2	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

3.2 Underground Utilities - 2034

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	5.5700e-003	0.0222	0.0827	1.4000e-004		6.1000e-004	6.1000e-004		6.1000e-004	6.1000e-004	0.0000	12.2118	12.2118	4.5000e-004	0.0000	12.2230
Total	**5.5700e-003**	**0.0222**	**0.0827**	**1.4000e-004**		**6.1000e-004**	**6.1000e-004**		**6.1000e-004**	**6.1000e-004**	**0.0000**	**12.2118**	**12.2118**	**4.5000e-004**	**0.0000**	**12.2230**

3.2 Underground Utilities - 2034

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.9000e-004	2.0000e-004	2.8600e-003	1.0000e-005	2.3700e-003	1.0000e-005	2.3800e-003	6.3000e-004	1.0000e-005	6.4000e-004	0.0000	1.3080	1.3080	1.0000e-005	0.0000	1.3083
Total	**3.9000e-004**	**2.0000e-004**	**2.8600e-003**	**1.0000e-005**	**2.3700e-003**	**1.0000e-005**	**2.3800e-003**	**6.3000e-004**	**1.0000e-005**	**6.4000e-004**	**0.0000**	**1.3080**	**1.3080**	**1.0000e-005**	**0.0000**	**1.3083**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	5.5700e-003	0.0222	0.0827	1.4000e-004		6.1000e-004	6.1000e-004		6.1000e-004	6.1000e-004	0.0000	12.2118	12.2118	4.5000e-004	0.0000	12.2230
Total	**5.5700e-003**	**0.0222**	**0.0827**	**1.4000e-004**		**6.1000e-004**	**6.1000e-004**		**6.1000e-004**	**6.1000e-004**	**0.0000**	**12.2118**	**12.2118**	**4.5000e-004**	**0.0000**	**12.2230**

3.2 Underground Utilities - 2034

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.9000e-004	2.0000e-004	2.8600e-003	1.0000e-005	2.3700e-003	1.0000e-005	2.3800e-003	6.3000e-004	1.0000e-005	6.4000e-004	0.0000	1.3080	1.3080	1.0000e-005	0.0000	1.3083
Total	**3.9000e-004**	**2.0000e-004**	**2.8600e-003**	**1.0000e-005**	**2.3700e-003**	**1.0000e-005**	**2.3800e-003**	**6.3000e-004**	**1.0000e-005**	**6.4000e-004**	**0.0000**	**1.3080**	**1.3080**	**1.0000e-005**	**0.0000**	**1.3083**

3.3 Building Construction - 2034

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1628	0.6481	1.7834	3.8900e-003		0.0189	0.0189		0.0189	0.0189	0.0000	348.0494	348.0494	0.0131	0.0000	348.3775
Total	**0.1628**	**0.6481**	**1.7834**	**3.8900e-003**		**0.0189**	**0.0189**		**0.0189**	**0.0189**	**0.0000**	**348.0494**	**348.0494**	**0.0131**	**0.0000**	**348.3775**

3.3 Building Construction - 2034

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.6400e-003	0.0640	0.0134	2.7000e-004	7.4800e-003	7.0000e-005	7.5500e-003	2.1600e-003	7.0000e-005	2.2200e-003	0.0000	26.0377	26.0377	1.1100e-003	0.0000	26.0654
Worker	5.0900e-003	2.5900e-003	0.0370	1.9000e-004	0.0306	9.0000e-005	0.0307	8.1300e-003	9.0000e-005	8.2200e-003	0.0000	16.9216	16.9216	1.8000e-004	0.0000	16.9261
Total	**6.7300e-003**	**0.0666**	**0.0504**	**4.6000e-004**	**0.0381**	**1.6000e-004**	**0.0383**	**0.0103**	**1.6000e-004**	**0.0104**	**0.0000**	**42.9593**	**42.9593**	**1.2900e-003**	**0.0000**	**42.9915**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1628	0.6481	1.7834	3.8900e-003		0.0189	0.0189		0.0189	0.0189	0.0000	348.0489	348.0489	0.0131	0.0000	348.3771
Total	**0.1628**	**0.6481**	**1.7834**	**3.8900e-003**		**0.0189**	**0.0189**		**0.0189**	**0.0189**	**0.0000**	**348.0489**	**348.0489**	**0.0131**	**0.0000**	**348.3771**

3.3 Building Construction - 2034

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.6400e-003	0.0640	0.0134	2.7000e-004	7.4800e-003	7.0000e-005	7.5500e-003	2.1600e-003	7.0000e-005	2.2200e-003	0.0000	26.0377	26.0377	1.1100e-003	0.0000	26.0654
Worker	5.0900e-003	2.5900e-003	0.0370	1.9000e-004	0.0306	9.0000e-005	0.0307	8.1300e-003	9.0000e-005	8.2200e-003	0.0000	16.9216	16.9216	1.8000e-004	0.0000	16.9261
Total	**6.7300e-003**	**0.0666**	**0.0504**	**4.6000e-004**	**0.0381**	**1.6000e-004**	**0.0383**	**0.0103**	**1.6000e-004**	**0.0104**	**0.0000**	**42.9593**	**42.9593**	**1.2900e-003**	**0.0000**	**42.9915**

3.4 Architectural Coating - 2034

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0241					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	7.6000e-004	4.9900e-003	0.0105	2.0000e-005		1.2000e-004	1.2000e-004		1.2000e-004	1.2000e-004	0.0000	1.4894	1.4894	6.0000e-005	0.0000	1.4909
Total	**0.0249**	**4.9900e-003**	**0.0105**	**2.0000e-005**		**1.2000e-004**	**1.2000e-004**		**1.2000e-004**	**1.2000e-004**	**0.0000**	**1.4894**	**1.4894**	**6.0000e-005**	**0.0000**	**1.4909**

3.4 Architectural Coating - 2034

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.0000e-005	3.0000e-005	4.5000e-004	0.0000	3.7000e-004	0.0000	3.7000e-004	1.0000e-004	0.0000	1.0000e-004	0.0000	0.2044	0.2044	0.0000	0.0000	0.2044
Total	**6.0000e-005**	**3.0000e-005**	**4.5000e-004**	**0.0000**	**3.7000e-004**	**0.0000**	**3.7000e-004**	**1.0000e-004**	**0.0000**	**1.0000e-004**	**0.0000**	**0.2044**	**0.2044**	**0.0000**	**0.0000**	**0.2044**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0241					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	7.6000e-004	4.9900e-003	0.0105	2.0000e-005		1.2000e-004	1.2000e-004		1.2000e-004	1.2000e-004	0.0000	1.4894	1.4894	6.0000e-005	0.0000	1.4909
Total	**0.0249**	**4.9900e-003**	**0.0105**	**2.0000e-005**		**1.2000e-004**	**1.2000e-004**		**1.2000e-004**	**1.2000e-004**	**0.0000**	**1.4894**	**1.4894**	**6.0000e-005**	**0.0000**	**1.4909**

3.4 Architectural Coating - 2034

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.0000e-005	3.0000e-005	4.5000e-004	0.0000	3.7000e-004	0.0000	3.7000e-004	1.0000e-004	0.0000	1.0000e-004	0.0000	0.2044	0.2044	0.0000	0.0000	0.2044
Total	**6.0000e-005**	**3.0000e-005**	**4.5000e-004**	**0.0000**	**3.7000e-004**	**0.0000**	**3.7000e-004**	**1.0000e-004**	**0.0000**	**1.0000e-004**	**0.0000**	**0.2044**	**0.2044**	**0.0000**	**0.0000**	**0.2044**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Light Industry	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Light Industry	18.50	10.10	7.90	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Light Industry	0.565475	0.033834	0.192058	0.100675	0.009211	0.004032	0.016699	0.069908	0.001423	0.001062	0.004327	0.000756	0.000539

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Light Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Light Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Light Industry	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Light Industry	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0376	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6000e-004	2.6000e-004	0.0000	0.0000	2.7000e-004
Unmitigated	0.0376	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6000e-004	2.6000e-004	0.0000	0.0000	2.7000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0376					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6000e-004	2.6000e-004	0.0000	0.0000	2.7000e-004
Total	**0.0376**	**0.0000**	**1.3000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.6000e-004**	**2.6000e-004**	**0.0000**	**0.0000**	**2.7000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0376					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6000e-004	2.6000e-004	0.0000	0.0000	2.7000e-004
Total	**0.0376**	**0.0000**	**1.3000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.6000e-004**	**2.6000e-004**	**0.0000**	**0.0000**	**2.7000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Light Industry	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Light Industry	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
Emergency Generator	0	0.25	3	555	0.73	Diesel

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

10.1 Stationary Sources

Unmitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	tons/yr										MT/yr					
Emergency Generator - Diesel (300 - 600 HP)	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

11.0 Vegetation

EMW-20 Phase II Construction 2034

Riverside-South Coast County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Light Industry	10.40	1000sqft	0.24	10,400.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.4	**Precipitation Freq (Days)**	28
Climate Zone	10			**Operational Year**	2035
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

EMW-20 Phase II Construction 2034 - Riverside-South Coast County, Winter

Project Characteristics - Phase II construction only, year 2034.

Land Use - General Light Industrial = Expanded building process area.

Construction Phase - Construction schedule per project enineers.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - Construction equipment per project engineers.

Trips and VMT - Crew sizes estimated from project description and equipment.
Minimum crew size of 5 (10 trips) for any single activity.

On-road Fugitive Dust -

Grading - 177,778 CY total soil exported during grading phases.

Architectural Coating - 50 g/L maximum VOC content per project eningeers.

Vehicle Trips - Construction only this model.

Area Coating - Construction only this model.

Energy Use - Construction only this model.

Water And Wastewater - Construction only this model.

Solid Waste - Construction only this model.

Construction Off-road Equipment Mitigation - Dust mitigation per SCAQMD Rule 403.

Water Mitigation -

Waste Mitigation - Additional 25% solid waste diversion mandated by AB 341 not accounted for in model defaults.

Stationary Sources - Emergency Generators and Fire Pumps -

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	100.00	50.00
tblArchitecturalCoating	EF_Nonresidential_Interior	100.00	50.00
tblArchitecturalCoating	EF_Parking	100.00	50.00
tblAreaCoating	ReapplicationRatePercent	10	0
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12

tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	100.00	207.00
tblEnergyUse	LightingElect	2.93	0.00
tblEnergyUse	NT24E	5.02	0.00
tblEnergyUse	NT24NG	17.13	0.00
tblEnergyUse	T24E	2.20	0.00
tblEnergyUse	T24NG	15.36	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	UsageHours	6.00	7.00
tblOffRoadEquipment	UsageHours	4.00	5.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblSolidWaste	SolidWasteGenerationRate	12.90	0.00
tblStationaryGeneratorsPumpsUse	HorsePowerValue	0.00	555.00
tblStationaryGeneratorsPumpsUse	HoursPerDay	0.00	0.25
tblStationaryGeneratorsPumpsUse	HoursPerYear	0.00	3.00
tblTripsAndVMT	VendorTripNumber	2.00	10.00
tblTripsAndVMT	WorkerTripNumber	5.00	10.00
tblTripsAndVMT	WorkerTripNumber	4.00	20.00
tblTripsAndVMT	WorkerTripNumber	1.00	10.00
tblVehicleTrips	ST_TR	1.32	0.00
tblVehicleTrips	SU_TR	0.68	0.00
tblVehicleTrips	WD_TR	6.97	0.00
tblWater	IndoorWaterUseRate	2,405,000.00	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2034	9.9731	6.8956	17.7070	0.0419	0.3743	0.1843	0.5586	0.1009	0.1842	0.2851	0.0000	4,154.4491	4,154.4491	0.1541	0.0000	4,158.3007
Maximum	**9.9731**	**6.8956**	**17.7070**	**0.0419**	**0.3743**	**0.1843**	**0.5586**	**0.1009**	**0.1842**	**0.2851**	**0.0000**	**4,154.4491**	**4,154.4491**	**0.1541**	**0.0000**	**4,158.3007**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2034	9.9731	6.8956	17.7070	0.0419	0.3743	0.1843	0.5586	0.1009	0.1842	0.2851	0.0000	4,154.4491	4,154.4491	0.1541	0.0000	4,158.3007
Maximum	**9.9731**	**6.8956**	**17.7070**	**0.0419**	**0.3743**	**0.1843**	**0.5586**	**0.1009**	**0.1842**	**0.2851**	**0.0000**	**4,154.4491**	**4,154.4491**	**0.1541**	**0.0000**	**4,158.3007**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.2060	1.0000e-005	1.0600e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2800e-003	2.2800e-003	1.0000e-005		2.4200e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Stationary	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.2060**	**1.0000e-005**	**1.0600e-003**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**2.2800e-003**	**2.2800e-003**	**1.0000e-005**	**0.0000**	**2.4200e-003**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.2060	1.0000e-005	1.0600e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2800e-003	2.2800e-003	1.0000e-005		2.4200e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Stationary	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.2060**	**1.0000e-005**	**1.0600e-003**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**2.2800e-003**	**2.2800e-003**	**1.0000e-005**	**0.0000**	**2.4200e-003**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Underground Utilities	Trenching	1/1/2034	2/14/2034	5	32	
2	Building Construction	Building Construction	2/15/2034	11/30/2034	5	207	
3	Architectural Coating	Architectural Coating	12/1/2034	12/7/2034	5	5	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 15,600; Non-Residential Outdoor: 5,200; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Underground Utilities	Excavators	1	7.00	158	0.38
Underground Utilities	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Building Construction	Cranes	1	5.00	231	0.29
Building Construction	Excavators	2	7.00	158	0.38
Building Construction	Forklifts	0	6.00	89	0.20
Building Construction	Off-Highway Trucks	1	5.00	402	0.38
Building Construction	Plate Compactors	1	7.00	8	0.43
Building Construction	Rollers	1	7.00	80	0.38
Building Construction	Rough Terrain Forklifts	1	7.00	100	0.40
Building Construction	Tractors/Loaders/Backhoes	2	7.00	97	0.37
Architectural Coating	Air Compressors	2	7.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Underground Utilities	2	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	20.00	10.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	2	10.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

3.2 Underground Utilities - 2034

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3480	1.3859	5.1672	8.8800e-003		0.0379	0.0379		0.0379	0.0379		841.3247	841.3247	0.0309		842.0971
Total	**0.3480**	**1.3859**	**5.1672**	**8.8800e-003**		**0.0379**	**0.0379**		**0.0379**	**0.0379**		**841.3247**	**841.3247**	**0.0309**		**842.0971**

3.2 Underground Utilities - 2034

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0272	0.0121	0.1682	8.8000e-004	0.1505	4.5000e-004	0.1510	0.0399	4.1000e-004	0.0403		87.7840	87.7840	9.2000e-004		87.8071
Total	**0.0272**	**0.0121**	**0.1682**	**8.8000e-004**	**0.1505**	**4.5000e-004**	**0.1510**	**0.0399**	**4.1000e-004**	**0.0403**		**87.7840**	**87.7840**	**9.2000e-004**		**87.8071**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3480	1.3859	5.1672	8.8800e-003		0.0379	0.0379		0.0379	0.0379	0.0000	841.3247	841.3247	0.0309		842.0971
Total	**0.3480**	**1.3859**	**5.1672**	**8.8800e-003**		**0.0379**	**0.0379**		**0.0379**	**0.0379**	**0.0000**	**841.3247**	**841.3247**	**0.0309**		**842.0971**

3.2 Underground Utilities - 2034

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0272	0.0121	0.1682	8.8000e-004	0.1505	4.5000e-004	0.1510	0.0399	4.1000e-004	0.0403		87.7840	87.7840	9.2000e-004		87.8071
Total	**0.0272**	**0.0121**	**0.1682**	**8.8000e-004**	**0.1505**	**4.5000e-004**	**0.1510**	**0.0399**	**4.1000e-004**	**0.0403**		**87.7840**	**87.7840**	**9.2000e-004**		**87.8071**

3.3 Building Construction - 2034

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.5727	6.2616	17.2311	0.0376		0.1827	0.1827		0.1827	0.1827		3,706.8477	3,706.8477	0.1398		3,710.3424
Total	**1.5727**	**6.2616**	**17.2311**	**0.0376**		**0.1827**	**0.1827**		**0.1827**	**0.1827**		**3,706.8477**	**3,706.8477**	**0.1398**		**3,710.3424**

3.3 Building Construction - 2034

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0164	0.6098	0.1394	2.5700e-003	0.0733	6.9000e-004	0.0739	0.0211	6.6000e-004	0.0217		272.0334	272.0334	0.0124		272.3441
Worker	0.0545	0.0241	0.3365	1.7600e-003	0.3010	9.0000e-004	0.3019	0.0798	8.2000e-004	0.0807		175.5680	175.5680	1.8500e-003		175.6142
Total	**0.0709**	**0.6339**	**0.4759**	**4.3300e-003**	**0.3743**	**1.5900e-003**	**0.3759**	**0.1009**	**1.4800e-003**	**0.1024**		**447.6014**	**447.6014**	**0.0143**		**447.9583**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.5727	6.2616	17.2311	0.0376		0.1827	0.1827		0.1827	0.1827	0.0000	3,706.8477	3,706.8477	0.1398		3,710.3424
Total	**1.5727**	**6.2616**	**17.2311**	**0.0376**		**0.1827**	**0.1827**		**0.1827**	**0.1827**	**0.0000**	**3,706.8477**	**3,706.8477**	**0.1398**		**3,710.3424**

3.3 Building Construction - 2034

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0164	0.6098	0.1394	2.5700e-003	0.0733	6.9000e-004	0.0739	0.0211	6.6000e-004	0.0217		272.0334	272.0334	0.0124		272.3441
Worker	0.0545	0.0241	0.3365	1.7600e-003	0.3010	9.0000e-004	0.3019	0.0798	8.2000e-004	0.0807		175.5680	175.5680	1.8500e-003		175.6142
Total	**0.0709**	**0.6339**	**0.4759**	**4.3300e-003**	**0.3743**	**1.5900e-003**	**0.3759**	**0.1009**	**1.4800e-003**	**0.1024**		**447.6014**	**447.6014**	**0.0143**		**447.9583**

3.4 Architectural Coating - 2034

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	9.6408					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.3051	1.9980	4.1947	6.9300e-003		0.0474	0.0474		0.0474	0.0474		656.7121	656.7121	0.0266		657.3766
Total	**9.9459**	**1.9980**	**4.1947**	**6.9300e-003**		**0.0474**	**0.0474**		**0.0474**	**0.0474**		**656.7121**	**656.7121**	**0.0266**		**657.3766**

3.4 Architectural Coating - 2034

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0272	0.0121	0.1682	8.8000e-004	0.1505	4.5000e-004	0.1510	0.0399	4.1000e-004	0.0403		87.7840	87.7840	9.2000e-004		87.8071
Total	**0.0272**	**0.0121**	**0.1682**	**8.8000e-004**	**0.1505**	**4.5000e-004**	**0.1510**	**0.0399**	**4.1000e-004**	**0.0403**		**87.7840**	**87.7840**	**9.2000e-004**		**87.8071**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	9.6408					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.3051	1.9980	4.1947	6.9300e-003		0.0474	0.0474		0.0474	0.0474	0.0000	656.7121	656.7121	0.0266		657.3766
Total	**9.9459**	**1.9980**	**4.1947**	**6.9300e-003**		**0.0474**	**0.0474**		**0.0474**	**0.0474**	**0.0000**	**656.7121**	**656.7121**	**0.0266**		**657.3766**

3.4 Architectural Coating - 2034

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0272	0.0121	0.1682	8.8000e-004	0.1505	4.5000e-004	0.1510	0.0399	4.1000e-004	0.0403		87.7840	87.7840	9.2000e-004		87.8071
Total	**0.0272**	**0.0121**	**0.1682**	**8.8000e-004**	**0.1505**	**4.5000e-004**	**0.1510**	**0.0399**	**4.1000e-004**	**0.0403**		**87.7840**	**87.7840**	**9.2000e-004**		**87.8071**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Light Industry	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Light Industry	18.50	10.10	7.90	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Light Industry	0.565475	0.033834	0.192058	0.100675	0.009211	0.004032	0.016699	0.069908	0.001423	0.001062	0.004327	0.000756	0.000539

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Light Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Light Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.2060	1.0000e-005	1.0600e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2800e-003	2.2800e-003	1.0000e-005		2.4200e-003
Unmitigated	0.2060	1.0000e-005	1.0600e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2800e-003	2.2800e-003	1.0000e-005		2.4200e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.2059					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-004	1.0000e-005	1.0600e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2800e-003	2.2800e-003	1.0000e-005		2.4200e-003
Total	**0.2060**	**1.0000e-005**	**1.0600e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2800e-003**	**2.2800e-003**	**1.0000e-005**		**2.4200e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.2059					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-004	1.0000e-005	1.0600e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2800e-003	2.2800e-003	1.0000e-005		2.4200e-003
Total	**0.2060**	**1.0000e-005**	**1.0600e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2800e-003**	**2.2800e-003**	**1.0000e-005**		**2.4200e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
Emergency Generator	0	0.25	3	555	0.73	Diesel

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

10.1 Stationary Sources

Unmitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	lb/day										lb/day					
Emergency Generator - Diesel (300 - 600 HP)	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

11.0 Vegetation

EMW-20 Final Operation 2035

Riverside-South Coast County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	4.90	1000sqft	0.11	4,900.00	0
General Light Industry	26.30	1000sqft	0.60	26,300.00	0
User Defined Industrial	1.00	User Defined Unit	20.00	871,200.00	0
Other Asphalt Surfaces	140.90	1000sqft	3.23	140,900.00	0
Parking Lot	12.10	1000sqft	0.28	12,100.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.4	**Precipitation Freq (Days)**	28
Climate Zone	10			**Operational Year**	2035
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

EMW-20 Final Operation 2035 - Riverside-South Coast County, Annual

Project Characteristics - Phase I and Phase II final operation for year 2035, no construction.

Land Use - General Office Building = Control Area
General Light Industrial = Expanded Process Area
User Defined Industrial = Brine Ponds

Construction Phase - No construction this model.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - No construction this model.

Trips and VMT - No construction this model.

On-road Fugitive Dust -

Grading -

Architectural Coating -

Vehicle Trips - 11 ADT (5 workers) per project engineer.

Area Coating - 50 g/L maximum VOC content per project eningeers.
Only the control/process building and parking lots to be paved.

Energy Use - 10,764,116 kWh/year total electricty per year for the expanded AWTF, no natural gas.
1,303,842 kWh/year total electricity for the brine system, no natural gas.

Construction Off-road Equipment Mitigation -

Water Mitigation - A 20% reduction in outdoor water use applied to account for CaLGreen requirements not included in model defaults.

Waste Mitigation - Additional 25% solid waste diversion mandated by AB 341 not accounted for in model defaults.

Stationary Sources - Emergency Generators and Fire Pumps - 2, 400kW diesel emergency generators.

Table Name	Column Name	Default Value	New Value
tblEnergyUse	LightingElect	2.93	0.00
tblEnergyUse	LightingElect	3.66	0.00
tblEnergyUse	NT24E	5.02	409.28
tblEnergyUse	NT24E	2.79	0.00
tblEnergyUse	NT24E	0.00	1.50
tblEnergyUse	NT24NG	17.13	0.00
tblEnergyUse	T24E	2.20	0.00

tblEnergyUse	T24E	3.07	0.00
tblEnergyUse	T24NG	15.36	0.00
tblEnergyUse	T24NG	3.47	0.00
tblLandUse	LandUseSquareFeet	0.00	871,200.00
tblLandUse	LotAcreage	0.00	20.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblStationaryGeneratorsPumpsEF	CH4_EF	0.07	0.07
tblStationaryGeneratorsPumpsEF	ROG_EF	2.2480e-003	2.2477e-003
tblStationaryGeneratorsPumpsUse	HorsePowerValue	0.00	555.00
tblStationaryGeneratorsPumpsUse	HoursPerDay	0.00	0.50
tblStationaryGeneratorsPumpsUse	HoursPerYear	0.00	6.00
tblStationaryGeneratorsPumpsUse	NumberOfEquipment	0.00	2.00
tblVehicleTrips	ST_TR	1.32	0.42
tblVehicleTrips	ST_TR	2.46	0.00
tblVehicleTrips	SU_TR	0.68	0.42
tblVehicleTrips	SU_TR	1.05	0.00
tblVehicleTrips	WD_TR	6.97	0.42
tblVehicleTrips	WD_TR	11.03	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2034	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2034	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
		Highest		

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	3.6913	2.0000e-005	2.3500e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.6000e-003	4.6000e-003	1.0000e-005	0.0000	4.8900e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3,847.3852	3,847.3852	0.1588	0.0329	3,861.1494
Mobile	2.0900e-003	0.0178	0.0307	2.0000e-004	0.0211	8.0000e-005	0.0212	5.6500e-003	8.0000e-005	5.7300e-003	0.0000	18.8913	18.8913	6.1000e-004	0.0000	18.9066
Stationary	5.4600e-003	0.0153	0.0139	3.0000e-005		8.0000e-004	8.0000e-004		8.0000e-004	8.0000e-004	0.0000	2.5361	2.5361	3.6000e-004	0.0000	2.5450
Waste						0.0000	0.0000		0.0000	0.0000	7.5452	0.0000	7.5452	0.4459	0.0000	18.6929
Water						0.0000	0.0000		0.0000	0.0000	2.2058	30.7349	32.9407	0.2278	5.6100e-003	40.3087
Total	**3.6989**	**0.0331**	**0.0470**	**2.3000e-004**	**0.0211**	**8.9000e-004**	**0.0220**	**5.6500e-003**	**8.9000e-004**	**6.5400e-003**	**9.7510**	**3,899.5522**	**3,909.3031**	**0.8336**	**0.0385**	**3,941.6074**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	3.6913	2.0000e-005	2.3500e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.6000e-003	4.6000e-003	1.0000e-005	0.0000	4.8900e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3,847.3852	3,847.3852	0.1588	0.0329	3,861.1494
Mobile	2.0900e-003	0.0178	0.0307	2.0000e-004	0.0211	8.0000e-005	0.0212	5.6500e-003	8.0000e-005	5.7300e-003	0.0000	18.8913	18.8913	6.1000e-004	0.0000	18.9066
Stationary	5.4600e-003	0.0153	0.0139	3.0000e-005		8.0000e-004	8.0000e-004		8.0000e-004	8.0000e-004	0.0000	2.5361	2.5361	3.6000e-004	0.0000	2.5450
Waste						0.0000	0.0000		0.0000	0.0000	5.6589	0.0000	5.6589	0.3344	0.0000	14.0196
Water						0.0000	0.0000		0.0000	0.0000	2.2058	30.3570	32.5628	0.2278	5.6100e-003	39.9295
Total	**3.6989**	**0.0331**	**0.0470**	**2.3000e-004**	**0.0211**	**8.9000e-004**	**0.0220**	**5.6500e-003**	**8.9000e-004**	**6.5400e-003**	**7.8647**	**3,899.1743**	**3,907.0389**	**0.7221**	**0.0385**	**3,936.5550**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**19.34**	**0.01**	**0.06**	**13.38**	**0.00**	**0.13**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	1/1/2034	1/13/2034	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 3.51

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Rubber Tired Dozers	0	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	0	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	0	0.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Site Preparation - 2034

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.2 Site Preparation - 2034

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	2.0900e-003	0.0178	0.0307	2.0000e-004	0.0211	8.0000e-005	0.0212	5.6500e-003	8.0000e-005	5.7300e-003	0.0000	18.8913	18.8913	6.1000e-004	0.0000	18.9066
Unmitigated	2.0900e-003	0.0178	0.0307	2.0000e-004	0.0211	8.0000e-005	0.0212	5.6500e-003	8.0000e-005	5.7300e-003	0.0000	18.8913	18.8913	6.1000e-004	0.0000	18.9066

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Light Industry	11.05	11.05	11.05	55,390	55,390
General Office Building	0.00	0.00	0.00		
Other Asphalt Surfaces	0.00	0.00	0.00		
Parking Lot	0.00	0.00	0.00		
User Defined Industrial	0.00	0.00	0.00		
Total	11.05	11.05	11.05	55,390	55,390

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Light Industry	18.50	10.10	7.90	59.00	28.00	13.00	92	5	3
General Office Building	18.50	10.10	7.90	33.00	48.00	19.00	77	19	4
Other Asphalt Surfaces	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0
Parking Lot	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0
User Defined Industrial	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Light Industry	0.565475	0.033834	0.192058	0.100675	0.009211	0.004032	0.016699	0.069908	0.001423	0.001062	0.004327	0.000756	0.000539
General Office Building	0.565475	0.033834	0.192058	0.100675	0.009211	0.004032	0.016699	0.069908	0.001423	0.001062	0.004327	0.000756	0.000539
Other Asphalt Surfaces	0.565475	0.033834	0.192058	0.100675	0.009211	0.004032	0.016699	0.069908	0.001423	0.001062	0.004327	0.000756	0.000539
Parking Lot	0.565475	0.033834	0.192058	0.100675	0.009211	0.004032	0.016699	0.069908	0.001423	0.001062	0.004327	0.000756	0.000539
User Defined Industrial	0.565475	0.033834	0.192058	0.100675	0.009211	0.004032	0.016699	0.069908	0.001423	0.001062	0.004327	0.000756	0.000539

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

EMW-20 Final Operation 2035 - Riverside-South Coast County, Annual

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	3,847.3852	3,847.3852	0.1588	0.0329	3,861.1494
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	3,847.3852	3,847.3852	0.1588	0.0329	3,861.1494
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Light Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
General Office Building	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Light Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
General Office Building	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Light Industry	1.07641e+007	3,429.6614	0.1416	0.0293	3,441.9311
General Office Building	0	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	4235	1.3494	6.0000e-005	1.0000e-005	1.3542
User Defined Industrial	1.3068e+006	416.3745	0.0172	3.5600e-003	417.8641
Total		**3,847.3852**	**0.1588**	**0.0329**	**3,861.1494**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Light Industry	1.07641e+007	3,429.6614	0.1416	0.0293	3,441.9311
General Office Building	0	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	4235	1.3494	6.0000e-005	1.0000e-005	1.3542
User Defined Industrial	1.3068e+006	416.3745	0.0172	3.5600e-003	417.8641
Total		**3,847.3852**	**0.1588**	**0.0329**	**3,861.1494**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	3.6913	2.0000e-005	2.3500e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.6000e-003	4.6000e-003	1.0000e-005	0.0000	4.8900e-003
Unmitigated	3.6913	2.0000e-005	2.3500e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.6000e-003	4.6000e-003	1.0000e-005	0.0000	4.8900e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.4204					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.2707					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.1000e-004	2.0000e-005	2.3500e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.6000e-003	4.6000e-003	1.0000e-005	0.0000	4.8900e-003
Total	**3.6913**	**2.0000e-005**	**2.3500e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**4.6000e-003**	**4.6000e-003**	**1.0000e-005**	**0.0000**	**4.8900e-003**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.4204					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.2707					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.1000e-004	2.0000e-005	2.3500e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.6000e-003	4.6000e-003	1.0000e-005	0.0000	4.8900e-003
Total	**3.6913**	**2.0000e-005**	**2.3500e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**4.6000e-003**	**4.6000e-003**	**1.0000e-005**	**0.0000**	**4.8900e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

Apply Water Conservation Strategy

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	32.5628	0.2278	5.6100e-003	39.9295
Unmitigated	32.9407	0.2278	5.6100e-003	40.3087

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	6.08188 / 0	27.1618	0.1992	4.8900e-003	33.6010
General Office Building	0.870895 / 0.533775	5.7789	0.0286	7.2000e-004	6.7078
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**32.9407**	**0.2278**	**5.6100e-003**	**40.3087**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	6.08188 / 0	27.1618	0.1992	4.8900e-003	33.6010
General Office Building	0.870895 / 0.42702	5.4010	0.0286	7.1000e-004	6.3285
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**32.5628**	**0.2278**	**5.6000e-003**	**39.9295**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	5.6589	0.3344	0.0000	14.0196
Unmitigated	7.5452	0.4459	0.0000	18.6929

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Light Industry	32.61	6.6195	0.3912	0.0000	16.3996
General Office Building	4.56	0.9256	0.0547	0.0000	2.2932
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**7.5452**	**0.4459**	**0.0000**	**18.6929**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Light Industry	24.4575	4.9647	0.2934	0.0000	12.2997
General Office Building	3.42	0.6942	0.0410	0.0000	1.7199
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**5.6589**	**0.3344**	**0.0000**	**14.0196**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
Emergency Generator	2	0.5	6	555	0.73	Diesel

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

10.1 Stationary Sources

Unmitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	tons/yr										MT/yr					
Emergency Generator - Diesel (300 - 600 HP)	5.4600e-003	0.0153	0.0139	3.0000e-005		8.0000e-004	8.0000e-004		8.0000e-004	8.0000e-004	0.0000	2.5361	2.5361	3.6000e-004	0.0000	2.5450
Total	**5.4600e-003**	**0.0153**	**0.0139**	**3.0000e-005**		**8.0000e-004**	**8.0000e-004**		**8.0000e-004**	**8.0000e-004**	**0.0000**	**2.5361**	**2.5361**	**3.6000e-004**	**0.0000**	**2.5450**

11.0 Vegetation

EMW-20 Final Operation 2035

Riverside-South Coast County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	4.90	1000sqft	0.11	4,900.00	0
General Light Industry	26.30	1000sqft	0.60	26,300.00	0
User Defined Industrial	1.00	User Defined Unit	20.00	871,200.00	0
Other Asphalt Surfaces	140.90	1000sqft	3.23	140,900.00	0
Parking Lot	12.10	1000sqft	0.28	12,100.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.4	**Precipitation Freq (Days)**	28
Climate Zone	10			**Operational Year**	2035
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

EMW-20 Final Operation 2035 - Riverside-South Coast County, Winter

Project Characteristics - Phase I and Phase II final operation for year 2035, no construction.

Land Use - General Office Building = Control Area
General Light Industrial = Expanded Process Area
User Defined Industrial = Brine Ponds

Construction Phase - No construction this model.

Off-road Equipment - Construction equipment per project engineers.

Off-road Equipment - No construction this model.

Trips and VMT - No construction this model.

On-road Fugitive Dust -

Grading -

Architectural Coating -

Vehicle Trips - 11 ADT (5 workers) per project engineer.

Area Coating - 50 g/L maximum VOC content per project eningeers.
Only the control/process building and parking lots to be paved.

Energy Use - 10,764,116 kWh/year total electricty per year for the expanded AWTF, no natural gas.
1,303,842 kWh/year total electricity for the brine system, no natural gas.

Construction Off-road Equipment Mitigation -

Water Mitigation - A 20% reduction in outdoor water use applied to account for CaLGreen requirements not included in model defaults.

Waste Mitigation - Additional 25% solid waste diversion mandated by AB 341 not accounted for in model defaults.

Stationary Sources - Emergency Generators and Fire Pumps - 2, 400kW diesel emergency generators.

Table Name	Column Name	Default Value	New Value
tblEnergyUse	LightingElect	2.93	0.00
tblEnergyUse	LightingElect	3.66	0.00
tblEnergyUse	NT24E	5.02	409.28
tblEnergyUse	NT24E	2.79	0.00
tblEnergyUse	NT24E	0.00	1.50
tblEnergyUse	NT24NG	17.13	0.00
tblEnergyUse	T24E	2.20	0.00

tblEnergyUse	T24E	3.07	0.00
tblEnergyUse	T24NG	15.36	0.00
tblEnergyUse	T24NG	3.47	0.00
tblLandUse	LandUseSquareFeet	0.00	871,200.00
tblLandUse	LotAcreage	0.00	20.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblStationaryGeneratorsPumpsEF	CH4_EF	0.07	0.07
tblStationaryGeneratorsPumpsEF	ROG_EF	2.2480e-003	2.2477e-003
tblStationaryGeneratorsPumpsUse	HorsePowerValue	0.00	555.00
tblStationaryGeneratorsPumpsUse	HoursPerDay	0.00	0.50
tblStationaryGeneratorsPumpsUse	HoursPerYear	0.00	6.00
tblStationaryGeneratorsPumpsUse	NumberOfEquipment	0.00	2.00
tblVehicleTrips	ST_TR	1.32	0.42
tblVehicleTrips	ST_TR	2.46	0.00
tblVehicleTrips	SU_TR	0.68	0.42
tblVehicleTrips	SU_TR	1.05	0.00
tblVehicleTrips	WD_TR	6.97	0.42
tblVehicleTrips	WD_TR	11.03	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2034	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2034	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	20.2269	1.7000e-004	0.0188	0.0000		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005		0.0405	0.0405	1.0000e-004		0.0431
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0114	0.0965	0.1629	1.0900e-003	0.1179	4.6000e-004	0.1184	0.0315	4.2000e-004	0.0319		112.1586	112.1586	3.7800e-003		112.2531
Stationary	0.9107	2.5456	2.3223	4.3800e-003		0.1340	0.1340		0.1340	0.1340		465.9303	465.9303	0.0653		467.5634
Total	**21.1490**	**2.6423**	**2.5040**	**5.4700e-003**	**0.1179**	**0.1345**	**0.2524**	**0.0315**	**0.1345**	**0.1660**		**578.1294**	**578.1294**	**0.0692**	**0.0000**	**579.8596**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	20.2269	1.7000e-004	0.0188	0.0000		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005		0.0405	0.0405	1.0000e-004		0.0431
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0114	0.0965	0.1629	1.0900e-003	0.1179	4.6000e-004	0.1184	0.0315	4.2000e-004	0.0319		112.1586	112.1586	3.7800e-003		112.2531
Stationary	0.9107	2.5456	2.3223	4.3800e-003		0.1340	0.1340		0.1340	0.1340		465.9303	465.9303	0.0653		467.5634
Total	**21.1490**	**2.6423**	**2.5040**	**5.4700e-003**	**0.1179**	**0.1345**	**0.2524**	**0.0315**	**0.1345**	**0.1660**		**578.1294**	**578.1294**	**0.0692**	**0.0000**	**579.8596**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	1/1/2034	1/13/2034	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 3.51

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Rubber Tired Dozers	0	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	0	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	0	0.00	0.00	0.00	19.80	7.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Site Preparation - 2034

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

3.2 Site Preparation - 2034

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

3.2 Site Preparation - 2034

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0114	0.0965	0.1629	1.0900e-003	0.1179	4.6000e-004	0.1184	0.0315	4.2000e-004	0.0319		112.1586	112.1586	3.7800e-003		112.2531
Unmitigated	0.0114	0.0965	0.1629	1.0900e-003	0.1179	4.6000e-004	0.1184	0.0315	4.2000e-004	0.0319		112.1586	112.1586	3.7800e-003		112.2531

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Light Industry	11.05	11.05	11.05	55,390	55,390
General Office Building	0.00	0.00	0.00		
Other Asphalt Surfaces	0.00	0.00	0.00		
Parking Lot	0.00	0.00	0.00		
User Defined Industrial	0.00	0.00	0.00		
Total	11.05	11.05	11.05	55,390	55,390

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Light Industry	18.50	10.10	7.90	59.00	28.00	13.00	92	5	3
General Office Building	18.50	10.10	7.90	33.00	48.00	19.00	77	19	4
Other Asphalt Surfaces	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0
Parking Lot	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0
User Defined Industrial	18.50	10.10	7.90	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Light Industry	0.565475	0.033834	0.192058	0.100675	0.009211	0.004032	0.016699	0.069908	0.001423	0.001062	0.004327	0.000756	0.000539
General Office Building	0.565475	0.033834	0.192058	0.100675	0.009211	0.004032	0.016699	0.069908	0.001423	0.001062	0.004327	0.000756	0.000539
Other Asphalt Surfaces	0.565475	0.033834	0.192058	0.100675	0.009211	0.004032	0.016699	0.069908	0.001423	0.001062	0.004327	0.000756	0.000539
Parking Lot	0.565475	0.033834	0.192058	0.100675	0.009211	0.004032	0.016699	0.069908	0.001423	0.001062	0.004327	0.000756	0.000539
User Defined Industrial	0.565475	0.033834	0.192058	0.100675	0.009211	0.004032	0.016699	0.069908	0.001423	0.001062	0.004327	0.000756	0.000539

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Light Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
General Office Building	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Light Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
General Office Building	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	20.2269	1.7000e-004	0.0188	0.0000		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005		0.0405	0.0405	1.0000e-004		0.0431
Unmitigated	20.2269	1.7000e-004	0.0188	0.0000		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005		0.0405	0.0405	1.0000e-004		0.0431

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	2.3035					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	17.9217					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.7200e-003	1.7000e-004	0.0188	0.0000		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005		0.0405	0.0405	1.0000e-004		0.0431
Total	**20.2269**	**1.7000e-004**	**0.0188**	**0.0000**		**7.0000e-005**	**7.0000e-005**		**7.0000e-005**	**7.0000e-005**		**0.0405**	**0.0405**	**1.0000e-004**		**0.0431**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	2.3035					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	17.9217					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.7200e-003	1.7000e-004	0.0188	0.0000		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005		0.0405	0.0405	1.0000e-004		0.0431
Total	**20.2269**	**1.7000e-004**	**0.0188**	**0.0000**		**7.0000e-005**	**7.0000e-005**		**7.0000e-005**	**7.0000e-005**		**0.0405**	**0.0405**	**1.0000e-004**		**0.0431**

7.0 Water Detail

7.1 Mitigation Measures Water

Apply Water Conservation Strategy

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
Emergency Generator	2	0.5	6	555	0.73	Diesel

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

10.1 Stationary Sources

Unmitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	lb/day										lb/day					
Emergency Generator - Diesel (300 - 600 HP)	0.9107	2.5456	2.3223	4.3800e-003		0.1340	0.1340		0.1340	0.1340		465.9303	465.9303	0.0653		467.5634
Total	**0.9107**	**2.5456**	**2.3223**	**4.3800e-003**		**0.1340**	**0.1340**		**0.1340**	**0.1340**		**465.9303**	**465.9303**	**0.0653**		**467.5634**

11.0 Vegetation

EIR Appendix C

Biological Technical Report

HELIX Environmental Planning

Eastern Municipal Water District Purified Water Replenishment Project

Biological Technical Report

September 2020 | EMW-20

Prepared for:

Eastern Municipal Water District
P.O. Box 8330
Perris, CA 92572

Prepared by:

HELIX Environmental Planning, Inc.
7578 El Cajon Boulevard
La Mesa, CA 91942

Eastern Municipal Water District Purified Water Replenishment Project

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September 2020 | EMW-20

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ACRONYMS AND ABBREVIATIONS

AMSL	above mean sea level
AWTF	Advanced Water Treatment Facility
BMP	Best Management Practices
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFG Code	California Fish and Game Code
City	City of San Jacinto
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
County	County of Riverside
CRPR	California Rare Plant Rank
CWA	Clean Water Act
District	Eastern Municipal Water District
EMWD	Eastern Municipal Water District
FC	Federally Listed Candidate
FE	Federally Listed Endangered
FESA	Endangered Species Act
FT	Federally Listed Threatened
GIS	Geographic Information Systems
GPS	Global Positioning System
HCP	Habitat Conservation Plan
HELIX	HELIX Environmental Planning, Inc.
MBTA	Migratory Bird Treaty Act
MCV	Manual of California Vegetation
MSHCP	Multiple Species Habitat Conservation Plan
NPPA	Native Plant Protection Act
NRCS	Natural Resources Conservation Service
NVCS	National Vegetation Classification System
NWI	National Wetlands Inventory
OHWM	Ordinary High Water Mark

ACRONYMS AND ABBREVIATIONS (cont.)

Project	Purified Water Replenishment
PCE	Primary Constituent Elements
PSE	Participating Special Entity
PWR	Purified Water Replenishment
ROW	right-of-way
RWQCB	Regional Water Quality Control Board
SAA	Streambed Alteration Agreement
SJVRWRF	San Jacinto Valley Regional Water Reclamation Facility
SWPPP	Storm Water Pollution Prevention Plan
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WL	Watch List

EXECUTIVE SUMMARY

This biological technical report was prepared to evaluate the proposed Eastern Municipal Water District's (District) Purified Water Replenishment (PWR) Project. The approximately 254-acre Study Area is located within the city of San Jacinto (City), with one location just outside the eastern city limits in unincorporated Riverside County (County). The District is not a signatory to the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP), and as such is not subject to the requirements of the MSHCP. The purpose of this report is to document the existing biological conditions within the Study Area and analyze the project's potential impacts to sensitive biological resources with respect to local, state, and federal policy. This report provides the biological resources technical documentation necessary for review under the California Environmental Quality Act.

The project proposes to construct and operate facilities that would replenish the San Jacinto Upper Pressure Groundwater Management Zone aquifer with recycled water and advanced treated water to reduce reliance on imported water sources, provide improved drought resiliency, and potentially improve the quality of the groundwater basin utilized by the District. The project would include construction of an Advanced Water Treatment (AWTF), a brine management system, Alessandro Blending Station facilities, sliplining of an existing 18" diameter pipeline, and a new 36" diameter pipeline.

HELIX conducted vegetation mapping, species habitat assessment, jurisdictional delineation, burrowing owl surveys, and a rare plant survey during the period of February through July 2020. In total, eight biological surveys were completed in 2020. Vegetation communities present within the Study Area were mapped based on the Holland/Oberbauer classification system and cross-walked to the Manual of California Vegetation (MCV). For communities not described by the MCV, of which there are four, the communities were described using the Holland/Oberbauer code distribution. Six plant alliances, associations, or semi-natural stands present within the Study Area: red willow association (southern willow scrub), open water, California buckwheat association (Riversidian sage scrub), field/pasture, disturbed habitat, and urban/developed lands.

Two sensitive plant species were observed within the Study Area: smooth tarplant (*Centromadia pungens* ssp. *laevis*) and chaparral (foothill) sand verbena (*Abronia villosa* var. *aurita*). Impacts to these species would be limited to very low numbers and would be less than significant based on the species' relatively low sensitivity and numerous recorded occurrences within the project vicinity (mainly outside the Study Area along the adjacent San Jacinto River corridor), indicating that the species' population is relatively stable in the region. Therefore, impacts on these plant species are less than significant and would not require mitigation.

A total of two special status animal species were detected on or within the Study Area during the 2020 surveys: least Bell's vireo (*Vireo bellii pusillus*) and white-faced ibis (*Plegadis chihi*). The site additionally supports suitable nesting habitat for bird species protected under the federal Migratory Bird Treaty Act (MBTA) and California Fish and Game Code (CFG Code). The project incorporates setbacks in excess of 500 feet from all potential least Bell's vireo habitat, thereby avoiding any potential direct or indirect impacts on the species. No potential direct or indirect impacts on white-faced ibis would occur due to the project avoiding direct impacts on suitable habitat and the species not having potential to breed in the region. If removal of nesting habitat for birds protected under the MBTA and CFG Code must occur

during the general breeding season, pre-construction surveys shall be completed, and no impacts to active bird nests shall be allowed.

Ten locations with potential aquatic resources were evaluated in the Study Area. The project has been specifically designed to avoid any impacts to potential jurisdictional areas by designing the project to occur in upland areas and through use of the trenchless installation methods including jack-and-bore for the 18” pipeline to be sliplined. No impacts would occur on jurisdictional features.

Implementation of avoidance and minimization measures and Best Management Practices will ensure that no inadvertent impacts occur to off-site habitat that will be avoided during construction. Implementation of these mitigation measures would reduce impacts on biological resources below a level of significance.

1.0 INTRODUCTION

This report describes the results of a biological resources study conducted by HELIX Environmental Planning, Inc. (HELIX) for the proposed Eastern Municipal Water District (District) Purified Water Replenishment (PWR) Project (project), which generally includes the construction and operation of facilities that would replenish the San Jacinto Upper Pressure Groundwater Management Zone aquifer with recycled water and advanced treated water. The purpose of this report is to document the existing biological conditions within an approximately 254-acre Study Area and provide an analysis of potential impacts on sensitive biological resources with respect to local, state, and federal policy. This report provides the biological resources technical documentation necessary for review under California Environmental Quality Act (CEQA) by the District.

1.1 PROJECT LOCATION

The proposed project would occur at multiple locations predominantly within the City of San Jacinto (City), with one location just outside the eastern City limits in unincorporated Riverside County (Figure 1, *Regional Location*). The project site occurs within Township 4 and 5 South, Range 1 West, on the U.S. Geological Survey (USGS) 7.5-minute Lakeview and San Jacinto quadrangles (Figure 2, *USGS Topography*). The project's proposed aboveground facilities would be located adjacent to the northern boundary of the District's existing San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) at 770 North Sanderson Avenue and at the District's existing Alessandro Ponds site near the intersection of West Ramona Parkway and North Vernon Avenue. The project's belowground pipelines would follow a route northeast from the SJVRWRF in an unpaved roadway, northeast along North Lyon Avenue, and southeast along Ramona Expressway, to the District's existing Mountain Avenue West Recharge Basin at the intersection of Ramona Expressway and East Esplanade Court (see Figure 3, *Project Vicinity [Aerial Photograph]*).

The project is located within the boundaries of the adopted Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP); however, the District is not a signatory agency to the MSHCP. The MSHCP provides a regional context for biological resources within western Riverside County. For reference, the project occurs within the Southwest Area Plan, with portions occurring within Criteria Cells 2775, 2878, 2893, 3098, 3099, 3204, and 3312 (Figure 4, *MSHCP Designations*). Although the MSHCP is not applicable to any of the District's projects, the proposed project has been planned and designed with consideration of the target conservation goals of the MSHCP, with project components being specifically sited within existing active agricultural lands, and disturbed and developed lands primarily associated with existing roadways.

U.S. Fish and Wildlife Service- (USFWS) designated critical habitat for San Bernardino kangaroo rat (*Dipodomys merriami parvus;* 25.6 acres) is shown on Figure 5, *USFWS Critical Habitat*. The San Bernardino kangaroo rat critical habitat is primarily located within the San Jacinto River corridor along suitable alluvial floodplains and coastal sage scrub habitats with gravelly soils. The critical habitat for this species overlaps the Study Area along the southeastern portion of the 36" pipeline; however, this pipeline will be entirely constructed within existing disturbed and developed right-of-way associated with Ramona Expressway.

1.2 PROJECT DESCRIPTION

The project proposes to construct and operate facilities that would replenish the San Jacinto Upper Pressure Groundwater Management Zone aquifer with recycled water and advanced treated water to reduce reliance on imported water sources, provide improved drought resiliency, and potentially improve the quality of the groundwater basin utilized by the District.

The proposed project would include the following components:

- Construction of an Advanced Water Treatment (AWTF) near the District's existing SJVRWRF;
- Construction of a brine management system north of the AWTF site that would include five interconnected evaporation ponds with a total evaporation surface area of approximately 20 acres;
- Construction of Alessandro Blending Station facilities that would blend advanced treated water and tertiary RW;
- Reline an existing 18-inch-diameter pipeline that would convey advanced treated water from the AWTF site to the proposed Alessandro Blending Station; and
- Construction of a new 36-inch-diameter pipeline that would convey blended water from the Alessandro Blending Station to the existing Mountain Avenue West Recharge Basin.

Specific staging areas have not yet been identified; staging areas would be located within developed locations or within a parcel that would be acquired by the District for the project and is within areas surveyed as part of the current study.

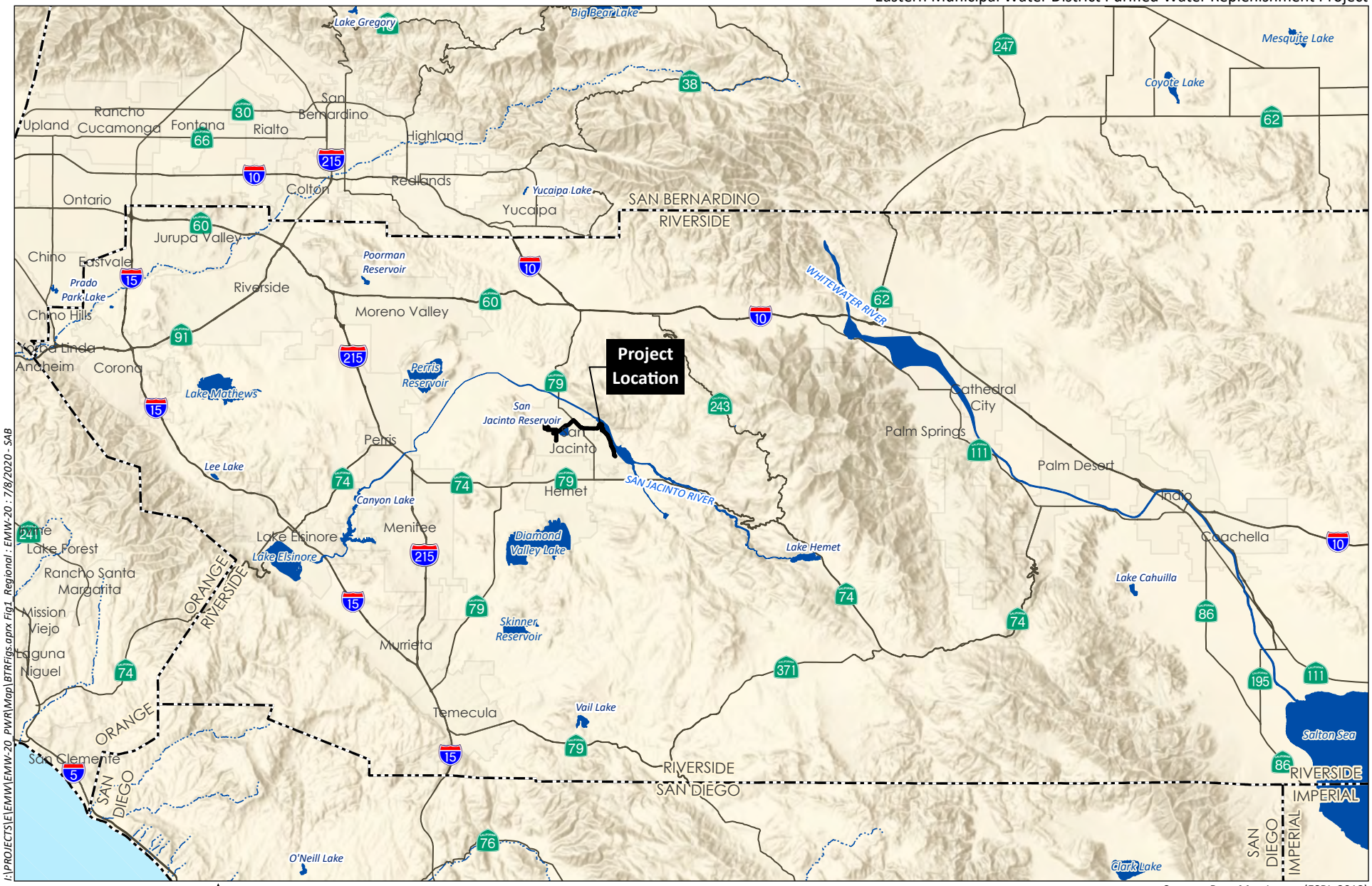
2.0 METHODS

Project evaluation included a review of existing information and field surveys. The methods used to evaluate the biological resources present within the Study Area are discussed in this section.

2.1 LITERATURE REVIEW

Prior to conducting biological field surveys, HELIX conducted a thorough review of relevant maps, databases, and literature pertaining to biological resources known to occur within the Study Area. Recent and historical aerial imagery, USGS topographic maps, soils maps (Natural Resource Conservation Service [NRCS] 2020), and other maps of the Study Area and vicinity were acquired and reviewed to obtain updated information on the natural environmental setting.

In addition, a query of special status species and habitats databases was conducted, including the USFWS species records (USFWS 2020a), California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB; CDFW 2020a), Calflora database (Calflora 2020), SanBIOS and California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants (CNPS 2020). The USFWS' National Wetlands Inventory (NWI) was also reviewed (USFWS 2020b). Any recorded locations of species, habitat types, wetlands, and other resources were mapped and overlain onto aerial imagery using Geographic Information Systems (GIS). Data pertaining to the MSHCP were also reviewed.



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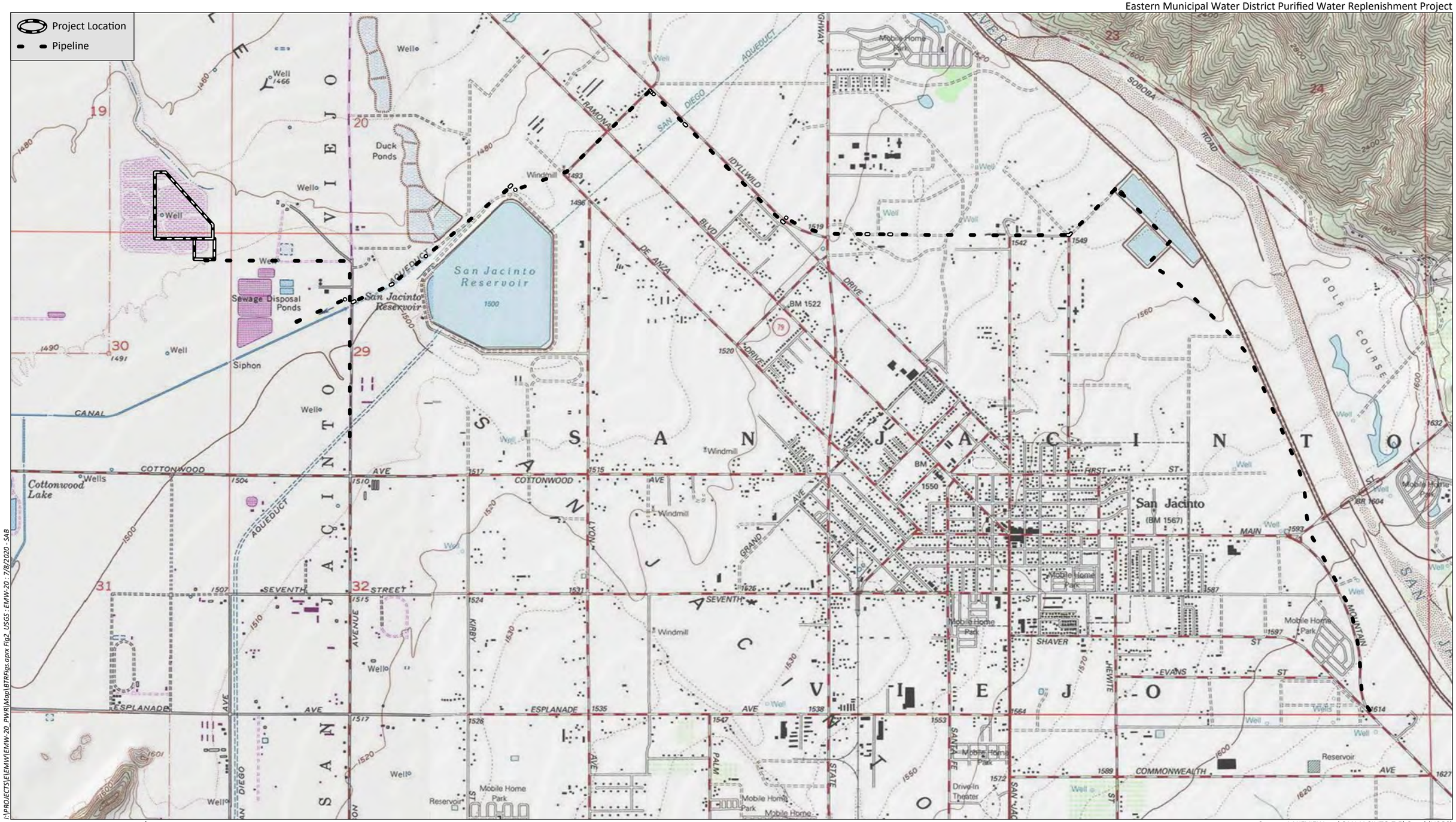
Source: Base Map Layers (ESRI, 2013)

HELIX Environmental Planning

Regional Location

Figure 1



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Source: LAKEVIEW and SAN JACINTO 7.5' Quad (USGS)

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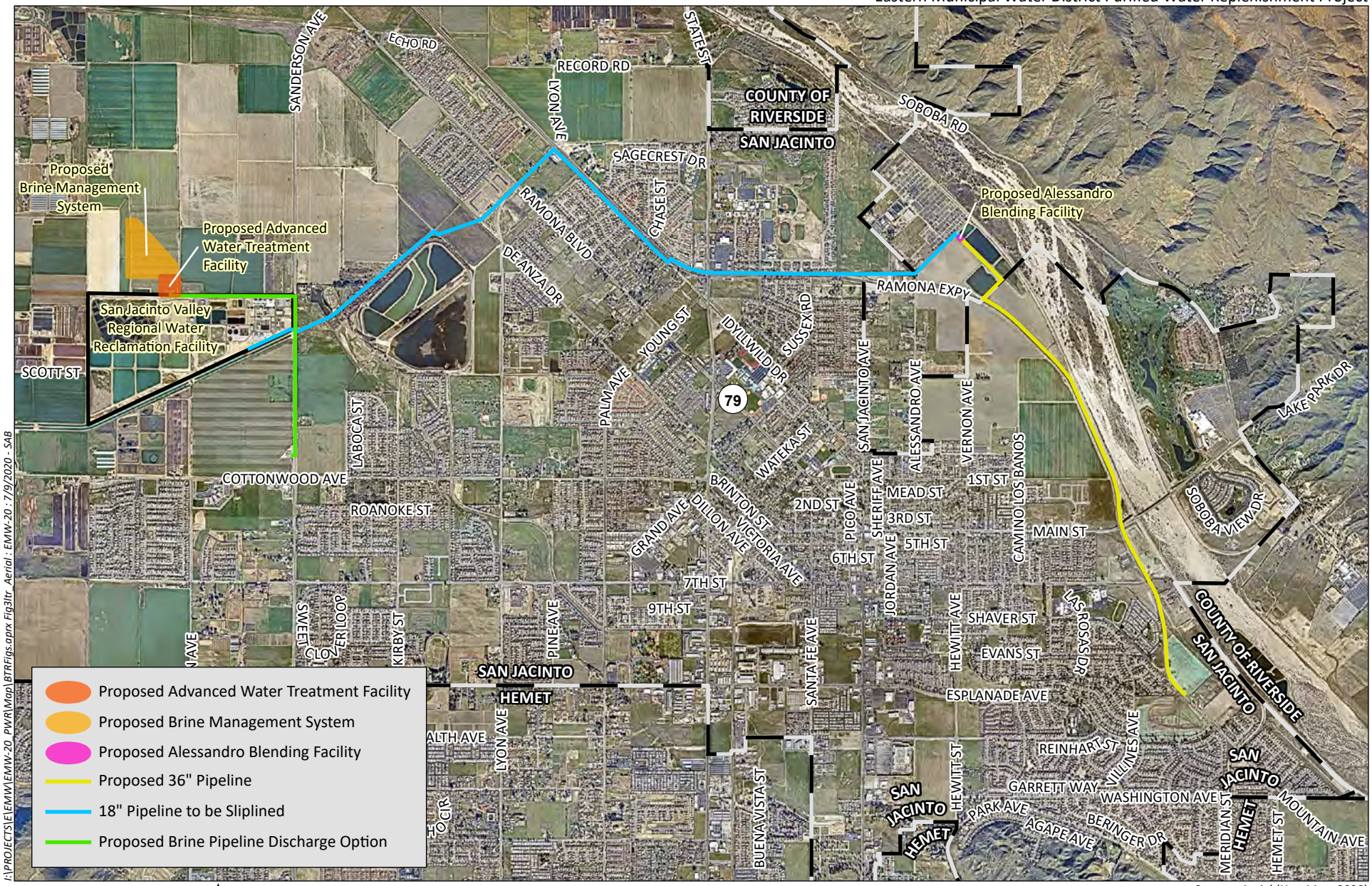
HELIX Environmental Planning

USGS Topography

Figure 2



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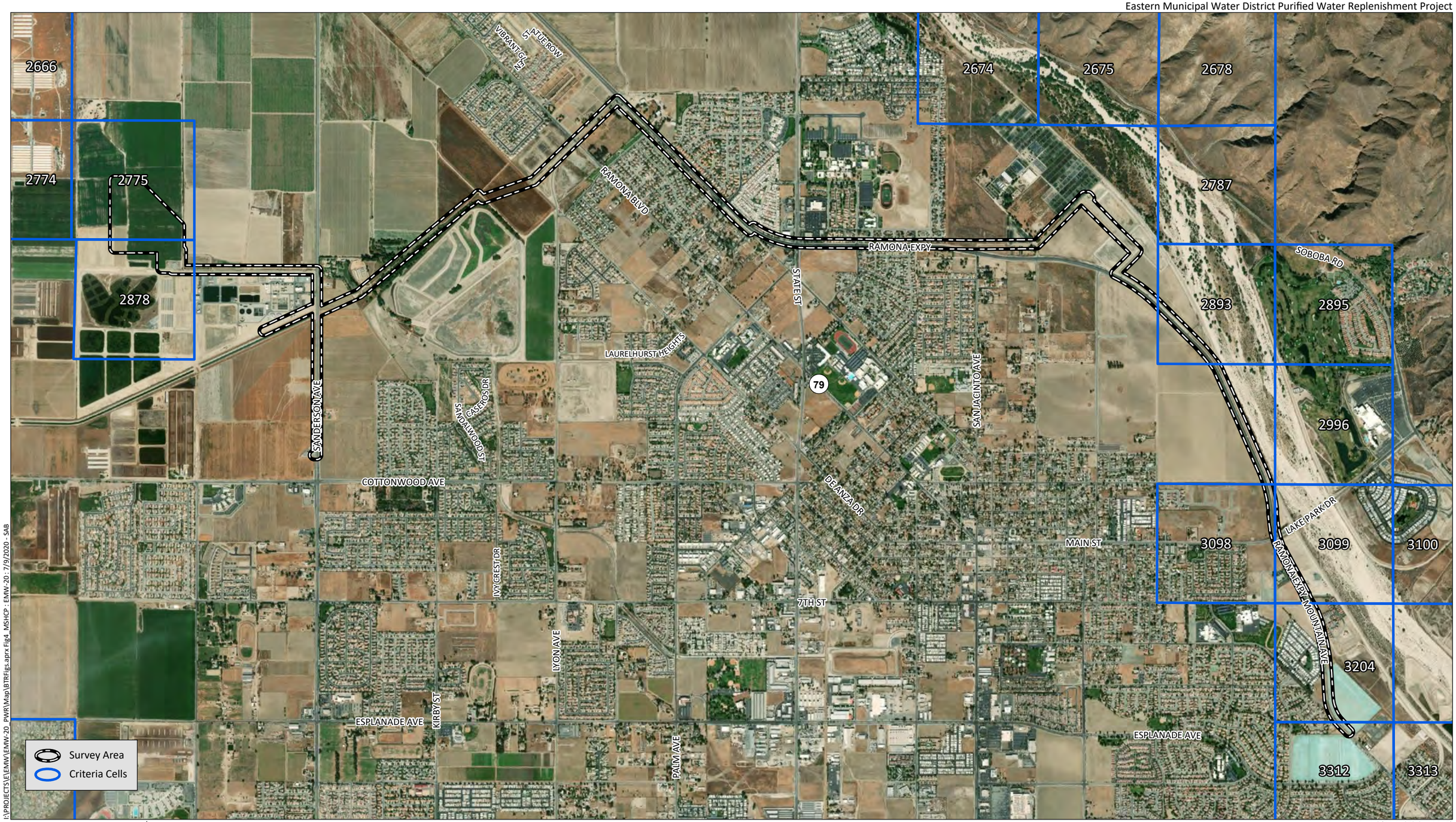
Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Project Vicinity (Aerial Photograph)

Figure 3



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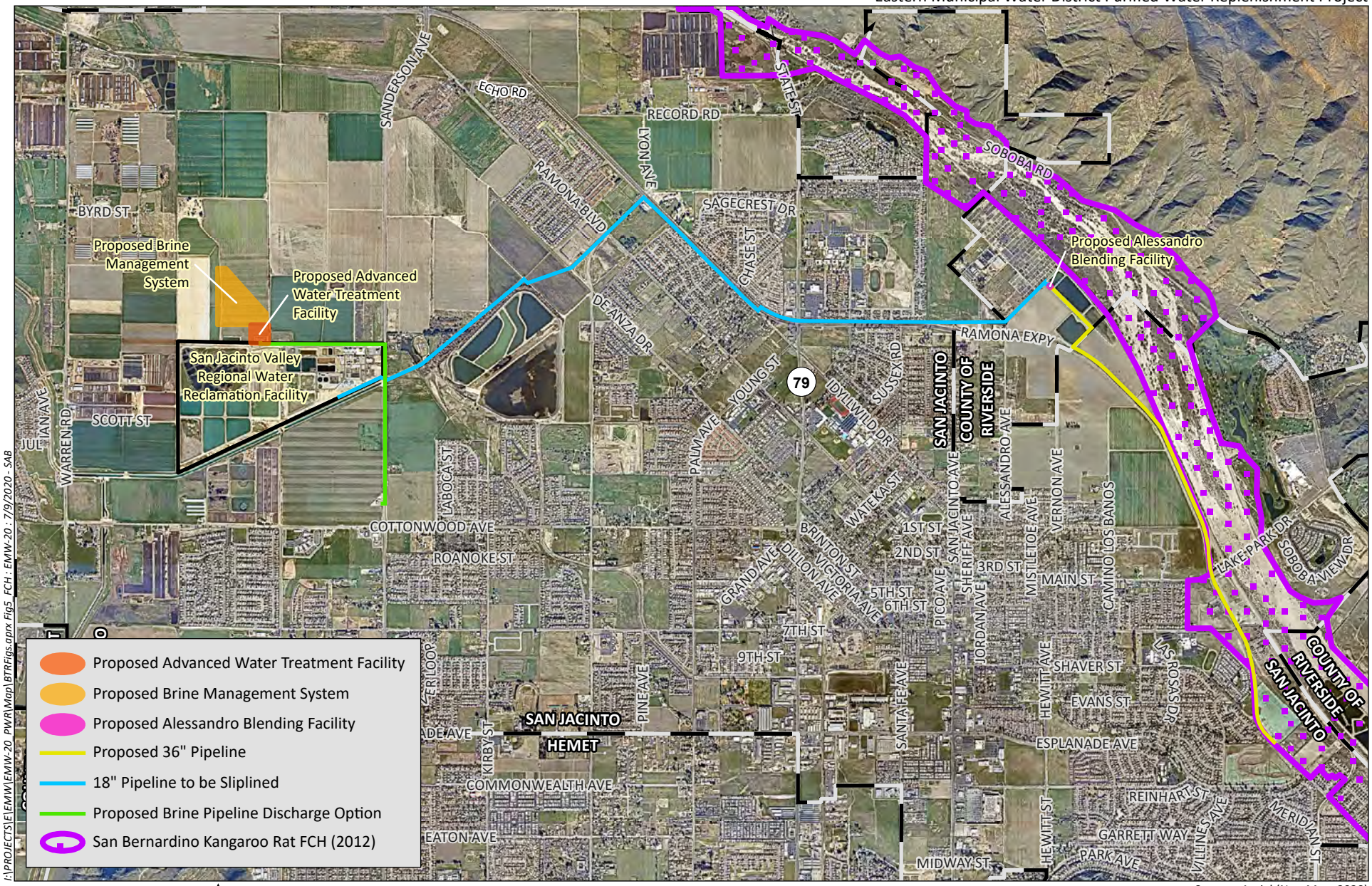
Source: Aerial (DigitalGlobe, 2018)

HELIX Environmental Planning

MSHCP Designations

Figure 4



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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

USFWS Critical Habitat

Figure 5

2.2 BIOLOGICAL SURVEYS

2.2.1 General Biological Survey

HELIX biologists Benjamin Rosenbaum and Alexander Walsh conducted a general biological survey of the Study Area on February 20, 2020. The approximately 254-acre Study Area includes the proposed brine ponds, advanced water treatment facility, brine pipeline discharge option, 18" pipeline to be sliplined, Alessandro blending facility, and 36" pipeline components in addition to an approximate 100-foot buffer surrounding these components. Vegetation communities within the Study Area were mapped on an aerial photograph (1"=300' scale). Vegetation types used by the CDFW follow the National Vegetation Classification System (NVCS) using the Manual of California Vegetation (MCV), 2nd Edition (Sawyer et al. 2009). The MCV serves as the California extension of the NVCS. The MCV classifies vegetation based on floristic and structural details that are represented as alliances and associations. Vegetation mapped within the Study Area followed Holland (1986) as modified by Oberbauer et al. (2008). Direct translations between Holland and MCV do not exist for all vegetation types. Additionally, a single vegetation community under Holland may fit the definition of several different alliances or associations described within the MCV. Vegetation communities mapped within the Study Area were translated to the equivalent classification unit under MCV in order to determine sensitivity rankings. For communities that do not have direct translations within MCV, professional judgment was used to find the best corresponding association or alliance. A minimum mapping unit size of 0.10 acre was used when mapping upland habitat; 0.01 acre was used when mapping wetland and riparian habitat. A list of all plant and animal species observed or detected within the Study Area was prepared. Plant species were identified in the field or later in the laboratory with the aid of voucher specimens. Animals were identified in the field by direct visual observation with the aid of binoculars or indirectly by detection of calls, tracks, burrows, or scat. Table 1, *Biological Surveys for the Purified Water Replenishment Project*, provides a summary of biological surveys conducted for the project.

Table 1
BIOLOGICAL SURVEYS FOR THE PURIFIED WATER REPLENISHMENT PROJECT

Survey Date	Survey Number	Personnel	Conditions
Jurisdictional Delineation Field Survey			
May 5, 2020	N/A	Rob Hogenauer	--
Vegetation Mapping and Habitat Assessment			
February 20, 2020	N/A	Benjamin Rosenbaum Alexander Walsh	61-76°F; wind 1-2 mph; clear sky
Rare Plant Focused Surveys			
April 28, 2020	1	Dan Torres Angelia Bottiani	61-64°F; wind 0-4 mph; clear sky
June 11, 2020	2	Dan Torres Matt Dimson	--
Burrowing Owl Surveys			
April 24, 2020	1	Dan Torres Matt Dimson	57-79°F; wind 0-1 mph; clear sky
May 18, 2020	2	Matt Dimson John Gardner	57-65°F; wind 2-5 mph; 100% - 10% clouds
June 11, 2020	3	Dan Torres Matt Dimson	64-85°F; wind 1-2 mph; clear sky

Table 1 (cont.)
BIOLOGICAL SURVEYS FOR THE PURIFIED WATER REPLENISHMENT PROJECT

Survey Date	Survey Number	Personnel	Conditions
Burrowing Owl Surveys (cont.)			
July 2, 2020	4	Dan Torres Matt Dimson	59-68°F; wind 0-2 mph; 100% clouds – clear sky

2.2.2 Rare Plant Survey

HELIX biologists Angelia Bottiani, Dan Torres, and Matt Dimson surveyed the Study Area for special status plant species during two survey events in spring and early summer of 2020 (Table 1). Special status plant species include species that are: listed as threatened or endangered, proposed for listing, or are candidate species by the USFWS or the CDFW; and those with a California Rare Plant Rank (CRPR) 1 through 4 as designated by the CNPS. The rare plant survey included a complete botanical inventory and 100 percent visual coverage of the Study Area. The survey periods were determined based on the recorded blooming periods of special status plant species known to occur within the Study Area and surrounding area. The first survey was conducted in April 2020 to detect early-blooming spring annual species. The second survey period was conducted in June 2020 to detect late-blooming spring annual species. A list of rare plants with potential to occur was compiled and reviewed for habitat suitability.

Field survey methods conformed to CNPS Botanical Survey Guidelines (CNPS 2001); Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities (CDFW 2018); and Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed, and Candidate Plants (USFWS 1996). Plant species encountered during the field surveys were identified to subspecies or variety, if applicable, to determine sensitivity status. The surveys were conducted on foot and were completed by walking meandering transects in areas of suitable habitat for special status plant species with potential to occur in the Study Area. Special status plant species encountered were mapped using a hand-held Global Positioning System (GPS) unit and/or on an aerial photograph. Biologists also looked for special status plant species opportunistically during other surveys and recorded their numbers and locations when encountered.

2.2.3 Burrowing Owl Survey

HELIX biologists conducted breeding season surveys for the burrowing owl in accordance with the survey guidelines in the *CDFW 2012 Staff Report on Burrowing Owl Mitigation* (CDFW 2012). Due to unforeseen circumstances, burrowing owl survey #1 was conducted one week later than recommended protocol; however, all surveys were completed during the peak of the breeding season and the circumstances did not change the quality of the data collected or the results of the survey. Four site visits were made from April 24 through July 2, 2020 by teams of two biologists (Table 1) to survey potential burrowing owl habitat (i.e., non-native grassland, disturbed habitat, and scrub communities where the shrub cover was sparse) where it occurs in the Study Area and 500 feet beyond. Much of the potential burrowing owl habitat in the Study Area was inspected with the aid of binoculars due to restricted access to private property.

The biologists slowly walked meandering transects through areas of potential habitat where it was legally accessible. Fence posts, rocks, and other possible perching locations, as well as mammal burrows (especially those of California ground squirrel [*Otospermophilus beecheyi*]) potentially suitable for use by burrowing owls were inspected and mapped with a hand-held GPS unit. These burrows were specifically

searched for sign of recent burrowing owl occupation including pellets with regurgitated fur, bones, and insect parts; white wash (excrement); and feathers. In addition, structures such as concrete culverts/piles, wood debris piles, trash piles, and openings beneath cement or asphalt pavement that were present were checked for burrowing owl sign.

2.2.4 Jurisdictional Delineation

HELIX biologist Rob Hogenauer conducted a field-based jurisdictional delineation of the Study Area on May 5, 2020 to identify and map aquatic resources potentially subject to U.S. Army Corps of Engineers (USACE) jurisdiction pursuant to Section 404 of the Clean Water Act (CWA), Regional Water Quality Control Board (RWQCB) jurisdiction pursuant to Section 401 of the Clean Water Act and State Porter-Cologne Water Quality Control Act, and streambed and riparian habitat potentially subject to CDFW jurisdiction pursuant to Sections 1600 et seq. of the California Fish and Game (CFG) Code. Prior to the delineation, recent aerial photographs (1"=100'), topographic maps (1"=100'), soil mapping, National Wetlands Inventory mapping, and USGS topographical maps were reviewed to determine the location of potential jurisdictional areas. The delineation was conducted on foot with the aid of 1”=300’ scale aerials and topographic maps. Potential aquatic resources evaluated within the Study Area included drainage features, depressions, and/or wetland vegetation that crossed or were adjacent to the proposed project impact areas.

Waters of the U.S.

Potential USACE-jurisdictional waters of the U.S. were generally determined based on the presence of a discernible ordinary high water mark (OHWM) and/or wetland conditions expressed by three parameters (vegetation, hydrology, and soils) established for wetland delineations, as described within the Wetlands Delineation Manual (Environmental Laboratory 1987) and Arid West Regional Supplement (USACE 2008). The OHWM was identified according to “A Field Guide to the Identification of the Ordinary High Water Mark in the Arid West Region of the Western United States” (Lichvar and McColley 2010). Mapping of drainage features was performed in the field based on the OHWM and surface indications of hydrology. Sampling points were inspected for primary and secondary wetland hydrology indicators. Areas were determined to be potential wetland waters of the U.S. if there was a dominance of hydrophytic vegetation, hydric soils, and wetland hydrology indicators. Areas were determined to be non-wetland waters of the U.S. if there was evidence of regular surface flow within an OHWM, but the vegetation and/or soils criterion were not met. Definitions of USACE jurisdictional areas are presented in Appendix H of this report.

Ten locations with potential aquatic resources were identified and evaluated on and immediately adjacent to the Study Area. Standard USACE wetland delineation data forms or OHWM Datasheets were not completed because all features delineated will be avoided and are considered ephemeral and therefore are not waters of the U.S.

Regional Water Quality Control Board Jurisdictional Waters

Potential RWQCB-jurisdictional areas were delineated in the same manner as potential waters of the U.S. All waters of the State are subject to jurisdiction pursuant to CWA Section 401. Ephemeral features, while not considered waters of the U.S., were determined to be waters of the State under exclusive regulatory jurisdiction of the RWQCB pursuant to the State Porter-Cologne Water Quality Control Act.

California Department of Fish and Wildlife Jurisdictional Areas

Potential CDFW-jurisdictional streambed and riparian habitat were determined based on the presence of riparian vegetation or regular surface flow within a measurable bed and bank. Streambeds within CDFW jurisdiction were delineated based on the definition of streambed as "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supporting fish or other aquatic life. This includes watercourses having a surface or subsurface flow that support riparian vegetation" (Title 14, Section 1.72). Potential CDFW-jurisdictional unvegetated streambed encompasses the top-of-bank to top-of-bank width for the features within the Study Area. Riparian habitat is not defined in Title 14, but the section refers to vegetation and habitat associated with a stream. The CDFW jurisdictional habitat includes all riparian shrub or tree canopy that may extend beyond the banks of a stream. Definitions of CDFW jurisdictional areas are presented in Appendix I of this report.

2.3 SURVEY LIMITATIONS

Noted animal species were identified by direct observation, vocalizations, or the observance of scat, tracks, or other signs. However, the lists of species identified are not necessarily comprehensive accounts of all species that utilize the project site, as species that are nocturnal, secretive, or seasonally restricted may not have been observed. Those species that are of special status and have potential to occur in the project site; however, are still addressed in this report.

2.4 NOMENCLATURE

Nomenclature for this report is taken from Holland (1986) and Oberbauer (2008) for vegetation communities; Jepson eFlora (2020) and Baldwin et al. (2012) for plants; North American Butterfly Association (2020) for butterflies; Society for the Study of Amphibians and Reptiles (2020) for reptiles and amphibians; American Ornithological Society (2020) for birds; and Bradley et al. (2014) for mammals. Plant species status is from the CNPS Rare Plant Inventory (2020) and CDFW (2020a). Animal species status is from the CDFW (2020b).

3.0 EXISTING CONDITIONS

3.1 GENERAL LAND USES

The Study Area is located within the San Jacinto Valley, which is a flat inland area situated at the western base of the San Jacinto Mountains. The area is characterized by agriculture, single-family residential development, and undeveloped lands, with additional land uses adjacent to or nearby the project alignment including small areas of commercial development, parks, Mt. San Jacinto College, and the Soboba Springs Golf Course (Figure 3). Land uses that characterize the project site and surrounding area include agricultural fields, dairy and livestock facilities, transportation infrastructure, water conveyance infrastructure, and intermittent areas of residential development.

3.2 TOPOGRAPHY AND SOILS

The Study Area is located in western Riverside County within the floodplain of the upper San Jacinto River Valley. Elevations within the Study Area range between approximately 1,615 feet above mean sea

level (AMSL) near the eastern Study Area extent, to approximately 1,480 feet AMSL the western portions of the Study Area.

The Study Area contains 22 soil types belonging to seven soil series: Dello loamy sand, 0 to 5 percent slopes; Dello loamy sand, gravelly substratum, 0 to 5 percent slopes; Dello loamy fine sand, 0 to 2 percent slopes; Dello loamy fine sand, saline-alkali, 0 to 5 percent slopes; Dello loamy fine sand, gravelly substratum, 0 to 2 percent slopes; Grangeville loamy fine sand, drained, 0 to 5 percent slopes; Grangeville sandy loam, drained, saline-alkali, 0 to 5 percent slopes; Grangeville sandy loam, sandy substratum, drained, 0 to 5 percent slopes; Grangeville sandy loam, sandy substratum, drained, saline-alkali, 0 to 5 percent slopes; Grangeville fine sandy loam, drained, 0 to 2 percent slopes; Grangeville fine sandy loam, poorly drained, saline-alkali, 0 to 5 percent slopes; Grangeville fine sandy loam, saline-alkali, 0 to 5 percent slopes; Grangeville fine sandy loam, loamy substratum, drained, 0 to 2 percent slopes; Metz loamy fine sand, gravelly sand substratum, 0 to 5 percent slopes; Riverwash; San Emigdio fine sandy loam, 0 to 2 percent slopes; Emigdio fine sandy loam, deep, 0 to 2 percent slopes, Traver loamy fine sand, eroded; Traver loamy fine sand, saline-alkali, eroded; Traver fine sandy loam, saline-alkali; Traver fine sandy loam, strongly saline-alkali, eroded; and Water (Figure 6, *Soils*). Of these soil mapping unit types, the Traver series is known to support sensitive plant species in the region.

3.3 VEGETATION COMMUNITIES

Vegetation communities present within the Study Area were mapped based on the Holland/Oberbauer classification system and cross-walked to the MCV. There are six plant alliances, associations, or semi-natural stands present within the Study Area (Table 2, *Vegetation Communities and Land Covers*; Figures 7a-7i, *Vegetation and Sensitive Resources*). For communities not described by the MCV, of which there are four, the communities were described using the Holland/Oberbauer code distribution. A brief description of each community within the Study Area is provided below.

Table 2
VEGETATION COMMUNITIES AND LAND COVERS

MCV Code	MCV Alliance/ Association	MCV Common Name	Holland Code	Holland Classification	Acres on Site
Riparian Forests and Woodlands					
3.9.1	*Salix laevigata* Association	Red Willow Association	62500	Southern willow scrub	8.13
				Total	**8.13**
Soft-Leaved, Drought-Deciduous Shrublands					
4.23.1	*Eriogonum fasciculatum* Association	California Buckwheat Association	32500	Riversidian Sage Scrub	0.5
				Total	**0.5**
Upland Herbaceous Vegetation					
N/A	Not Available	Not Available	18310	Field/Pasture	83.5
				Total	**83.5**

Table 2 (cont.)
VEGETATION COMMUNITIES AND LAND COVERS

MCV Code	MCV Alliance/ Association	MCV Common Name	Holland Code	Holland Classification	Acres on Site
Unvegetated[1]					
N/A	Not Available	Not Available	11300	Disturbed Habitat	53.0
N/A	Not Available	Not Available	12000	Developed	106.9
N/A	Not Available	Not Available	64100	Open Water	2.07
				Total	**161.97**
				COMMUNITIES TOTAL	**254.10**

[1] The Vegetation Classification Manual does not classify generally unvegetated habitats such as those found in the Oberbauer updated Holland classification system: developed, disturbed habitat, open water, and field/pasture.
[2] Vegetation categories and numerical codes are from Holland (1986) and Oberbauer (2008).
[3] Upland habitats are rounded to the nearest 0.1 acre and wetland/riparian habitats to the nearest 0.01 acre; thus, totals reflect rounding.

3.3.1 Red Willow Association (Southern Willow Scrub)

Red willow association or southern willow scrub consists of dense, broadleaved, winter-deciduous stands of trees dominated by shrubby willows (*Salix* spp.) in association with mule fat (*Baccharis salicifolia*), and with scattered emergent cottonwood (*Populus fremontii*) and western sycamores (*Platanus racemosa*). This vegetation community occurs on loose, sandy or fine gravelly alluvium deposited near stream channels during flood flows. Within the Study Area, this habitat is dominated by red willow (*Salix laevigata*). Approximately 8.13 acres of southern willow scrub occurs within the Study Area (Figures 7b, 7c).

3.3.2 Open Water

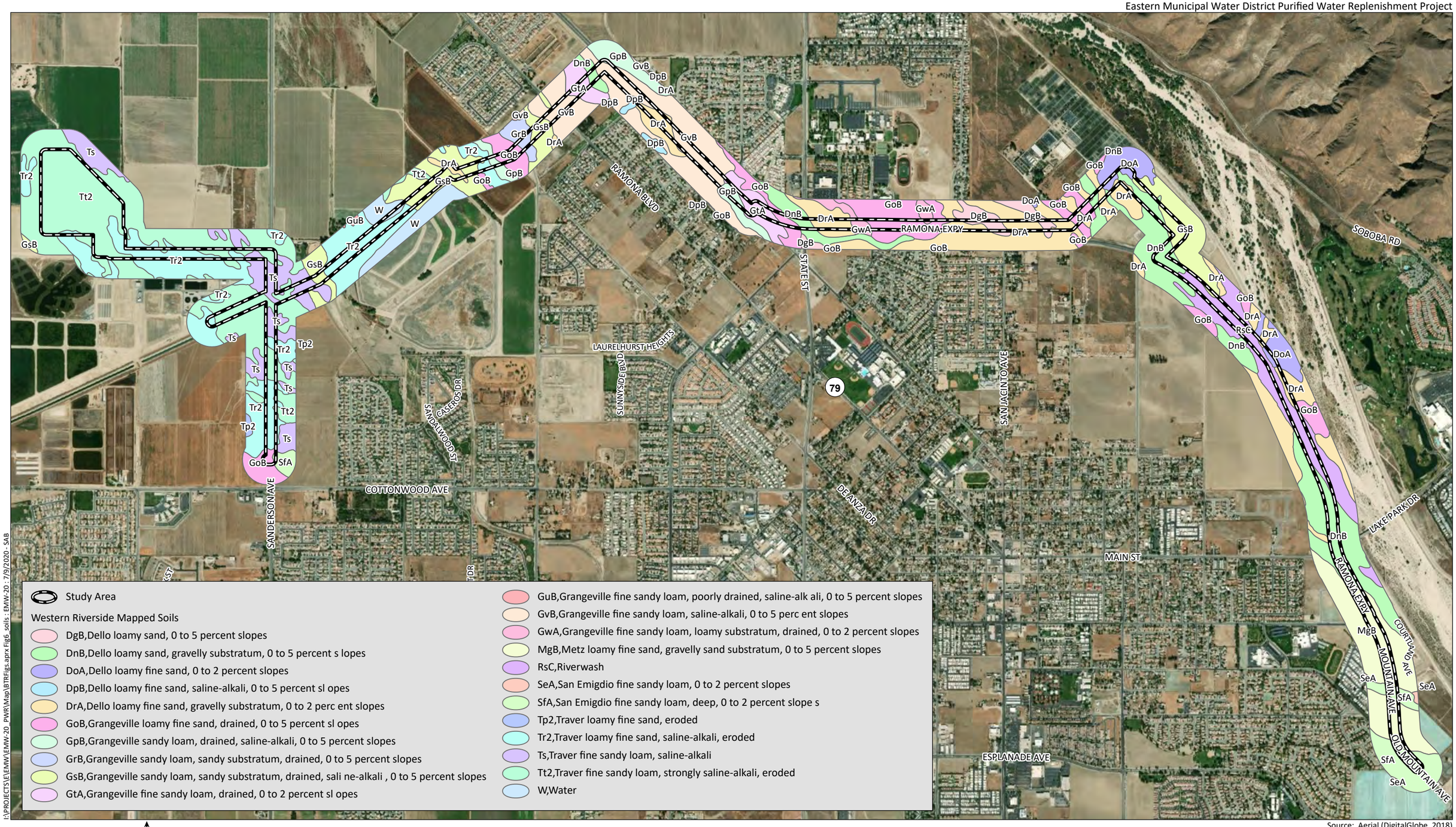
Open water is an unvegetated habitat. It is made up of year-round bodies of saline or fresh water. Fresh water bodies include lakes, streams, ponds, or rivers. Approximately 2.07 acres of open water occurs within the Study Area (Figures 7b, 7c, 7f, 7g).

3.3.3 California Buckwheat Association (Riversidian Sage Scrub)

California buckwheat association or Riversidian sage scrub is the most xeric expression of coastal sage scrub, typically found on xeric sites such as steep slopes, severely drained soils, or clays that release stored soil moisture slowly. Typical stands are fairly open and dominated by California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum* ssp. *fasciculatum*), and foxtail chess (*Bromus madritensis* ssp. *rubens*). Riversidian sage scrub within the Study Area is dominated by California buckwheat and felt-leaved yerba santa (*Eriodictyon crassifolium*). Approximately 0.5 acre of Riversidian sage scrub occurs within the Study Area (Figure 7h).

3.3.4 Field/Pasture

In fields/pastures, planted fields are usually monoculture crops that are irrigated and usually artificially seeded and maintained. Approximately 83.5 acres of field/pasture occurs within the Study Area (Figures 7a, 7b, 7c, 7d, 7f, 7g, and 7i).



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Source: Aerial (DigitalGlobe, 2018)

HELIX Environmental Planning

Soils

Figure 6

Study Area

Sensitive Species Observation*

White-faced Ibis (*Plegadis chihi*)

Smooth Tarplant (*Centromadia pungens ssp. laevis*)

Vegetation and Land Cover Type

Urban/Developed

Disturbed Habitat

Field Pasture

*Count of individuals is labeled if greater than 1.

San Jacinto Valley Regional Water Reclamation Facility

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Source: Aerial (NearMap, 2020)

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HELIX Environmental Planning

Vegetation and Sensitive Resources

Figure 7a

Study Area

Sensitive Species Observation*

Smooth Tarplant (*Centromadia pungens ssp. laevis*)

Smooth Tarplant (*Centromadia pungens ssp. laevis*)

Vegetation and Land Cover Type

Urban/Developed

Disturbed Habitat

Field Pasture

Open Water

Red Willow Association

*Count of individuals is labeled if greater than 1.

45

925

2

SANDERSON AVE

15

200

1600

80

5

3

20

15

2

15

San Jacinto Valley Regional Water Reclamation Facility

1200

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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Vegetation and Sensitive Resources

Figure 7b

Study Area

Sensitive Species Observation*

Smooth Tarplant (*Centromadia pungens ssp. laevis*)

Least Bell's Vireo (*Vireo bellii pusillus*)

Smooth Tarplant (*Centromadia pungens ssp. laevis*)

Vegetation and Land Cover Type

Urban/Developed

Disturbed Habitat

Field Pasture

Open Water

Red Willow Association

*Count of individuals is labeled if greater than 1.



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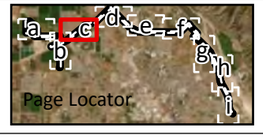

HELIX Environmental Planning

Source: Aerial (NearMap, 2020)

Vegetation and Sensitive Resources

Figure 7c



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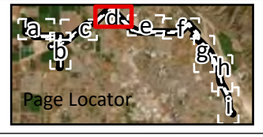

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Vegetation and Sensitive Resources

Figure 7d

Study Area
Vegetation and Land Cover Type
Urban/Developed

STATE ST
79
RAMONA EXPY

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Page Locator

Source: Aerial (NearMap, 2020)

HELIX
Environmental Planning

Vegetation and Sensitive Resources

Figure 7e

Study Area

Vegetation and Land Cover Type

- Urban/Developed
- Disturbed Habitat
- Field Pasture
- Open Water

RAMONA EXPY

SAN JACINTO AVE

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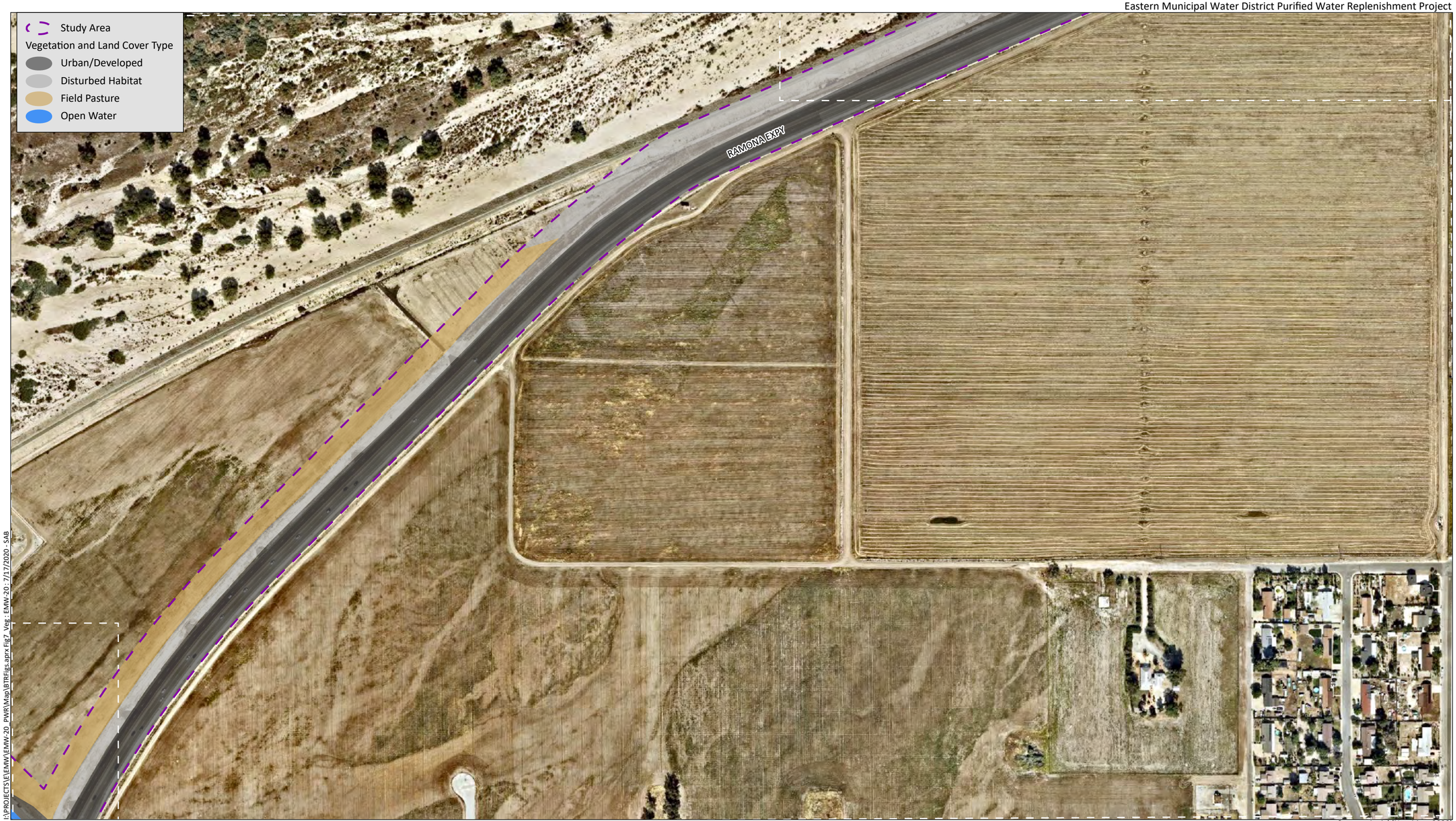
Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Vegetation and Sensitive Resources

Figure 7f



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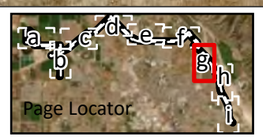

HELIX
Environmental Planning

Vegetation and Sensitive Resources

Figure 7g

Study Area

Sensitive Species Observation*

- Chaparral Sand-verbena (*Abronia villosa var. aurita*)
- Smooth Tarplant (*Centromadia pungens ssp. laevis*)

Vegetation and Land Cover Type

- Urban/Developed
- Disturbed Habitat
- California Buckwheat Association

*Count of individuals is labeled if greater than 1.

LAKE PARK DR

RAMONA EXPY

MAIN ST

0 300 Feet

Page Locator

Source: Aerial (NearMap, 2020)

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HELIX Environmental Planning

Vegetation and Sensitive Resources

Figure 7h

Study Area

Sensitive Species Observation*

Chaparral Sand-verbena (*Abronia villosa var. aurita*)

Smooth Tarplant (*Centromadia pungens ssp. laevis*)

Vegetation and Land Cover Type

Urban/Developed

Disturbed Habitat

Field Pasture

*Count of individuals is labeled if greater than 1.



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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Vegetation and Sensitive Resources

Figure 7i

3.3.5 Disturbed Habitat

Disturbed habitat includes land cleared of vegetation (e.g., dirt roads), land containing a preponderance of non-native plant species such as ornamentals or ruderal exotic species that take advantage of disturbance (previously cleared or abandoned landscaping), or land showing signs of past or present animal usage that removes any capability of providing viable habitat.

Within the Study Area, disturbed habitat consists of bare ground with scattered annual non-native species including mustard (*Brassica* ssp.), Russian thistle (*Salsola tragus*) and filaree (*Erodium cicutarium*). Disturbed habitat covers approximately 53.0 acres of the Study Area and consists of dirt roads and undeveloped land adjacent to roadsides (Figures 7a, 7b, 7c, 7d, 7f, 7g, 7h, and 7i).

3.3.6 Urban/Developed

Urban/developed land includes areas that have been constructed upon or otherwise covered with a permanent, unnatural surface and may include, for example, structures, pavement, irrigated landscaping, or hardscape to the extent that no natural land is evident. These areas no longer support native or naturalized vegetation. Developed portions of the Study Area consist of paved roads, residential developments, and access paths with compacted soil/gravel. A total of 106.9 acres of urban/developed land occurs in the Study Area (Figures 7a - 7i).

3.4 PLANTS

A total of 86 plant species were observed within the Study Area during the general biological survey and focused species surveys, of which 49 (57 percent) are non-native species (Appendix A, *Plant Species Observed*). The predominance of non-native species is indicative of the high degree of disturbance as a result of historical and current uses of the Study Area.

3.5 ANIMALS

A total of 45 animal species were observed/detected within the Study Area during the general biological survey and focused species surveys: one butterfly, two reptile, one amphibian, 38 bird species, and three mammal species (Appendix B; *Animal Species Observed or Detected*).

3.6 SENSITIVE RESOURCES

3.6.1 Sensitive Vegetation Communities/Habitats

Sensitive vegetation communities/habitat types are defined as land that supports unique vegetation communities or the habitats of rare or endangered species or subspecies of animals or plants as defined by Section 15380 of the State CEQA Guidelines.

The CDFW evaluates the rarity of natural communities using the NatureServe's Heritage Methodology (Faber-Langendoen et. al 2012) in which communities are given a G (global) and S (State) rank based on their degree of imperilment (as measured by rarity, trends, and threats). Communities are assigned an overall rank of 1 through 5, with 1 being considered very rare and threatened and 5 being considered demonstrably secure. Communities with a Rarity Ranking of S1 (critically imperiled), S2 (imperiled), or S3 (vulnerable) are considered sensitive by the CDFW.

A single sensitive vegetation community occurs within the Study Area: red willow association (southern willow scrub). California buckwheat association (Riversidian sage scrub dominated by California buckwheat) has a ranking of S5; therefore, it is not considered a sensitive vegetation community. Disturbed habitat, field/pasture, open water, and urban/developed lands also do not meet the definition of sensitive habitat under CEQA.

3.6.2 Special Status Plant Species

Special status plant species have been afforded special status and/or recognition by the USFWS and/or CDFW. They may also be included in the CNPS' Inventory of Rare and Endangered Plants. Their status is often based on one or more of three distributional attributes: geographic range, habitat specificity, and/or population size. Sensitive species are those considered unusual or limited in that they are: (1) only found in the region; (2) a local representative of a species or association of species not otherwise found in the region; or (3) severely depleted within their ranges or within the region. Two sensitive plant species were observed within the Study Area: smooth tarplant (*Centromadia pungens* ssp. *laevis*) and chaparral (foothill) sand verbena (*Abronia villosa* var. *aurita*).

Smooth tarplant (*Centromadia pungens* ssp. *laevis*)
Listing: --/--; CRPR List 1.B1
Distribution: Elevations between 295 – 2,624 feet (90-800 m) in Riverside County.
Habitat: Sandy soil on flats and foothills in mixed grassland, coastal sage scrub, and chaparral communities.
Status on site: This species was observed along the brine pipeline discharge option, 18" pipeline to be sliplined, and 36" pipeline (Figures 7b, 7c, 7h, and 7i). Approximately 4,207 individuals as well as four polygons with multiple individuals were observed.

Chaparral (foothill) sand-verbena (*Abronia villosa* var. *aurita*)
Listing: --/--; CRPR List 1B.1
Distribution: Western Riverside, San Bernardino, and San Diego counties; Baja California, Mexico
Habitat: Sandy floodplains or flats in generally, inland, arid areas of sage scrub and open chaparral
Status on site: This species was observed along the 36" pipeline (Figures 7h and 7i). Approximately 47 individuals were observed.

Sensitive Plant Species with Potential to Occur

Additional special status plant species that were not observed but may have potential to occur within the Study Area are listed in Appendix C, *Special Status Plant Species Observed or with Potential to Occur*. An explanation of status codes is included as Appendix E, *Explanation of Status Codes for Plant and Animal Species*. No additional plant species have a high potential to occur based on geographic range, elevation range, and/or lack of suitable habitat in the Study Area.

3.6.3 Special Status Animal Species

Special status animal species include those that have been afforded special status and/or recognition by the USFWS and/or CDFW. In general, the principal reason an individual taxon (species or subspecies) is given such recognition is the documented or perceived decline or limitations of its population size or geographical extent and/or distribution, resulting in most cases from habitat loss.

Two special status animal species were observed within or adjacent to the Study Area during the 2020 biological surveys. The two special status animal species know to occur within the Study Area and listed below. Status codes are defined in Appendix E.

Least Bell's vireo (*Vireo bellii pusillus*)
Status: FE, SE
Distribution: Observed throughout much of southern California in the breeding season but in smaller numbers in foothills and mountains
Habitat(s): Mature riparian woodland
Status on site: An individual (single, unpaired) vireo was observed within suitable riparian habitat that occurs within the Study Area adjacent to the 18" pipeline to be sliplined (Figure 7c). Suitable riparian habitat does not occur elsewhere within the Study Area.

White-faced ibis (*Plegadis chihi*)
Status: --/WL
Distribution: Primarily observed in northwestern San Diego County but also observed in Riverside County in winter. No longer breeds regularly anywhere in California.
Habitat(s): Nests in freshwater marshes and forages in shallow waters and wet, grassy habitats
Status on site: A group of white-faced ibis were observed flying over the proposed advanced water treatment facility in the northwest of the project site (Figure 7a).

Sensitive Animal Species with Potential to Occur

Special status animal species that were not observed or otherwise detected, but determined to have some potential to occur on-site are included in Appendix D, *Special Status Animal Species Observed or with Potential to Occur*. The species are grouped into invertebrates and vertebrates (amphibians, reptiles, birds, and mammals) and alphabetized by scientific name. An explanation of status codes is included as Appendix E, *Explanation of Status Codes for Plant and Animal Species*.

None of the species analyzed have a high potential to occur within the project site based on geographic range, elevation range, and/or lack of suitable. Two special status species are known from the local area but are not expected to occur within the project site itself due to lack suitable habitat: burrowing owl (*Athene cunicularia*) and San Bernardino kangaroo rat (*Dipodomys merriami parvus*).

Burrowing owl was not detected during the 2020 protocol-level surveys and is presumed to be absent from the Study Area. A total of 32 potential burrows were recorded within the Study Area but sign of burrowing owl presence or use was not observed at any of the burrows. The burrowing owl survey report is included as Appendix F, *2020 Burrowing Owl Survey Report*.

San Bernardino kangaroo rat and sign of the species (e.g., potential burrows, tail drags, suitable substrate) was not detected during the 2020 HELIX surveys. No portions of the project site support suitable habitat for the species due to existing developments and land uses, in addition to previous and ongoing intensive soil disturbance as a result of agricultural practices and roadway maintenance. The southeastern portion of the project site occurs within areas mapped as USFWS critical habitat for the San Bernardino kangaroo rat. This portion of the project site comprises the disturbed and developed right-of-way associated with the Ramona Expressway where the 36" pipeline is proposed to be installed. HELIX inspected the project site at this location for the presence or absence of the Primary Constituent Elements (PCE; the physical and biological features that are essential to the conservation of the

subspecies) required for this species. Alluvial fans, washes, and associated floodplain habitat consisting of predominantly sandy soils with open sage scrub habitat do not occur within the project site. Additionally, suitable upland areas adjacent to alluvial fan habitat with sandy soils and open sage scrub that provide foraging or repopulation opportunities do not occur within the project site. This species prefers burrowing and foraging in soils deposited by alluvial processes, which are found further east of the Study Area along the San Jacinto River corridor. Habitat within the project site consists of disturbed, compacted soils mainly along road shoulders and lacks open sage scrub habitat which would exclude this species from occurring within the project site. While this species may occur along the San Jacinto River east of the project site, existing barriers to movement (i.e., levee, vertical banks, fences, developments) occur between the river and the project site that preclude this species from traveling onto the project site.

No other species have high potential to occur based on geographic range, elevation range, and/or lack of suitable habitat in the project site.

Nesting Birds

Trees and shrubs both within and adjacent to the project site could provide suitable nesting habitat for numerous bird species known to the region.

Raptor Foraging

Two raptor species were observed off-site during the general biological survey (red-tailed hawk [*Buteo jamaicensis*] and turkey vulture [*Cathartes aura*]) and several others have potential to forage in the project vicinity. The project site does not provide high-quality raptor habitat due to the active agricultural, residential, and transportation uses. Extensive raptor foraging habitat occurs off-site in the project vicinity within undeveloped fallow and dry-farmed lands in the San Jacinto Valley.

3.6.4 Jurisdictional Waters and Wetlands

In the context of this assessment, jurisdictional waters and wetlands include waters of the U.S., including wetlands regulated by the USACE pursuant to the CWA Section 404; waters of the State regulated by the RWQCB pursuant to Section 401 of the CWA and State Porter-Cologne Water Quality Control Act; and/or streambed and riparian habitat regulated by the CDFW pursuant to Sections 1600 *et seq*. of the CFG Code.

Potential waters of the U.S., waters of the State, and CDFW jurisdictional habitat are present within the Study Area (Figures 8a-8i, *Aquatic Resources Delineation*). The southern willow scrub habitat is considered potentially jurisdictional to the USACE, RWQCB, and/or CDFW. Several ephemeral concrete and earthen-lined drainages occur within the Study Area along the sides of paved roadways. Agricultural ditches, erosional features, and areas of open water that function as holding basins for EMWD are regularly maintained, lack vegetation, lack connectivity to other jurisdictional drainage courses, and would not be considered to be under the jurisdiction of USACE, RWQCB, and/or CDFW. The project has been specifically designed to avoid impacts to waters and riparian habitat under the jurisdiction of USACE, RWQCB, and CDFW.

Study Area

Potential RWQCB and CDFW Jurisdiction
Agricultural Ditch (Ephemeral)

12
4
6

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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Delineation

Figure 8a

Eastern Municipal Water District Purified Water Replenishment Project

Study Area
1' Width of Potential Jurisdictional Feature - Existing Culvert
Potential USACE and RWQCB Jurisdiction
Wetland Waters of the U.S./State
Potential RWQCB and CDFW Jurisdiction
Concrete Channel (Ephemeral)
Earthen Channel (Ephemeral)
Potential CDFW Jurisdiction
Lake Fringe/Wetland/Riparian
Lake/Open Water

SAN REMO AVE
SANDERSON AVE

0 300 Feet

Source: Aerial (NearMap, 2020)

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HELIX Environmental Planning

Aquatic Resources Delineation

Figure 8b



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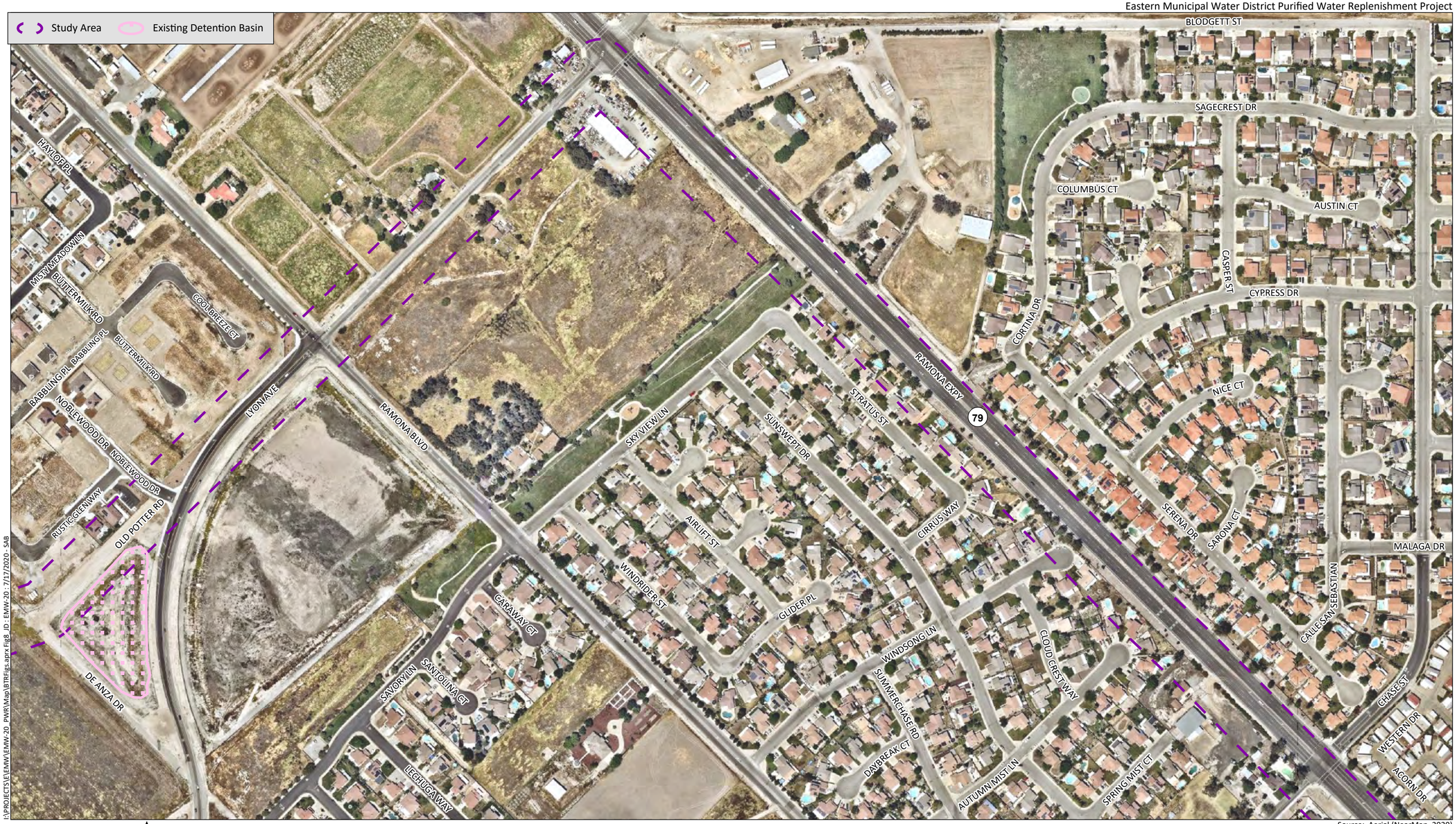
Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Delineation

Figure 8c



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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Delineation

Figure 8d

Study Area

CORONA ST
MALAGA DR
CALLE SAN SEBASTIAN
SERENA DR
CHASE ST
EVERGREEN DR
COUNTRY CLUB DR
SIERRA DR
WESTERN DR
HICKORY AVE
PROSPECT DR
HERITAGE RANCH RD
GROVE AVE
FRONTIER AVE
FERNWOOD DR
ELM DR
DEERWOOD DR
BOUNTY WAY
DISCOVERY DR
CHESTNUT DR
BIRCH DR
ACORN DR
IDYLLWILD DR
RAINTREE LN
79
COMMUNITY COLLEGE DR
VILLA CHAPARRAL RD
STATE ST
GOLD ST
SIERRA SENECA DR
BUSHY TAIL TRL
WESTERN VILLAGE DR
COUNTRY VILLAGE DR
ZION CT
TETON CT
GLACIER CT
YOSEMITE WAY
CUMBRE CT
RAMONA EXPY
EAGLE RD
CAMBRIDGE DR
LIVERPOOL LN
OXFORD LN
SUSSEX RD

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0 300 Feet

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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Delineation

Figure 8e

Study Area
Potential RWQCB and CDFW Jurisdiction
Streambed (Ephemeral)

WESTERN VILLAGE DR
CEDAR BREAKS WAY
YOSEMITE WAY
MONTROSE AVE
OLMSTED ST
BERGIN ST
SUNSET LN
SAN JACINTO AVE
RAMONA EXPY
ALESSANDRO AVE
VERNON AVE
SPINNAKER ST
4

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0 300 Feet

N

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Delineation

Figure 8f



HELIX Environmental Planning

Aquatic Resources Delineation

Figure 8g

Study Area
Erosion in Existing Maintenance Area Uplands (Non-Jurisdictional)
Potential RWQCB and CDFW Jurisdiction
Earthen Channel (Ephemeral)

LAKE PARK DR
RAMONA EXPY
MAIN ST
7TH ST
DONNA WAY
BOXELDER WAY
POPPY ST
PRAISE ST
TRUTH ST
OFFERING WAY
FAITHFUL WAY
REWARD ST
12
12
10
2

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0 300 Feet

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Delineation

Figure 8h

Study Area
Erosion in Existing Maintenance Area Uplands (Non-Jurisdictional)

BROOKMERE RD
BROOKMERE RD
SHANONDOAH RD
COURTLAND AVE
COURTLAND AVE
OAK KNOLL RD
OAK KNOLL RD
ST ALBAN RD
ST ALBAN RD
MOUNTAIN AVE
OLD MOUNTAIN AVE
ESPLANADE AVE
FAULKNER AVE
SORRENTO LN
NAPOLI WAY
GENOA LN
APPIAN WAY
CAPRI LN
VILLINES AVE
CORTE FLORADORA
CAMINO MIRANDA
AVENIDA ROSA MUNDI
AVENIDA ROUNDELAY
EVANS ST
GALILEO WAY
OSPREY ST
GONDOR WAY
RAMONA EXPY
7TH ST
10
2

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0 300 Feet

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Delineation

Figure 8i

3.6.5 Wildlife Corridor/Core Wildlife Areas

Wildlife corridors connect otherwise isolated pieces of habitat and allow movement or dispersal of plants and animals. Wildlife corridors can be local or regional in scale and may function in different ways depending on species and time of year. Wildlife corridors represent areas where wildlife movement is concentrated due to natural or manufactured constraints. Local corridors provide access to resources such as food, water, and shelter. Animals can use these corridors, such as hillsides and tributary drainages to main drainages, to travel among different habitats (i.e., riparian and upland habitats). Some animals require riparian habitat for breeding and upland habitat for burrowing. Regional corridors provide these functions and also link two or more large areas of open space. Regional corridors also provide avenues for wildlife dispersal, migration, and contact between otherwise distinct populations.

The project is not located within any linkages recognized by the South Coast Missing Linkages report (South Coast Wildlands 2008) or MSHCP. The Study Area does not by itself function as nor does it contribute to any local or regional wildlife corridors or linkages. It is also not contained within or connected to any local or regional core resource areas. The majority of the Study Area and project features occur within developed roadways/public right-of-way (ROW), active agricultural fields, and previously established pipeline easements. A strip of red willow association (southern willow scrub) occurs east of Sanderson Avenue and north of the San Jacinto Reservoir. This narrow strip of habitat is isolated and does not connect to the San Jacinto river corridor or other areas of intact undeveloped/undisturbed land. As such, the habitat would not function as a wildlife corridor or core wildlife area, although it may function as a stopover site for migrating bird species. The San Jacinto River corridor is located approximately 2.5 miles east of the strip of red willow association and over 700 feet east of the proposed 36” pipeline. The San Jacinto River corridor functions to facilitate regional wildlife movement. The San Jacinto River corridor is not connected to the project site due to a flood levee that occurs to the east of the Ramona Expressway, separating the project site from the San Jacinto River corridor.

4.0 REGULATORY FRAMEWORK

Biological resources in the project site are subject to regulatory review by federal, State, and local agencies. Under CEQA, impacts associated with a proposed project are assessed with regard to significance criteria determined by the CEQA Lead Agency (in this case, EMWD) pursuant to CEQA Guidelines. Biological resources-related laws and regulations that apply to the project include the Federal Endangered Species Act (FESA), Migratory Bird Treaty Act (MBTA), CWA, CEQA, California Endangered Species Act (CESA), and CFG Code.

4.1 FEDERAL

4.1.1 Federal Endangered Species Act

Administered by the USFWS, the federal ESA provides the legal framework for the listing and protection of species (and their habitats) that are identified as being endangered or threatened with extinction. Actions that jeopardize endangered or threatened species and the habitats upon which they rely are considered take under the ESA. Section 9(a) of the ESA defines take as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct.” “Harm” and

"harass" are further defined in federal regulations and case law to include actions that adversely impair or disrupt a listed species' behavioral patterns.

Sections 7 and 4(d) of the Federal ESA regulate actions that could jeopardize endangered or threatened species. Section 7, administered by the USFWS, describes a process of Federal interagency consultation for use when Federal actions may adversely affect listed species. A Section 7 Consultation (formal or informal) is required when there is a nexus between a listed species' use of a site and if the project is funded (wholly or in part) by the State Revolving Fund. A biological assessment is required for any major construction activity, if it may affect listed species. Take can be authorized via a letter of Biological Opinion, issued by the USFWS, for non-marine related listed species issues. The project would be funded in part by the State Resolving Fund. A Section 7 Consultation would be required if impacts to a federally listed species would occur.

Identified by the USFWS, critical habitat is defined as areas of land that are considered necessary for endangered or threatened species to recover. The ultimate goal is to restore healthy populations of listed species within their native habitat, so they can be removed from the list of threatened or endangered species. Once an area is designated as critical habitat pursuant to the federal ESA, all federal agencies must consult with the USFWS to ensure that any action they authorize, fund, or carry out is not likely to result in destruction or adverse modification of the critical habitat.

4.1.2 Migratory Bird Treaty Act

All migratory bird species that are native to the United States or its territories are protected under the federal MBTA, as amended under the Migratory Bird Treaty Reform Act of 2004 (FR Doc. 05-5127). The MBTA is generally protective of migratory birds but does not actually stipulate the type of protection required. In common practice, the MBTA is used to place restrictions on disturbance of active bird nests during the nesting season (generally February 1 to August 31). In addition, the USFWS commonly places restrictions on disturbances allowed near active raptor nests.

4.1.3 Clean Water Act and Rivers and Harbors Act

Federal wetland regulation (non-marine issues) is guided by the Rivers and Harbors Act of 1899 and the CWA. The Rivers and Harbors Act deals primarily with discharges into navigable waters, while the purpose of the CWA is to restore and maintain the chemical, physical, and biological integrity of all waters of the U.S. Permitting for projects filling waters of the U.S. is overseen by the USACE under Section 404 of the CWA. Most development projects are permitted using Individual Permit or Nationwide Permit instruments.

4.2 STATE REGULATIONS

4.2.1 California Environmental Quality Act

Primary environmental legislation in California is found in CEQA and its implementing guidelines (State CEQA Guidelines), which require that projects with potential adverse effects (i.e., impacts) on the environment undergo environmental review. Adverse environmental impacts are typically mitigated as a result of the environmental review process in accordance with existing laws and regulations.

4.2.2 California Endangered Species Act

The CESA established that it is state policy to conserve, protect, restore, and enhance state endangered species and their habitats. Under state law, plant and animal species may be formally designated rare, threatened, or endangered by official listing by the California Fish and Game Commission. The CESA authorizes that private entities may "take" plant or wildlife species listed as endangered or threatened under the FESA and CESA, pursuant to a federal Incidental Take Permit if the CDFW certifies that the incidental take is consistent with CESA (CFG Code Section 2080.1[a]). For state-only listed species, Section 2081 of CFG Code authorizes the CDFW to issue an Incidental Take Permit for state listed threatened and endangered species if specific criteria are met. The MSCP is a regional Natural Communities Conservation Plan that was granted take coverage under Section 2081 of the CESA.

4.2.3 Native Plant Protection Act

Sections 1900–1913 of the CFG Code (Native Plant Protection Act; NPPA) direct the CDFW to carry out the state legislature's intent to "…preserve, protect, and enhance endangered or rare native plants of this state." The NPPA gives the California Fish and Game Commission the power to designate native plants as "endangered" or "rare" and protect endangered and rare plants from take.

4.2.4 California Fish and Game Code

The CFG Code provides specific protection and listing for several types of biological resources. Section 1600 of CFG Code requires a Streambed Alteration Agreement (SAA) for any activity that would alter the flow, change, or use any material from the bed, channel, or bank of any perennial, intermittent, or ephemeral river, stream, and/or lake. Typical activities that require an SAA include excavation or fill placed within a channel, vegetation clearing, structures for diversion of water, installation of culverts and bridge supports, cofferdams for construction dewatering, and bank reinforcement. Notification is required prior to any such activities.

Pursuant to CFG Code Section 3503, it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto. Raptors and owls and their active nests are protected by CFG Code Section 3503.5, which states that it is unlawful to take, possess, or destroy any birds of prey or to take, possess, or destroy the nest or eggs of any such bird unless authorized by the CDFW. Section 3513 states that it is unlawful to take or possess any migratory non-game bird as designated in the MBTA. These regulations could require that construction activities (particularly vegetation removal or construction near nests) be reduced or eliminated during critical phases of the nesting cycle unless surveys by a qualified biologist demonstrate that nests, eggs, or nesting birds will not be disturbed, subject to approval by CDFW and/or USFWS.

4.3 LOCAL REGULATIONS

4.3.1 Multiple Species Habitat Conservation Plan

The MSHCP is a comprehensive multi-jurisdictional effort that includes multiple cities and unincorporated County lands in western Riverside County. Rather than addressing sensitive species on an individual basis, the MSHCP focuses on the conservation of 146 species, proposing a reserve system of approximately 500,000 acres and a mechanism to fund and implement the reserve system (Dudek 2003). Most importantly, the MSHCP allows participating entities to issue take permits for listed species

so that individual applicants need not seek their own permits from the USFWS and/or CDFW. The MSHCP was adopted on June 17, 2003, by the Riverside County Board of Supervisors. The Incidental Take Permit was issued by both the USFWS and CDFW on June 22, 2004.

The EMWD is not a signatory to the MSHCP, and as such is not subject to the requirements of the MSHCP. The EMWD has the option to obtain a take authorization for activities by receiving coverage through the Participating Special Entity (PSE) process. However, since implementation of the proposed project does not require a take of any MSHCP covered species, it is not anticipated that EMWD would pursue the PSE process under MSHCP.

5.0 SIGNIFICANCE OF PROJECT IMPACTS AND PROPOSED MITIGATION

This section describes potential direct and indirect impacts associated with the proposed project. Direct impacts immediately alter the affected biological resources such that those resources are eliminated temporarily or permanently. Direct impact areas for pipelines that will be installed via open cut trenching assume an impact width of 2.5 feet on either side of the centerline of the 36" pipeline alignment, and a width of 1.25 feet on either side of the centerline of the brine pipeline discharge option alignment to account for the trench, spoils, and equipment and materials staging areas. Indirect impacts consist of secondary effects of a project, including noise, decreased water quality (e.g., through sedimentation, urban contaminants, or fuel release), fugitive dust, colonization of non-native plant species, animal behavioral changes, and night lighting. The magnitude of an indirect impact can be the same as a direct impact; however, the effect usually takes a longer time to become apparent.

5.1 CRITERIA FOR DETERMINING IMPACT SIGNIFICANCE

The significance of impacts to biological resources present or those with potential to occur was determined based upon the sensitivity of the resource and the extent of the anticipated impacts. For certain highly sensitive resources (e.g., a federally listed species), any impact would be significant. Conversely, other resources that are of low sensitivity (e.g., species with a large, locally stable population in the County but declining elsewhere) could sustain some impact with a less than significant effect.

According to Appendix G of the CEQA Guidelines, project impacts to biological resources would be considered significant if they would:

(a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by CDFW or USFWS.

(b) Have a substantial adverse effect on any riparian habitat or sensitive natural community identified by local or regional plans, policies, regulations or by CDFW or USFWS.

(c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the CWA (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling hydrological interruption, or other means.

(d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

(e) Conflict with local policies or ordinances protecting biological resources, such a tree preservation policy or ordinance.

(f) Conflict with provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

5.2 ISSUE 1: SPECIAL-STATUS SPECIES

Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS?

5.2.1 Impact Analysis

5.2.1.1 Special Status Plant Species

Less than Significant with Mitigation. The project would have no impact on federal or State listed plant species (Figures 9a-9i, *Vegetation and Sensitive Resources/Land Use Impacts*). Two non-listed sensitive plant species were observed within the Study Area: smooth tarplant and chaparral sand-verbena. Chaparral sand-verbena and smooth tarplant are both a CRPR 1B.1 species. As a CRPR 1B.1 plant species, both smooth tarplant and chaparral sand-verbena have been assigned to a watch list for plants of reported limited distribution and moderate degree and immediacy of threat by the CNPS.

As currently proposed, potential impacts on smooth tarplant and chaparral sand-verbena would be limited to a very low number of individuals. Approximately eight individuals of smooth tarplant and three individuals of sand-verbena could be impacted during construction. The project would avoid approximately 43 individuals of smooth tarplant and 10 individuals of sand-verbena that were mapped within the Study Area. The project would impact one percent and avoid 99 percent of the total smooth tarplant individuals mapped within the study area. The project would impact 21 percent and avoid 79 percent of the total chaparral sand-verbena individuals within the Study Area. The impacted individuals are scattered in their local arrangement and are not part of a core population in the local or regional area. There are numerous documented occurrences of these species throughout the surrounding area indicating that the Study Area does not represent a geographically significant population. Given the low number of individuals that could be impacted and numerous recorded occurrences within the project vicinity (both within and outside of the Study Area along the adjacent San Jacinto River corridor, in particular), the potential impacts are considered to be less than significant and would not require mitigation. However, if project work limits are exceeded and additional inadvertent impacts occur, the impacts could increase in severity and represent a potential significant impact. Mitigation measures **BIO-1** and **BIO-2** would require the installation of temporary construction fencing and biological monitoring where work limits occur adjacent to known sensitive resources to be avoided, including smooth tarplant and verbena individuals. Implementation of mitigation measures **BIO-1** and **BIO-2** would ensure that additional impacts on sensitive resources that occur adjacent to project work limits are avoided.

5.2.1.2 Special Status Animal Species

Less than Significant with Mitigation. If unmitigated, the project could result in significant direct and/or indirect impacts on special status bird species during construction, as detailed further below. No impacts on the California State species of special concern, white faced ibis, would occur due to the project's avoidance of suitable habitat and the fact that the species is not known to nest in the region. While USFWS critical habitat for the San Bernardino kangaroo rat occurs along the San Jacinto River and extends onto the Ramona Expressway within the project site (Figure 5), the project site lacks the species' critical habitat PCE's and any suitable habitat for the species. No suitable habitat or areas supporting the species' critical habitat PCE's occur immediately adjacent to the project site. Existing barriers occur between the project site and suitable habitat associated with the San Jacinto River corridor that preclude the species from readily moving onto the project site. As proposed below to prevent inadvertent encroachment beyond work limits, installation of temporary construction fencing along project impact limits would further prevent the species from entering the project work areas during construction. Therefore, no direct or indirect impact on the species or its critical habitat are anticipated.

The project would require the removal of non-sensitive vegetation and other potential nesting habitat for common birds and raptors protected under the MBTA and CFG Code. If unmitigated, impacts on active nests belonging to bird species protected under the MBTA and CFG Code would be significant. Mitigation measure **BIO-3** would ensure that the appropriate pre-construction survey and avoidance measures are implemented prior to and during construction to avoid any impacts on nesting birds and raptors. With the implementation of mitigation measure **BIO-3**, no impacts would occur.

The off-site southern willow scrub habitat near San Jacinto Reservoir that occurs adjacent to the 18" pipeline to be slip-lined has the potential to support the federally and State listed endangered least Bell's vireo. An unpaired individual was incidentally observed during biological surveys within 500 feet of the proposed location for slip line and excavation activities. The impact footprint for the slip line and excavation activities has been specifically sited within disturbed uplands setback from the off-site southern willow scrub by at least 500 feet. Direct or indirect impacts to least Bell's vireo would be avoided. No impacts or take of least Bell's vireo or suitable habitat for the species are proposed; none are authorized without additional consultation with the USFWS and CDFW. Mitigation measures **BIO-1** and **BIO-2** would further require the installation of temporary construction fencing and biological monitoring where work limits occur adjacent to known sensitive resources. Implementation of these additional avoidance measures would ensure that no inadvertent encroachment or other impacts on sensitive biological resources occur during construction.

Portions of the project site adjacent to the proposed brine ponds and 36" pipeline support suitable habitat for burrowing owl. Although protocol-level surveys completed in 2020 for the project were negative, potential burrows were observed and this species has been documented along the San Jacinto River, east of the proposed 36" pipeline, in addition to an area approximately 1,400 feet east of proposed Advanced Water Treatment Facility. Therefore, although no owls were present in 2020, there remains the potential for owls to move into the potential impact area in the future and prior to construction. If unmitigated, direct and indirect impacts on the species would be considered significant. Mitigation measure **BIO-4** would ensure that the appropriate take avoidance measures are implemented prior to and during construction in accordance with the requirements published by CDFW. With the implementation of mitigation measure **BIO-4**, no impacts on burrowing owl would occur.

5.2.2 Mitigation Measures

The following mitigation measures would ensure that potential impacts on special status animal species are avoided by the project.

BIO-1 **Temporary Construction Fencing.** Prior to construction, to help ensure inadvertent impacts to environmentally sensitive areas outside of the approved impact footprint are avoided, temporary construction fencing, including silt fencing, as appropriate and where determined necessary by the SWPPP, shall be installed at the edges of the approved impact limits for the project. Temporary fencing shall be installed at all locations where the project components occur adjacent to resources depicted on Figure 9 (Figures 9a-9i, *Vegetation and Sensitive Resources/Land Use Impacts)* and Figure 10 (Figures 10a-10i, *Aquatic Resources Avoidance*) of the project's approved Biological Technical Report, in addition to locations at the Proposed Alessandro Blending Facility and the Proposed 36" Pipeline trenching along Ramona Expressway, from Vernon Avenue to Old Mountain Avenue. A qualified biologist shall be retained to monitor the installation of the temporary construction fencing wherever it would abut environmentally sensitive areas. Construction activities shall be restricted to areas within the approved impact limits at all times during construction.

BIO-2 **Biological Monitoring.** A qualified biologist will conduct a pre-construction environmental training session for construction personnel to inform them of the sensitive biological resources in the local area and the avoidance measures in place to remain in compliance. The biologist will periodically monitor construction activities where temporary construction fencing has been installed in accordance with mitigation measure **BIO-1**.

BIO-3 **Nesting Bird and Raptor Avoidance**: Trimming, grubbing, and clearing of vegetation shall be avoided during the general avian breeding season (January 15 to July 15 for raptors; February 15 to August 31 for other avian species) to the extent feasible. If trimming, grubbing, or clearing of vegetation is proposed to occur during the general avian breeding season, a pre-construction survey shall be conducted by a qualified biologist no more than seven days prior to vegetation clearing to determine if active bird nests are present in the affected areas. If there are no nesting birds (includes nest building or other breeding/nesting behavior) within this area, trimming, grubbing, and clearing of vegetation shall be allowed to proceed. If active bird nests are confirmed to be present during the pre-construction survey, a buffer zone will be established by the biologist. Construction activities shall avoid any active nests until a qualified biologist has verified that the young have fledged, or the nest has otherwise become inactive.

BIO-4 **Burrowing Owl Pre-Construction Take Avoidance Survey**: Prior to construction, EMWD shall retain a qualified biologist to conduct required pre-construction take avoidance surveys for the burrowing owl in accordance with the protocol described in the CDFW Staff Report on Burrowing Owl Mitigation (CDFW 2012). The initial take avoidance survey shall occur no less than 14 days prior to initiating ground disturbing activities, with a final survey conducted within 24 hours prior to initiating ground disturbing activities. If, after the initial take avoidance survey, no suitable burrowing owl habitat, including burrows, is present, then the second survey 24 hours prior to ground disturbance shall not be required. If no active burrowing owl burrows (nesting sites) are identified within the potential impact area of the project during the take avoidance surveys, then no additional action shall be required. If active burrowing owl burrows

are identified within the potential impact area, then no impacts shall occur to active burrowing owl nests or individuals and the following additional avoidance actions shall be required:

> The project shall avoid disturbing active burrowing owl burrows (nesting sites) and burrowing owl individuals. Buffers shall be established around occupied burrows in accordance with guidance provided in the CDFW Staff Report on Burrowing Owl Mitigation (CDFW 2012) based on the proposed level of disturbance. For low disturbance projects, initial setback distances for avoidance of active burrows shall be 200 meters from April 1 to October 15 and 50 meters from October 16 to March 31. Exceptions can be made to the avoidance distance for areas with natural (hills, trees) or artificial (buildings, walls) barriers in place. The final avoidance buffer shall be at the discretion of the biologist. If, after consideration of a reduced buffer, an adequate avoidance buffer cannot be provided between an occupied burrow and required ground-disturbing activities, then passive relocation activities during the non-breeding season (September 1 through January 31) may be authorized in consultation with CDFW, which would include preparation, approval, and implementation of a Burrowing Owl Exclusion Plan in accordance with protocol described in the CDFW Staff Report on Burrowing Owl Mitigation.

5.2.3 Conclusions

Project implementation could result in significant impacts to nesting birds and raptors, including special status avian species (i.e., burrowing owl), with the potential to nest within or adjacent to the project site. Implementation of mitigation measures **BIO-1** through **BIO-4** would ensure that potential impacts are avoided by the project.

5.3 ISSUE 2: RIPARIAN HABITAT AND SENSITIVE NATURAL COMMUNITIES

Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the CDFW or USFWS?

5.3.1 Impact Analysis

No Impact. The proposed project would result in impacts to field/pasture, disturbed habitat, and developed land, which are not considered sensitive natural communities (Figures 9a through 9i). Impacts to these vegetation communities are not considered significant and, therefore, do not require mitigation.

Project impacts for each proposed area are depicted on Figures 9a through 9i and summarized below within Table 3, *Vegetation Community/Land Use Impacts*.

Study Area
Temporary Construction Fence
Impact Areas
Proposed Advanced Water Treatment Facility
Proposed Brine Pipeline Discharge Option
Proposed Brine Management System
Sensitive Species Observations*
White-faced Ibis (*Plegadis chihi*)
Smooth Tarplant (*Centromadia pungens ssp. laevis*)
Vegetation and Land Cover Type
Developed
Disturbed Habitat
Field/Pasture
*Count of individuals is labeled if greater than 1.



Source: Aerial (NearMap, 2020)

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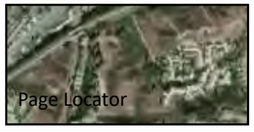

HELIX
Environmental Planning

Vegetation and Sensitive Resources/Land Use Impacts

Figure 9a

Study Area
Temporary Construction Fence
Impact Areas
Slipline Pit and Excavation Area
Proposed Brine Pipeline Discharge Option
Sensitive Species Observations*
Smooth Tarplant (*Centromadia pungens ssp. laevis*)
Smooth Tarplant (*Centromadia pungens ssp. laevis*)
Vegetation and Land Cover Type
Developed
Disturbed Habitat
Field/Pasture
Open Water
Southern Willow Scrub
*Count of individuals is labeled if greater than 1.

45
925
2
SANDERSON AVE
15
200
1600
80
5
3
20
15
2
15
1200
San Jacinto Valley Regional Water Reclamation Facility

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Source: Aerial (NearMap, 2020)

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HELIX Environmental Planning

Vegetation and Sensitive Resources/Land Use Impacts

Figure 9b

Study Area
Temporary Construction Fence
Impact Areas
Slipline Pit and Excavation Area
Sensitive Species Observations*
Least Bell's Vireo (*Vireo bellii pusillus*)
Smooth Tarplant (*Centromadia pungens ssp. laevis*)
Smooth Tarplant (*Centromadia pungens ssp. laevis*)
Vegetation and Land Cover Type
Developed
Disturbed Habitat
Field/Pasture
Open Water
Southern Willow Scrub
*Count of individuals is labeled if greater than 1.



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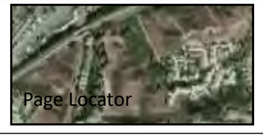

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Vegetation and Sensitive Resources/Land Use Impacts

Figure 9c



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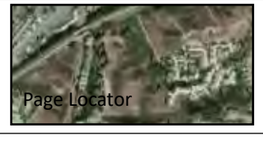

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Vegetation and Sensitive Resources/Land Use Impacts

Figure 9d



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HELIX Environmental Planning

Vegetation and Sensitive Resources/Land Use Impacts

Figure 9e



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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Vegetation and Sensitive Resources/Land Use Impacts

Figure 9f



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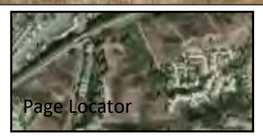

HELIX Environmental Planning

Vegetation and Sensitive Resources/Land Use Impacts

Figure 9g

Study Area

Temporary Construction Fence

Impact Areas

Proposed 36" Pipeline

Sensitive Species Observations*

Chaparral Sand-verbena(*Abronia villosa var. aurita*)

Smooth Tarplant (*Centromadia pungens ssp. laevis*)

Vegetation and Land Cover Type

Developed

Disturbed Habitat

Riversidian Sage Scrub

*Count of individuals is labeled if greater than 1.

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RAMONA EXPY

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HELIX Environmental Planning

Vegetation and Sensitive Resources/Land Use Impacts

Figure 9h

Study Area
Temporary Construction Fence
Impact Areas
Proposed 36" Pipeline
Sensitive Species Observations*
Chaparral Sand-verbena(*Abronia villosa var. aurita*)
Smooth Tarplant (*Centromadia pungens ssp. laevis*)
Vegetation and Land Cover Type
Developed
Disturbed Habitat
Field/Pasture
*Count of individuals is labeled if greater than 1.



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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Vegetation and Sensitive Resources/Land Use Impacts

Figure 9i

Study Area
Temporary Construction Fence
Impact Areas
Proposed Advanced Water Treatment Facility
Proposed Brine Pipeline Discharge Option
Proposed Brine Management System
Potential RWQCB and CDFW Jurisdiction
Agricultural Ditch (Ephemeral)

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4
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Source: Aerial (NearMap, 2020)

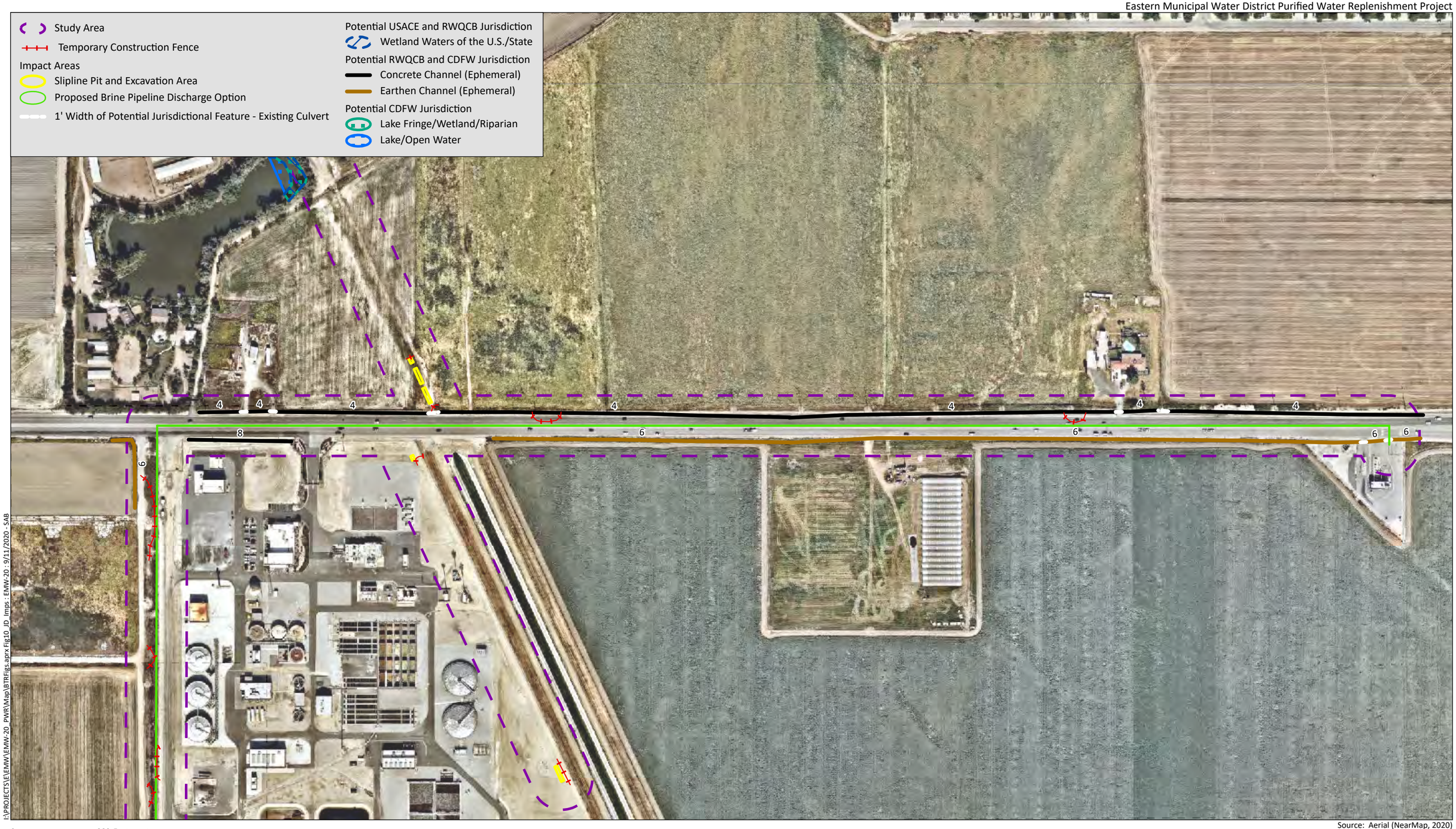
HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 10a

Study Area
Temporary Construction Fence
Impact Areas
Slipline Pit and Excavation Area
Proposed Brine Pipeline Discharge Option
1' Width of Potential Jurisdictional Feature - Existing Culvert

Potential USACE and RWQCB Jurisdiction
Wetland Waters of the U.S./State
Potential RWQCB and CDFW Jurisdiction
Concrete Channel (Ephemeral)
Earthen Channel (Ephemeral)
Potential CDFW Jurisdiction
Lake Fringe/Wetland/Riparian
Lake/Open Water



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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 10b



Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 10c



Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 10d

Study Area
Temporary Construction Fence
Impact Areas
Slipline Pit and Excavation Area



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Source: Aerial (NearMap, 2020)

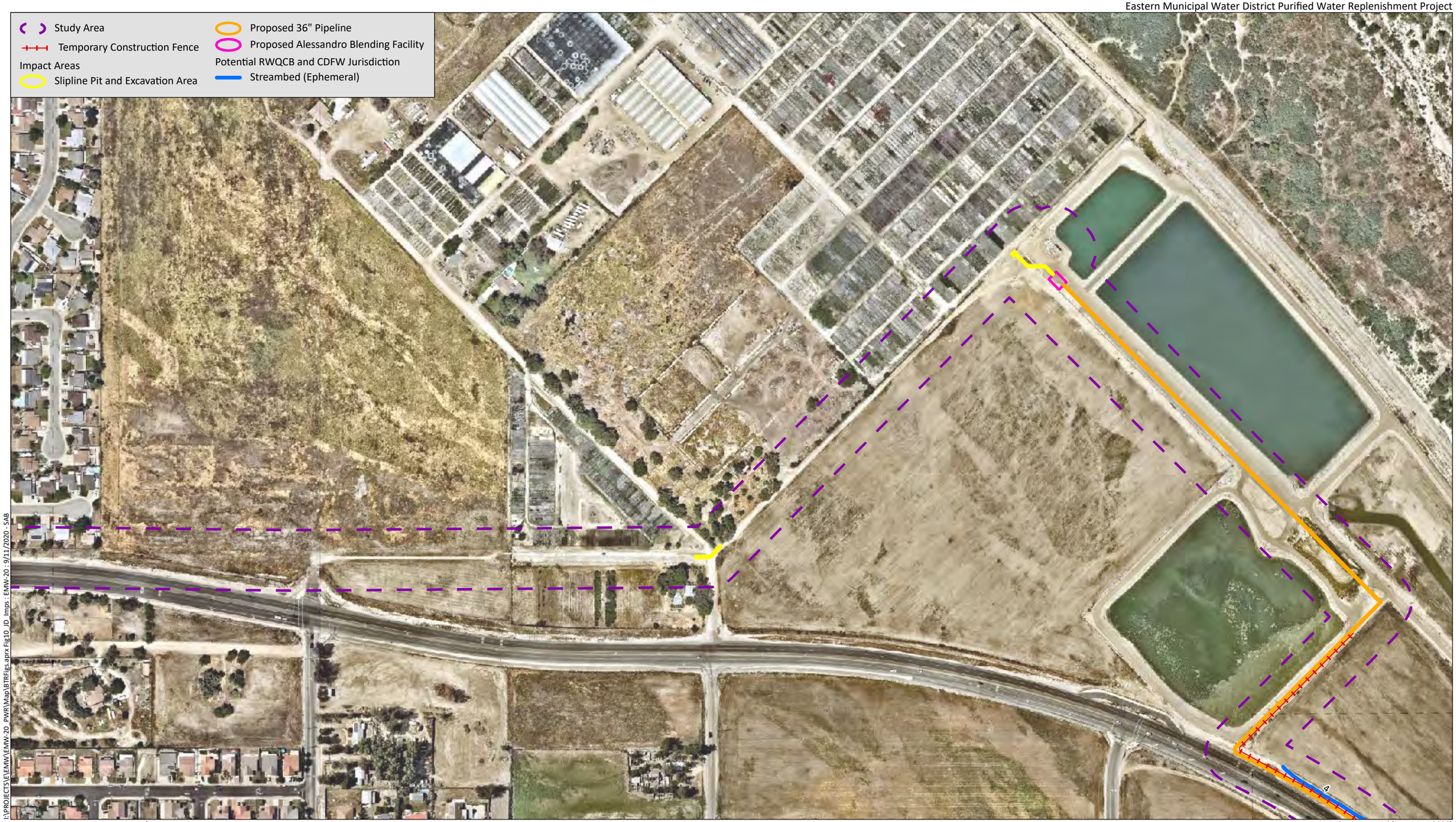
HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 10e

Eastern Municipal Water District Purified Water Replenishment Project

Study Area
Temporary Construction Fence
Impact Areas
Slipline Pit and Excavation Area
Proposed 36" Pipeline
Proposed Alessandro Blending Facility
Potential RWQCB and CDFW Jurisdiction
Streambed (Ephemeral)



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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 10f



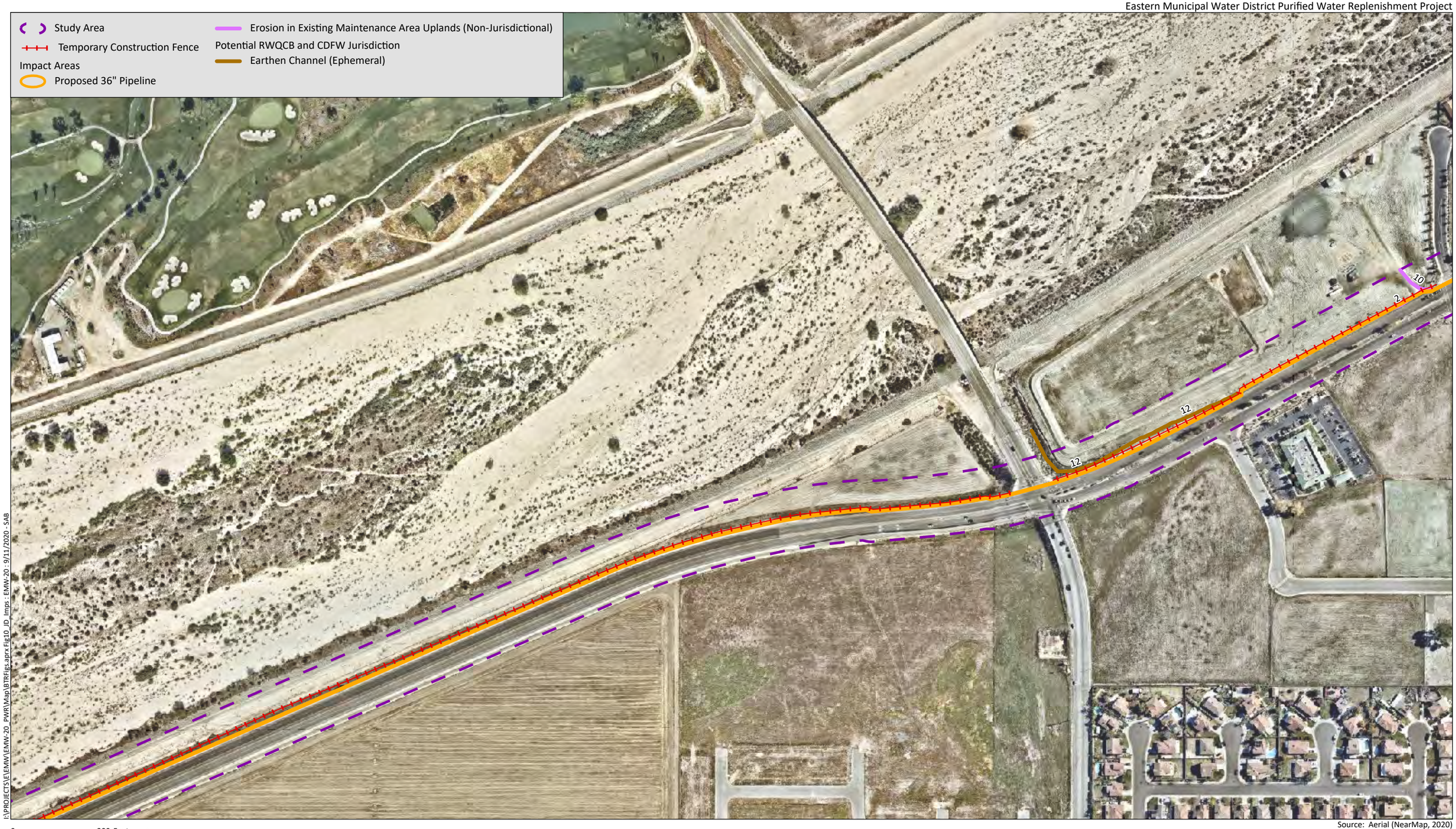
Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 10g

Study Area
Temporary Construction Fence
Impact Areas
Proposed 36" Pipeline
Erosion in Existing Maintenance Area Uplands (Non-Jurisdictional)
Potential RWQCB and CDFW Jurisdiction
Earthen Channel (Ephemeral)



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Source: Aerial (NearMap, 2020)

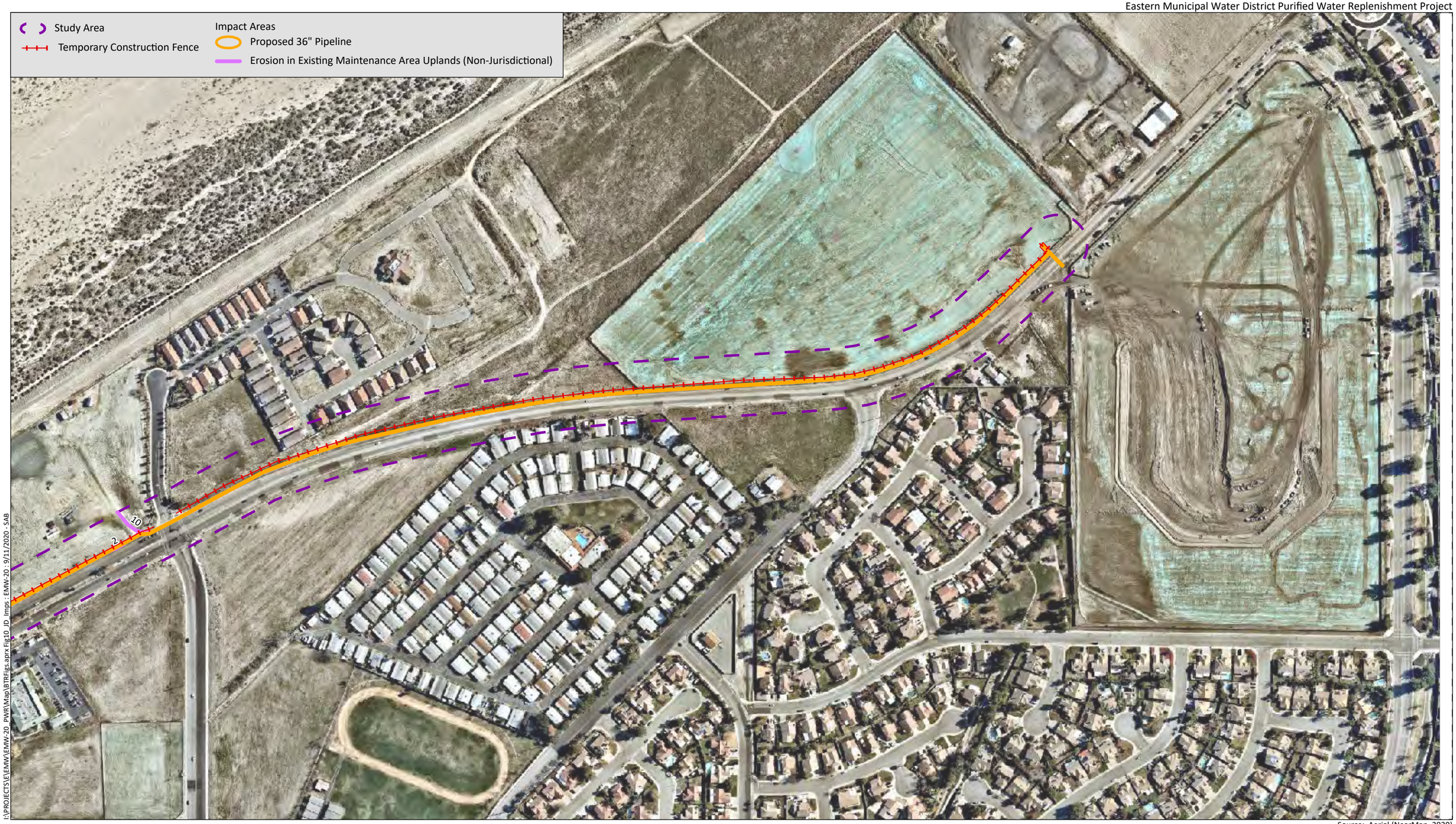
HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 10h

Study Area
Temporary Construction Fence

Impact Areas
Proposed 36" Pipeline
Erosion in Existing Maintenance Area Uplands (Non-Jurisdictional)



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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Aquatic Resources Avoidance

Figure 10i

Table 3
VEGETATION COMMUNITY/LAND USE IMPACTS

Vegetation Community	Rarity[1]	Impacts by Project Area (acres)[2]							
		Excavation Area	36" Pipeline	Advanced Water Treatment Facility	Alessandro Blending Facility	Brine Pipeline Discharge Option	Brine Pond	Slipline Connector Segment	TOTAL
Southern willow scrub	--	--	--	--	--	--	--	--	**--**
Open Water	--	--	--	--	--	--	--	--	**--**
Riversidian sage scrub	S5	--	<0.1 (0.0005)	--	--	--	--	--	**<0.1 (0.0005)**
Field/pasture	--	<0.1 (0.05)	<0.1 (0.02)	3.2	--	<0.1 (0.0003)	27.8	--	**31.1**
Disturbed	--	<0.1 (0.04)	0.6	--	--	--	1.3	--	**1.9**
Developed	--	0.1	1.1	1.4	<0.1 (0.04)	0.5	--	<0.1 (0.02)	**3.2**
	Subtotal:	**0.2**	**1.7**	**4.6**	**<0.1 (0.04)**	**0.5**	**29.1**	**<0.1 (0.02)**	**--**
	TOTAL:								**36.2**

[1] Rarity Ranking from CDFW's Natural Communities List (2018c).
[2] Acreages rounded to the nearest 0.1 acre for uplands and 0.01 acre for wetlands; total reflects rounding.

5.3.2 Mitigation Measures

No mitigation required.

5.3.3 Conclusion

The project would not result in impacts to sensitive natural communities.

5.4 ISSUE 3: JURISDICTIONAL WETLANDS AND WATERWAYS

Would the project have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the federal CWA (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

5.4.1 Impact Analysis

Less than Significant with Mitigation. The project has been specifically designed to avoid impacts to federally protected wetlands and other potential jurisdictional aquatic resources by restricting project components to occur entirely within upland areas and by implementing trenchless construction methods, including jack-and-bore for the 18" pipeline to be sliplined (Figures 10a-10i). The launching and receiving pit locations will be located within upland areas. Jack and bore technologies are different from horizontal directional drilling in that they do not involve the use of a directional drill auger or fluid that could inadvertently release during operation and cause a potential frac-out event. The proposed jack-and-bore activities would have no potential to cause an inadvertent drill fluid release or frac-out and no associated impacts are anticipated. Therefore, no direct impacts on federal protected wetlands or other potential jurisdictional aquatic resources would occur.

Potential indirect impacts on jurisdictional resources would be prevented during construction through successful implementation of standard BMPs as part of the project's Storm Water Pollution Prevention Plan (SWPPP). Implementation of a SWPPP and associated BMPs are a regulatory requirement for the proposed project. Specific BMPs may include but would not necessarily be limited to: maintaining the project work areas free of trash and debris; employing appropriate standard spill prevention practices and clean-up materials; installing and maintaining sediment and erosion control measures; maintaining effective control of fugitive dust; and properly storing, handling, and disposing of toxins and pollutants, including waste materials.

In the unexpected event that temporary construction fencing and other BMPs aren't properly implemented during construction, materials, equipment, and personnel could inadvertently encroach into potential jurisdictional aquatic resources that are planned to be avoided. If unmitigated, this would represent a potential significant impact. Mitigation measures **BIO-1** and **BIO-2** would ensure that no impacts on adjacent resources occur.

5.4.2 Mitigation Measures

Implementation of required BMPs in combination with Mitigation Measures **BIO-1** and **BIO-2**, which requires installation of temporary construction fencing and biological monitoring, would ensure that construction activities are contained within the proposed work limits and that potentially significant direct and indirect impacts on jurisdictional resources are avoided.

5.4.3 Conclusion

The proposed project would avoid direct impacts to jurisdictional resources present within the project site. Implementation of the Mitigation Measure **BIO-1** and **BIO-2** would ensure that construction activities remain within the approved limits of work and avoid unauthorized direct and indirect impacts to jurisdictional resources.

5.5 ISSUE 4: WILDLIFE MOVEMENT AND NURSERY SITES

Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory corridors, or impede the use of native wildlife nursery sites?

5.5.1 Impact Analysis

Less than Significant. The project site does not by itself represent, nor does it contribute to, any known wildlife corridors, linkages, or wildlife nursery sites. The project has been specifically sited within existing disturbed and developed land, including primarily active agricultural land and public roadway right-of-way area. Many of the project components are underground utilities.

The project does include several above-ground elements in the form of small treatment facilities and brine ponds, but these features would not act as major impediments to wildlife movement, including access to nursery sites, foraging habitat, breeding habitat, water sources, or other areas necessary for their life history. Higher quality habitat that functions as a wildlife movement corridor occurs east of the project site along the San Jacinto River. The project avoids and is set back from the San Jacinto River corridor, with the closest project elements being sited within the Ramona Expressway right-of-way and

on existing developed land, all of which are separated from the River corridor by existing barriers (e.g., fences, levee, vertical walls). As the project developments have been specifically sited within existing disturbed and developed areas, the potential impact on wildlife movement and nursery sites would be less than significant and no additional mitigation is required.

5.5.2 Mitigation Measures

No mitigation is required.

5.5.3 Conclusion

Project implementation would not result in significant impacts on wildlife movement and nursery sites. No impact would occur, and mitigation is not required.

5.6 ISSUE 5: LOCAL POLICIES AND ORDINANCES

Would the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

5.6.1 Impact Analysis

No Impact. No local policies or ordinances pertaining to biological resources are applicable to the project. The project is an essential public utility that would primarily occur within the existing disturbed areas and public road rights-of-way. No impact or conflict would occur.

5.6.2 Mitigation Measures

No mitigation is required.

5.6.3 Conclusion

The project would not conflict with local policies or ordinances protecting biology resources.

5.7 ISSUE 6: ADOPTED CONSERVATION PLANS

Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

5.7.1 Issue 6 Impact Analysis

No Impact. The project is located within the boundaries of the adopted Western Riverside MSHCP; however, EMWD is not a signatory to the MSHCP, and as such is not subject to the requirements of the MSHCP. The project is not located within the Stephen's kangaroo rat Habitat Conservation Plan (HCP) or any core areas for the HCP, and focused surveys are not required under the HCP for activities occurring on lands outside of core reserves. No other adopted conservation plans are applicable to the project. Therefore, no impact on any adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved habitat conservation plan would occur.

A brief consistency analysis is provided here to demonstrate how the project would not conflict with the conservation goals and objectives of the MSHCP. The site occurs within portions of Criteria Cells 2775, 2878, 2893, 3098, 3024, and 3312, but is situated primarily within disturbed lands, field/pastures, and existing developed lands. Much effort went into the project design to specifically site the proposed facilities within disturbed and developed areas. Conservation in the local area is generally targeted further to the northeast and east within the alluvial system of the San Jacinto River and contiguous uplands connecting the River with the San Jacinto Mountains. Perhaps the most important conservation target for the local area is that for the San Bernardino kangaroo rat, which critical habitat (Unit 3) has been designated around the reach of the San Jacinto River that occurs east of the project. A thorough assessment was completed in 2020 to confirm the presence or absence of suitable habitat as well as any PCE's identified for its critical habitat. Consistent with the MSHCP survey requirements, surveys for narrow endemic and criteria area plant species were completed as part of the year 2020 rare plant survey effort for the project. Additional, protocol-level surveys for burrowing owl were completed during the peak 2020 breeding season for the species. Last, an assessment and delineation of riparian/riverine areas and vernal pools was completed in 2020 consistent with MSHCP requirements.

The following was determined upon completion of the year 2020 biological surveys completed for the project: no permanent loss of habitat targeted under the MSHCP would result from the project; no suitable habitat or PCE's for San Bernardino kangaroo rat occurs within the project impact area; no burrowing owl occur within the project impact area; and no riparian/riverine areas or vernal pools occur within the project impact area. Where these resources occur or have potential to occur adjacent to the project impact areas, the project will implement site protection and other BMPs in accordance with the required SWPPP and mitigation measure **BIO-1**. A qualified biologist would be required to monitor installation of site protection and periodically monitor activities in accordance with mitigation measure **BIO-2**. These measures would help to ensure that off-site sensitive resources are protected from construction activities and that the activities are monitored by a qualified biologist. In addition, the project would implement breeding season avoidance and pre-construction take avoidance surveys for nesting birds and raptors, including burrowing owl, under mitigation measures **BIO-3** and **BIO-4** to ensure that no impacts occur to individuals consistent with MSHCP requirements.

The year 2020 biological surveys did confirm the presence of two rare plants (smooth tarplant and chaparral sand-verbena), one of which (smooth tarplant) requires additional avoidance procedures under the MSHCP. The MSHCP states that 90 percent of those portions of the property that provide for long-term conservation value for the identified species shall be avoided until it is demonstrated that conservation goals for the particular species are met. The smooth tarplant found within and immediately adjacent to the project impact area include low numbers of scattered individuals, primarily situated within roadway right-of-way areas. The project would avoid the large majority of the smooth tarplant individuals found during the 2020 assessment and will avoid more than 90 percent of those portions of the right-of-way areas and adjoining properties that could provide for long-term conservation value toward the species. Therefore, the project would be consistent with MHSCP requirements for smooth tarplant.

5.7.2 Mitigation Measures

Compliance with existing regulations and implementation of Mitigation Measures **BIO-1** through **BIO-4** would ensure project consistency with the MSHCP.

5.7.3 Conclusion

The project could result in potential significant impacts to sensitive biological resources addressed under the MSHCP; however, compliance with existing regulations and implementation of measures **BIO-1** through **BIO-4** would help ensure that impacts are avoided and the project activities are not in conflict with the MHSCP.

6.0 FEDERAL CONFORMANCE ANALYSIS FOR BIOLOGICAL RESOURCES ISSUES

6.1 ISSUE 1: FEDERAL ENDANGERED SPECIES ACT, SECTION 7

Does the project involve any direct effects from construction activities, or indirect effects such as growth inducement that may affect federally listed threatened or endangered species or their critical habitat that are known, or have a potential, to occur on site, in the surrounding area, or in the service area?

The project site is situated mainly on field/pastures, disturbed land, and developed land and located outside any recognized wildlife corridor or linkage. While the southeastern portion of the project site along the 36" pipeline occurs in an area designated by the USFWS as Critical Habitat for the federally-listed species San Bernardino kangaroo rat, the project site does not contain the PCE or suitable habitat for this species such as alluvial fan sage scrub with gravelly or sandy soils. The project action area is restricted to the disturbed and developed road right-of-way for Ramona Expressway where is overlaps with critical habitat. Therefore, the proposed action would have no effect on Critical Habitat.

The project has been sited to occur over 500 feet from suitable habitat for the federally-listed least Bell's vireo. No impacts or take of least Bell's vireo or suitable habitat for the species are proposed; none are authorized without additional consultation with the USFWS and CDFW.

Further discussion is provided below regarding potential effects of the proposed action on federally-listed species.

Federally-Listed Plant Species. No federally-listed endangered (FE), threatened (FT), or candidate (FC) plant species are known or have the potential to occur in the vicinity of the project site. Therefore, the project would have no effect on federally-listed plant species.

Federally-Listed Animal Species. In total, one FE animal species and one FT animal species is known to occur in the vicinity of the project site (Appendix D):

- Least Bell's vireo; FT
- San Bernardino kangaroo rat; FE

As discussed above, the project would have no effect on the San Bernardino kangaroo rat, suitable habitat for the species, and critical habitat for the species. The project would have no effect on the least Bell's vireo or suitable habitat for the species. Although no effect is anticipated, mitigation measures **BIO-1** and **BIO-2** include site protection and biological monitoring measures that would further ensure that no effect on these species occurs.

6.1.1 Mitigation Measures

With the implementation of Mitigation Measures **BIO-1** and **BIO-02**, the proposed action would have no effect on federally listed species or their critical habitat, and the project would be in conformance with the ESA.

6.1.2 Conclusion

If unmitigated, project implementation may affect federally listed species and critical habitat; however, implementation of mitigation measures **BIO-1** and **BIO-2** would ensure that the project has no effect.

6.2 ISSUE 2: MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT, ESSENTIAL FISH HABITAT

Does the project involve any direct effects from construction activities, or indirect effects such as growth inducement that may adversely affect essential fish habitat?

The project would be constructed within upland areas that lack marine resources and Essential Fish Habitat regulated under the Magnuson-Stevens Fishery Conservation and Management Act. No Essential Fish Habitat occurs in the immediate vicinity of the project site. Therefore, the project would have no effect on Essential Fish Habitat and would be in conformance with the Magnuson-Stevens Fishery Conservation and Management Act.

6.2.1 Mitigation Measures

No mitigation is required.

6.2.2 Conclusion

The project would have no direct or indirect effect on essential fish habitat.

6.3 ISSUE 3: COASTAL ZONE MANAGEMENT ACT

Is any portion of the project site located within the coastal zone?

The project site is not located within the Coastal Zone. The western portion of the project site is located approximately 45.0 miles from the nearest Coastal Zone boundary. No coastal habitat occurs in the immediate vicinity of the project site. Therefore, the project would have no effect on any areas designated as Coastal Zone and would be in conformance with the Coastal Zone Management Act.

6.3.1 Mitigation Measures

No mitigation is required.

6.3.2 Conclusion

The project would have no direct or indirect effect on areas designated as Coastal Zone.

6.4 ISSUE 4: MIGRATORY BIRD TREATY ACT

Will the project affect protected migratory birds that are known, or have a potential, to occur on site, in the surrounding area, or in the service area?

Construction of the proposed project may result in the removal or trimming of trees and other vegetation during the general bird nesting season (January 15 through September 15) and, therefore, would have the potential to adversely affect nesting birds protected under the MBTA. Implementation of mitigation measure **BIO-3** would ensure the appropriate pre-construction surveys and avoidance measures are completed to prevent adverse effects on nesting birds. With the implementation of mitigation measure **BIO-3**, the project would result in no effect on migratory birds and would be in conformance with the MBTA.

6.5 ISSUE 5: PROTECTION OF WETLANDS

Does any portion of the project boundaries contain areas that should be evaluated for wetland delineation or require a permit from the United States Army Corps of Engineers?

The entire project would be constructed entirely within upland areas that do not support wetlands or other waters of the U.S. subject to the regulatory jurisdiction of the USACE; none occur within the project boundaries. Therefore, the project would have no effect on wetlands and would not require a permit from the USACE.

6.6 ISSUE 6: WILD AND SCENIC RIVER ACT

Is any portion of the project located within a wild and scenic river?

None of the proposed project components are planned on or in the immediate vicinity of areas designated as Wild and Scenic River. Therefore, the proposed project would have no effect on any areas designated as Wild and Scenic River and would be in conformance with the Wild and Scenic Rivers Act.

7.0 CERTIFICATION/QUALIFICATION

The following individuals contributed to the fieldwork and/or preparation of this report.

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Appendix A

Plant Species Observed

Appendix A
Plant Species Observed

Family	Scientific Name*,†	Common Name	Habitat[1]
Dicots			
Amaranthaceae	*Amaranthus blitoides*	prostrate pigweed	DH
	*Salsola tragus**	Russian thistle	Dev
Apiaceae	*Conium maculatum**	poison hemlock	DH
Arecaceae	*Phoenix dactylon**	date palm	DH
	*Washingtonia robusta**	Mexican fan palm	SWS
Asteraceae	*Amblyopappus pusillus*	pineapple weed	DH, SWS
	Ambrosia psilostachya	western ragweed	DH
	Baccharis Salicifolia	mulefat	SWS
	*Centaurea benedicta**	blessed thistle	DH
	*Centaurea melitensis**	star thistle	DH
	Centromadia pungens ssp. laevis †	smooth tarplant	SWS
	Encelia farinosa	brittlebush	DH
	Erigeron canadensis	horseweed	DH
	*Erigeron sumatrensis**	tropical horseweed	DH
	Helianthus annuus	common sunflower	DH
	Heterotheca grandiflora	telegraph weed	DH
	*Lactuca serriola**	prickly lettuce	DH
	Lasthenia californica	goldfields	DH
	*Oncosiphon pilulifer**	stinket	DH
	Rafinesquia californica	California chicory	DH
	*Senecio vulgaris**	groundsel	DH
	*Sonchua oleraceus**	common sowthistle	DH
	Stephanomeria virgata	rod wirelettuce	DH
	Xanthium strumarium	rough cockleburr	DH
Boraginaceae	*Amsinckia menziesii*	fiddleneck	DH
	Cryptantha sp.	popcorn flower	DH
	Emmenanthe penduliflora	whispering bells	DH
	Eriodictyon crassifolium	felt-leaved yerba santa	RSS
	Heliotropium curassavicum	salt heliotrope	DH
	Pectocarya sp.	combseed	DH
	Phacelia distans	common phacelia	DH
Brassicaceae	*Brassica tournefortii**	Asian mustard	DH
	*Hirschfeldia incana **	short-podded mustard	DH
	*Lepidium latifolium**	perennial pepperweed	SWS
	*Sisymbrium irio**	London rocket	DH
Chenopodiaceae	*Bassia hyssopifolia**	five horn bassia	DH
	*Chenopodium album**	lambs quarters	DH
Euphorbiaceae	*Croton californicus*	California croton	DH
Fabaceae	*Acmispon glaber*	deerweed	DH
	Acmispon strigosus	stiff-haired lotus	DH
	Lupinus succulentus	arroyo lupine	DH
	*Medicago polymorpha**	California burclover	DH
	*Medicago sativa**	alfalfa	FP
	Melilotus indicus	sweetclover	DH
	*Robinia pseudoacacia**	black locust	DH
	*Trifolium repens**	white clover	DH

Appendix A (cont.)
Plant Species Observed

Family	Scientific Name*,†	Common Name	Habitat[1]
Dicots (cont.)			
Geraniaceae	*Erodium cicutarium**	red stem filaree	DH
	*Erodium botrys**	longbeak stork's bill	DH
Malvaceae	*Malva pariflora**	cheeseweed	DH
Myrtaceae	*Eucalyptus globulus**	blue gum eucalyptus tree	SWS, DH
Nyctaginaceae	*Abronia villosa* var. *aurita*	desert sand verbena	DH
Oleaceae	*Olea europaea**	olive	DH
Onagraceae	*Camissoniopsis bistorta*	California suncup	DH
Orobanchaceae	*Castilleja exserta*	owl's clover	DH
Platanaceae	*Platanus racemosa*	Western sycamore	SWS
Pinaceae	*Pinus halepensis**	aleppo pine	DH
Polemoniaceae	*Gilia* sp.	gilia	DH
Polygonaceae	*Eriogonum fasciculatum*	California buckwheat	RSS
	Eriogonum gracile	slender woolly buckwheat	DH
	*Polygonum aviculare**	common knotgrass	DH
	*Rumex crispus**	curly dock	SWS
Portulacaceae	*Portulaca halimoides*	purslane	DH
Salicaceae	*Populus fremontii*	Fremont's cottonwood	SWS
	Salix laevigata	red willow	SWS
Solanaceae	*Datura wrightii*	jimson weed	DH
	*Nicotina glauca**	tree tobacco	SWS
Tamaricaceae	*Tamarix ramosissima**	salt cedar	SWS
Urticaceae	*Urtica urens**	annual stinging nettle	DH
Verbenaceae	*Lantana camara**	wild sage	DH
Zygophyllaceae	*Larrea tridentata*	creosote bush	DH
	*Tribulus terrestris**	puncture vine	DH
Monocots			
Poaceae	*Avena barbata**	wild oat	DH
	*Avena fatua**	wild oat	DH
	*Bromus catharticus**	Schrader's bromegrass	DH
	*Bromus diandrus**	ripgut brome	DH
	*Bromus madritensis rubens**	foxtail chess	DH
	*Bromus tectorum**	cheatgrass	DH
	*Cynodon dactylon**	Bermuda grass	DH
	*Festuca myuros**	rattail fescue	DH
	*Festuca perennis**	Italian rye-grass	DH
	*Hordeum murinum**	false barley	DH
	*Hordeum vulgare**	barley	DH
	Poa secunda	pine bluegrass	DH
	*Phalaris minor**	little seed canary grass	DH
	*Polypogon monspeliensis**	annual beard grass	SWS
	*Schismus barbatus**	Mediterranean grass	DH

* Non-native

† Sensitive

1 RSS=Riversidian sage scrub; DH=Disturbed habitat; SWS=Southern willow scrub; Dev=developed; FP=Field/Pasture

Appendix B

Animal Species Observed or Detected

Appendix B
Animal Species Observed or Detected

Taxon		Scientific Name†	Common Name
Order	**Family**		
INVERTEBRATES			
Lepidoptera	Pieridae	*Pieris rapae*	white cabbage butterfly
VERTEBRATES			
Amphibians and Reptiles			
Squamata	Phrynosomatidae	*Sceloporus occidentalis*	fence lizard
		Uta stansburiana	side-blotched lizard
Anura	Hylidae	*Pseudacris regilla*	pacific tree frog
Birds			
Accipitriformes	Accipitridae	*Buteo jamaicensis*	red-tailed hawk
		Buteo lineatus	red-shouldered hawk
Anseriformes	Anatidae	*Anas platyrhynchos*	mallard
		Aix sponsa	wood duck
Apodiformes	Trochilidae	*Selasphorus sasin*	Allen's hummingbird
Cathartiformes	Cathartidae	*Cathartes aura*	turkey vulture
Charadriiformes	Recurvirostridae	*Himantopus mexicanus*	black-necked stilt
	Charadriidae	*Charadrius vociferus*	killdeer
Columbiformes	Columbidae	*Zenaida macroura*	mourning dove
Falconiformes	Falconidae	*Falco sparverius*	American kestrel
Gruiformes	Rallidae	*Fulica Americana*	American coot
Passeriformes	Aegithalidae	*Psaltriparus minimus*	American bushtit
	Corvidae	*Corvus brachyrhynchos*	American crow
		Corvus corax	common raven
	Fringillidae	*Amorphous mexicanus*	house finch
		Spinus psaltria	lesser goldfinch
	Hirundinidae	*Hirundo rustica*	barn swallow
		Petrochelidon sp.	cliff swallow
		Stelgidopteryx serripennis	northern rough-winged swallow
	Icteridae	*Agelaius phoeniceus*	redwing blackbird
		Icterus cucullatus	hooded oriole
		Quiscalus quiscula	common grackle
		Sturnella neglecta	western meadowlark
	Mimidae	*Mimus polyglottos*	northern mockingbird
	Parulidae	*Setophaga coronata*	yellow-rumped warbler
	Passerellidae	*Melozone crissalis*	California towhee
		Melospiza melodia	song sparrow
	Sturnidae	*Sturnus vulgaris*	European starling
	Troglodytidae	*Thryomanes bewickii*	Bewick's wren

Appendix B (cont.)
Animal Species Observed or Detected

Taxon		Scientific Name†	Common Name
Order	**Family**		
Birds (cont.)			
Passeriformes (cont.)	Tyrannidae	*Sayornis nigricans*	black phoebe
		Sayornis saya	Say's phoebe
		Tyrannus vociferans	Cassin's kingbird
	Vireonidae	*Vireo bellii pusillus* †	least Bell's vireo
Pelecaniformes	Ardeidae	*Bubulcus ibis*	cattle egret
	Threskiornithidae	*Plegadis chihi* †	white-faced ibis
Piciformes	Picidae	*Dryobates nuttallii*	Nuttall's woodpecker
Piciformes	Picidae	*Melanerpes formicivorus*	acorn woodpecker
Strigiformes	Strigidae	*Bubo virginianus*	great horned owl
Mammals			
Carnivora	Canidae	*Canis latrans*	coyote
Lagomorpha	Leporidae	*Sylvilagus audubonii*	desert cottontail
Rodentia	Sciuridae	*Otospermophilus beecheyi*	California ground squirrel

† Sensitive

Appendix C

Special Status Plant Species Observed or with Potential to Occur

Appendix C
Rare Plant Species Potential to Occur[1]

Species Name	Common Name	Status[2]	Habitat, Ecology, and Life History	Potential to Occur[3]
Abronia villosa var. *aurita*	Chaparral sand-verbena	--/-- CRPR 1B.1	Annual herb. Occurs in sandy places within coastal scrubs, chaparral, and desert dunes. Flowering period: Mar - Sep. Elevation: 246 to 5,249 feet (75 to 1,600 meters).	**Present.** This species was observed Approximately 35 individuals were observed along the 36" pipeline (Figures 6h and 6i).
Atriplex serenana var. *davidsonii*	Davidson's saltscale	--/-- CRPR 1B.2	Small annual herb. This species is historically associated with the isolated alkaline flats of southern California valley areas that have primarily been drained and converted to residential housing or agriculture. Flowering period: Apr-Oct. Elevation range: 0 – 656 feet (0-200 m).	**Low.** The Study Area supports limited suitable habitat for this species, but the Study Area exists outside of this species elevation range. There is a record of this species from 2015 on CNDDB approximately 1.3 miles north of the project site. This species was not observed during the HELIX 2020 surveys.
Centromadia pungens ssp. *laevis*	Smooth tarplant	--/-- CRPR 1B.1	Small annual herb. Occurs in sandy soil on flats and foothills in mixed grassland, coastal sage scrub, and chaparral communities. Flowering period May-Jun. Elevation range: 295 – 2,624 feet (90-800 m).	**Present.** This species was observed along the brine pipeline discharge option, 18" pipeline to be sliplined, and 36" pipeline (Figures 6b, 6c, 6h, and 6i). Approximately 12 individuals as well as four polygons with multiple individuals were observed

Appendix C (cont.)
Rare Plant Species Potential to Occur[1]

Species Name	Common Name	Status[2]	Habitat, Ecology, and Life History	Potential to Occur[3]
Deinandra mohavensis	Mojave tarplant	--/SE CRPR 1B.3	Medium annual herb. Occurs in moist sites, openings in chaparral, desert scrub, and woodlands. Flowering period Jun-Oct. Elevation range: 1509 – 5249 feet (460-1600 m).	**Low.** Suitable openings in chaparral, desert scrub, and woodlands do not occur within the Study Area. The nearest observation of this species was recorded in 1995 on CNDDB, approximately 1 mile to the north of the proposed Alessandro ponds and within the San Jacinto River. This species was not observed during the HELIX 2020 surveys.
Imperata brevifolia	California satintail	--/-- CRPR 2B.1	Large perennial grass. Occurs in wet streams, meadows, streambanks, and floodplains. Flowering period Sep-May. Elevation range: below 1640 feet (500 m).	**Low.** The Study Area supports a limited area of suitable habitat within active agricultural areas. This species was recorded in 1988 on CNDDB, 1 mile to the east of the Study Area within the Soboba hot springs. This species was not observed during the HELIX 2020 surveys.
Lasthenia glabrata ssp. *coulteri*	Coulter's goldfields	--/-- CRPR 1B.1	Annual herb. Grows in vernal pools, playas, and saline habitats within alkali sinks, coastal salt marshes, and wetland communities. Flowering period: Apr – May. Elevation: below 3,281 feet (1,000 meters).	**Low.** The Study Area does not support vernal pools, playas, or saline habitats. The nearest observation of this species was recorded in 2007 on CNDDB, east of Sanderson Avenue and intersects the Study Area along the 18" pipeline to be sliplined. This species was not observed during the HELIX 2020 surveys.

Appendix C (cont.)
Rare Plant Species Potential to Occur[1]

Species Name	Common Name	Status[2]	Habitat, Ecology, and Life History	Potential to Occur[3]
Pseudognaphalium leucocephalum	White rabbit-tobacco	--/-- CRPR 2B.2	Perennial herb. Occurs on sandy or gravelly soils of benches, dry stream bottoms, and canyon bottoms within coastal scrub, chaparral, cismontane woodland, and riparian woodland. Flowering period: Jul - Nov. Elevation: below 6,890 feet (2,100 meters).	**Moderate.** The Study Area supports limited suitable habitat for this species. The nearest observation of this species was recorded in 2003 on CNDDB, along the San Jacinto River at the intersection of Main Street and the San Jacinto River, which occurs within the Study Area. This species was not observed during the HELIX 2020 surveys.
Sidalcea neomexicana	Salt spring checkerbloom	--/-- CRPR 2B.2	Perennial herb. Occurs in alkaline springs, marshes. Flowering period: Mar - Jun. Elevation: Below 4921 feet (1500 m).	**Low.** The Study Area supports limited suitable habitat for this species. There is a record of this species from 1966 on CNDDB along Cottonwood Avenue near Warren Road, which occurs within the southwestern portion of the Study Area. This species was not observed during the HELIX 2020 surveys.

Source: HELIX (2020)

[1] Sensitive species reported on CNDDB and CNPS databases.

[2] Listing is as follows: F = Federal; S = State of California; E = Endangered; T = Threatened.
CRPR = California Rare Plant Rank: 1A – presumed extinct; 1B – rare, threatened, or endangered in California and elsewhere; 2A – rare, threatened, or endangered in California and elsewhere; 2B – rare, threatened, or endangered in California but more common elsewhere; 3 – more information on distribution, endangerment, ecology, and/or taxonomic validity is needed. Extension codes: .1 – seriously endangered; .2 – moderately endangered; .
3 – not very endangered.

[3] Potential to Occur is assessed as follows: **None**: Habitat suitable for species survival does not occur on the study area, the study area is not within geographic range of the species, and/or the study area is not within the elevation range of the species; **Low**: Suitable habitat is present on the study area but of low quality and/or small extent. The species has not been recorded recently on or near the study area. Although the species was not observed during surveys for the current project, the species cannot be excluded with certainty; **Moderate**: Suitable habitat is present on the study area and the species was recorded recently near the study area; however, the habitat is of moderate quality and/or small extent. Although the species was not observed during surveys for the current project, the species cannot be excluded with certainty; **High**: Suitable habitat of sufficient extent is present on the study area and the species has been recorded recently on or near the study area, but was not observed during surveys for the current project. However, focused/protocol surveys are not required or have not been completed; **Presumed Present**: The species was observed during focused surveys for the current project and is assumed to occupy the study area; **Presumed Absent**: Suitable habitat is present on the study area but focused surveys for the species were negative.

Appendix D

Special Status Animal Species Observed or with Potential to Occur

Appendix D
Special Status Animal Species Observed or with Potential to Occur

Species	Status[1]	Habitat Associations	Potential to Occur[2]
INVERTEBRATES			
Versatile fairy shrimp (*Branchinecta lindahli*)	--/--	Restricted to vernal pools and other ephemeral basin in southern California from coastal Orange County to San Diego County. Found in seasonally astatic pools which occur in tectonic swales or earth slump basins and other areas of shallow, standing water often in patches of grassland and agriculture interspersed in coastal sage scrub and chaparral.	**None.** No vernal pools, ephemeral ponds, or other potentially suitable habitat occurs within the Study Area. The nearest observation of this species was recorded in 2015 approximately 4,000 feet to the west of the proposed brine ponds within the San Jacinto solar property. This species was not observed during the HELIX 2020 surveys.
VERTEBRATES			
Amphibians			
Western spadefoot toad (*Spea hammondii*)	--/SSC	Occurs from northern California southward to San Diego County, and west of the Sierra Nevada at elevations below 4,500 feet. This terrestrial species requires temporary pools for breeding. Suitable upland habitats include coastal sage scrub, chaparral, and grasslands. Most common in grasslands with vernal pools or mixed grassland-coastal sage scrub areas. Breeds in temporary pools formed by heavy rains, but also found in riparian habitats with suitable water resources. Breeding pools must lack exotic predators such fish, bullfrogs, and crayfish for the species to successfully reproduce. Estivates in burrows within upland habitats adjacent to potential breeding sites.	**None.** No vernal pools, ephemeral ponds, or other potentially suitable habitat occurs within the Study Area. The nearest observation of this species was recorded in 1993 approximately 6 miles to the north of the Study Area at Breeze lake within the Beaumont badlands. This species was not observed during the HELIX 2020 surveys.
Reptiles			
Southern california legless lizard (*Anniella stebbinsi*)	--/SSC	Occurs in sparsely vegetated areas with moist warm, loose soil with plant cover; moisture is essential. Common in several habitats but especially in beach dunes, coastal scrub, chaparral, pine-oak woodlands, desert scrub, sandy washes, and stream terraces with sycamores, cottonwoods, or oaks. Found primarily in areas with sandy or loose organic soils or where there is plenty of leaf litter. Sometimes found in suburban gardens in southern California.	**Low.** While sparsely vegetated areas occur within the Study Area, likely suitable habitat occurs along the San Jacinto River outside of the study area. The nearest observation of this species was recorded in 1893 on CNDDB, approximately 6,000 feet to the west of the Study Area in areas that appear to have been developed. Additional CNDDB records occur 8,000 feet to the east of the Study Area in the vicinity of Juaro Canyon. This species was not observed during the HELIX 2020 surveys.

Appendix D (cont.)
Special Status Animal Species Observed or with Potential to Occur

Species	Status[1]	Habitat Associations	Potential to Occur[2]
Reptiles (cont.)			
California glossy snake (*Arizona elegans occidentalis*)	--/SSC	Occurs along the coastal regions from San Francisco south to San Diego County; though it is absent along the central coast of California. Inhabits arid scrub, rocky washes, grasslands, and chaparral. Prefers open areas and areas with soils loose enough for easy burrowing.	**Low.** The Study Area does not occur within a coastal area, and suitable arid scrub, rocky washes, grasslands, or chaparral do not occur within the Study Area. The nearest observation of this species was recorded in 2012 approximately 5,000 feet to the south of the 36" pipeline within the San Jacinto River corridor. This species was not observed during the HELIX 2020 surveys.
Orange-throated whiptail (*Aspidoscelis hyperythra*)	--/WL	Found within the southwestern portion of California in southern San Bernardino, western Riverside, Orange, and San Diego Counties on the western slopes of the Peninsular ranges below 3,500 feet. Suitable habitat includes coastal sage scrub, chaparral, juniper woodland, oak woodland, and grasslands along with alluvial fan scrub and riparian areas. Occurrence of the species correlated with the presence perennial plants (such as California buckwheat, California sagebrush, black sage, or chaparral) to provide a food base for its major food source, termites.	**Moderate.** The nearest observation of this species was recorded in 2005 on CNDDB, east of the proposed 36" pipeline along the San Jacinto River. Suitable habitat for this species does not occur within the Study Area, but this species may be observed foraging near perennial sage scrub plants along the shoulder of the Ramona Expressway. This species was not observed during the HELIX 2020 surveys.

Appendix D (cont.)
Special Status Animal Species Observed or with Potential to Occur

Species	Status[1]	Habitat Associations	Potential to Occur[2]
Reptiles (cont.)			
Red-diamond rattlesnake (*Crotalus ruber*)	--/SSC	Occurs in the southwestern portion of California from San Bernardino County southward to San Diego County at elevations below 5,000 feet. Has a wide tolerance for varying environments including the desert, dense foothill chaparral, warm inland mesas and valleys, and cool coastal zones. Most commonly found near heavy brush with large rocky microhabitats. Chamise and red shank chaparral associations may offer better structural habitat for refuges and food resources.	**Low.** The nearest observation of this species was recorded on CNDDB on an undisclosed date, the general observation location was within the City of San Jacinto in areas that appear to have been developed. This species was not observed during the HELIX 2020 surveys.
Coast horned lizard (*Phrynosoma blainvillii*)	--/SSC	Occurs from southern California to northern Baja California. In California, the species predominately occurs from Kern County south to San Diego County west of the desert at elevations below 8,000 feet. Inhabits a wide variety of vegetation types including sagebrush scrub, chaparral, grasslands, forests, and woodlands but is restricted to areas with suitable sandy, loose soils with open areas for basking. Diet primarily composed of native harvester ants (*Pogonmyrmex* sp.) and are generally excluded from areas invaded by Argentine ants (*Linepithema humile*).	**Moderate.** The nearest observation of this species was recorded in 2005 on CNDDB, approximately 2,500 feet to the south of the proposed 36" pipeline. Suitable habitat for this species is moderately present within the Study Area, but much higher quality habitat occurs within the San Jacinto river corridor to the east of the Study Area. This species was not observed during the HELIX 2020 surveys.
Birds			
Tricolored blackbird (*Agelaius tricolor*)	BCC/SCE, SSC	Highly colonial, nomadic species occurring as a year-round resident of California from Sonoma County to San Diego. Common locally in the Central Valley and sporadically throughout the State. Breeds in dense colonies. Breeding habitat typically characterized by emergent freshwater marsh dominated by tall, dense cattails (*Typha* spp.) and bulrush (*Schoenoplectus* spp.), though the species also utilizes willows (*Salix* spp.), blackberries (*Rubus* spp.), thistles (*Cirsium* and *Centaurea* spp.), nettles (*Urtica* sp.), and agricultural crops. Forages in grasslands and cropland habitats adjacent to breeding areas.	**Moderate.** This species has been documented at ponds owned by EMWD, specifically the San Jacinto Wastewater Treatment Plant. The San Jacinto Wastewater Treatment Plant occurs directly south of and adjacent to the proposed brine ponds. Populations of this species have been documented at this location between April and May each year. Last observed at the pond in 2015. Suitable habitat that includes freshwater marsh dominated by cattails or bulrush do not occur within the Study Area. This species was not observed during the HELIX 2020 surveys.

Appendix D (cont.)
Special Status Animal Species Observed or with Potential to Occur

Species	Status[1]	Habitat Associations	Potential to Occur[2]
Birds (cont.)			
Burrowing Owl (*Athene cunicularia*)	BCC/SSC	Found from central California east to the Mojave Desert and south to coastal San Diego County. Primarily a grassland species that prefers areas with level to gentle topography and well-drained soils. Species can also occupy agricultural areas, vacant lots, and pastures. Requires underground burrows for nesting and roosting that are typically dug by other species such as California ground squirrel (*Spermophilus beecheyi*). Also utilizes natural rock cavities, debris piles, culverts, and pipes for nesting and roosting.	**High**. This species has been documented within multiple burrow complexes along the San Jacinto River east of the proposed 36" pipeline. Additionally, two adults and one breeding pair were observed in 2007 in the area approximately 1,400 feet east of proposed Advanced Water Treatment Facility. This species was not observed during the HELIX 2020 surveys.
Ferruginous hawk (*Buteo regalis*)	BCC/WL	Found only as wintering individual in California. Typically occupies flat and rolling terrain in grasslands, shrub habitats, and deserts.	**Low.** This species has been documented wintering 0.4 miles south of junction of Ramona Boulevard and Colorado River aqueduct in 1991. This occurrence is approximately 5,500 feet north of the Study Area. This species was not observed during the HELIX 2020 surveys.
Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)	FT/SE	Uncommon summer resident of California. Current breeding distribution is restricted to isolated sites in Sacramento, Amargosa, Kern, Santa Ana, and Colorado River valleys. Riparian obligates that nest in riparian woodlands with native broadleaf trees and shrubs, such as cottonwoods and willows, at least 50 acres or more in size within the arid to semiarid landscapes. Most likely to be found in patches of riparian habitat greater than 200 acres.	**None.** The nearest observation of this species was recorded on CNDDB in 1893, the general observation location was within the City of San Jacinto in areas that appear to have been developed. Suitable habitat for this species, including riparian woodlands at least 50 acres in size, do not occur within the Study Area. This species was not observed during the HELIX 2020 surveys.

Appendix D (cont.)
Special Status Animal Species Observed or with Potential to Occur

Species	Status[1]	Habitat Associations	Potential to Occur[2]
Birds (cont.)			
Southwestern willow flycatcher (*Empidonax traillii extimus*)	FE/SE	Breeds in southern California, Arizona, New Mexico, southwestern Colorado, and extreme southern portions of Nevada and Utah. Riparian obligates that breed in relatively dense riparian habitats along rivers, streams, or other wetlands where surface water is present, or soils are very saturated. Breeding habitat can consist of monotypic stands of willows (*Salix* ssp.), a mixture of native broadleaf trees and shrubs, monotypic stands of exotics such as tamarisk (*Tamarix* spp.) or Russian olive (*Elaeagnus angustifolia*), or mixture of native broadleaf trees and shrubs with exotics. Restricted in San Diego County to two modest colonies at San Luis Rey River and Santa Margarita River, with a few scattered pairs.	**None.** Dense riparian habitats along rivers, streams, or other wetlands where surface water is present, or soils that are very saturated do not occur within the Study Area. The nearest observation of this species was recorded in 2003 within the San Jacinto River, approximately 1.5 miles north of the proposed Alessandro Blending Facility. This species was not observed during the HELIX 2020 surveys.
Loggerhead shrike (*Lanius ludovicianus*)	BCC/SSC	In California, found year-round throughout the foothills and lowlands with winter migrants found coastally north of Mendocino County. Inhabits a variety of habitats seen foraging over open ground within areas of short vegetation, pastures with fence rows, old orchards, mowed roadsides, cemeteries, golf courses, riparian areas, open woodland, agricultural fields, desert washes, desert scrub, grassland, broken chaparral and beach with scattered shrubs. Individuals forage by perching to search for prey (such as large insects, small mammals, amphibians, reptiles, and fish) and using impaling as a means of handling prey.	**Moderate.** This species has been documented at ponds owned by EMWD, specifically the San Jacinto Wastewater Treatment Plant. The San Jacinto Wastewater Treatment Plant occurs directly south of and adjacent to the proposed brine ponds. One active nest was observed during the spring of 2005. This species was not observed during the HELIX 2020 surveys.

Appendix D (cont.)
Special Status Animal Species Observed or with Potential to Occur

Species	Status[1]	Habitat Associations	Potential to Occur[2]
White-faced ibis (*Plegadis chihi*)	--/WL	Uncommon summer resident in sections of southern California and a rare visitor in the Central Valley. Local wintering visitor along coast. Prefers to feed in fresh emergent wetlands, shallow lacustrine waters, muddy ground of wet meadows, and irrigated or flooded pastures and croplands. Nests in dense, fresh emergent wetland.	**Present.** A group of white-faced ibis were observed flying over the proposed advanced water treatment facility in the northwest of the project site (Figure 7a). This species has been documented at ponds owned by EMWD, specifically the San Jacinto Wastewater Treatment Plant. The San Jacinto Wastewater Treatment Plant occurs directly south of and adjacent to the proposed brine ponds. Populations of this species have been documented at this location between April and May each year, with previous observations occurring in 2015. Suitable habitat that includes irrigated or flooded pastures occurs at the location of the proposed brine ponds, but farming activities were active in this location at the time of the general biological survey. An active rookery was observed at the San Jacinto Wastewater Treatment Plant during the spring of 2005 and 2006.
Birds (cont.)			
Least Bell's Vireo (*Vireo bellii pusillus*)	FE/SE	In California, breeds along the coast and western edge of the Mojave Desert from Santa Barbara County south to San Diego County, and east to Inyo, San Bernardino, and Riverside Counties. Breeding habitat consists of early to mid-successional riparian habitat, often where flowing water is present, but also found in dry watercourses within the desert. A structurally diverse canopy and dense shrub cover is required for nesting and foraging. Dominant species within breeding habitat includes cottonwood and willows with mule fat, oaks, and sycamore, and mesquite (*Prosopis glandulosa*) and arrowweed (*Pluchea sericea*) within desert habitats. The species can be tolerant of the presence of non-native species such as tamarisk.	**Present.** This species was observed within riparian habitat that occurs within the Study Area adjacent to the 18" pipeline to be sliplined (Figure 6c). Suitable riparian habitat does not occur elsewhere within the Study Area. Additionally, this species has been documented along the San Jacinto river as recently as 2008, approximately 1,200 feet to the north east of the proposed Alessandro Blending Facility along the San Jacinto River.

Appendix D (cont.)
Special Status Animal Species Observed or with Potential to Occur

Species	Status[1]	Habitat Associations	Potential to Occur[2]
Yellow-headed blackbird (*Xanthocephalus xanthocephalus*)	--/WL	Uncommon summer resident in sections of southern California and a rare visitor in the Central Valley. Local wintering visitor along coast. Prefers to feed in fresh emergent wetlands, shallow lacustrine waters, muddy ground of wet meadows, and irrigated or flooded pastures and croplands. Nests in dense, fresh emergent wetland.	**Moderate.** This species has been documented at ponds owned by EMWD, specifically the San Jacinto Wastewater Treatment Plant. The San Jacinto Wastewater Treatment Plant occurs directly south of and adjacent to the proposed brine ponds. An unknown number of this species was observed building nests in this location in 1995. Suitable habitat that includes irrigated or flooded pastures occurs at the location of the proposed brine ponds, but farming activities were active in this location at the time of the general biological survey. This species was not observed during the HELIX 2020 surveys.
Mammals			
San Bernardino kangaroo rat (*Dipodomys merriami parvus*)	FE/SSC	Occurs in southwestern San Bernardino and western Riverside Counties primarily within the San Bernardino, Menifee, and San Jacinto valleys. Inhabits alluvial fan sage scrub and coastal sage scrub habitats with gravelly and sandy soils. Occupies alluvial floodplains and adjacent upland habitats. Rarely found in dense vegetation or rocky washes.	**High.** The nearest observation of this species was recorded in 2010 on CNDDB along the San Jacinto River. Alluvial floodplains and coastal sage scrub habitats with gravelly soils do not occur within the study area but occur directly east of the proposed 36" pipeline within the San Jacinto River corridor. USFWS critical habitat for this species occurs along the San Jacinto river and intersects the southeastern portion of the Study Area and extends onto the Ramona Expressway along the 36" pipeline. This species was not observed during the HELIX 2020 surveys.

Appendix D (cont.)
Special Status Animal Species Observed or with Potential to Occur

Species	Status[1]	Habitat Associations	Potential to Occur[2]
Western yellow bat (*Lasiurus xanthinus*)	--/SSC	Occurs from southern California through southern Nevada, western Arizona, and southern New Mexico. Found in Los Angeles, San Bernardino, and San Diego Counties of California. In San Diego, commonly found in Anza Borrego Desert but is also established west of the desert within rural to suburban areas including Escondido, Vista, Ramona, Lakeside, El Cajon, and La Mesa. Roosts primarily on dead palm frond skirts of native and non-native fan palms (*Washingtonia* spp.) but has also been observed in cottonwoods and yuccas (*Yucca* spp.; *Hesperoyucca* ssp.). Occurs within a variety of habitats where palms are present including desert riparian, desert washes, palm oasis, cottonwood-willow riparian forest, and developed areas.	**Low.** The nearest observation of this species was recorded on CNDDB in 1998, the general observation location was within the City of San Jacinto in areas that appear to have been developed. Native and non-native fan palms, or other suitable roosting sites for this species, were not observed within the Study Area. This species was not observed during the HELIX 2020 surveys.

Appendix D (cont.)
Special Status Animal Species Observed or with Potential to Occur

Species	Status[1]	Habitat Associations	Potential to Occur[2]
Mammals (cont.)			
Los Angeles pocket mouse (*Perognathus longimembris brevinasus*)	--/SSC	Occurs in the coastal basins of southern California from the San Fernando Valley of Los Angeles County, east to the City of San Bernardino in San Bernardino County, and south through San Jacinto and Temecula Valleys of Riverside County. Inhabits lower elevations grassland, alluvial sage scrub, and coastal sage scrub. Prefers sparsely vegetated habitats with fine, sandy soils.	**Low.** The nearest observation of this species was recorded on CNDDB in 1908, approximately 2.8 miles south of the 36" pipeline. The general observation location was within the City of San Jacinto in areas that appear to have been developed. Native and non-native fan palms, or other suitable roosting sites for this species, were not observed within the Study Area. This species was not observed during the HELIX 2020 surveys.
American badger (*Taxidea taxus*)	--/SSC	Uncommon, permanent resident found through California, except for the extreme north coast areas. Associated with large blocks of undeveloped land composed of open valleys, alluvial fans, meadows, grasslands, and sandy desert. Dens function as sites for resting and parturition. Friable, easily crumbled soils are important for denning.	**Low.** The nearest observation of this species was recorded on CNDDB in 1893, the general observation location was within the City of San Jacinto in areas that appear to have been developed. Large blocks of undeveloped land including alluvial fans and sandy desert occur to the east of the Study Area along the San Jacinto River and San Jacinto mountains. This species was not observed during the HELIX 2020 surveys.

[1] F = Federal; S = State of California; E = Endangered; T = Threatened; CE = Candidate Endangered; R = Rare; BCC = Federal Bird of Conservation Concern; SSC = State Species of Special Concern; FP = State Fully Protected

[2] Potential to Occur is assessed as follows. **None**: Species is so limited to a particular habitat that it cannot disperse on its own, and habitat suitable for its establishment and survival does not occur in the project site; **Not Expected**: Species moves freely and might disperse through or across the project site, but suitable habitat for residence or breeding does not occur in the study area; **Low**: Suitable habitat is present in the project site but no sign of the species was observed during surveys, however the species cannot be excluded with certainty; **High**: Suitable habitat occurs in the study area and the species has been recorded recently on or near the study area, but was not observed during project surveys; **Present**: The species was observed during biological surveys for the project and is assumed to occupy the project site.

Appendix E

Explanation of Codes

Appendix E
Explanation of Status Codes for Plant and Animal Species

FEDERAL AND STATE CODES

U.S. Fish and Wildlife Service (USFWS)

BCC	Bird of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
FC	Federal candidate species
FE	Federally listed endangered
FPD	Federally proposed for delisting
FPE	Federally proposed endangered
FPT	Federally proposed threatened
FT	Federally listed threatened

USFWS Birds of Conservation Concern (BCC)

The primary legal authority for Birds of Conservation Concern (2008) is the Fish and Wildlife Conservation Act of 1980 (FWCA), as amended. Other authorities include the Endangered Species Act, Fish and Wildlife Act (1956) and 16 USC §701. A FWCA 1988 amendment (Public Law 100-653, Title VIII) requires the Secretary of the Interior through the USFWS to "identify species, subspecies, and populations of all migratory non-game birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973." The 2008 BCC report is the most recent effort by the USFWS to carry out this proactive conservation mandate.

The BCC report aims to identify accurately the migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the USFWS' highest conservation priorities and draw attention to species in need of conservation action. The USFWS hopes that by focusing attention on these highest priority species, the report will promote greater study and protection of the habitats and ecological communities upon which these species depend, thereby ensuring the future of healthy avian populations and communities. Birds of Conservation Concern 2008 lists are available online at https://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php.

USFWS Federal Candidate (FC) Species

Federal candidate species are those for which the USFWS has on file "sufficient information on biological vulnerability and threats to support a proposal to list as endangered or threatened, but for which preparation and publication of a proposal is precluded by higher-priority listing actions. [The USFWS] maintain[s] this list for a variety of reasons: to notify the public that these species are facing threats to their survival; to provide advance knowledge of potential listings that could affect decisions of environmental planners and developers; to provide information that may stimulate conservation efforts that will remove or reduce threats to these species; to solicit input from interested parties to help us identify those candidate species that may not require protection under the [Endangered Species Act] or additional species that may require the Act's protections; and to solicit necessary information for setting priorities for preparing listing proposals" (Federal Register 70:90 [May 11, 2005]).

Appendix E (cont.)
Explanation of Status Codes for Plant and Animal Species

USFWS Federal Proposed Endangered (FPE) Species

Any species the Service has determined is in danger of extinction throughout all or a significant portion of its range and the Service has proposed a draft rule to list as endangered. Proposed endangered species are not protected by the take prohibitions of section 9 of the ESA until the rule to list is finalized. Under section 7(a)(4) of the ESA, federal agencies must confer with the Service if their action will jeopardize the continued existence of a proposed species.

USFWS Federal Proposed Threatened (FPT) Species

Any species the Service has determined is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and the Service has proposed a draft rule to list as threatened. Proposed threatened species are not protected by the take prohibitions of section 9, consistent with any protective regulations finalized under section 4(d) of the ESA, until the rule to list is finalized. Under section 7(a)(4) of the ESA, federal agencies must confer with the Service if their action will jeopardize the continued existence of a proposed species.

USFWS Bald and Golden Eagle Protection Act (BGEPA)

In 1782, Continental Congress adopted the bald eagle as a national symbol. During the next one and a half centuries, the bald eagle was heavily hunted by sportsmen, taxidermists, fisherman, and farmers. To prevent the species from becoming extinct, Congress passed the Bald Eagle Protection Act in 1940. The Act was extremely comprehensive, prohibiting the take, possession, sale, purchase, barter, or offer to sell, purchase, or barter, export or import of the bald eagle “at any time or in any manner.”

In 1962, Congress amended the Eagle Act to cover golden eagles, a move that was partially an attempt to strengthen protection of bald eagles, since the latter were often killed by people mistaking them for golden eagles. The golden eagle, however, is accorded somewhat lighter protection under the Act than the bald eagle. Another 1962 amendment authorizes the Secretary of the Interior to grant permits to Native Americans for traditional religious use of eagles and eagle parts and feathers.

California Department of Fish and Wildlife (CDFW)

SCE	State candidate for listing as endangered
SCT	State candidate for listing as threatened
SE	State listed endangered
SR	State listed rare
ST	State listed threatened
SSC	State species of special concern
WL	Watch List
FP	Fully Protected species refers to all vertebrate and invertebrate taxa of concern to the Natural Diversity Data Base regardless of legal or protection status. These species may not be taken or possessed without a permit from the Fish and Game Commission and/or CDFW.
Special Animal	Refers to all vertebrate and invertebrate taxa of concern to the Natural Diversity Database regardless of legal or protection status.

Appendix E (cont.)
Explanation of Status Codes for Plant and Animal Species

Federal and State Forest Service Codes

Federal

FS U.S. Department of Agriculture Forest Service Sensitive

The USDA Forest Service defines sensitive species as those plant and animal species identified by a regional forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density, or significant current or predicted downward trends in habitat capability that would reduce a species existing distribution. Regional foresters shall identify sensitive species occurring within the region. More information is available at http://www.fs.fed.us/r5/projects/sensitive-species.

State

CDF California Department of Forestry and Fire Protection Sensitive

The Board of Forestry classifies as "sensitive species" those species that warrant special protection during timber operations. The list of "sensitive species" is given in §895.1 (Definitions) of the California Forest Practice Rules, which are available online at www.fire.ca.gov.

California Environmental Quality Act (CEQA)

For plants with no current federal or state legal standing, "CEQA" refers to the fact that under the Act, impacts to species may be found significant under certain circumstances (e.g., the species are regionally sensitive and/or are protected by a local policy, ordinance, or habitat conservation plan; or the impact involves interference with certain movements or migrations, with wildlife corridors or with nursery sites).

Bureau of Land Management (BLM) Sensitive

BLM Manual 6840 defines sensitive species as "species that require special management consideration to avoid potential future listing under the ESA and that have been identified in accordance with procedures set forth in this manual" (https://www.blm.gov/sites/blm.gov/files/uploads/mediacenter_blmpolicymanual6840.pdf). Species designated as Bureau sensitive must be native species found on BLM-administered lands for which the BLM has the capability to significantly affect the conservation status of the species through management, and either: 1. There is information that a species has recently undergone, is undergoing, or is predicted to undergo a downward trend such that the viability of the species or a distinct population segment of the species is at risk across all or a significant portion of the species range, or 2. The species depends on ecological refugia or specialized or unique habitats on BLM-administered lands, and there is evidence that such areas are threatened with alteration such that the continued viability of the species in that area would be at risk. The Bureau Sensitive Species designation is not meant to include federally listed, proposed, candidate, or state listed species. It is BLM policy to provide sensitive species with the same level of protection given to federal candidate species.

Appendix E (cont.)
Explanation of Status Codes for Plant and Animal Species

OTHER CODES AND ABBREVIATIONS

California Native Plant Society California Rare Plant Rank (CRPR) Codes

Lists

1A = Presumed extirpated in California and either rare or extinct elsewhere. Eligible for state listing.

1B = Rare, threatened, or endangered in California and elsewhere. Eligible for state listing.

2A = Presumed extirpated in California but common elsewhere. Eligible for state listing.

2B = Rare, threatened, or endangered in California but more common elsewhere. Eligible for state listing.

3 = Review List: Plants about which more information is needed. Some eligible for state listing.

4 = Watch List: Plants of limited distribution. Needs monitoring for changes in population status. Few (if any) eligible for state listing.

List/Threat Code Extensions

.1 = Seriously threatened in California (over 80 percent of occurrences threatened/high degree and immediacy of threat)

.2 = Moderately threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat)

.3 = Not very threatened in California (less than 20% of occurrences threatened / low degree and immediacy of threat or no current threats known)

A "CA Endemic" entry corresponds to those taxa that only occur in California.

All List 1A (presumed extinct in California) and some List 3 (need more information; a review list) plants lacking threat information receive no extension. Threat Code guidelines represent only a starting point in threat level assessment. Other factors, such as habitat vulnerability and specificity, distribution, and condition of occurrences, are considered in setting the Threat Code.

County of San Diego

Plant sensitivity:

List A Plants rare, threatened, or endangered in California and elsewhere
List B Plants rare, threatened, or endangered in California but more common elsewhere
List C Plants that may be quite rare but need more information to determine true rarity status
List D Plants of limited distribution and are uncommon but not presently rare or endangered

Animal sensitivity:

Groups 1 and 2 Animals considered sensitive under California Environmental Quality Act (CEQA) review of projects.

Appendix E (cont.)
Explanation of Status Codes for Plant and Animal Species

Multiple Species Conservation Program (MSCP) Covered

Multiple Species Conservation Program covered species for which the County of San Diego and City of San Diego have take authorization within the MSCP (South County) subarea and City of San Diego subarea.

Draft North County Multiple Species Conservation Program (NC MSCP) Covered

Species proposed for coverage under the Draft North County Multiple Species Conservation Program.

MSCP Narrow Endemic

Narrow endemic species are native species that have "restricted geographic distributions, soil affinities, and/or habitats." The MSCP participants' subarea plans have specific conservation measures to ensure impacts to narrow endemics are avoided to the maximum extent practicable.

Multiple Habitat Conservation Program (MHCP)

The MHCP encompasses the cities of Carlsbad, Encinitas, Escondido, Oceanside, San Marcos, Solana Beach, and Vista.

MHCP-TS = MHCP target species which MHCP cities are evaluating for coverage.

MHCP-PS = MHCP priority species for which MHCP cities are likely to need take authorizations

Proposed MHCP Covered Species

Species considered to be adequately conserved by the MHCP provided that all participants meet all conditions listed in the Final MHCP Plan. Final determination of "coverage" can be made only after the wildlife agencies, following completion of the USFWS internal Section 7 process. Listed in Table 3-6 of the Final MHCP Volume 1.

MHCP Narrow Endemic

"Narrow Endemic" is a sensitivity rating given by the MHCP to indicate "those species considered so restricted in distribution and abundance that substantial loss of their populations or habitat might jeopardize the species' continued existence or recovery." Listed in Table 3-2 of the Final MHCP Volume 1.

County of Riverside

Multiple Species Habitat Conservation Plan (MSHCP) Covered

MSHCP Covered Species indicates that the species is part of a proposed list of species (146 total) considered at this time to be adequately conserved by the Western Riverside County MSHCP, provided

Appendix E (cont.)
Explanation of Status Codes for Plant and Animal Species

that participants meet all conditions listed in the Final MSHCP. These species are discussed in Section 2.1.4 and 9.2 of the MSHCP, Volume 1.

Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) Group Designation

Group 1 – Take coverage is warranted based upon regional or landscape level considerations, such as healthy population levels, widespread distribution throughout the MSHCP Plan Area, and life history characteristics that respond to habitat-scale conservation and management actions.

Group 2 – Take coverage is warranted based upon regional or landscape level considerations with the addition of site-specific conservation and management requirements that area clearly identified in the MSHCP for species that are generally well distributed but that have core habitats that require conservation.

Group 3 – Take coverage is warranted based upon site-specific considerations and the identification of specific conservation and management conditions for species within a narrowly defined habitat or limited geographic area within the MSHCP Plan Area.

Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) Special Species Acronyms/Abbreviations

NEPSSA	Narrow Endemic Plant Species Survey Area species – Designated Area where focused surveys are required for plant species that are highly restricted by their habitat affinities, edaphic requirements, or other ecological factors, and for which specific conservation measures have been identified in Section 6.1.3 of the MSHCP, Volume I.
CASSA	Criteria Area Species Survey Area – Designated areas where focused surveys for specific species are required. These are species for which existing available information is not sufficient, and for which specific conservation measures have been identified in Section 6.3.2 of the MSHCP, Volume I.
Planning Species	Subsets of Covered Species that are intended to provide guidance for MSHCP Reserve assembly in Cores, Linkages, and Area Plans.

Poway Subarea Plan Habitat Conservation Plan (HCP) Target Species

Species known or potentially occurring in the City of Poway Subarea Plan region that are listed as threatened or endangered by federal or state agencies or are likely to be listed in the future. They are also non-sensitive species that are considered indicators of habitat quality or are otherwise important for preserve design.

Appendix F

2020 Burrowing Owl Survey Report

HELIX Environmental Planning, Inc.
7578 El Cajon Boulevard
La Mesa, CA 91942
619.462.1515 **tel**
619.462.0552 **fax**
www.**helixepi**.com

September 10, 2020 EMW-20

Mr. Joseph Broadhead
Principal Water Resource Specialist
Eastern Municipal Water District
2270 Trumble Road
P.O. Box 8300
Perris, CA 92572

Subject: 2020 Burrowing Owl (*Athene cunicularia*) Survey Report for the Eastern Municipal Water District Purified Water Replenishment Project

Dear Mr. Broadhead:

At your request, HELIX Environmental Planning, Inc. (HELIX) conducted a focused burrowing owl (*Athene cunicularia*) survey for the Eastern Municipal Water District Purified Water Replenishment Project (project) located in the City of San Jacinto, California. The survey effort was completed in accordance with current protocol accepted by the California Department of Fish and Wildlife (CDFW) in their 2012 Staff Report on Burrowing Owl Mitigation (California Department of Fish and Game [CDFG] 2012). This letter presents the results of the 2020 breeding season survey effort.

PROPERTY LOCATION AND DESCRIPTION

The proposed project would occur at multiple locations predominantly within the City of San Jacinto, with one location just outside the eastern city limits in unincorporated Riverside County (Figure 1, *Regional Location*). The project site occurs within Township 4 and 5 South, Range 1 West, on the U.S. Geological Survey (USGS) 7.5-minute Lakeview and San Jacinto quadrangles (Figure 2, *USGS Topography*). The project's aboveground facilities would be located adjacent to the northern boundary of the District's existing San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) at 770 North Sanderson Avenue and at the District's existing Alessandro Ponds site near the intersection of West Ramona Parkway and North Vernon Avenue. The project's belowground pipelines would follow a route northeast from the SJVRWRF in an unpaved roadway, northeast along North Lyon Avenue, and southeast along Ramona Expressway to the District's existing Mountain Avenue West Recharge Basin at the intersection of Ramona Expressway and East Esplanade Court (see Figure 3, *Project Vicinity [Aerial Photograph]*).

For added context, it is noted that the project is located within the planning boundaries of the adopted Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). It is within the Southwest Area Plan with the western portion of the proposed project located within Criteria Cells 2775 and 2878, and the eastern portion of the proposed project located within Criteria Cells 2893, 3098, 3099, 3204, and 3312 (Figure 4, *Subarea Plan Designations*); however, the District is not a signatory to the MSHCP and is not obtaining coverage for the project as a Participating Special Entity (PSE) through the Western Riverside County Regional Conservation Authority (RCA).

PROJECT DESCRIPTION

The project proposes to construct and operate facilities that would replenish the San Jacinto Upper Pressure Groundwater Management Zone aquifer with recycled water and advanced treated water to reduce reliance on imported water sources, provide improved drought resiliency, and potentially improve the quality of the groundwater basin utilized by the District. The proposed project would include the following components:

- Construction of Advanced Water Treatment (AWT) facilities near the District's existing SJVRWRF;
- Construction of a brine management system that would include five interconnected evaporation ponds on approximately 20 acres north of the proposed AWT site;
- Construction of Alessandro Blending Station facilities that would blend advanced treated water and tertiary reclaimed water (RW);
- Modification of an existing 18-inch-diameter pipeline that would convey advanced treated water from the AWT site to the proposed Alessandro Blending Station; and
- Construction of a new 36-inch-diameter pipeline that would convey blended water from the Alessandro Blending Station to the existing Mountain Avenue West Recharge Basin.

Specific staging areas have not yet been identified; staging areas would be located within developed locations or within a parcel that would be acquired by the District for the project and within areas surveyed as part of the current study.

METHODS

The focused burrowing owl survey was conducted in accordance with current CDFW burrowing owl survey guidelines (CDFW 2012). The survey was conducted by qualified HELIX biologists Daniel Torres, Matthew Dimson, and John Gardner from April 24 to July 2, 2020 (Table 1, *Survey Times and Conditions*).

Table 1
SURVEY TIMES AND CONDITIONS

SITE VISIT	DATE	TIME	CONDITIONS	BIOLOGIST
1	4/24/2020	0605-1000	57°F – 79°F, wind 0-1 mph, 0% cloud cover	Matthew Dimson Daniel Torres
2	5/18/2020	0621-0946	57°F – 65°F, wind 2-5 mph, 100% -10% cloud cover	Matthew Dimson John Gardner
3	6/11/2020	0510-1000	64°F – 84°F, wind 0 mph, 0% cloud cover	Matthew Dimson Daniel Torres
4	7/2/2020	0610-1015	59°F – 68°F, wind 0-2 mph, 100% - 0% cloud cover	Matthew Dimson Daniel Torres

°F = degrees Fahrenheit; mph = miles per hour

Approximately 136 acres determined to be suitable for burrowing owl were targeted during the survey effort, including disturbed habitat and field/pasture vegetation communities located on and within 150 meters of the project site. The 136-acre area targeted for the survey effort is herein referred to as the survey area (Figure 4). Areas on and within 150 meters of the project determined not to be suitable for burrowing owl were excluded from the survey effort. Excluded areas generally included developed land and undeveloped land characterized by dense tree- and/or shrub-dominated vegetation. Other excluded areas include those where access was not permitted and/or comprised of private lands outside of the project site. Representative photographs of the survey area are included as Attachment A.

Transects approximately 20 meters apart were surveyed across the entire on-site portions of the survey area. Potentially suitable habitat occurring off-site and within the 150-meter survey area buffer was visually surveyed with the aid of binoculars. The biologists walked slowly and methodically, closely checking the areas that met the basic requirements of owl habitat, which include:

- Open expanses of sparsely vegetated areas (less than 30 percent canopy cover for trees and shrubs);
- Gently rolling or level terrain;
- An abundance of small mammal burrows, especially those of the California ground squirrel (*Spermophilus beecheyi*); and
- Fence posts, rocks, or other low perching locations.

All potential owl burrows were checked for signs of recent owl occupation. Signs of occupied burrows include pellets/casting (regurgitated fur, bones, and/or insect parts); white wash (excrement); and/or feathers.

RESULTS

No burrowing owls were observed on or adjacent to the property. Burrows with potential to support burrowing owls (i.e., California ground squirrel burrows and man-made culverts and/or pipes) were noted on the project site, but no sign of burrowing owl occupation was observed (Figure 4). The project site is not considered occupied by burrowing owl. A list of animal species observed or detected are included as Attachment B.

Please contact me or Karl Osmundson at (619) 462-1515 if you have any questions.

Sincerely,

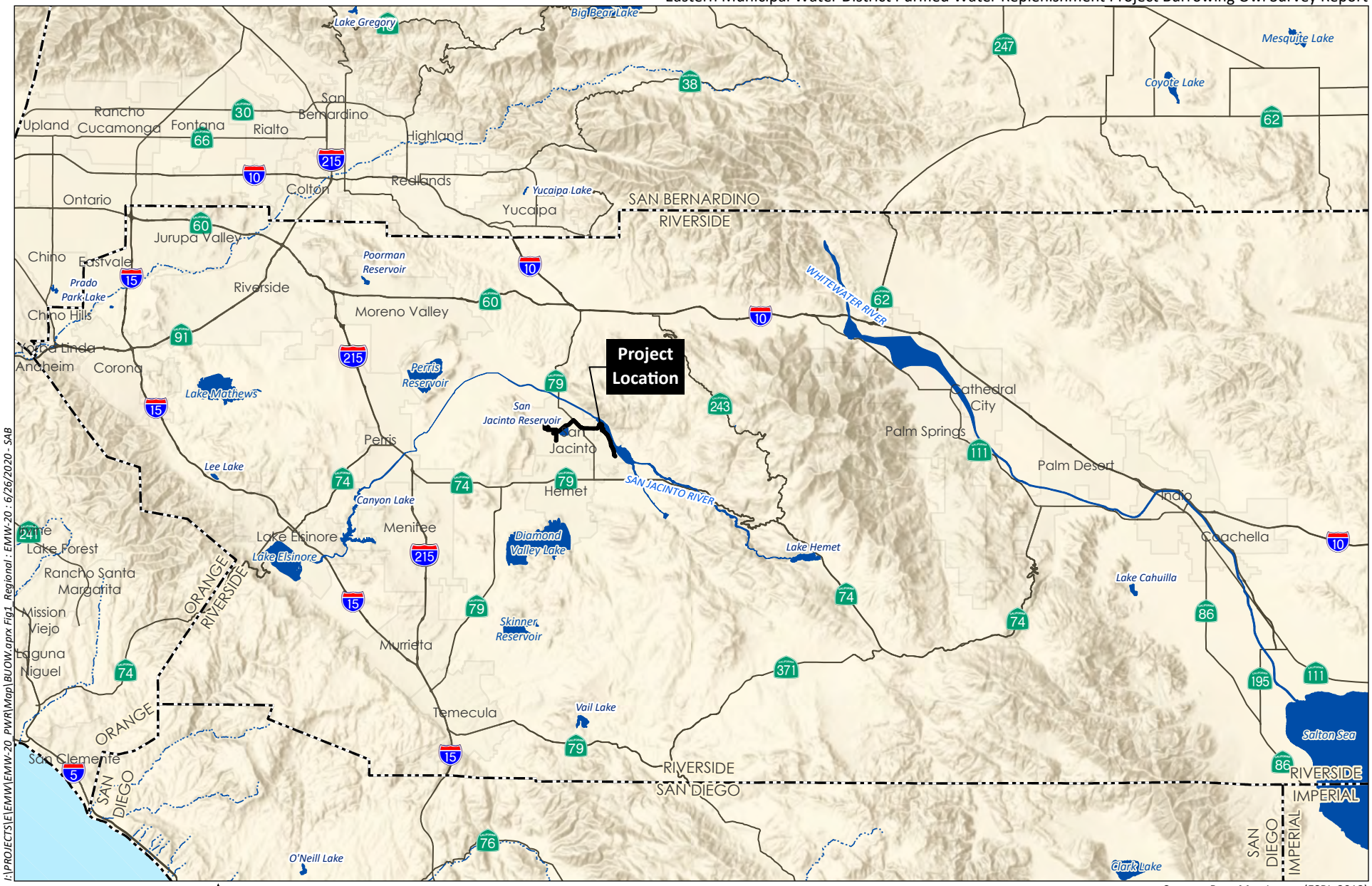
Benjamin Rosenbaum
Biologist

Enclosures:

Figure 1	Regional Location
Figure 2	USGS Topography (Project Vicinity)
Figure 3	Aerial Photograph
Figure 4	Burrowing Owl Survey Area and Results
Attachment A	Representative Site Photographs
Attachment B	Animal Species Observed or Detected

LITERATURE CITED

California Department of Fish and Game (CDFG). 2012. Staff Report on Burrowing Owl Mitigation. State of California Natural Resource Agency. March 7.



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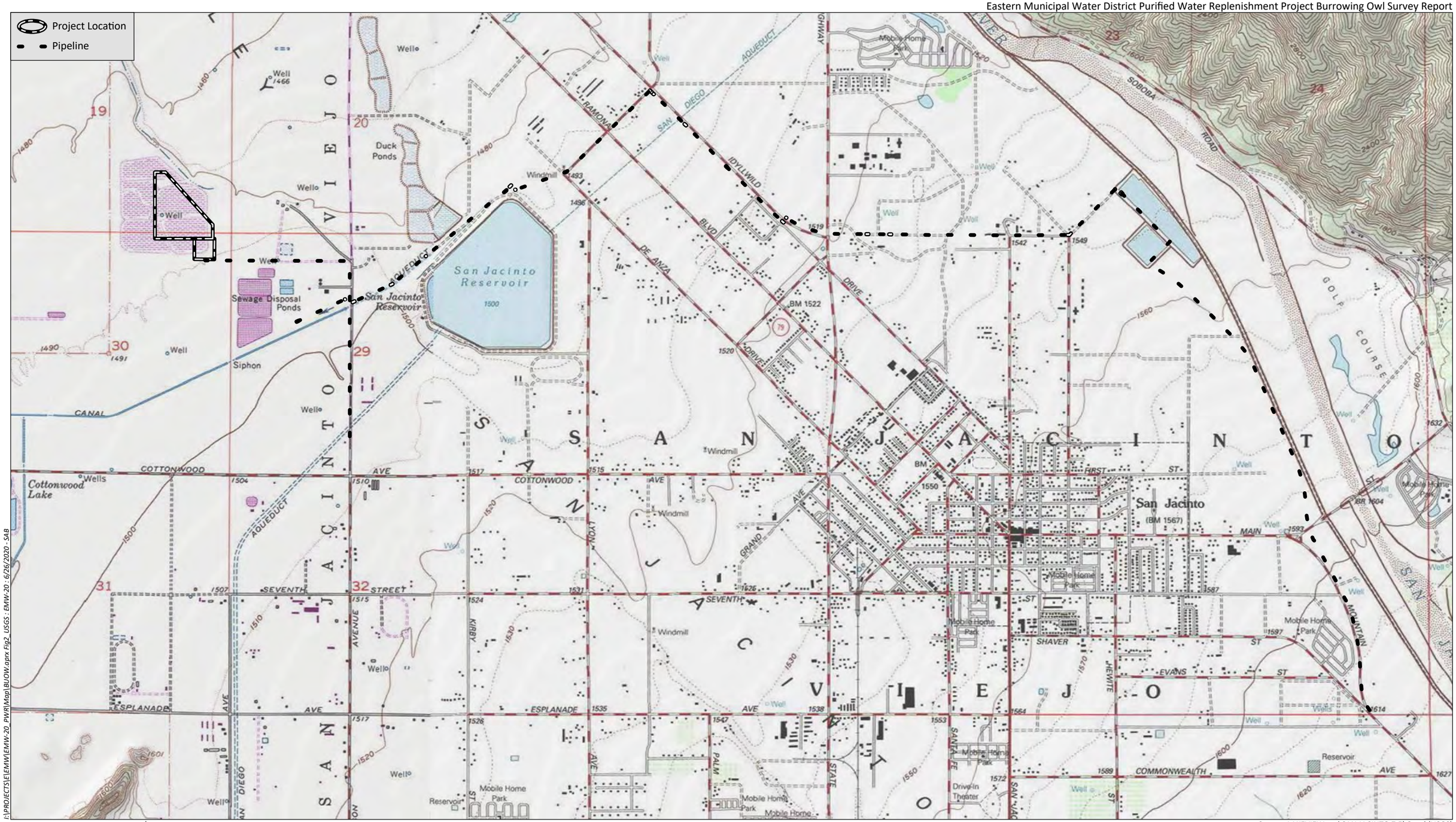
Source: Base Map Layers (ESRI, 2013)

HELIX Environmental Planning

Regional Location

Figure 1



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Source: LAKEVIEW and SAN JACINTO 7.5' Quad (USGS)

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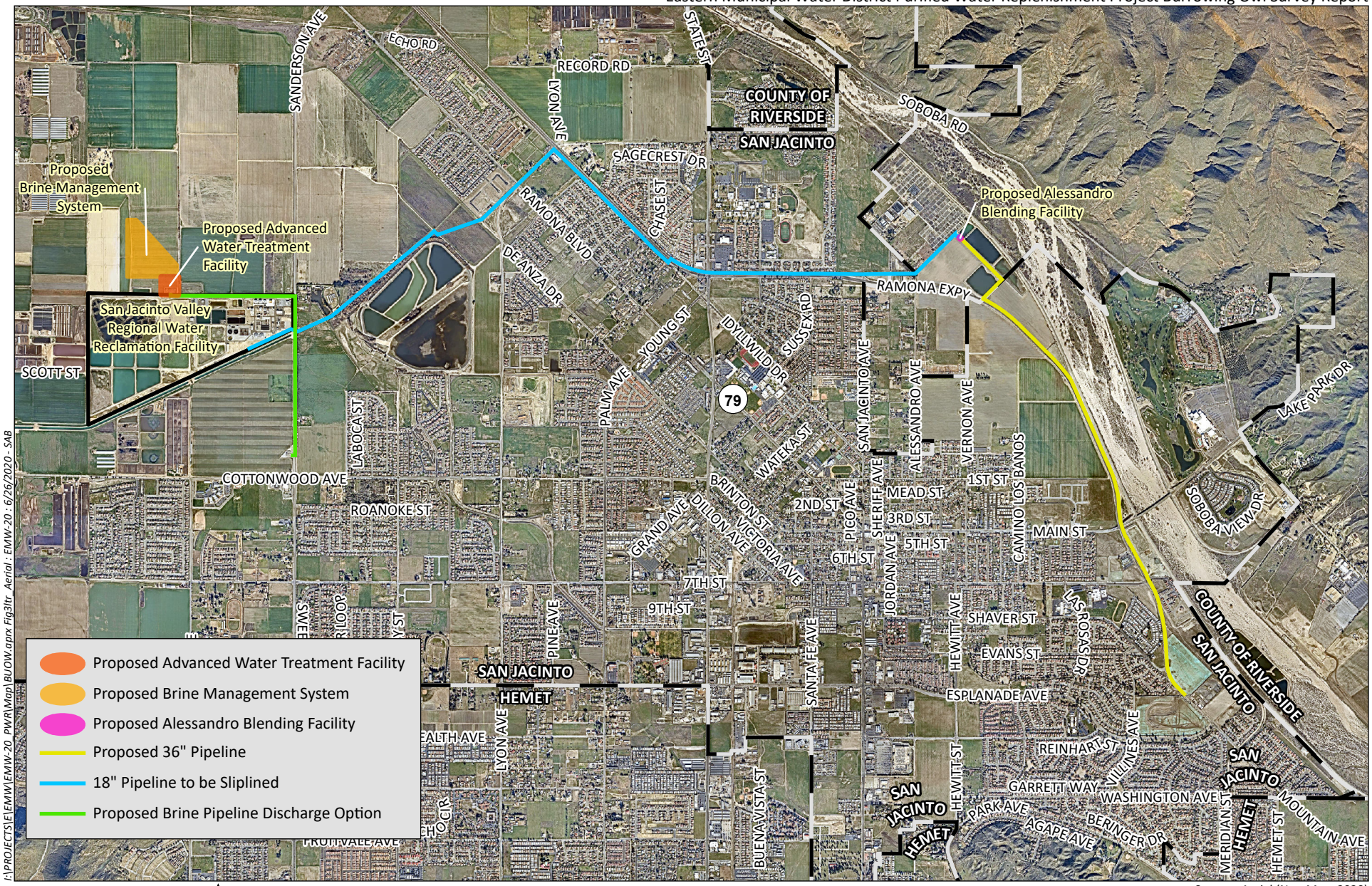
HELIX Environmental Planning

USGS Topography

Figure 2



Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Project Vicinity (Aerial Photograph)

Figure 3

Survey Area
150-meter Buffer
Potential Burrowing Owl Burrow (*Athene cunicularia*)
Vegetation and Land Cover Type
Developed
Disturbed Habitat
Field/Pasture

1
2
San Jacinto Valley Regional Water Reclamation Facility

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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Burrowing Owl Survey Area and Results

Figure 4a

Survey Area
150-meter Buffer
Potential Burrowing Owl Burrow (*Athene cunicularia*)
Vegetation and Land Cover Type
Developed
Disturbed Habitat
Field/Pasture
Open Water
Southern Willow Scrub

3
2
1
SANDERSON AVE
San Jacinto Valley Regional Water Reclamation Facility

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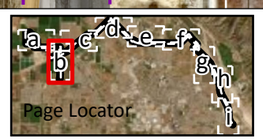

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Burrowing Owl Survey Area and Results

Figure 4b



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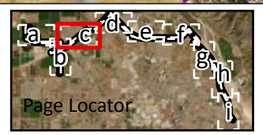

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Burrowing Owl Survey Area and Results

Figure 4c

Survey Area
150-meter Buffer
Vegetation and Land Cover Type
Developed
Disturbed Habitat
Field/Pasture

MISTY MEADOW LN
BUTTERMILK RD
COOL BREEZE CT
BABBLING PL
NOBLEWOOD DR
GOLDEN STRAW ST
RUSTIC GLEN WAY
RAMONA BLVD
RAMONA EXPY
79
4
3
5

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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Burrowing Owl Survey Area and Results

Figure 4d

Survey Area
150-meter Buffer
Potential Burrowing Owl Burrow (*Athene cunicularia*)
Vegetation and Land Cover Type
Developed
Disturbed Habitat

STATE ST
RAMONA EXPY
79
4
5
6

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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Burrowing Owl Survey Area and Results

Figure 4e

Survey Area
150-meter Buffer
Vegetation and Land Cover Type
Developed
Disturbed Habitat
Field/Pasture
Open Water

5
6
7
RAMONA EXPY
SAN JACINTO AVE

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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Burrowing Owl Survey Area and Results

Figure 4f



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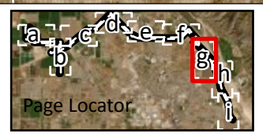

Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Burrowing Owl Survey Area and Results

Figure 4g

Survey Area
150-meter Buffer
Vegetation and Land Cover Type
Developed
Disturbed Habitat
Riversidian Sage Scrub

LAKE PARK DR
COURTLAND AVE
MOUNTAIN AVE
7TH ST
MAIN ST
RAMONA EXPY
8
9
7

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Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Burrowing Owl Survey Area and Results

Figure 4h

Survey Area
150-meter Buffer
Vegetation and Land Cover Type
Developed
Disturbed Habitat
Field/Pasture

MOUNTAIN AVE
ESPLANADE AVE
BROOKMERE RD
SHANNONDOAH RD
COURTLAND AVE
OAK KNOLL RD
ST ALBAN RD
ST ALBAN RD
9
MOUNTAIN AVE
OLD MOUNTAIN AVE
8
7TH ST
RAMONA EXPY

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Source: Aerial (NearMap, 2020)

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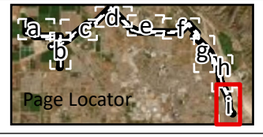

HELIX Environmental Planning

Burrowing Owl Survey Area and Results

Figure 4i



View of burrowing owl survey area, facing northeast. Photo taken April 24, 2020.



View of burrowing owl survey area, facing south. Photo taken April 24, 2020.

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View of burrowing owl survey area, facing south. Photo taken April 24, 2020.



View of burrowing owl survey area, facing south. Photo taken April 24, 2020.

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View of burrowing owl survey area, facing west. Photo taken April 24, 2020.



View of burrowing owl survey area, facing east. Photo taken April 24, 2020.

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View of burrowing owl survey area, facing north. Photo taken April 24, 2020.



View of burrowing owl survey area, facing north. Photo taken April 24, 2020.

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View of burrowing owl survey area, facing southwest. Photo taken April 24, 2020.



View of burrowing owl survey area, facing southwest. Photo taken April 24, 2020.

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View of burrowing owl survey area, facing southwest. Photo taken April 24, 2020.



View of burrowing owl survey area, facing northwest. Photo taken April 24, 2020.

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View of burrowing owl survey area, facing northeast. Photo taken April 24, 2020.



View of burrowing owl survey area, facing northeast. Photo taken April 24, 2020.

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View of burrowing owl survey area, facing northeast. Photo taken April 24, 2020.



View of burrowing owl survey area, facing northeast. Photo taken April 24, 2020.

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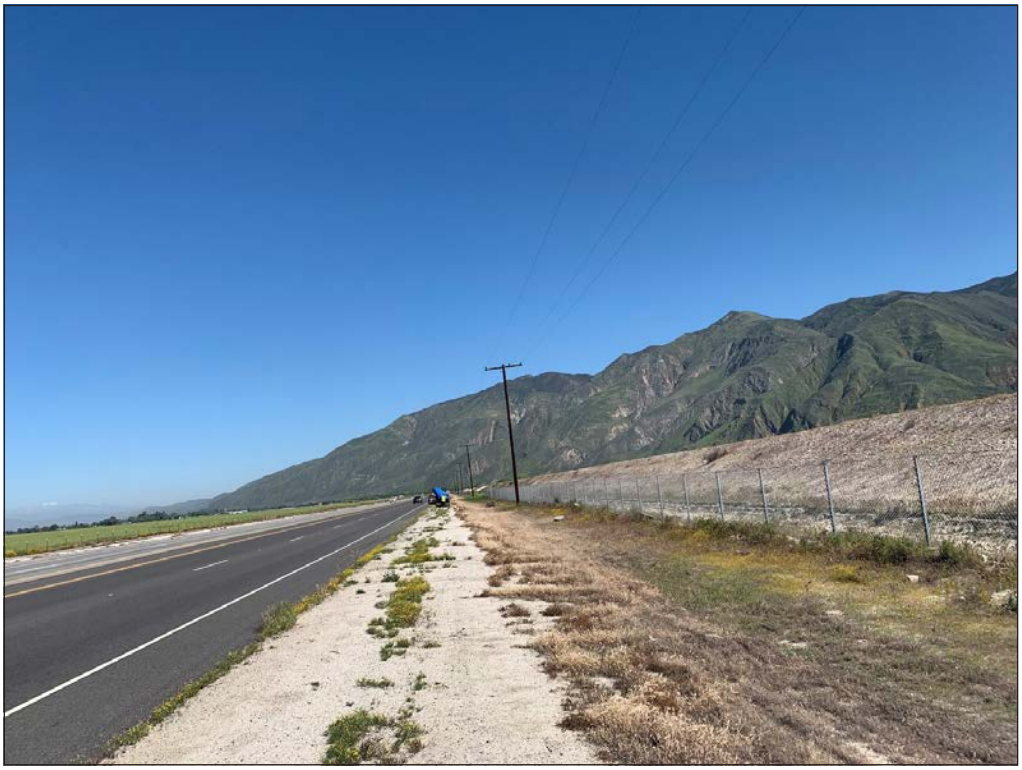

View of burrowing owl survey area, facing northwest. Photo taken April 24, 2020.

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Appendix B
Animal Species Observed or Detected During Burrowing Owl Surveys

Taxon		Scientific Name	Common Name
Order	**Family**		
VERTEBRATES			
Amphibians and Reptiles			
Squamata	Phrynosomatidae	*Sceloporus occidentalis*	western fence lizard
Birds			
Accipitriformes	Accipitridae	*Buteo jamaicensis*	red-tailed hawk
		Buteo lineatus	red-shouldered hawk
	Cathartidae	*Cathartes aura*	turkey vulture
Anseriformes	Anatidae	*Anas platyrhynchos*	mallard
		Branta canadensis†	Canada goose
Apodiformes	Trochilidae	*Calypte anna*	Anna's hummingbird
		Selasphorus sasin	Allen's hummingbird
Charadriiformes	Charadriidae	*Charadrius vociferus*	killdeer
Columbiformes	Columbidae	*Zenaida macroura*	mourning dove
Falconiformes	Falconidae	*Falco sparverius*	American kestrel
Gruiformes	Rallidae	*Fulica americana*	American coot
Passeriformes	Corvidae	*Corvus brachyrhynchos*	American crow
		Corvus corax	common raven
	Fringillidae	*Haemorhous mexicanus*	house finch
		Spinus psaltria	lesser goldfinch
	Hirundinidae	*Hirundo rustica*	barn swallow
		Petrochelidon pyrrhonota	cliff swallow
		Stelgidopteryx serripennis	northern rough-winged swallow
	Icteridae	*Agelaius phoeniceus*	red-winged blackbird
		Icterus bullockii	Bullock’s oriole
		Icterus cucullatus	hooded oriole
		Quiscalus mexicanus	great-tailed grackle
		Sturnella neglecta	western meadowlark
	Mimidae	*Mimus polyglottos*	northern mockingbird
	Parulidae	*Setophaga coronata*	yellow-rumped warbler
	Passeridae	*Passer domesticus*	house sparrow
	Passerellidae	*Melospiza melodia*	song sparrow
		Melozone crissalis	California towhee
		Zonotrichia leucophrys	white-crowned sparrow
	Sturnidae	*Sturnus vulgaris*	European starling
	Troglodytidae	*Thryomanes bewickii*	Bewick's wren
	Tyrannidae	*Sayornis nigricans*	black phoebe
		Sayornis saya	Say’s phoebe
		Tyrannus vociferans	Cassin's kingbird
	Vireonidae	*Vireo bellii pusillus*†	least Bell’s vireo
Pelecaniformes	Threskiornithidae	*Plegadis chihi*†	white-faced ibis
Piciformes	Picidae	*Dryobates nuttallii*	Nuttall's woodpecker
Podicipediformes	Podicipedidae	*Aechmophorus occidentalis*†	western grebe
Mammals			
Carnivora	Canidae	*Canis latrans*	coyote
Lagomorpha	Leporidae	*Sylvilagus bachmani*	brush rabbit
Rodentia	Sciuridae	*Otospermophilus beecheyi*	California ground squirrel

†Sensitive species

Appendix G

Wetlands and Waters of the U.S. Definitions

Appendix G
Federal Jurisdictional Information

WETLANDS AND "WATERS OF THE U.S." DEFINITIONS

WETLANDS

The U.S. Army Corps of Engineers (USACE; 33 CFR 328.3) and the Environmental Protection Agency (EPA; 40 CFR 230.3) jointly define wetlands as "[t]hose areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (Environmental Laboratory 1987).

WATERS OF THE U.S.

The official definition of "Waters of the U.S." and their limits of jurisdiction (as they may apply) are defined by the USACE' Regulatory Program Regulations (33 CFR 328.3, paragraphs [a] 1-3 and [e], and Section 328.4, paragraphs [c] 1 and 2) as follows:

1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
2. All interstate waters including interstate wetlands;
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce including any such waters,
    i. which are or could be used by interstate or foreign travelers for recreation or other purposes; or
    ii. from which fish or shellfish are or could be taken and sold in interstate commerce; or
    iii. which are used or could be used for industrial purpose by industries in interstate commerce;
4. All impoundments of waters otherwise defined as waters of the United States under the definition;
5. Tributaries of waters;
6. The territorial seas;
7. Wetlands adjacent to waters (other than waters that are themselves wetlands)…

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Federal Jurisdictional Information

NON-TIDAL WATERS OF THE U.S.

The limits of jurisdiction in non-tidal waters: In the absence of adjacent wetlands, the jurisdiction extends to the OHWM, or when adjacent wetlands are present, the jurisdiction extends to the limit of the adjacent wetlands.

The term OHWM refers to that line on the shore established by the fluctuation of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation (scouring), the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

Waters of the U.S. must exhibit an OHWM or other evidence of surface flow created by hydrologic physical changes. These physical changes include (Riley 2005):

- Natural line impressed on the bank
- Shelving
- Changes in the character of soil
- Destruction of terrestrial vegetation
- Presence of litter and debris
- Wracking
- Vegetation matted down, bent, or absent
- Sediment sorting
- Leaf litter disturbed or washed away
- Scour
- Deposition
- Multiple observed flow events
- Bed and banks
- Water staining
- Change in plant community

Further guidance on identifying the OHWM in the Arid Southwest (Lichvar and McColley 2008). This publication provided geomorphic and vegetation OHWM indicators specific to the Arid Southwest.

Jurisdictional areas also must be connected to Waters of the U.S. (Guzy and Anderson 2001; U.S. Supreme Court 2001).

As a consequence of the U.S. Supreme Court decision in Rapanos v. United States, a memorandum was developed regarding Clean Water Act jurisdiction (Grumbles and Woodley 2007). The memorandum states that the EPA and the USACE will assert jurisdiction over traditional navigable waters (TNW), wetlands adjacent to TNW, tributaries to TNWs that are a relatively permanent water body (RPW), and wetlands adjacent to TNW. An RPW has year-round flow or a continuous seasonal flow (i.e., typically for three months or longer). Jurisdiction over other waters (i.e., non TNW and RPW) will be based on a fact-specific analysis to determine if they have a significant nexus to a TNW.

Pursuant to the USACE Instructional Guidebook (USACE and EPA 2007), the significant nexus evaluation will cover the subject reach of the stream (upstream and downstream) as well as its adjacent wetlands (Illustrations 2 through 6, USACE and EPA 2007). The evaluation will include the flow characteristics,

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Federal Jurisdictional Information

annual precipitation, ability to provide habitat for aquatic species, ability to retain floodwaters and filter pollutants, and proximity of the subject reach to a TNW, drainage area, and the watershed.

WETLAND CRITERIA

Wetland boundaries are determined using three mandatory criteria (hydrophytic vegetation, wetland hydrology, and hydric soil) established for wetland delineations and described within the Wetlands Delineation Manual (Environmental Laboratory 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (USACE 2008). Following is a brief discussion of the three criteria and how they are evaluated.

Vegetation

"Hydrophytic vegetation is defined herein as the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present" (Environmental Laboratory 1987).

The wetland indicator status (obligate upland, facultative upland, facultative, facultative wetland, obligate wetland, or no indicator status) of the dominant plant species of all vegetative layers is determined. Species considered to be hydrophytic include the classifications of facultative, facultative wetland, and obligate wetland as defined in the current list of wetland plants of the Arid Southwest (Lichvar, et al. 2016; Table A-1). The percent of dominant wetland plant species is calculated. The hydrophytic vegetation criterion is considered to be met if it meets the "Dominance Test," "Prevalence Index," or the vegetation has morphological adaptations for prolonged inundation.

Table A-1
DEFINITIONS OF PLANT INDICATOR CATEGORIES

Indicator Categories	Abbreviation	Qualitative Description
Obligate	OBL	Almost always occur in wetlands
Facultative Wetland	FACW	Usually occur in wetlands but may occur in non-wetlands
Facultative	FAC	Occur in wetlands and non-wetlands
Facultative Upland	FACU	Usually occur in non-wetlands but may occur in wetlands
Upland	UPL	Almost never occur in wetlands

Hydrology

"The term 'wetland hydrology' encompasses all hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface at some time during the growing season. Areas with evident characteristics of wetland hydrology are those where the presence of water has an overriding influence on characteristics of vegetation and soils due to anaerobic reducing conditions, respectively" (Environmental Laboratory 1987).

Appendix G (cont.)
Federal Jurisdictional Information

Hydrologic characteristics must indicate that the ground is saturated to within 12 inches of the surface for at least five percent of the growing season during a normal rainfall year (approximately 18 days for most of low-lying southern California). Hydrology criteria are evaluated based on the characteristics listed below (USACE 2008). Where positive indicators of wetland hydrology are present, the limit of the OHWM (or the limit of adjacent wetlands) is noted and mapped. Evidence of wetland hydrology is met by the presence of a single primary indicator or two secondary indicators.

Primary

- surface water (A1)
- high water table (A2)
- saturation (A3)
- water marks (B1; non-riverine)
- sediment deposits (B2; non-riverine)
- drift deposits (B3; non-riverine
- surface soil cracks (B6)
- inundation visible on aerial imagery (B7)
- water-stained leaves (B9)
- salt crust (B11)
- biotic crust (B12)
- aquatic invertebrates (B13)
- hydrogen sulfide odor (C1)
- oxidized rhizospheres along living roots (C3)
- presence of reduced iron (C4)
- recent iron reduction in tilled soils (C6)
- thin muck surface (C7)

Secondary

- watermarks (B1; riverine)
- sediment deposits (B2; riverine)
- drift deposits (B3; riverine)
- drainage patterns (B10)
- dry-season water table (C2)
- crayfish burrows (C8)
- saturation visible on aerial imagery (C9)
- shallow aquitard (D3)
- FAC-neutral test (D5)

In the absence of all other hydrologic indicators and in the absence of significant modifications of an area's hydrologic function, positive hydric soil characteristics are assumed to indicate positive wetland hydrology. This assumption applies unless the site visit was done during the wet season of a normal or wetter-than-normal year. Under those circumstances, wetland hydrology would not be present.

Appendix G (cont.)
Federal Jurisdictional Information

Soils

The USACE and EPA, in their administration of Section 404 of the Clean Water Act, rely on the National Technical Committee for Hydric Soils (NTCHS) for a definition of hydric soils. According to the NTCHS, "A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part." (Federal Register 1994)

Soils must exhibit physical and/or chemical characteristics indicative of permanent or periodic saturation. Soil matrix and mottle colors are identified at each sampling plot using a Munsell soil color chart (Kollmorgen 1994). Generally, an 18-inch or deeper pit is excavated with a shovel at each sampling plot unless refusal occurs above 18 inches.

Soils in each area are closely examined for hydric soil indicators, including the characteristics listed below. Hydric soil indicators are presented in three groups. Indicators for "All Soils" (A) are used in any soil regardless of texture, indicators for "Sandy Soils" (S) area used in soil layers with USDA textures of loamy fine sand or coarser, and indicators for "Loamy and Clayey Soils" (F) are used with soil layers of loamy very fine sand and finer (USACE 2008 and Vasilias et al. 2017).

- histosols (A1)
- histic epipedons (A2)
- black histic (A3)
- hydrogen sulfide (A4)
- stratified layers (A5)
- 1 cm muck (A9)
- depleted below dark surface (A11)
- thick dark surface (A12)
- sandy mucky mineral (S1)
- sandy gleyed matrix (S4)
- sandy redox (S5)
- stripped matrix (S6)
- loamy mucky mineral (F1)
- loamy gleyed matrix (F2)
- depleted matrix (F3)
- redox dark surface (F6)
- depleted dark surface (F7)
- redox depressions (F8)
- vernal pools (F9)
- 2 cm muck (A10)
- reduced vertic (F18)
- red parent material (TF2)

Hydric soils may be assumed to be present in plant communities that have complete dominance of obligate or facultative wetland species. In some cases, there is only inundation during the growing season and determination must be made by direct observation during that season, recorded hydrologic data, testimony of reliable persons, and/or indication on aerial photographs.

Appendix G (cont.)
Federal Jurisdictional Information

NON-WETLAND WATERS OF THE U.S.

The non-wetland Waters of the U.S. designation is met when an area has periodic surface flows but lacks sufficient indicators to meet the hydrophytic vegetation and/or hydric soils criteria. For purposes of delineation and jurisdictional designation, the non-wetland Waters of the U.S. boundary in non-tidal areas is the OHWM as described in the Section 404 regulations (33 CFR Part 328).

U.S. Geological Survey Mapping

The U.S. Geological Survey (USGS) quad maps are one of the resources used to aid in the identification and mapping of jurisdictional areas. Their primary uses include understanding the subregional landscape position of a site, major topographical features, and a project's position in the watershed.

In our experience, the designation of watercourse as a blue-line stream (intermittent or perennial) on USGS maps has been unreliable and typically overstates the hydrology of most streams. This has also been the experience of others, including the late Dr. Luna Leopold. Dr. Leopold was a hydrologist with USGS from 1952 to 1972, professor in the Department of Geology and Geophysics and Department of Landscape Architecture, University of California, Berkeley from 1972 to 1986, and Professor Emeritus from 1987 until his death in 2006. In regard to USGS maps, Dr. Leopold wrote, "I tried to devise a way of defining hydrologic criteria for the channels shown on topographic maps and developed some promising procedures. None were acceptable to the topographers, however. I learned that the blue lines on a map are drawn by non-professional, low-salaried personnel. In actual fact, they are drawn to fit a rather personalized aesthetic" (Leopold 1994).

Appendix G (cont.)
Federal Jurisdictional Information

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Appendix H

California Fish and Wildlife Regulations

Appendix H
State Jurisdictional Information

CALIFORNIA FISH AND WILDLIFE REGULATIONS

The California Department of Fish and Wildlife (CDFW) regulates alterations or impacts to streambeds or lakes (wetlands) under Fish and Game Code Sections 1600 through 1616 for any private, state, or local government or public utility-initiated projects. The Fish and Game Code Section 1602 requires any entity to notify the CDFW before beginning any activity that will do one or more of the following: (1) substantially obstruct or divert the natural flow of a river, stream, or lake; (2) substantially change or use any material from the bed, channel, or bank of a river, stream, or lake; or (3) deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into a river, stream, or lake. Fish and Game Code Section 1602 applies to all perennial, intermittent, and ephemeral rivers, and streams as well as lakes in the state.

In order to notify the CDFW, a person, state, or local governmental agency or public utility must submit a complete notification package and fee to the CDFW regional office that serves the county where the activity will take place (CDFW 2016). A fee schedule is included in the notification package materials. Under the Permit Streamlining Act (Government Code Sections 65920 et seq.), the CDFW has 30 days to determine whether the package is complete. If the requestor is not notified within 30 days, the application is automatically deemed to be complete.

Once the notification package is deemed to be complete, the CDFW will determine whether the applicant will need a Lake or Streambed Alteration Agreement (SAA) for the activity, which will be required if the activity could substantially adversely affect an existing fish and wildlife resource. If an SAA is required, the CDFW will conduct an on-site inspection, if necessary, and submit a draft SAA that will include measures to protect fish and wildlife resources while conducting the project. If the applicant is applying for a regular SAA (less than five years), the CDFW will submit a draft SAA within 60 calendar days after notification is deemed complete. The 60-day time period does not apply to notifications for long-term SAAs (greater than five years).

After the applicant receives the SAA, the applicant has 30 calendar days to notify the CDFW whether the measures in the draft SAA are acceptable. If the applicant agrees with the measures included in the draft SAA, the applicant will need to sign the SAA and submit it to the CDFW. If the applicant disagrees with any measures in the draft SAA, the applicant must notify the CDFW in writing and specify the measures that are not acceptable. Upon written request, the CDFW will meet with the applicant within 14 calendar days of receiving the request to resolve the disagreement. If the applicant fails to respond in writing within 90 calendar days of receiving the draft SAA, the CDFW may withdraw that SAA. The time periods described above may be extended at any time by mutual agreement.

After the CDFW receives the signed draft SAA, the CDFW will make it final by signing the SAA; however, the CDFW will not sign the SAA until it both receives the notification fee and ensures that the SAA complies with the California Environmental Quality Act (Public Resources Code Section 21000 et seq.). After the applicant receives the final agreement, the applicant may begin the project, provided that the applicant has obtained any other necessary federal, state, and/or local authorizations.

Appendix H
State Jurisdictional Information

WATER RESOURCE CONTROL BOARD REGULATIONS

SECTION 401 WATER QUALITY CERTIFICATION

Whenever a project requires a federal Clean Water Act (CWA) Section 404 permit or a Rivers and Harbors Act Section 10 permit, it must first obtain a CWA Section 401 Water Quality Certification. The Regional Water Quality Control Board (RWQCB) administers the 401 Certification program. Federal CWA Section 401 requires that every applicant for a Section 404 permit must request a Water Quality Certification that the proposed activity will not violate state and federal water quality standards.

PORTER-COLOGNE WATER QUALITY CONTROL ACT

The State Water Resource Control Board (SWRCB) and the RWQCB regulate the discharge of waste to waters of the State via the 1969 Porter-Cologne Water Quality Control Act (Porter-Cologne) as described in the California Water Code (SWRCB 2017). The California Water Code is the State's version of the federal CWA. Waste, according to the California Water Code, includes sewage and any and all other waste substances, liquid, solid, gaseous, or radioactive, associated with human habitation, or of human or animal origin, or from any producing, manufacturing, or processing operation, including waste placed within containers of whatever nature prior to, and for purposes of, disposal. State waters that are not federal waters may be regulated under Porter-Cologne. A Report of Waste Discharge must be filed with the RWQCB for projects that result in discharge of waste into waters of the State. The RWQCB will issue Waste Discharge Requirements (WDRs) or a waiver. The WDRs are the Porter-Cologne version of a CWA 401 Water Quality Certification.

Appendix H
State Jurisdictional Information

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EIR Appendix D

Cultural Resources Survey

HELIX Environmental Planning

Eastern Municipal Water District Purified Water Replenishment Project

Cultural Resources Survey

May 2020 | EMW-20

Prepared for:

Eastern Municipal Water District
P.O. Box 8300
Perris, CA 92572-8300

Mary Robbins-Wade
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Prepared by:

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Eastern Municipal Water District Purified Water Replenishment Project

Cultural Resources Survey

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May 2020 | EMW-20

National Archaeological Database Information

Authors:	Mary Robbins-Wade, M.A., RPA, and Theodore G. Cooley, M.A., RPA
Firm:	HELIX Environmental Planning, Inc.
Client/Project:	Eastern Municipal Water District/Purified Water Replenishment Project
Report Date:	May 2020
Report Title:	Cultural Resources Survey for the Eastern Municipal Water District Purified Water Replenishment Project, San Jacinto Riverside County, California
Submitted to:	Eastern Municipal Water District, P.O. Box 8300 Perris, CA 92572-8300
Type of Study:	Cultural resources survey
New Sites:	None
Previously Recorded Sites:	P-33-003970 (CA-RIV-3970); P-33-003971 (CA-RIV-3971); P-33-007297; P-33-011265 (CA-RIV-6726H); P-33-015734 (CA-RIV-8195); P-33-015735; P-33-024874 (CA-RIV-11852); P-33-028071 (CA-RIV-12672)
USGS Quad:	Lakeview and San Jacinto 7.5’ USGS quadrangles
Acreage:	
Key Words:	Riverside County; City of San Jacinto; Eastern Municipal Water District; Luiseño; positive archaeological survey; cultural resources study; no new resources found; alluvial soils; Township 4 South and 5 South, Range 1 West

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ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
ACBCI	Agua Caliente Band of Cahuilla Indians
AMSL	above mean sea level
APN	Assessor's Parcel Number
BP	before present
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CHRIS	California Historical Resources Information System
CRHR	California Register of Historical Resources
District	Eastern Municipal Water District
EIC	Eastern Information Center
EMWD	Eastern Municipal Water District
HELIX	HELIX Environmental Planning, Inc.
NAHC	Native American Heritage Commission
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
OHP	Office of Historic Preservation
PRC	Public Resources Code
SR	State Route
TCA	Traditionally Culturally Affiliated
TCP	Traditional Cultural Properties
TCR	Tribal Cultural Resources
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey

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EXECUTIVE SUMMARY

HELIX Environmental Planning, Inc. (HELIX) was contracted by Eastern Municipal Water District (District; EMWD) to conduct a cultural resources survey for the proposed Purified Water Replenishment Project (project), situated in the San Jacinto River Valley in western Riverside County, California. The project would occur at multiple locations predominantly within the City of San Jacinto, with one location just outside the eastern city limits in unincorporated Riverside County. The implementation of the project would replenish the San Jacinto Upper Pressure Groundwater Management Zone aquifer with recycled water and advanced treated water to reduce reliance on imported water sources, provide improved drought resiliency, and potentially improve the quality of the groundwater basin utilized by the District's Integrated Recharge and Recovery Program (IRRP). The proposed project would include: (1) construction of an Advanced Water Treatment Facility (AWTF); (2) construction of a brine management system; (3) construction of the Alessandro Blending Station facilities; (4) modification of an existing 18-inch-diameter conveyance pipeline; and (5) construction of a new 36-inch-diameter conveyance pipeline.

A cultural resources study including a records search, Sacred Lands File search, Native American outreach, a review of historic aerial photographs and maps, and a pedestrian survey was conducted for the project. This report details the methods and results of the cultural resources study and has been prepared to comply with the California Environmental Quality Act (CEQA) and Section 106 of the National Historic Preservation Act (NHPA).

A records search conducted at the Eastern Information Center (EIC) on February 4, 2020 indicated that 87 previous cultural resources studies have been conducted within one mile of the project, 20 of which overlap with the project area. The records search results also indicated that a total of 90 cultural resources have been previously recorded within one mile of the project; eight historic period resources, including three refuse scatters, a dairy facility, two concrete slabs with a refuse deposit, a farmstead, and segments of the Colorado River Aqueduct and the San Diego Aqueduct are located within or in immediate proximity to the project area.

The field investigations included an intensive pedestrian survey of the project area by HELIX archaeologists and a Native American tribal cultural monitor from the Soboba Band of Luiseño Indians on February 20, 2020. The survey did not result in the identification of any new cultural resources, but materials or features related to five previously recorded resource were identified within the project area. Three of the eight previously recorded cultural resources, P-33-007297 (the former Raymar Dairy), P-33-015735 (a historic rural residential complex), and P-33-024874 (CA-RIV-11852; a post-1945 resource consisting of two concrete slabs), were found not to extend into the project area.

The five previously recorded resources identified within the project area include the Colorado River Aqueduct Casa Loma Siphon and San Diego Aqueduct (CA-RIV-6726H and CA-RIV-8195) and three historic trash scatters: P-33-003970 (CA-RIV-3970), P-33-003971 (CA-RIV-3971) and P-33-028071 (CA-RIV-12672). The three historic trash scatters have all been subject to a great deal of past disturbance and have very limited research potential; they are recommended as ineligible for the California Register of Historical Resources (CRHR) or the National Register of Historic Places (NRHP). P-33-011265 (CA-RIV-6726H) and P-33-015734 (CA-RIV-8195) are segments of the Colorado River Aqueduct and the San Diego Aqueduct. Both of these resources have been previously assessed as eligible for the NRHP (and by extension, the CRHR). Although the segments of the aqueducts are within the project area, they will not be subject to direct impacts from the project. The EMWD pipeline to be sliplined parallels the Casa Loma

Siphon of the Colorado River Aqueduct and the San Diego Aqueduct, but the project will not affect the aqueducts.

As such, no impacts to significant cultural resources are anticipated; no historical resources (per CEQA) or historic properties (per NHPA) will be adversely affected by the project. However, multiple cultural resources are known in the immediate vicinity of the project area, and the project vicinity is sensitive for cultural resources, as noted by the Soboba tribe. Soboba responded that the project location is in proximity to known sites, is a shared use area that was used in ongoing trade between the tribes and is considered culturally sensitive by the people of Soboba. In addition, portions of the project area could not be surveyed due to active agricultural uses and other factors.

Based on this, it is recommended that an archaeological and Native American monitoring program be implemented for ground-disturbing activities. The monitoring program would include attendance by the archaeologist and Native American monitor(s) at a preconstruction meeting with the grading contractor and the presence of archaeological and Native American monitors during initial ground-disturbing activities. Both archaeological and Native American monitors would have the authority to temporarily halt or redirect grading and other ground-disturbing activity in the event that cultural resources are encountered. If significant cultural material is encountered, the archaeological Principal Investigator and tribal representatives would coordinate with District staff to develop and implement appropriate mitigation measures.

1.0 INTRODUCTION

1.1 PROJECT LOCATION AND DESCRIPTION

The Eastern Municipal Water District (District; EMWD) is proposing to construct the Purified Water Replenishment Project (project), situated in the San Jacinto River Valley in western Riverside County, California (Figure 1, *Regional Location*). The project would replenish the San Jacinto Upper Pressure Groundwater Management Zone aquifer with recycled water and advanced treated water to reduce reliance on imported water sources, provide improved drought resiliency, and potentially improve the quality of the groundwater basin utilized by the District's Integrated Recharge and Recovery Program (IRRP). The proposed project would occur at multiple locations predominantly within the City of San Jacinto, with one location just outside the eastern city limits in unincorporated Riverside County. The proposed project would include: (1) construction of an Advanced Water Treatment Facility (AWTF); (2) construction of a brine management system; (3) construction of the Alessandro Blending Station facilities; (4) modification of an existing 18-inch-diameter conveyance pipeline; and (5) construction of a new 36-inch-diameter conveyance pipeline.

The project's proposed aboveground facilities would be located adjacent to the northern boundary of the District's existing San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) at 770 North Sanderson Avenue and at the District's existing Alessandro Ponds site near the intersection of West Ramona Parkway and North Vernon Avenue. One of the project's belowground pipelines would follow a route northeast from the SJVRWRF in an unpaved roadway, northeast along North Lyon Avenue, and southeast along Ramona Expressway, where it would turn off northeast to near the District's existing Alessandro Ponds site. The project's second pipeline would run from near the Alessandro Ponds site southeast along Ramona Expressway to the District's existing Mountain Avenue West Recharge Basin at the intersection of Ramona Expressway and East Esplanade Court. The project elements are located in Township 4 South, and 5 South, Range 1 West, on the U.S. Geological Survey (USGS) 7.5-minute Lakeview and San Jacinto quadrangles (Figure 2, *USGS Topography*, and Figure 3, *Project Location*).

1.2 REGULATORY FRAMEWORK

Cultural resources are defined as buildings, sites, structures, or objects, each of which may have historical, architectural, archaeological, cultural, and/or scientific importance. Significant resources are those resources that have been found eligible for listing in the California Register of Historical Resources (CRHR) or the National Register of Historic Places (NRHP), as applicable.

1.2.1 National Historic Preservation Act

Federal regulations that would be applicable to the project if there is a federal nexus (e.g., permitting or funding from a federal agency) consist of the National Historic Preservation Act (NHPA) and its implementing regulations (16 United States Code 470 et seq., 36 CFR [Code of Federal Regulations] Part 800). Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on "historic properties", that is, properties (either historic or archaeological) that are

eligible for the NRHP. To be eligible for the NRHP, a historic property must be significant at the local, state, or national level under one or more of the following four criteria:

A. Associated with events that have made a significant contribution to the broad patterns of our history;

B. Associated with the lives of persons significant in our past;

C. Embodies the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; and/or

D. Has yielded or may be likely to yield, information important in prehistory or history.

1.2.2 California Environmental Quality Act

The California Environmental Quality Act (CEQA), Public Resources Code (PRC) 21084.1 and CEQA Guidelines, California Code of Regulations (CCR) Title 14 Section 15064.5 discuss significant cultural resources as "historical resources," and define them as:

- Resource(s) listed in or determined eligible by the State Historical Resources Commission for listing in the CRHR (14 CCR Section 15064.5[a][1]);

- Resource(s) either listed in the NRHP or in a "local register of historical resources" or identified as significant in a historical resource survey meeting the requirements of Section 5024.1(g) of the PRC, unless "the preponderance of evidence demonstrates that it is not historically or culturally significant" (14 CCR Section 15064.5[a][2]);

- Resources determined by the Lead Agency to meet the criteria for listing in the CRHR (14 CCR Section 15064.5[a][3]).

For listing in the CRHR, a historical resource must be significant at the local, state, or national level under one or more of the following four criteria:

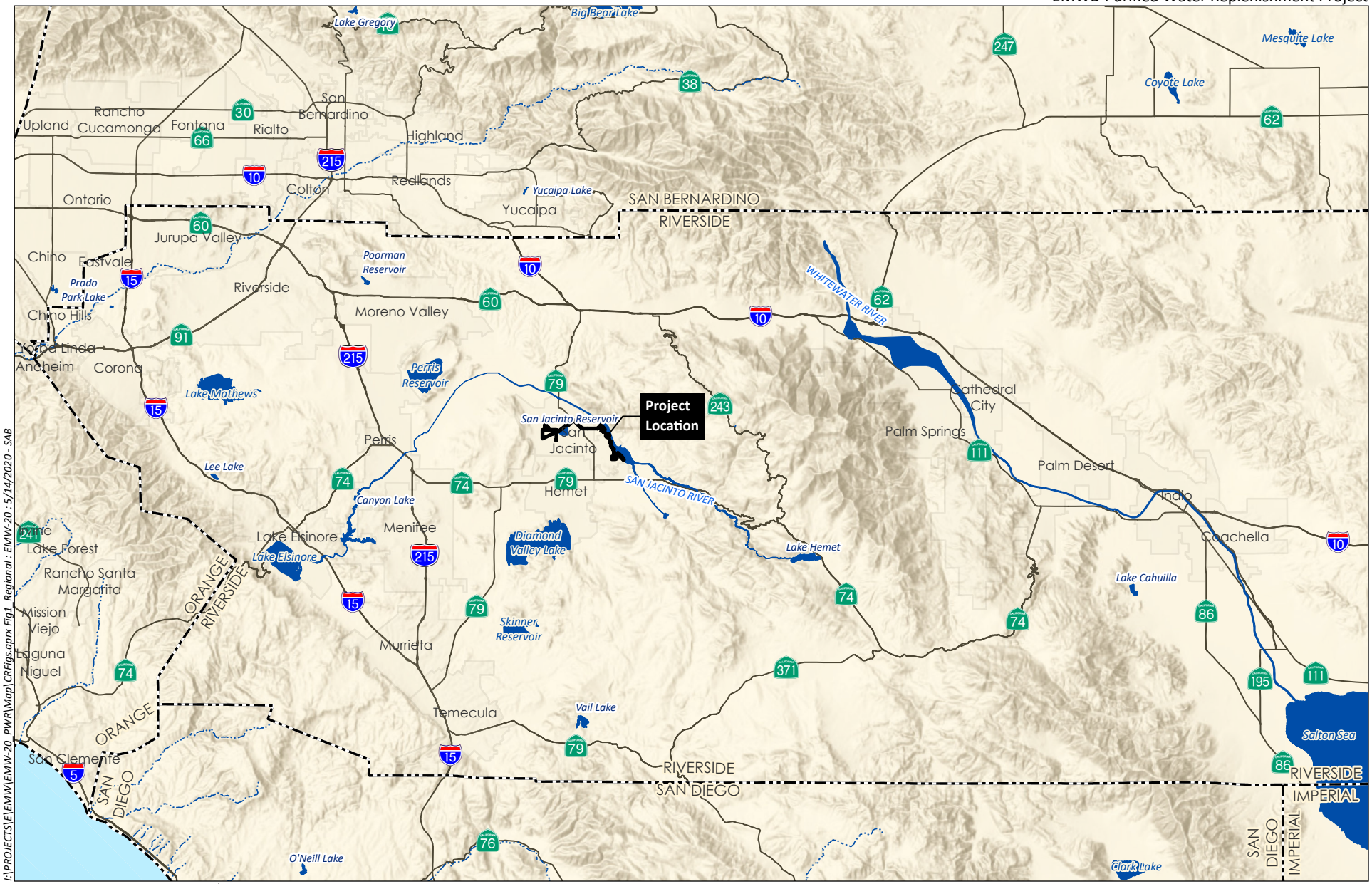
1. It is associated with events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States;

2. It is associated with the lives of persons important to local, California, or national history;

3. It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of a master or possesses high artistic values;

4. It has yielded or has the potential to yield information important to the prehistory or history of the local area, California, or the nation.

Under 14 CCR Section 15064.5(a)(4), a resource may also be considered a "historical resource" for the purposes of CEQA at the discretion of the lead agency.



I:\PROJECTS\E\EMW\EMW-20_PWR\Map\CRFigs.apnx Fig1 Regional : EMW-20 : 5/14/2020 - SAB

0 10 Miles

Source: Base Map Layers (ESRI, 2013)

HELIX Environmental Planning

Regional Location

Figure 1

Project Location
Pipeline

San Jacinto Reservoir
Sewage Disposal Ponds
Duck Ponds
Cottonwood Lake
San Jacinto
(BM 1567)
Mobile Home Park
Drive-In Theater
Siphon
Windmill
Well
Wells
Reservoir
BM 1522
BM 1604
AQUEDUCT
SAN DIEGO AQUEDUCT
RAMONA EXPRESSWAY
IDYLLWILD BLVD
DE ANZA DRIVE
SOBOBA ROAD
GOLF COURSE
CANAL
COTTONWOOD AVE
SEVENTH ST
ESPLANADE AVE
FIRST ST
MAIN ST
SHAVER ST
EVANS ST
COMMONWEALTH AVE
GRAND AVE
LYON AVE
PALM AVE
STATE ST
SANTA FE ST
SAN JACINTO MOUNTAIN
SAN DIEGO AVE
NIDAY AVENUE
HEWITE ST
T. 5 S. R. 1 W.
T. 5 S. R. 1 E.
SAN JACINTO
LAKEVIEW
19
20
29
30
31
32
23
24

0 2,000 Feet

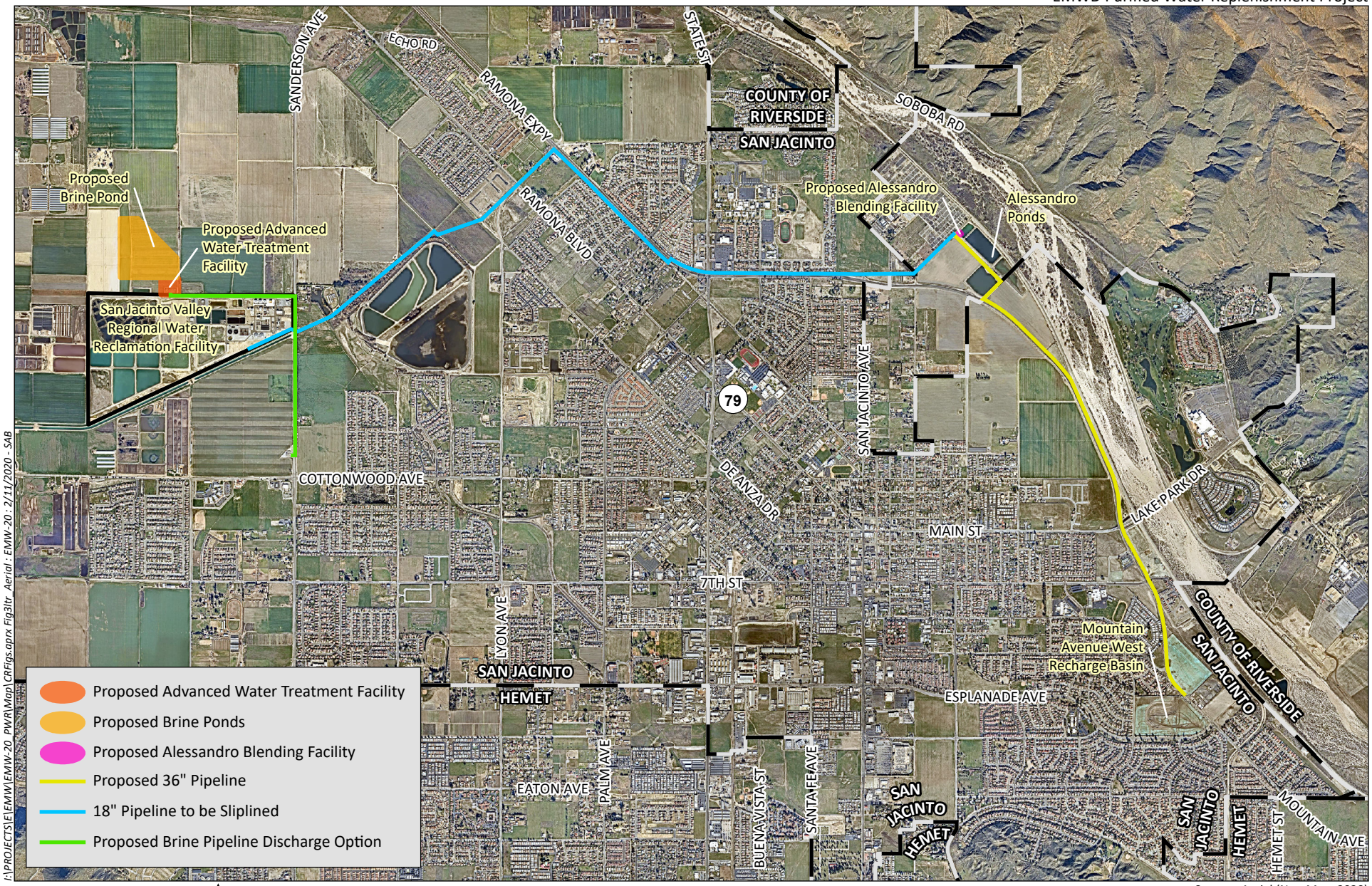
Source: LAKEVIEW and SAN JACINTO 7.5' Quad (USGS)

i:\PROJECTS\EMW\EMW-20_PWR\Map\CRFigs.aprx Fig2_USGS : EMW-20 : 5/14/2020 - SAB

HELIX Environmental Planning

USGS Topography

Figure 2



Source: Aerial (NearMap, 2020)

HELIX Environmental Planning

Project Location

Figure 3

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All resources that are eligible for listing in the NRHP or CRHR must have integrity, which is the authenticity of a historical resource's physical identity evidenced by the survival of characteristics that existed during the resource's period of significance. Resources, therefore, must retain enough of their historic character or appearance to be recognizable as historical resources and to convey the reasons for their significance. Integrity is evaluated with regard to the retention of location, design, setting, materials, workmanship, feeling, and association. In an archaeological deposit, integrity is assessed with reference to the preservation of material constituents and their culturally and historically meaningful spatial relationships. A resource must also be judged with reference to the particular criteria under which it is proposed for nomination. Under Section 106 of the NHPA, actions that alter any of the characteristics that qualify a property for eligibility for listing in the NRHP "in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association" (36 CFR 800.5[a]) constitute an adverse effect to the historic property.

1.2.3 Native American Heritage Values

Federal and state laws mandate that consideration be given to the concerns of contemporary Native Americans with regard to potentially ancestral human remains, associated funerary objects, and items of cultural patrimony. Consequently, an important element in assessing the significance of the study site has been to evaluate the likelihood that these classes of items are present in areas that would be affected by the proposed project.

Potentially relevant to prehistoric archaeological sites is the category termed Traditional Cultural Properties (TCPs) in discussions of cultural resource management performed under federal auspices. According to Patricia L. Parker and Thomas F. King (1998), "Traditional" in this context refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or through practice. The traditional cultural significance of a historic property, then, is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices. Cultural resources can include TCPs, such as gathering areas, landmarks, and ethnographic locations, in addition to archaeological districts. Generally, a TCP may consist of a single site, or group of associated archaeological sites (district or traditional cultural landscape), or an area of cultural/ethnographic importance.

In California, the Traditional Tribal Cultural Places Bill of 2004 requires local governments to consult with Native American Tribes during the project planning process, specifically before adopting or amending a General Plan or a Specific Plan, or when designating land as open space for the purpose of protecting Native American cultural places. The intent of this legislation is to encourage consultation and assist in the preservation of Native American places of prehistoric, archaeological, cultural, spiritual, and ceremonial importance. State Assembly Bill (AB) 52, effective July 1, 2015, introduced the Tribal Cultural Resource (TCR) as a class of cultural resource and additional considerations relating to Native American consultation into CEQA. As a general concept, a TCR is similar to the federally defined TCP; however, it incorporates consideration of local and state significance and required mitigation under CEQA. A TCR may be considered significant if included in a local or state register of historical resources; or determined by the lead agency to be significant pursuant to criteria set forth in PRC §5024.1; or is a geographically defined cultural landscape that meets one or more of these criteria; or is a historical resource described in PRC §21084.1, a unique archaeological resource described in PRC §21083.2; or is a non-unique archaeological resource if it conforms with the above criteria.

1.3 SURVEY AREA

The survey area for the Purified Water Replenishment Project includes the proposed pipeline alignments, AWTF, brine pond, and Alessandro Blending Facility, as well as the existing pipeline proposed to be sliplined (Figures 2 and 3). A 50-foot buffer on either side of the pipeline was surveyed for new pipeline alignments. Specific staging areas have not yet been identified; staging areas would be within developed locations or within the survey area .

1.4 PROJECT PERSONNEL

A cultural resources survey was conducted by HELIX Environmental Planning, Inc. (HELIX) in February 2020 to assess whether the project would have any effects on cultural resources. Mary Robbins-Wade, M.A., RPA, served as Principal Investigator and senior report author. Theodore G. Cooley, M.A., RPA, is a co-author of the report. HELIX archaeologists Julie Roy, B.A. and Mary Villalobos, B.A. conducted the field survey with Frank Morreo (Native American monitor) from the Soboba Band of Luiseño Indians (Soboba). Resumes for key project personnel are presented in Appendix A. This report addresses the methods and results of the cultural resources survey, which included a records search, Sacred Lands File search, Native American outreach, review of historic maps and aerial photographs, and an intensive pedestrian field survey.

2.0 PROJECT SETTING

2.1 NATURAL SETTING

The project area is located within the floodplain of the upper San Jacinto River Valley in westernmost Riverside County, California. Diamond Valley Lake lies approximately six miles to the south, and Perris Reservoir is approximately nine miles to northwest. The project area is situated on alluvium deposited by the San Jacinto River and alluvial fan sediments eroded from the mostly granitic bedrock of the immediately adjacent Lakeview Mountains to the west and San Jacinto Mountains to the east. Elevations in the project area range from approximately 1,615 feet above mean sea level (AMSL) near the eastern project extent to approximately 1,480 feet AMSL in the western portions of the project area. Land uses within and surrounding the project area include agricultural fields, dairy and livestock facilities, transportation infrastructure, water conveyance infrastructure, and intermittent areas of residential development.

Geologically, the project area, being located entirely on the floodplain of the San Jacinto River, is mapped as alluvium, composed mostly of sand and gravel of late Pleistocene to early Holocene age (Dibblee and Minch 2003; Morton and Matti 2001). The adjacent rocky Lakeview Mountain foothills to the west and San Jacinto Mountain foothills to east are both mapped mostly as Cretaceous era tonalite and granodiorite granitic bedrock but with older metasedimentary rocks also present, intermixed within the granitic bedrock (Dibblee and Minch 2003; Morton and Matti 2001).

The study area contains mostly alluvial associated soils. Soils mapped in the project area and/or the immediate vicinity include Traver loamy fine sand, saline-alkali, eroded, and Traver fine sandy loam, strongly saline-alkali, eroded; Dello loamy sand, gravelly substratum, 0 to 2 and 0 to 5 percent slopes; Metz loamy sand, gravelly substratum, 0 to 2 and 0 to 5 percent slopes; and Metz loamy fine sand, 0 to 2 percent slopes; San Emigdio fine sandy loam 0 to 2 and 2 to 8 percent slopes; San Emigdio fine sandy

loam, deep, 0 to 2 percent slopes, and San Emigdio loam, 0 to 2 percent slopes; Grangeville sandy loam, drained, saline-alkali, 0 to 5 percent slopes; Grangeville sandy loam, sandy substratum, drained, 0 to 5 percent slopes; Grangeville sandy loam, sandy substratum, drained, saline alkali, 0 to 5 percent slopes; Grangeville fine sandy loam, drained, 0 to 2 percent slopes; Grangeville fine sandy loam, poorly drained, saline-alkali, 0 to 5 percent slopes; Grangeville fine sandy loam, saline-alkali, 0 to 5 percent slopes; Grangeville fine sandy loam, loamy substratum, drained, 0 to 2 percent slopes; and Riverwash (U.S. Department of Agriculture 2020).

While the rocky foothill hill areas to the east and west of the project area currently contain mostly non-native grassland and weeds with intermittent areas of sage scrub vegetation, it seems probable that, prehistorically, sage scrub vegetation predominated in these adjacent foothill areas, with intermittent areas of native grassland. It also seems likely that in the alluvial floodplain areas of the San Jacinto River Valley that predominate in the project area, prior to tilling in historic and modern times, the vegetation also contained a mixture of native grassland and sage scrub vegetation, as well as riparian plants in the well-watered areas adjacent to the San Jacinto River channel. Prehistorically, the natural vegetation of the sage scrub community included plants such as California sagebrush (*Artemisia californica*), white sage (*Salvia apiana*), flat-top buckwheat (*Eriogonum fasciculatum*), broom baccharis (*Baccharis sarothroides*), wild onion (*Allium haematochiton*), laurel sumac (*Malosma laurina*), San Diego sunflower (*Viguiera laciniata*), golden-yarrow (*Eriophyllum confertiflorum*), sawtooth goldenbush (*Hazardia squarrosa*), yucca (*Yucca schidigera*, Y. *whipplei*), prickly pear cactus (*Opuntia occidentalis*), and scrub oak (*Quercus dumosa*), which would have covered most of the adjacent hill and mountain areas, with interspersed areas of native grasslands (*Stipa*, *Elymus*, *Poa*, and *Muhlenbergia*). The likely more extensive stands of riparian communities along the San Jacinto River would have included plants such as sycamore (*Platanus racemosa*), Fremont cottonwood (*Populus fremontii*), coast live oak (*Quercus agrifolia*), and willow (*Salix* sp.) (Munz 1974). Major wildlife species found in this environment prehistorically were coyote (*Canis latrans*); mule deer (*Odocoileus hemionus*); grizzly bear (*Ursus arctos*); mountain lion (*Felis concolor*); rabbit (*Sylvilagus audubonii*); jackrabbit (*Lepus californicus*); and various rodents, the most notable of which are the valley pocket gopher (*Thomomys bottae*), California ground squirrel (*Ostospermophilus beecheyi*), and dusky footed woodrat (*Neotoma fuscipes*) (Head 1972). Rabbits, jackrabbits, and rodents were very important to the prehistoric diet; deer were somewhat less significant for food, but were an important source of leather, bone, and antler. Many of the native plant species found in these vegetation communities and those found in the project vicinity are known to have been used by native populations for food, medicine, tools, and ceremonial and other uses (Bean 1978; Bean and Shipek 1978; Bean and Saubel 1979; Hedges and Beresford 1986; Oxendine 1983). Many of the animal species living within these communities such as rabbits, deer, small mammals, and birds would have been used by native inhabitants as well.

2.2 CULTURAL SETTING

2.2.1 Prehistoric Period

2.2.1.1 Introduction

Moratto (1984) has previously defined eight archaeological regions and 16 subregions for California. The location of the project places it within the boundary of the San Diego subregion of the Southern Coast Region, but it is also located adjacent to the boundary with the Colorado River subregion of the Desert Region (Moratto 1984: 148, Figure 4.13). The following culture history outlines and briefly describes the known prehistoric cultural Traditions and chronology of archaeological sites in the vicinity of the project.

The approximately 10,000 years of documented prehistory of the region has often been divided into three periods: Early Prehistoric Period (San Dieguito Tradition [Warren 1968]), Archaic Period (Milling Stone Horizon [Wallace 1955], Encinitas Tradition [Warren 1968]), and Late Prehistoric Period.

Prior to 1984, when Moratto defined the San Diego subregion, little archaeological investigation had occurred in the westernmost Riverside and San Bernardino counties portion of this subregion. This paucity of archaeological information limited the ability of early researchers to assess the cultural and temporal associations for the archaeological resources in this part of the subregion. One of the few early studies to occur in this area prior to 1984 was conducted near Temecula in the early 1950s at a site identified as the ethnohistoric village of *Temek*u (McCown 1955). The investigation produced a substantial, primarily Late Prehistoric Period, artifact assemblage, but with some possible late Archaic materials as well. Another study, conducted in the 1970s, for the construction of the Perris Reservoir (O'Connell et al. 1974, eds.), consisted of investigations at several sites and was, perhaps, the most extensive study conducted in the area prior to 1984. The results, which included several radiocarbon dates, indicated a predominance of occupation at the sites during the Late Prehistoric Period, after A.D. 1500, but with some limited evidence for occupation as early 380 B.C. (Bettinger 1974:159-162). During the last approximately 35 years since 1984, several archaeological studies have occurred in western Riverside County that have served to substantially augment the archaeological record for the area (e.g., Applied EarthWorks, Inc. 2001; Grenda 1997; Keller and McCarthy 1989; McCarthy 1986, 1987). Based on the information provided by these and other subsequent studies in the area, Sutton and Gardner(2010) and others have recently begun to define the early prehistory of this area of the San Diego subregion and how it fits in with the previously better-known areas off the subregion. The three chronological periods defined for the prehistory of the San Diego subregion are described below.

2.2.1.2 Early Prehistoric Period

The Early Prehistoric Period represents the time of the entrance of the first known human inhabitants into California. In some areas of California, it is referred to as the Paleo-Indian period, and it is associated with the Big-Game-Hunting activities of the peoples of the last Ice Age, occurring during the Terminal Pleistocene (pre-10,000 years ago) and the Early Holocene (beginning circa 10,000 years ago) (Erlandson 1994, 1997; Erlandson et al. 2007). In the western United States, the most substantial evidence for the Paleo-Indian or Big-Game-Hunting peoples derives from finds of large fluted spear and projectile points (Fluted-Point Tradition) at sites in places such as Clovis and Folsom in the Great Basin and the Desert southwest (Moratto 1984:79–88). In California, most of the evidence for the Fluted-Point Tradition derives principally from areas along the western margins of the Great Basin including the eastern Sierras and the Mojave Desert, and in the southern Central Valley (Dillon 2002; Rondeau et al. 2007). Elsewhere in California, with the exception of a site in the north coast ranges in northwestern California, CA-LAK-36, only isolated occurrences of fluted spear points have occurred, scattered around the state (Dillon 2002; Rondeau et al. 2007). These isolated occurrences have, however, included two fluted points or fluted point fragments recently discovered in, or in close proximity to, the San Diego subregion; one in the mountainous eastern area of San Diego County approximately 41 miles to the southeast of the project area (Kline and Kline 2007) and another along the coast approximately 40 miles to the west of the project area, in adjacent Orange County (Fitzgerald and Rondeau 2012). Two examples have also been discovered to the south in Baja California (Des Lauriers 2008; Hyland and Gutierrez 1995). Despite these isolated occurrences of fluted points in the San Diego subregion and Baja California, none have been found, to date, in the western Riverside or San Bernardino counties area (Dillon 2002; Rondeau et al. 2007).

The earliest sites in the San Diego subregion, documented to be over 9,000 years old, belong to the San Dieguito Tradition (Warren et al 1998; Warren and Ore 2011). The San Dieguito Tradition, with an artifact assemblage distinct from that of the Fluted Point Tradition, has been documented mostly in the coastal and near coastal areas in San Diego County (Carrico et al. 1993; Rogers 1966; True and Bouey 1990; Warren 1966; Warren and True 1961), as well as in the southeastern California deserts (Rogers 1939, 1966; Warren 1967). The content of the earliest component of the C.W. Harris Site (CA-SDI-149/316/4935B), located along the San Dieguito River, approximately 46 miles to the south of the project, formed the basis upon which Warren and others (Rogers 1966; Vaughan 1982; Warren 1966, 1967; Warren and True 1961) identified the "San Dieguito complex," which Warren later reclassified as the San Dieguito Tradition (1968). This Tradition is characterized by an artifact inventory consisting almost entirely of flaked stone biface and scraping tools but lacking the fluted points associated with the Fluted-Point Tradition. Diagnostic artifact types and categories associated with the San Dieguito Tradition include elongated bifacial knives; scraping tools; crescentics; and Silver Lake, Lake Mojave, and leaf-shaped projectile points (Knell and Becker 2017; Rogers 1939; Warren 1967). Some researchers interpret the San Dieguito Tradition/complex as having a primarily, but not exclusively, hunting subsistence orientation, but sufficiently hunting-oriented as to be distinct from the more gathering-oriented complexes of traits that were to follow in the Archaic Period (Warren 1968; Warren et al. 1998). Other researchers see the San Dieguito subsistence system as less focused on hunting and more diversified, and, therefore, possibly ancestral to, or a developmental stage for, the subsequent, predominantly gathering-oriented, Encinitas Tradition, denoted in the San Diego area as the "La Jolla/Pauma complex" (True 1958, 1980) during the Archaic Period (cf. Bull 1983; Ezell 1987; Gallegos 1985, 1987, 1991; Koerper et al. 1991). While little definite evidence for the San Dieguito Tradition has been discovered in other coastal and near-coastal areas of southern California outside of San Diego County, some evidence has recently been attributed to it in the eastern mountains of San Diego County (Pigniolo 2005) and in a coastal area to the north in Los Angeles County (Sutton and Grenda 2012).

2.2.1.3 Archaic Period

During the subsequent Archaic Period, artifact assemblages of the Milling Stone Horizon/Encinitas Tradition occur at a range of coastal and adjacent inland sites, and, in contrast to those of the previous Early Prehistoric Period, are relatively common in the study area region. These assemblages appear to indicate that a relatively stable, sedentary, predominantly gathering complex, possibly associated with one people, was present in the coastal and immediately inland areas of southern California for more than 7,000 years (Grenda 1997: Sutton and Gardner 2010; Warren 1968; Warren et al. 1998;).

Warren has proposed that during the Archaic Period in the south coastal region, the Encinitas Tradition began circa 8,500 years ago and extended essentially unchanged until circa 1,500 years ago (Warren 1968:2; Warren et al. 1998). Also during the Archaic Period in the coastal region, beginning somewhere north of San Diego and extending to Santa Barbara, a fourth cultural assemblage, variously described as the Intermediate Horizon (Wallace 1955) or Campbell Tradition (Warren 1968), has been delineated and distinguished, following the Milling Stone Horizon/Encinitas Tradition. This assemblage is distinguished from earlier Archaic assemblages by the presence of large projectile points and milling tools such as the mortar and pestle. The time period of this assemblage is viewed as beginning circa 4,800 years ago and continuing to as late as 1,300 years ago (Warren 1968). While still a matter of some debate, in the southernmost coastal region, Warren and others (1998) have subsequently divided the Archaic Period into a Middle Archaic Period and the time period encompassing the extent of the Intermediate/Campbell cultural assemblage, termed the Final Archaic Period.

In the vicinity of the study area, archaeological investigations conducted at several sites in Perris Valley for the Perris Reservoir project, approximately nine miles to the northwest of the project area, produced a single radiocarbon date within the Archaic Period of circa 2,200 years before present (B.P.), as well as a few diagnostic artifacts, as the only evidence for a late Archaic Period occupation at the sites (Bettinger 1974:159-162). Investigations at another site, CA-RIV-1806, in the mountains northwest of Temecula, also produced a radiocarbon date for the late Archaic Period of circa 2775 B.P. (McCarthy 1986:73). More recently, large-scale archaeological investigations have been conducted for the Eastside Reservoir (since renamed Diamond Valley Lake) Project, located approximately six miles south of the study area. This project involved reservoir construction within the adjacent Domenigoni and Diamond valleys (Goldberg 2001; Robinson 2001). Based on the results from this project, the researchers developed a local chronology specific to the Domenigoni and Diamond valleys based on projectile point style changes and associated radiocarbon dates (Robinson 2001). The terminology in this chronology resembles that already presented above, with the period from 9,500 to 7,000 years ago designated as the Early Archaic period, the period from 7,000 to 4,000 years ago as the Middle Archaic, and the period from 4,000 to 1,500 years ago as the Late Archaic. Only two components could be firmly dated to the Early Archaic at the reservoir sites, but sparse evidence of Early Archaic activity was noted in six other localities. One site did, however, produce two radiocarbon dates of 9190±50 and 9310±60 B.P. (McDougall 2001). For the Middle Archaic, firm evidence was documented in 14 locations, with traces at four other sites. During the Late Archaic, a profusion of activity and occupation was evident, with 23 firmly dated site components and sparse evidence at eight other localities (Goldberg 2001:524).

Another archaeological investigation conducted in relative proximity to the study area has also produced evidence for prehistoric occupation in the area during the earliest part of the Archaic Period. This investigation occurred at Lake Elsinore, located approximately 20 miles to the southwest of the study area (Grenda 1997). This natural lake is situated in a fault-created basin whose principal source of water in prehistoric times was the San Jacinto River (Grenda 1997:3). Archaeological investigations conducted at a site located along the old lake shoreline indicated occupation as early as 8,500 years ago (Grenda 1997). Thus, prehistoric occupation during the Archaic Period in areas of western Riverside County in the study area vicinity is documented to have occurred beginning, possibly as early as 9,300 years ago, and remained present to the end of the period, approximately 1,500 years ago. While this temporal extent correlates with Warren's original proposed extent of the Encinitas Tradition, refinement of his characterization of the Tradition as being a relatively stable, sedentary, predominantly gathering complex, possibly associated with one people, and with an extent mostly restricted to the San Diego County area, may now, based on more recent information available, be subject to some revision (cf. Sutton and Gardener 2010).

2.2.1.4 Late Prehistoric Period

The beginning of the Late Prehistoric Period, circa 1,500 years ago, is seen as a time marked by a number of rather abrupt changes. The magnitude of these changes and the short period of time within which they took place are reflected in significant alteration of previous subsistence practices and the adoption of significant new technologies. As discussed further below, some of this change may have been as a result of significant variations in climatic conditions. Subsistence and technological changes that occurred include a shift from hunting using atlatl and dart to the bow and arrow; a de-emphasizing of shellfish gathering along some areas of the coast (possibly due to silting-in of the coastal lagoons); and an increase in the storage of crops, such as acorns and pinyon nuts. Other new traits introduced during the Late Prehistoric Period include the production of pottery and cremation of the dead, and, locally, in the western Riverside County area, a shift in settlement pattern is apparent (cf. Wilke 1974).

This shift in settlement is first noted during the early part of the period from 1,500 to 750 years ago and is evidenced locally in the results from the Eastside Reservoir (Diamond Lake) Project by a rather sudden decline in occupation in the local area during the initial part of the period. This 750-year period was termed by the Eastside Reservoir researchers as the Saratoga Springs Period, following Warren's (1984) desert terminology. This period can also be seen to partially coincide with a warm and arid period known as the Medieval Warm Period, documented to have occurred between approximately 1,100 and 600 years ago (Jones et al. 1999; Kennett and Kennett 2000; Stine 1994). During this period, at least two episodes of severe drought have also been demonstrated, the first between 1060 and 840 cal B.P. and the second between 740 and 650 cal B.P. (Goldberg 2001; Stine 1994). While sites dating to this period are not absent in western Riverside County (e.g., Keller and McCarthy 1989; McCarthy 1987:34), Goldberg (2001) hypothesized that the Medieval Warm Period could account for the decline in sites occurring in the Eastside Reservoir Project area during the Saratoga Springs Period (1500 to 750 B.P.), claiming that desert and inland areas of western Riverside County, such as where the Eastside Reservoir Project and the current study area are located, would no longer be suitable to support residential bases. Goldberg (2001) further hypothesized that settlements would possibly be clustered at more suitable water sources during this time, such as at the coast, Lake Cahuilla, or Lake Elsinore (cf. Wilke 1974, 1978). While a decline was noted during the initial part of the Saratoga Springs Period, subsequently, during the latter part of the period, during the time of the Medieval Warm Period, a reoccupation began to occur (Goldberg 2001:578). According to Goldberg, "When components dating to the Medieval Warm segment of the Saratoga Springs Period are segregated and combined with Medieval Warm components from the Late Prehistoric Period, it shows that the frequency of refuse deposits and artifact and toolstone caches during the Medieval Warm is slightly higher than during the Late Archaic and much higher than during the later portion of the Late Prehistoric Period" (2001:578).

In the Eastside Reservoir Project, the Late Prehistoric Period was defined as extending from the end of the Saratoga Springs Period (750 B.P.) to 410 B.P. A subsequent Protohistoric Period was also defined as extending from 410 to 150 B.P. The Late Prehistoric (750–410 B.P.) was characterized by the presence of Cottonwood points, although research indicated that Cottonwood points had actually begun to appear in the Eastside Reservoir Project study area as early as 950 B.P. Ceramics and abundant obsidian began to appear around the time of the Cabrillo exploration in A.D. 1542; so, this date (i.e., circa 410 B.P.), until the establishment of the mission system in the late 1700s, was defined as the Protohistoric Period (Robinson 2001). It should also be noted that the end of the Saratoga Springs Period and the beginning of the Late Prehistoric Period, 750 B.P. also coincides with the onset of the Little Ice Age, generally dated from 750 to 150 B.P. (Goldberg 2001; Sutton et al. 2007). During this period, the climate was cooler and moister, and the sites identified within the Eastside Reservoir Project study area reflected a substantial increase in number and diversity, longer occupation periods, and more sedentary land use. Similar intensification of land use also occurred during this time in neighboring San Gorgonio Pass (Bean et al. 1991) and Perris Valley (Wilke 1974).

Differing from the terminology used in the Eastside Reservoir study, the Late Prehistoric Period has been more commonly described archaeologically in northern San Diego County and the western portion of Riverside County as the San Luis Rey (SLR) complex. As originally defined by Meighan (1954), the SLR complex is associated with the ethnographic Luiseño, who were present in the area at the time of first contact with Europeans. Meighan saw the complex as occurring in two phases: SLR I and SLR II, with the principal archaeological element distinguishing the two phases being the absence of pottery in SLR I sites and its presence in SLR II assemblages. The introduction of pottery was seen as having disseminated to the prehistoric Luiseño from their neighbors, the Kumeyaay, to the south (Rogers 1936; Meighan 1954:221). Elements of the SLR I phase include small, triangular, pressure-flaked projectile

points (generally Cottonwood series, with Desert Side-notched series points rarely occurring); milling implements: mortars and pestles, manos and metates, and bedrock milling features; bone awls; Olivella shell beads; other stone and shell ornaments; and cremations (Meighan 1954; Moratto 1984; Pigniolo 2001; True et al. 1974). In addition to pottery, the later SLR II assemblages include several other elements not found in SLR I assemblages: "cremation urns, red and black pictographs, and such nonaboriginal items as metal knives and glass beads" (Meighan 1954:223). SLR I was originally thought by Meighan to date from A.D. 1400 to A.D. 1750, with SLR II dating between A.D. 1750 and A.D. 1850 (Meighan 1954:223). This chronology was subsequently revised, however, by True and others, who suggested that, while "some pottery probably filtered across from Diegueño [Kumeyaay] territory perhaps as early as A.D. 1200-1300 under some circumstances, . . . the introduction of pottery as a regular and important element in the San Luis Rey lifeway probably did not take place until a century or two before the arrival of the Spanish (perhaps A.D. 1500-1600)" (True et al. 1974:97).

2.2.2 Ethnohistory

While ethnographers do not entirely agree, the project location is generally considered to lie within the traditional territory of the Luiseño people. The name Luiseño derives from Mission San Luis Rey de Francia and has been used to refer to the Native people associated with the mission. A number of ethnographic and ethnohistoric studies of the Luiseño have occurred, including Bean and Shipek (1978), Boscana (1947), DuBois (1908), Jones (1992), Kroeber (1925), Masiel-Zamora (2013), Oxendine (1983), Shipek (1977), Sparkman (1908), Talley (1982), and White (1963). Some ethnographers place the area of the project within or adjacent to a "transitional" area between the Luiseño and the linguistically-related Cahuilla to the east (Bean 1972, 1978; Bean and Shipek 1978), but Kroeber (1925) places it firmly within the traditional territory of the Luiseño people (see Kroeber 1925: Plate 57). The Luiseño and Cahuilla are both Takic-speaking people of the Uto-Aztecan linguistic stock (Miller 1986). The Luiseño language belongs to the Cupan group of the Takic subfamily and is part of the widespread Uto-Aztecan language family (Bean and Shipek 1978; Sparkman 1908; White 1963). The Cahuilla and another neighbor to the east, the Cupeño, also speak Cupan languages. The ethnographic uncertainty of the boundary between the Luiseño and the Cahuilla likely indicates that it has varied through time. In relative proximity to the project area, in the northern portion of San Diego County, Luiseño territory is bordered by the linguistically distinct Hokan-based, Yuman-speaking, Kumeyaay, also known as Ipai-Tipai, or Diegueño (named for Mission San Diego de Alcala).

The Luiseño followed a seasonal gathering cycle, with bands occupying a series of campsites within their territory (Bean and Shipek 1978; White 1963). The Luiseño lived in semi-sedentary villages usually located along major drainages, in valley bottoms, and also on the coastal strand, with each family controlling gathering areas (Bean and Shipek 1978; Sparkman 1908; White 1963). True (1990) indicated that the predominant determining factor for placement of villages and campsites was locations where water was readily available, preferably on a year-round basis. While most of the major Luiseño villages known ethnographically were located closer to the coast along the Santa Margarita River Valley and the San Luis Rey River Valley (Bean and Shipek 1978; Kroeber 1925; White 1963), Kroeber (1925) does indicate general locations for three Luiseño villages in more inland areas. He places the village of *Panache* in proximity to Lake Elsinore and the confluence of the San Jacinto River and Temescal Creek, approximately 20 miles to the southwest of the project, and the villages of *Temeku* and *Meha* in the vicinity of the confluence of the upper Santa Margarita River and Temecula Creek, approximately 24 miles to the southwest of the project area (Kroeber 1925: Plate 57; McCown 1955:1). Kroeber also indicates another Luiseño village, *Sovovo* (*Soboba*, *Sovovatum*), located in close proximity to the project area, to the southeast, along the upper San Jacinto River (Kroeber 1925: Plate 57).

It must also be noted that interpretations by ethnographers and linguistic anthropologists may differ from the beliefs and traditional knowledge of the Luiseño people. Traditional stories and songs of the Native people also describe the extent of traditional use areas. The Luiseño creation story indicates that the Luiseño people have always been here, not migrating from elsewhere. The creation story of the Pechanga Band of the Luiseño tells that the world was created at Temecula. "The *Káamalam* [first people] moved to a place called *Nachíivo Pomíisavo*, but it was too small, so they moved to a place called '*exva Teméeku,*' this place you now known as Temeku. Here they settled while everything was still in darkness (DuBois 1908)" (Masiel-Zamora 2013:2). The website of the Soboba tribe states, "Since time immemorial the descendants of the Soboba people are those whom have lived on and occupied the land that is presently known as the cities of San Jacinto, Hemet, Valle Vista and Winchester" (Soboba Band of Luiseño Indians n.d.). A traditional Luiseño story tells of a great flood, and the people went to higher ground, where they were saved. The San Luis Rey Band say that this higher ground where the people were saved is Morro Hill. Some Luiseño informants indicated the place in this story is a hill just east of Highway 395 in the San Luis Rey River Valley (Cupples and Hedges 1977).

Prehistorically, the Cahuilla territory was topographically diverse, occupying elevations from 11,000 feet in the San Bernardino Mountains to below sea level at the Salton Sea (Bean 1978). The Cahuilla term *?ivi?lyu?atum* (or *īvīatim*) refers to those who speak the Cahuilla language and is also a recognition of a commonly shared cultural tradition (Bean 1972; Strong 1929). The Cahuilla are thought to have been in part distinguished from other Uto-Aztecan-speaking groups (the Luiseño, Serrano, and Gabrielino) by mountain ranges and plains, but they are known to have interacted regularly with these and other groups through trade, intermarriage, ritual, and war. Cahuilla villages were commonly situated within canyons extending into mountain ranges or on nearby alluvial fans, typically near sources of water and food (Bean 1978; Bean et al. 1991). The diverse habitat of the Cahuilla enabled a wide variety of plant and animal species to be used for food, goods manufacture, and medicine (Bean 1978).

2.2.3 Historical Background

2.2.3.1 Spanish Period

While Juan Rodriguez Cabrillo visited San Diego briefly in 1542, the beginning of the historic period in the San Diego area is generally given as 1769. In the mid-eighteenth century, Spain had escalated its involvement in California from exploration to colonization (Weber 1992). and in that year, a Spanish expedition headed by Gaspar de Portolá and Junípero Serra established the Royal Presidio of San Diego. Portolá then traveled north from San Diego seeking suitable locations to establish military presidios and religious missions in order to extend the Spanish Empire into Alta California.

The first documented Spanish contact in what is now Riverside County was by Spanish military captain Juan Bautista de Anza who led expeditions in 1774 and 1775 from Sonora to Monterey (Bolton 1930). Anza embarked on the initial expedition to explore a land route northward through California from Sonora, with the second expedition bringing settlers across the land route to strengthen the colonization of San Francisco (Rolle 1963). Anza's route led from the San Jacinto Mountains northwest through the San Jacinto Valley, which was named "San José" by Anza. Little documentation exists of Anza's route being used after the two expeditions, although it was likely used to bring Spanish supplies into the newly colonized Alta California (Lech 2004). In 1781, the Spanish government closed the route, due to uprisings by the Yuman Indians. However, by that time, the missions were established and self-sufficient; thus, the need for Spanish supplies from Sonora had begun to diminish.

Although Riverside County proved to be too far inland to include any missions within its limits, Missions San Juan Capistrano and San Luis Rey de Francia, established in 1776 and 1798 respectively, claimed a large part of southwestern Riverside County. Due to the inland geographical location of the Cahuilla territory, the Spanish missions did not have as direct an effect on them as it did on the Luiseño who lived along the coast (Bean 1978). On the coast, the Luiseño were moved into the Mission environment, where living conditions and diseases promoted the decline of the Luiseño population (Bean and Shipek 1978). However, throughout the Spanish Period, the influence of the Spanish progressively spread further from the coast and into the inland areas of southern California as Missions San Luis Rey and San Gabriel extended their influence into the surrounding regions and used the lands for grazing cattle and other animals.

In the 1810s, ranchos and mission outposts called *asistencias* were established, increasing the amount of Spanish contact in the region. An asistencia was established in Pala in 1818 and in San Bernardino in 1819. Additionally, Rancho San Jacinto was established for cattle grazing in the San Jacinto Valley (Bean and Vane 1980; Brigandi 1999). In 1820, Father Payeras, a senior mission official, promoted the idea that the San Bernardino and Pala *asistencias* be developed into full missions in order to establish an inland mission system (Lech 2004). However, Mexico won its independence from Spain in 1821, bringing an end to the Spanish Period in California.

2.2.3.2 Mexican Period

Although Mexico gained its independence from Spain in 1821, Spanish patterns of culture and influence remained for a time. The missions continued to operate as they had in the past, and laws governing the distribution of land were also retained in the 1820s. Following secularization of the missions in 1834, large ranchos were granted to prominent and well-connected individuals, ushering in the Rancho Era, with the society making a transition from one dominated by the church and the military to a more civilian population, with people living on ranchos or in pueblos. With the numerous new ranchos in private hands, cattle ranching expanded and prevailed over agricultural activities.

In order to obtain a rancho, an applicant submitted a petition containing personal information and a land description and map (*diseño*). In 1835, Jose Antonio Estudillo of San Diego submitted a petition for the San Jacinto Rancho. Although Estudillo's petition was for four square leagues (approximately 30,000 acres), in 1842 he was granted close to the maximum size allowed of 11 square leagues (Lech 2004; State Lands Commission 1982). In 1845, Estudillo's son-in-law, Miguel de Pedrorena filed a petition for half of the San Jacinto Viejo Rancho and a small additional portion of land two miles to the northeast in the hills east of Lamb Canyon (Lech 2004). This portion, the northern half of the San Jacinto Viejo Rancho, became known as the San Jacinto Nuevo y Potrero Rancho.

Following the secularization of the missions in 1834, the political instability led to Indian revolts and uprisings against the Mexican rancheros who, not uncommonly, treated Indians as serfs. Many Indians left the missions and ranchos and sought refuge among inland inhabitants. Some Luiseño people even acquired land grants and eventually entered into mainstream Mexican culture (Bean and Shipek 1978). During the Mexican period, the Cahuilla were likewise increasingly influenced by Mexican culture. Some of the Cahuilla acquired Spanish names, learned Spanish, and adopted forms of Spanish subsistence, such as raising cattle, agriculture, and wage labor (Bean 1978; Ward 1967). Many Cahuilla worked seasonally for the Mexicans, traveling to and from their villages (Bean 1978).

2.2.3.3 American Period

American governance began in 1848, when Mexico signed the Treaty of Guadalupe Hidalgo, ceding California to the United States at the conclusion of the Mexican–American War.

California's acquisition by the United States substantially increased the growth of the population in California. The California gold rush, the end of the Civil War, and the passage of the Homestead Act implementing the United States' manifest destiny to occupy and exploit the North American continent brought many people to California after 1848. While the American system required that the newly acquired land be surveyed prior to settlement, the Treaty of Guadalupe Hidalgo bound the United States to honor the land claims of Mexican citizens who were granted ownership of ranchos by the Mexican government (Lech 2004). The Land Act of 1851 established a board of commissioners to review land grant claims, and land patents for the land grants were issued from 1876 to 1893. The San Jacinto Nuevo y Potrero Rancho land grant was patented in 1883 to Miguel Pedrorena, Maria Antonia Estudillo Pedrorena, Isabel Pedrorena, and Helena Pedrorena.

Initially, southern California was divided into only two counties: Los Angeles and San Diego. In 1853, San Bernardino County was added. Riverside County was formed in 1893 from a small portion of San Bernardino County and a larger part of San Diego County.

Southern California was developed by Americans and other immigrants who migrated to the western frontier in pursuit of gold and other mining, agriculture, trade, and land speculation (Lech 2004). During the latter part of the nineteenth century "boom and bust" cycles brought thousands of people into southern California. While many eventually left, some remained to later form the foundations of small communities based on farming, orchards, dairies, and livestock ranching. The population growth of southern California during these early years of the American Period brought a need for mail and freight travel. In 1857, John Butterfield was awarded a six-year contract to transport mail twice a week between St. Louis, Missouri, and San Francisco, California (Helmich 2008). The Butterfield Stage Route used the same trail as the Sonora (or Southern Emigrant) Trail from Yuma through Warner Springs and Temecula, and then up through Temescal Valley to Chino, and then to Los Angeles. By the mid-nineteenth century, the Southern Emigrant Trail ran through western Riverside County in a similar alignment to the current Interstate (I)-15 freeway. The Butterfield Overland Stage route went through a major stop called "Alamos," the Spanish word for cottonwoods, in Murrieta. Another branch of the Southern Emigrant Trail veered northward from Temecula to Box Springs near present-day Moreno Valley, roughly following the present-day route of I-215 (Lech 2004).

Local mail routes within southern California were also developed beginning in the 1850s, such as the line begun in 1852 by Phineas Banning between Los Angeles and San Diego (Stott 1968). In 1868, Tomlinson & Co. briefly operated a daily mail route from Tucson, Arizona to Los Angeles via San Diego and San Bernardino (Stott 1968), although after only four months the company had lost $12,000 and discontinued service (Mills 1957). In 1867, the U.S. Mail Company sent weekly stages that ran between San Diego and San Bernardino. The mail route passed through San Jacinto, and in 1870 San Jacinto's first post office opened (Lech 2004).

During the early days of the American Period, the San Jacinto Valley had centered on the Estudillos' stock farm on the San Jacinto Rancho (Fowler 1912; Lech 2004). By the 1860s, however, economic considerations forced the Estudillo family to begin selling portions of their rancho. Americans began

immigrating in great numbers, by 1870 almost 100 people were living in the San Jacinto region, and orchards and farms rapidly replaced cattle ranching (Fowler 1912; Lech 2004).

While stagecoaches were successful at transporting gold, people, and mail, the need for a railroad to California was imperative. In the 1850s, surveys were initiated by the federal government to determine a railroad route to the Pacific coast (Lech 2004). Although the first transcontinental railroad was completed in 1869 to northern California, in the 1870s the Southern Pacific Railroad Company, incorporated in 1865 and consolidated in 1870, began to construct a southern route that would traverse the state (Fickewirth 1992). In the early 1880s, the California Southern Railway, a subsidiary of the Atchison, Topeka and Santa Fe Railway (Santa Fe), was completed and allowed for travel through the Cajon Pass to Barstow to a junction of the Atlantic and Pacific Railroad and down to San Diego through western Riverside County. In 1887, Santa Fe officials consolidated their family of railroads in southern California, forming the California Central Railway. Although the California Southern remained an individual subsidiary at that time, it consolidated with the California Central Railway and the Redondo Beach Railway two years later, in 1889. The resulting corporation was the Southern California Railway Company, wholly owned by Santa Fe (Price 1988). In 1906 all of lines of Southern California Railway Company were deeded to the Atchison, Topeka and Santa Fe Railway Company.

In 1885, a group of local investors and residents approached the California Southern Railroad to abandon its Pinacante station in exchange for several town lots, a well to supply steam trains, and a depot. In return, the railroad would designate the new town as an official stop along the route from San Diego to San Bernardino. Fred Perris worked with the developers to survey the land, and they named the town (Perris) after him, with the City of Perris incorporating later, in 1911.

By 1880, Henry Hewitt had bought approximately 8,000 acres of land in the San Jacinto Valley and was running a store and a hotel. In the early 1880s, the San Jacinto Land Association bought more than 10,000 acres of land and developed the town of New San Jacinto, which grew rapidly and by 1886 had 250 residents, 150 houses, two hotels, a brickyard, lumberyards, a blacksmith, and a newspaper (Lech 2004). By 1887 the Estudillo Land and Water Company had been incorporated in order to subdivide and market the last remaining 1,100 acres of the Estudillo land grant. The Estudillo Land and Water Company offered the San Jacinto Valley Railway, purchased by the California Central Railway that same year, 27 acres of land for a railroad right-of-way and depot. As such, the railroad to the San Jacinto Valley ended on the Estudillo tract approximately 0.5 mile west of San Jacinto (Lech 2004).

With the completion of the California Southern Railway, settlers flocked to the Perris and San Jacinto valleys in even greater numbers. By the early 1890s, San Jacinto had a population of 1,500, three hotels, 24 stores, a bank, and was a thriving civic center for the region (Lech 2004). When Riverside County was formed in the early 1890s, San Jacinto boasted that it exported more than it imported and that it was the second largest city in “size and importance” in the newly formed county (Bynon 1893).

The project area and surrounding region developed along with the railroad. The trains were used to transport settlers into the area, creating a period of agricultural and land development, ultimately resulting in the establishment of Riverside County in 1893, formed from portions of San Bernardino and San Diego counties. Although the railroad had been the impetus for founding the town, agriculture was also important to the future development of the area. Within the San Jacinto Valley, farms stretched for a 20-mile area, and farm products ranging from hay to fruits were brought to San Jacinto for shipment on the railroad (Lech 2004).

Along with much of southern California, the San Jacinto and Perris valleys were plagued by water scarcity in the late nineteenth and early twentieth centuries (Bean and Vane 1980). In 1922, California reached an agreement with the other states in the Colorado River watershed basin allowing the allotment of water needed to construct the Colorado River Aqueduct, which runs through the San Jacinto Valley directly north of, and also through, the project area (Gruen 1998). The construction of the Colorado River Aqueduct by the Los Angeles Metropolitan Water District occurred along various points simultaneously between 1934 and 1941, helping to fuel a torpid economy in the midst of the Great Depression. This massive undertaking allowed the Metropolitan Water District to employ up to 10,500 people at any given time, with a total employment of 35,648 over an eight-year period, making it southern California's single-largest work opportunity during the Great Depression (Gruen 1998). At its completion, the Colorado River Aqueduct was a huge American engineering achievement stretching for 242 miles.

Due to construction of the Colorado River Aqueduct and other efforts to bring water to the region by the Eastern Municipal Water District in the 1950s, agriculture in the area shifted from dry farming crops to a more diverse collection of crops; irrigation allowed alfalfa, the King potato, and sugar beets to be grown in the Perris valley (City of Perris, n.d.). The State Water Project was approved by the California Legislature in 1951, with construction beginning in 1957; the terminus of this approximately 600-mile long water delivery and storage system is Lake Perris, which was constructed in the latter part of the 1960s and early 1970s. In addition to being an important water resource, Lake Perris afforded the area with recreational activities.

The portion of the Colorado River Aqueduct within and in proximity to the project area is the Casa Loma Siphon and Canal, which was described as follows:

> The Casa Loma Siphon was designed as a double-barreled siphon that travels underground from the west portal of the San Jacinto Tunnel to the conduit which connects to the east portal of the Bernasconi Tunnel. It was one of the last components of the aqueduct to be completed.
>
> The second barrel of the Casa Loma Siphon and the Casa Loma Canal were constructed as part of the CRA expansion. Instead of following the alignment of the first barrel, the second barrel and the canal travel in a U shape in order to connect with the San Diego Canal (a later period expansion). The San Diego Canal, built as an element of the Second San Diego Aqueduct, carries State Water Project water to San Diego [Beedle 2005].

3.0 ARCHIVAL RESEARCH AND CONTACT PROGRAM

3.1 RECORDS SEARCH

HELIX staff conducted a records search of the California Historical Resources Information System (CHRIS) at the Eastern Information Center (EIC) on February 4, 2020. The records search covered the project site and a one-mile radius around it and included a review of archaeological and historical resource data, locations and citations for previous cultural resources studies, and a review of the State Office of Historic Preservation's (OHP's) historic properties directory. A records search summary and map are included as Appendix B (Confidential Appendices, bound separately).

3.1.1 Previous Studies

The records search identified 87 previous cultural resource studies within the one-mile-radius records search limits, 19 of which are immediately adjacent to or include portions of the project area (Table 1, *Previous Studies Within and Immediately Adjacent to the Project Area*). Of these 19 studies, 15 were indicated as archaeological/cultural resources surveys or assessment reports; one as a historic properties survey report; one as a cultural resource "study"; one as a cultural resources monitoring report; and one was vague as to the nature of the study. In all, the majority of the reports on file at EIC within the records search limits were reports of surveys or assessments, with the remainder including reports from literature searches, site evaluations, site data recovery programs, cultural resources monitoring, historic building evaluations, and management planning documents.

One survey, conducted IN 2009 for the EMWD Citrus In-Lieu Northern Alignment Reach 1, covered A large section of the current project area, running from Sanderson Avenue on the west to the Alessandro Ponds on the east. The only resource noted during that survey was the San Diego Aqueduct (P-33-015734), which was noted as being deeply buried (Encarnacion, et al. 2009).

Table 1
PREVIOUS STUDIES WITHIN AND IMMEDIATELY ADJACENT TO THE PROJECT AREA

EIC Report No.	Report Title	Author, Date
RI-5718	Phase I Cultural Resources Assessment: Tentative Tract No. 32376, Western Village, San Jacinto, Riverside County, California	Shepard, 2004
RI-5772	Phase I Cultural Resources Study for the North San Jacinto Sewer Project, City of San Jacinto, Riverside County, California	Jones and Stokes, 2004
RI-6478	Historical/Archaeological Resources Survey Report, San Jacinto MDP Detention Basin, in the City of San Jacinto, Riverside County, California	Tang, Hogan, Encarnacion, and Ballester, 2005
RI-6479	Historical/Archaeological Resources Survey Report: San Jacinto Town Center Project, City of San Jacinto, Riverside County, California	Tang, Hogan, Encarnacion, and Porter, 2005
RI-6882	Cultural Resources Survey for the Ramona Express Gap Closure Project: Seventh Street to Cedar Avenue, San Jacinto, Riverside County, California	Hunt and Wesson, 2005
RI-6885	Cultural Resources Survey for the Ramona Expressway Widening Project: State Street to Lake Park Drive, San Jacinto, Riverside County, California.	Hunt and Wesson, 2005
RI-6910	Negative Archaeological Survey Report: Main Street Bridge, City of San Jacinto	McLean and Schroth, 1998
RI-7394	Phase I Cultural Resources Survey Report: JD Pierce Project, Tentative Tract 33862 (APN 433-070-044; 433-110-020, -028, -029, -031; 434-190-002, -003, -004) San Jacinto, County of Riverside, California	Aislin-Kay and Lord, 2006
RI-7533	Phase I Cultural Resources Assessment Report: Crossroads at San Jacinto Commercial Development, City of San Jacinto, Riverside County, California	Shepard, 2007

Table 1
PREVIOUS STUDIES WITHIN AND IMMEDIATELY ADJACENT TO THE PROJECT AREA

EIC Report No.	Report Title	Author, Date
RI-8144	Phase I Cultural Resources Assessment and Paleontological Records Review Ramona Expressway and Alessandro Avenue Project San Jacinto, Riverside County, California.	Sanka, 2006
RI-8350	Historical / Archaeological Resources Survey Report: EMWD Citrus In-Lieu Northern Alignment Reach 1, City of San Jacinto, Riverside County, California.	Encarnacion, Ballester, and Shaker, 2009
RI-9138	Negative Archaeological Survey Report for the Colorado River Aqueduct	Sylvia, 2002
RI-9326	Cultural Resources Monitoring Program Ramona Expressway Widening Phase II City of San Jacinto Riverside County, California	Goodwin, 2015
RI-9483	Cultural Resources Study for the Eastern Municipal Water District Alessandro Recycled Water Storage Pond Optimization Project, San Jacinto, Riverside County, California	Haas and Duran, 2015
RI-9587	Cultural Resources Assessment Ramona Expressway Widening Project Sanderson Avenue to Main Street City of San Jacinto Riverside County, California	Goodwin and Wilson, 2011
RI-10462	Historic Property Survey Report for the Sanderson Avenue Safety Improvements Project City of San Jacinto, Riverside County, California HSJPL 5075(021)	Miller, 2018
RI-10463	Archaeological Survey Report for the Sanderson Avenue Safety Improvements Project City of San Jacinto, Riverside County, California HSIPL 5075(021)	Miller, 2018
RI-10486	San Jacinto Valley Enhanced Recharge and Recovery Program	Strauss, Vader, Ehringer, Bever, and Taylor, 2018
RI-10695	Cultural Resources Survey Blaze/Ensite #22117 (284939)	Perez, 2015

3.1.2 Previously Recorded Resources

The EIC has a record of 90 previously recorded cultural resources within a one-mile radius of the project, (Table 2, *Previously Recorded Resources within One Mile of the Project Area*). Eight of these resources are situated within or in immediate proximity to the project: CA-RIV-3970, CA-RIV-3971, and CA-RIV-12672 are historic refuse scatters/deposits; P-33-007297 is the remnants (concrete slabs and driveway) of the Raymar Dairy; CA-RIV-6726H is the Colorado River Aqueduct, and CA-RIV-8195 is the San Diego Aqueduct and San Diego Canal, constructed in the mid-twentieth century, but these two resources have overlapping segments; P-33-015735 is a historic residence and associated outbuildings constructed in the Craftsman style, circa 1920s (now demolished); and CA-RIV-11852 consists of two concrete slabs and a refuse deposit post-dating 1945. These eight resources are described in further detail below.

Table 2
PREVIOUSLY RECORDED RESOURCES WITHIN ONE MILE OF THE PROJECT AREA

Resource Number	Resource Number	Age and Resources Present	Description	Recorder, Date
P-33-000124	CA-RIV-124	Prehistoric Site	"Ancient village of Ivah which once thrived in the region of the present town of San Jacinto."	Eberhart, 1948
P-33-000125	CA-RIV-125	None Given	No information given.	Eberhart, 1951
P-33-000403	CA-RIV-403	Prehistoric Site	Bedrock milling stations (various) with various elements (slicks, mortars, and mortar-like pits). Groove petroglyph panel. Associated ground stone, cores, and sparse flake scatter.	No recorder given, n.d.; McCarthy et al., 1987; Tohe et al., 1988; McKenna, 2001, 2005
P-33-001138	CA-RIV-1138	Prehistoric Site	"Special activity area", possible midden, a petroglyph, bedrock milling feature with numerous elements (slicks). Associated basin metate, core, ground stone, flakes, fire-affected rock (high density). Boulder with petroglyph was removed in 1977 and re-located to the Soboba Indian Reservation.	Eastvold, 1977; McCarthy et al., 1987
P-33-001161	CA-RIV-1161	Ethnohistoric Site	"Soboba Reservation" "Baskets being made, mortars, metates being used".	Smith, 1938
P-33-001627	CA-RIV-1627	Prehistoric Site	Occupation site, ground stone fragments, flake.	Napton, 1977
P-33-003309	CA-RIV-3309	Prehistoric Site	Bedrock milling feature with six elements (slicks).	McCarthy and Schroth, 1987
P-33-003310	CA-RIV-3310	Prehistoric Site	Two bedrock milling features with five elements (mortars).	Schroth et al., 1987
P-33-003316	CA-RIV-3316	Prehistoric Site	Bedrock milling features with two elements (mortar, slick).	Schroth and Everson, 1987
P-33-003318	CA-RIV-3318	Prehistoric Site	Two bedrock milling features with six elements (metates, slick)	Schroth et al., 1987
P-33-003319	CA-RIV-3319	Prehistoric Site	Bedrock milling features with two elements (metates)	Schroth et al., 1987
P-33-003970*	CA-RIV-3970*	Historic Site	Sparse scatter of historic and modern refuse, including ceramics and glass bottles and jars.	SRS, n.d.; Brian F. Smith and Associates, 2006
P-33-003971*	CA-RIV-3971*	Historic Site	Potentially re-deposited fill and a trash scatter consisting of glass, ceramic, brick, porcelain, and china fragments.	SRS, n.d.
P-33-005776	---	Historic Building	State Ranger's office constructed ca. 1921 and relocated in 1984 from a private property located two blocks away from its present location.	Thornton, 1994
P-33-006257	---	Historic Building	Residence, vernacular wood frame, constructed ca. 1930.	Warner, 1982

Table 2 (cont.)
PREVIOUSLY RECORDED RESOURCES WITHIN ONE MILE OF THE PROJECT AREA

Resource Number	Resource Number	Age and Resources Present	Description	Recorder, Date
P-33-006258	---	Historic Building	Residence originally utilized as a farmhouse constructed in the bungalow style in 1917.	Warner, 1982
P-33-006271	---	Historic Building	Residence constructed in the Craftsman Bungalow style in 1912.	Warner, 1982
P-33-006315	---	Historic Building	Residence, vernacular wood frame, constructed ca. 1923	Warner, 1982
P-33-007297*	---	Historic Structure	Raymar Dairy facility, with a milking barn constructed in the Moderne/Art Deco-style in 1957; a 1938 house demolished prior to recording (Van Luven 1982). 2004 update indicated buildings demolished, only concrete slabs and semi-circular driveway remain	Van Luven, 1982; Shepard, 2004
P-33-007304	---	Historic Building	Bull Slaytons Gym, vernacular wood frame, constructed ca. 1920.	Swift, 1982
P-33-007305	---	Historic Building	office originally utilized as a residence, vernacular wood frame, constructed in 1920.	Stuart, 1982
P-33-007309	---	Historic Building	Clayton Record, Sr. residence constructed in the Mediterranean/Spanish Revival Style in 1939.	Swift, 1982
P-33-007313	---	Historic Building	Residence, vernacular ranch house, constructed ca. 1920.	Summers, 1982
P-33-007317	---	Historic Building	Vacant building originally utilized as a farmhouse constructed in the Craftsman style ca. 1912.	Warner, 1982
P-33-007318	---	Historic Building	Residence, vernacular wood frame, constructed ca. 1917.	Stuart, 1982
P-33-007319	---	Historic Building	Bosman's Sewing Barn currently utilized for sewing sales and originally utilized as a dairy, constructed in the Moderne, Commercial style ca. 1940.	Stuart, 1982
P-33-007320	---	Historic Building	Residence, vernacular wood frame, constructed ca. 1899.	Stuart, 1982
P-33-007321	---	Historic Building	Residence, vernacular wood frame, constructed ca. 1890.	Van Luven, 1982
P-33-007322	---	Historic Building	Residence constructed in the bungalow style ca. 1926.	Swift, 1982
P-33-007325	---	---	Voided. Same as P-33-017050/CA-RIV-8869.	N.A.
P-33-007327	---	Historic Building	Loma Soboba, currently utilized as a residence and originally utilized as a motel and camp, vernacular ranch house, constructed in 1942.	Summers, 1982
P-33-007337	---	Historic Building	Residence, vernacular brick style in 1890.	Van Luven, 1982

Table 2 (cont.)
PREVIOUSLY RECORDED RESOURCES WITHIN ONE MILE OF THE PROJECT AREA

Resource Number	Resource Number	Age and Resources Present	Description	Recorder, Date
P-33-007338	---	Historic Building	Vacant building originally utilized as a farmhouse, vernacular ranch house, constructed ca. 1903.	Van Luven, 1982
P-33-007339	---	Historic Building	Residential building, vernacular wood frame, constructed in 1900.	Van Luven, 1982
P-33-007340	---	Historic Building	Residence, vernacular ranch house, constructed in 1895.	Van Luven, 1982
P-33-007342	---	Historic Building	Residence, vernacular wood frame, constructed in 1926.	Van Luven, 1982
P-33-007343	---	Historic Building	William Record Home, vernacular ranch house, Eastlake style, constructed in 1888.	Stuart, 1982
P-33-007344	---	Historic Building	Residence, vernacular wood frame, constructed in 1920.	Warren, 1982
P-33-007347	---	Historic Building	Residence, vernacular wood frame, constructed in 1900.	Stuart, 1982
P-33-007348	---	Historic Building	Residence constructed in the Mediterranean/Spanish Revival Style in 1930.	Stuart, 1982
P-33-007349	---	Historic Building	Residence, vernacular wood frame ranch house, constructed in 1890.	Stuart, 1982
P-33-007350	---	Historic Building	Residence constructed in the Craftsman Bungalow style in 1912.	Stuart, 1982
P-33-007351	---	Historic Building	Record Rancho, presently and originally utilized as a milking barn in the Moderne/Art Deco style in 1937.	Swift, 1982
P-33-007368	---	Historic Building	Residence constructed in the Eastlake style ca. 1898.	Warner, 1982
P-33-007369	---	Historic Building	Residence constructed in the Queen Anne style in 1897.	Warner, 1982
P-33-007383	---	Historic Building	Rural farmhouse.	Swift, 1982; Bailey and Mitchell, 2003
P-33-007384	---	Historic Structure	Concrete silo, associated with now non-existent structures constructed ca. 1950s. Contains a vertical shaft attached to the right side with the words “A. Durand Ranch” painted on the side.	Stuart, 1982; McKenna, 2003
P-33-007385	---	Historic Building	Residence, vernacular wood frame with classical elements, constructed ca. 1911.	Swift, 1982
P-33-007386	---	Historic Building	Residence, vernacular wood frame and vernacular brick, constructed in 1900.	Van Luven, 1982
P-33-007387	---	Historic Building	Residence, vernacular wood frame, constructed in 1920. Building mapped incorrectly at the EIC, building has not been moved and is located at 22789 San Jacinto Avenue.	Van Luven, 1982; Garrison and Barket, n.d.

Table 2 (cont.)
PREVIOUSLY RECORDED RESOURCES WITHIN ONE MILE OF THE PROJECT AREA

Resource Number	Resource Number	Age and Resources Present	Description	Recorder, Date
P-33-007388	---	Historic Building	Residence constructed in the Bungalow style in 1920.	Van Luven, 1982
P-33-007389	---	Historic Building	Residence constructed in the Bungalow style in 1920.	Stuart, 1982
P-33-007399	---	Historic Building	Residence originally utilized as a ranch house constructed in the Craftsman Bungalow style in 1910.	Warren, 1982
P-33-007400	---	Historic Building	Residence constructed in the Vernacular Wood Frame style in 1932.	Stuart, 1982
P-33-007402	---	Historic Building	Residence constructed in the Vernacular Wood Frame style ca. 1915.	Starrat, 1984
P-33-007403	---	Historic Building	Residence constructed in the Vernacular Wood Frame style ca. 1910.	Starrat, 1984
P-33-007404	---	Historic Building	Residence constructed in the Vernacular Wood Frame style ca. 1910.	Starrat, 1984
P-33-009697	---	Historic Site	Russian Trans-Polar Landing Site. Recorded as the second trans-polar flight and the first to California, setting a record for distance traveled over the pole in 1937. Originally destined for San Francisco but landed in San Jacinto due to foggy conditions.	Seider, 1988; Bourne Lortie, 1989
P-33-011265*	CA-RIV-6726H*	Historic structure	Colorado River Aqueduct	Goodman and Neves, 2000; Dice 2001; Boggs, 2003; Wilson, Craft, and Wise, 2005; Beedle, 2005; DeGiovine, Martin, Wilson, and. Chmiel, 2009; Kremkau. 2011; Loftus, 2016;
P-33-013897	CA-RIV-7605	Prehistoric Site	Bedrock milling feature with one element (slick)	Andrews, 2004
P-33-014282	CA-RIV-7814	Historic Site	Bothin Villa constructed in 1907 and demolished in 1931 with glass, porcelain, and miscellaneous metal fragments in erosion ruts in road.	White, 2005
P-33-014317	---	Historic Structure	Concrete reservoir constructed in 1909 by E.T. Salmon.	White, 2005
P-33-014318	---	Historic Structure	Concrete reservoir constructed in 1907 as landscaping for the Bothin estate.	White, 2005
P-33-014964	---	Historic Building	Residence, constructed in 1920, with an associated cistern.	Harris, 2006

Table 2 (cont.)
PREVIOUSLY RECORDED RESOURCES WITHIN ONE MILE OF THE PROJECT AREA

Resource Number	Resource Number	Age and Resources Present	Description	Recorder, Date
P-33-014994	CA-RIV-7967	Historic Structure	Two historic residential structures constructed in the late 1950s and early 1960s. Features possibly associated with the structures are a metal pump, two gates, and concrete pads.	Michael Brandman Associates, 2006
P-33-015734*	CA-RIV-8195*	Historic Structure	San Diego Aqueduct and San Diego Canal constructed in the mid-twentieth century.	Easter and Beedle, 2005; Craft, 2007
P-33-015735*	---	Historic Building	Residence with associated outbuildings constructed in the Craftsman style ca. 1920s. Residence and associated outbuildings have been demolished.	Easter and Beedle, 2006
P-33-015741	---	Historic Site	Reflection Lake constructed by the Army Corps of Engineers after World War II and before 1953. RVs are located on the east side of the lake with some having small attached docks from which the residents fish.	Easter and Beedle, 2005
P-33-016028	---	Historic Building	Residence, constructed ca. 1915.	Hoover, 2007
P-33-016943	---	Historic Building	Corwin Ranch composed of seven buildings (primary residence, two laborer's residences, an office, an apricot cutting and drying shed, a walnut processing shed, and a maintenance shed). This ranch was a walnut and apricot producer. The Corwins are recognized as early settlers and agriculturalists in the Hemet area.	Smallwood, 2007
P-33-017050	CA-RIV-8869	Historic Building	Mansion, constructed for Jose Antonio Estudillo in 1885. Acreage formed a part of the Mexican Land Grant. Mansion is in a ruined state.	Crull, 2008
P-33-017051	CA-RIV-8870	Historic Building	Residence, constructed in 1948.	Crull, 2008
P-33-017052	CA-RIV-8871	Historic Building	Residence, constructed in 1946.	Crull, 2008
P-33-017053	CA-RIV-8872	Prehistoric Site	Bedrock milling feature with two elements (mortar, trough slick).	Crull, 2008
P-33-017054	CA-RIV-8873	Historic Structures	Outbuildings (four) constructed in 1950s.	Crull, 2008
P-33-017055	CA-RIV-8874	Historic Building	Building, constructed in 1960s.	Crull, 2008
P-33-017056	CA-RIV-8875	Historic Structure	Shelter containing pumping equipment and a bathroom connected to shelter.	Crull, 2008

Table 2 (cont.)
PREVIOUSLY RECORDED RESOURCES WITHIN ONE MILE OF THE PROJECT AREA

Resource Number	Resource Number	Age and Resources Present	Description	Recorder, Date
P-33-017364	---	Ethnohistoric Site	Grove of cottonwood trees with apparent traditional cultural value to local Luiseño tribal members. Grove has been traditionally utilized for harvesting tree mushrooms, or *shakapish* in Luiseño. In contemporary times other materials have been gathered from this grove for medicinal uses, carving of game pieces, and for construction of ramadas.	Smallwood, 2008
P-33-017395	---	Prehistoric Site	Two bedrock milling features with three elements (basin slicks, slick). Natural rock shelter is noted adjacent to Outcrop #1 but no cultural material was observed inside.	Wilson, 2008
P-33-017928	---	Historic Structure	Farmhouse, vernacular, constructed in 1947.	Dice, 2010
P-33-018035	---	Historic Structure	Possible tank house remnant, possibly constructed in late nineteenth century.	Taft and Lynch, 2010
P-33-021063	CA-RIV-10911	Historic Site	Block 142 of the San Jacinto Rancho consisting of two properties utilized for fields associated with use as pastureland. Contains brick and wood debris, evidence of grazing/pasture use, and scant evidence of residential demolition, possibly utilized between 1880 to post-1945.	McKenna, 2012
P-33-024106*	CA-RIV-11852*	Historic Site	Concrete slabs and a refuse deposit possibly dating to circa 1950-1970.	Goodwin, 2014
P-33-024874	CA-RIV-12330	Historic Site	Water tank, pump house ruins, concrete water basin, historic refuse, and modern trash. Dates approximately between 1943 and 1953.	Garrison, and Suquimoto, 2016
P-33-028069	---	Historic Structure	Cinder block and concrete foundation or well pad constructed in 1920.	Vader and Avila, 2016
P-33-028070	---	Historic Structure	Three structures (clubhouse, small storage area, partially subterranean structure) associated with the Valley Trap Club.	Vader and Avila, 2016
P-33-028071*	CA-RIV-12672*	Historic Site	Sparse refuse scatter dating to the early and mid-twentieth century.	Vader and Avila, 2016
P-33-028508	CA-RIV-12844	Historic Site	San Jacinto Retail Center remnant comprised of a concrete slab constructed between 1972 and 1978.	Sanka and Gillean, 2018
P-33-028524	---	Historic Building	Residence, twentieth-century vernacular, constructed before 1938.	Taylor, 2017

*Resource adjacent to or crossed by project

3.2 DESCRIPTIONS OF PREVIOUSLY RECORDED CULTURAL RESOURCES WITHIN THE PROJECT AREA

3.2.1 P-33-003970 (CA-RIV-3970)

CA-RIV-3970 is a historic archaeological site situated along the northern portion of the proposed 36-inch pipeline route, originally recorded on the north side of the West Ramona Expressway. It was recorded as a scatter of historic and modern refuse. The earliest historic materials were ascribed to the late nineteenth century and included items such as glass bottles and jars. Also indicated as present were ceramic fragments, shoe soles, and roof tiles (SRS n.d.a). After the original recordation by SRS, the site area was also enlarged to the south by Smith (2006), who indicated that the site was not a significant resource under CEQA, due to its limited research potential and the large amount of disturbance to the site.

3.2.2 P-33-003971 (CA-RIV-3971)

CA-RIV-3971 is a historic archaeological site situated along the central portion of the proposed 36-inch pipeline route, near the intersection of Main Street and the West Ramona Expressway. The site was recorded as consisting of two zones: the eastern portion of the site "consists of a dense modern dump….Based on the condition of some of the remains, dumping in this location continues today" (SRS n.d.b). The portion of the site crossed by the pipeline alignment is described as:

> a very low density (1 object per 25 m square) scatter of mixed historic and modern refuse dispersed across a plowed field. Ninety percent of this portion of the scatter consists of modern debris similar to that found at SRS-732-1(H) [CA-RIV-3970]; highly fragmented "historic" materials account for the remaining ten percent [SRS n.d.b]

The earliest historic materials were ascribed to the late nineteenth century and included items such as glass bottles and jars. The later materials were listed as "glass, ceramic crockery, brick fragments, porcelin [sic], and china" (SRS n.d.).

3.2.3 P-33-007297

P-33-007297 is a historic resource situated along the north side of the northeast end of the proposed 18-inch pipeline route, near the intersection of North San Jacinto Avenue and the West Ramona Expressway. It is recorded as the Raymar Dairy facility, with a milking barn constructed in the Moderne/ Art Deco-style, built in 1957; a 1938 house had been demolished prior to recording (Van Luven 1982). An update in 2004 indicated that the dairy buildings had been demolished and that only concrete slabs and a semi-circular driveway remained (Shepard 2004). This resource is located north of the pipeline proposed for sliplining, and none of the proposed insertion or pulling pits are located in proximity to it.

3.2.4 P-33-011265 (CA-RIV-6726H)

Historic resource CA-RIV-6726H is the Colorado River Aqueduct, which traverses approximately 242 miles to bring water from the Colorado River at Lake Havasu to Lake Mathews and ultimately to constituent cites. The segment of the resource within the project area is part of the Casa Loma Siphon Barrel 2 of the Aqueduct. The Aqueduct as a whole has previously been assessed as eligible for the NRHP and the CRHR, although not all segments have been assessed. The segment of the Casa Loma Siphon

within the project area was built in 1959-1960 and is entirely underground (Beedle 2005). To the west of the project area, the Casa Loma Canal is an aboveground channel.

> The Colorado River Aqueduct meets the criteria for eligibility for both the National Register of Historic Places (NRHP) and the California Register of Historical Resources (CRHR). The Colorado River Aqueduct is regionally significant under Criterion A as a driving and enabling force for the economic development of southern California. It is also significant under Criterion C as a marvel of civil engineering. The use of pre-cast concrete pipes was developed during its construction; this is now the construction method of choice for underground pipes. The Casa Loma Siphon is a contributing feature of the Colorado River Aqueduct as part of the system that brings water to Los Angeles and as a [sic] early example of a pre-cast concrete pipe [Beedle 2005].

3.2.5 P-33-015734 (CA-RIV-8195)

CA-RIV-8195 is recorded as the San Diego Aqueduct and Canal. The segment surveyed and recorded within the project area is the same as the segment of the Colorado River Aqueduct recorded within the project area as part of CA-RIV-6726H. “In 1947, San Diego joined the Metropolitan Water District of Southern California; and the first San Diego Aqueduct was constructed to receive water from the CRA [Colorado River Aqueduct]. The Casa Loma Canal and second San Diego Canal were later constructed to augment the water supply of San Diego” (Easter and Beedle 2005).

3.2.6 P-33-015735

P-33-015735 is a historic resource situated along the north side of the proposed brine pipeline route, east of the proposed AWTF and the proposed brine pond. It is recorded as the “Sanderson Avenue property” and is described as a single-family home, a one-story, Craftsman-style house with one associated outbuilding, located on the west side of Sanderson Avenue. The house rested on a concrete foundation with a partial basement containing a kitchen. While the site record for P-33-015735 only described the buildings, the resource was recorded to include the entire property (approximately 212 acres) (Easter and Beedle 2006). Easter and Beedle (2006) noted the presence of a “farm on the location” on 1901 and 1943 topographic maps, as well as on a 1949 aerial photograph of the area. They also indicated that all buildings on the location “have been removed” (2006). While the buildings have been removed, the presence of farm-associated buildings and farming activity on the Sanderson Avenue property (P-33-015735), dating back to the late nineteenth and early twentieth century, could have archaeological implications. Although the buildings (no longer extant) are not in immediate proximity to the project, the property borders the project elements as described above. The buildings described in this resource had been previously recorded (in 1982) as P-33-007322 (Swift 1982).

3.2.7 P-33-024874 (CA-RIV-11852)

CA-RIV-11852 is a historic resource situated in the central portion of the proposed 18-inch pipeline route, along the West Ramona Expressway between North State Street and Eagle Drive. It is recorded as two concrete slabs and a refuse deposit dating after 1945, possibly circa 1950-1970. The historic refuse includes construction-related materials, including a crumpled galvanized tank, wound steel pipe, pipe fittings, metal fence posts, barbed wire fragments, cinder block fragments, and wood and plank fragments. The two slabs are interpreted as possibly related to two farm buildings that were identified on historic aerials for the mid-twentieth century and no longer extant(Goodwin 2015). This site is

located on the south side of West Ramona Expressway; the pipeline is located on the north side of the road.

3.2.8 P-33-028071 (CA-RIV-12672)

CA-RIV-12672 is a historic archaeological site situated along the central portion of the proposed 36-inch pipeline route, near the intersection of Main Street and the West Ramona Expressway. It is recorded as a sparse scatter of approximately 50 items of historic refuse, ascribed to the early to mid-twentieth century, including glass beverage bottle fragments, tableware fragments, brick fragments, and porcelain insulator fragments. Also noted was a high degree of disturbance possibly indicating the site is a secondary deposit (Vader and Avila 2016). The site is within an artificially created earthen basin. This site, located along the south side of Main Street, is in proximity to the previously recorded resource CA-RIV-3971, also described as a scatter of historic refuse, located approximately 300 feet to the north, on the north side of Main Street. The site record indicated site condition as poor and noted, "The site has either been heavily disturbed by the construction of the basin, or the artifacts were washed into the basin from the river during a high flow event (Vader and Avila 2016).

3.3 OTHER ARCHIVAL RESEARCH

Various additional archival sources were consulted, including historic topographic maps and aerial imagery. These include aerials from 1966, 1967, and 1972 (NETR Online 2020) and several historic USGS topographic maps, including the 1901 San Jacinto (1:125,000), 1901 Elsinore (1:125,000), the 1942 Perris (1:62,500), the 1943 and 1956 Banning (1:62,500), the 1953 Lakeview (1:24,000), the 1953 San Jacinto (1:24,000), and the 1972 San Jacinto (1:24,000) topographic maps. The purpose of this research was to identify historic structures and land use in the area.

On the 1901 San Jacinto (1:125,000) map, a canal labeled as the "San Jacinto and Pleasant Valley Co's. Canal," extends along Commonwealth Avenue. A small portion of the southeastern end of the proposed 36-inch pipeline route overlaps with a branch of this canal that extends northwest from the main canal into a community labeled on the map as "Bowers", just south of San Jacinto. Portions of the route of the proposed 18-inch pipeline extend along segments of two roads present on this 1901 map: Idyllwild Drive (State Route 79) and Potter Road.

On the 1901 Elsinore (1:125,000) map and the 1943 Banning (1:62,500) map, buildings are visible at the location of P-33-015735 (Sanderson Avenue property; also recorded as P-33-007322). Easter and Beedle (2006) noted the presence of a "farm on the location" on 1901 and 1943 topographic maps, as well as on a 1949 aerial photograph of the area. Also noted on both the 1901 San Jacinto and Elsinore maps was the Southern California Railroad, San Jacinto Division, whose terminus was in the City of San Jacinto.

In general, the early aerial photographs and topographic maps examined indicate that, prior to 45 years ago, and dating back into the nineteenth century, the area in which the project lies contained mostly rural farm and/or dairy-related activity, with structures associated with scattered farmsteads and/or dairy operations predominating in the area. Communities such as San Jacinto and Hemet were rural communities associated with these agricultural and dairy activities. Other than these rural activities, the other features noted on the historic aerials were the construction, beginning in the 1930s, of the Colorado and San Diego aqueducts and associated facilities in the area. Not surprisingly, six of the eight cultural resources recorded within or immediate proximity to the project alignment are related to these

rural farming and dairy activities with the other two related to the construction of the aqueducts and associated facilities in the area.

3.4 NATIVE AMERICAN CONTACT PROGRAM

HELIX contacted the NAHC on January 28, 2020 for a Sacred Lands File search and list of Native American contacts for the project area. The NAHC indicated in a response dated February 11, 2020 that the Sacred Lands File search was positive and recommended contacting the tribal contacts provided in order to obtain additional cultural resources information. Letters were sent on February 18, 2020 to Native American representatives and interested parties identified by the NAHC. Three responses have been received to date (Table 3, *Native American Contact Program Responses*). If additional responses are received, they will be forwarded to District staff. Native American correspondence is included as Appendix C (Confidential Appendices, bound separately).

Table 3
NATIVE AMERICAN CONTACT PROGRAM RESPONSES

Contact/Tribe	Response
Morongo Band of Mission Indians	Responded via email on February 26, 2020: Morongo has "…no additional comments to provide at this time and will likely defer to the Soboba Band once formal government-to-government consultation is initiated by the lead agency for this project."
Agua Caliente Band of Cahuilla Indians (ACBCI)	Responded in a letter sent via email on March 16, 2020: the project is not located within ACBCI's reservation but is located within the Tribe's Traditional Use Area. Requested copies of cultural resource documentation (report and site records) associated with the project be provided to them.
Soboba Band of Luiseño Indians (Soboba)	Responded in a letter sent via email on March 18, 2020: "The information provided to us on said project has been assessed through our Cultural Resource Department, where it was concluded that although it is outside the existing reservation, the project area does fall within the bounds of our Tribal Traditional Use Areas. This project location is in proximity to known sites, is a shared use area that was used in ongoing trade between the tribes and is considered to be culturally sensitive by the people of Soboba." "Soboba Band of Luiseño Indians is requesting the following: 1. To initiate a consultation with the project proponents and lead agency. 2. The transfer of information to the Soboba Band of Luiseño Indians regarding the progress of this project should be done as soon as new developments occur. 3. Soboba Band of Luiseño Indians continues to act as a consulting tribal entity for this project. 4. Working in and around traditional use areas intensifies the possibility of encountering cultural resources during the construction/excavation phase. For this reason, the Soboba Band of Luiseño Indians requests that Native American Monitor(s) from the Soboba Band of Luiseño Indians Cultural Resource Department to be present during any ground disturbing proceedings. Including surveys and archaeological testing. 5. Request that proper procedures be taken, and requests of the tribe be honored."

4.0 SURVEY

4.1 SURVEY METHODS

An intensive pedestrian survey of proposed project pipeline alignments and facility locations was undertaken on February 20, 2020 by HELIX archaeologists Julie Roy and Mary Villalobos, and Soboba tribal cultural monitor Frank Morreo. The survey extent for the new pipeline constructions (the brine pipeline discharge option pipeline and the 36-inch pipeline) consisted of the pipeline alignment and a 50-foot wide buffer corridor, centered on the pipeline. Where feasible within the corridor, survey transects were walked in 5-to-10-meter intervals (Plate 1). While much of the proposed project alignment was either along paved roads or in open agricultural land, some portions were within areas where systematic survey methods were infeasible, such as on private property where fencing precluded access, active agricultural fields where crops were present and/or irrigation was actively occurring, or within built environments such as wastewater facilities, a solar plant, and within the existing Alessandro Ponds facility.



Plate 1. Field transect survey along 50-foot corridor; view to the north.

Another exception to this methodology was along the 18-inch existing pipeline alignment of the project. Because this existing pipeline is proposed to be sliplined, the only ground disturbance required is at locations along the alignment where pits will be excavated in order to accomplish the insertion and pulling of the sliplining into the pipeline. The pit locations are generally dictated by the points along the alignment where an angle in the alignment occurs or where a new valve entry could be required for the sliplining. Consequently, only these insertion and pulling pit locations and a 25-foot radius around each were surveyed using the methodology employed elsewhere on the survey. In all other accessible or unobstructed areas, transects were walked as the most effective way to cover the area and identify whether there were cultural resources present.

For the field survey, the archaeological crew and Native American monitor met EMWD staff at the Alessandro Ponds, where they surveyed the proposed Alessandro Blending Facility and the portion of the 36-inch pipeline that is inside the fence of the Alessandro Ponds. From there, the crew proceeded to the west end of the project area, where EMWD staff provided access to the proposed brine pond and AWTF locations. These facilities, which were situated in open, active, agricultural fields at the time of the survey, were planted and being irrigated (Plate 2). Consequently, these agricultural activities severely limited the ability to conduct systematic transect survey of the proposed pond and AWTF areas, and only reconnaissance survey of accessible portions could be performed of these locations. Survey began in this initial area from a dirt access road east of Odell Street, with an agricultural field to the north and a sewage treatment plant and a solar facility to the south of the brine pond and AWTF locations. Following the reconnaissance survey of the pond and AWTF locations, survey proceeded to the proposed brine pipeline discharge option alignment. This alignment angled to the west (Plate 3) from the proposed treatment facility and then south onto North Sanderson Avenue to a location just north of Cottonwood Avenue. Most of this alignment along North Sanderson Road was within the roadway and, consequently, survey accessibility and ground visibility were somewhat limited. This alignment crosses over the Colorado River Aqueduct, Casa Loma Canal/Siphon, which extends as an above ground channel to the west (Casa Loma Canal) and passes underground beneath North Sanderson Avenue to the east (Casa Loma Siphon).



Plate 2. Planted and irrigated field in brine pond area; view to the north.



Plate 3. Overview of proposed brine pipeline option alignment, west of Sanderson Avenue; view to the east.

The field survey then proceeded of the sliplining pit locations along the existing 18-inch pipeline alignment that follows the underground Casa Loma Siphon from North Sanderson Road along the northwest side of the San Jacinto Reservoir across an open field to Potter Road. The segment of the 18-inch alignment along the northern edge of the San Jacinto Reservoir lies along a channel possibly artificially created by the construction of the underground Colorado River Aqueduct, Casa Loma Siphon. This channel currently contains water sufficient to maintain a thick stand of water-reliant vegetation, including both native and nonnative plants (Plate 4). The survey of the pit locations along the 18-inch alignment then continued to the southeast along the Ramona Expressway to Bergin Street where the alignment then curves to the east to follow Olmstead Street and ends at the Alessandro Ponds facility (Plate 5). The pit locations were mainly in built environments, with paved roads and crosswalks where ground visibility was therefore limited. From there survey continued of the proposed 36-inch pipeline alignment extending southeast along a fence line within the ponds facility and then along the south side of the westernmost pond and back up along the Ramona Expressway and then to the south on the east side of the Expressway past Main Street to a point, approximately 700 feet past Old Mountain Road (Plate 6).



Plate 4. Channel vegetation along 18-inch pipeline alignment; view to the east.



Plate 5. Overview of 36-inch pipeline route within the Alessandro Pond Facility; view to the north.



Plate 6. Overview of 36-inch pipeline route along Ramona Expressway; view to the south.

4.2 SURVEY RESULTS

In general, the project area contains open, relatively level floodplain containing agricultural fields, as well as areas of built environment, such as water conveyance features, paved roadways, and intermittent tracts of residential development. Vegetation within the project area and surroundings consisted mostly of non-native plants as a result of substantial agricultural activity during the twentieth century, and more recently, by residential development of former agricultural lands. Most of the proposed project facilities and pipeline alignments were located either in open agricultural land, along paved roads, and/or along existing pipeline alignments. Ground visibility varied greatly (0 to 100 percent) within the project area; as such, percentages of visibility could not be accurately assessed and quantified. Overall, ground visibility was approximately 50 percent on average.

No newly identified cultural resources were observed during the current survey, but five of the eight cultural resources previously recorded within or immediately adjacent to project, were reidentified. These include the Colorado River Aqueduct and San Diego Aqueduct (CA-RIV-6726 and CA-RIV-8195) and three historic trash scatters: CA-RIV-3970, CA-RIV-3971 and CA-RIV-12672. Locations of these resources are shown in Figure 4, *Locations of Cultural Resources* (Confidential Appendix D, bound separately).

Three of the eight previously recorded cultural resources, P-33-007297 (the former Raymar Dairy), P-33-015735 (a historic rural residential complex), and P-33-024874/CA-RIV-11852 (a post-1945 resource consisting of two concrete slabs), were found not to extend into the project area.

4.2.1 Descriptions of Cultural Resources within the Project Area

4.2.1.1 P-33-003970 (CA-RIV-3970)

CA-RIV-3970 consists of a scatter of historic and modern refuse, with material dating from the 1880s to the time the site was recorded. As previously noted, the site was assessed as not a significant resource under CEQA, based on its limited research potential and the high degree of disturbance Smith (2006).The site is recorded along the northern portion of the proposed 36-inch pipeline route and is mapped as straddling the West Ramona Expressway. During the current survey, historic cultural materials consistent with those previously noted at the site were observed within the project area along the Ramona Expressway within the recorded site boundary (Plate 7). Also noted during the survey was substantial disturbance in the site area from a variety of previous activities.



Plate 7. Overview of CA-SDI-3970, east side of Ramona Expressway; view to the east.

4.2.1.2 P-33-003971 (CA-RIV-3971)

CA-RIV-3971 was recorded as consisting of two "zones": one a modern trash dump that appeared to still be in use at the time it was recorded, and the second a sparse scatter of 90 percent modern trash and 10 percent historic debris, dating as far back as the 1880s. The resource is recorded along the south-central portion of the proposed 36-inch pipeline route and is mapped at the EIC as straddling the West Ramona Expressway on the north side of Main Street (Plate 8), at the intersection of Main Street and West Ramona Expressway. During the current survey, historic cultural materials consistent with those previously noted at the site were observed along the Ramona Expressway within the recorded site boundary (Plate 9). Substantial disturbance was also noted in the site area during the survey, from various previous construction activities. This site, located along the north side of Main Street, is also in

proximity to previously recorded resource CA-RIV-12672 (described below), also described as a scatter of historic refuse, located approximately 300 feet to the south, on the south side of Main Street.

4.2.1.3 P-33-011265 (CA-RIV-6726H)

The segment of CA-RIV-6726H within the project area is the Casa Loma Siphon/Canal of the Colorado River Aqueduct (Plate 10). Within the project area, this is an underground siphon, with canal to the west of the project area. Manholes and other Aqueduct infrastructure were noted within and adjacent to the project area, as were valves and other elements of the existing EMWD infrastructure. South of the existing pipeline, a bridge constructed of railroad ties was identified within the project area. The bridge appeared to be built to channel the water flow in the creek and allow vehicles to cross; its age is indeterminate. The Aqueduct would not be affected by the project, which proposes to slipline the existing EMWD pipeline in this area.

4.2.1.4 P-33-015734 (CA-RIV-8195)

CA-RIV-8195 is the San Diego Aqueduct and San Diego Canal; however, the segment within the project area is the same area also recorded as CA-RIV-6726H, along the Casa Loma Siphon (Plate 10). As noted above, the Aqueduct would not be affected by the project, which proposes to slipline the existing EMWD pipeline in this area.



Plate 8. Overview of CA-SDI-3971, east of Ramona Expressway, north of Main Street; view to the north.



Plate 9. Overview of CA-SDI-3971, along east side of Ramona Expressway; view to the south.



Plate 10. Overview of CA- RIV-6726/CA-RIV-8195, west side of North Sanderson Avenue; view to the southwest.

4.2.1.5 P-33-028071 (CA-RIV-12672)

CA-RIV-12672 is a historic archaeological site situated along the central portion of the proposed 36-inch pipeline route, recorded as a sparse scatter of approximately 50 items of historic refuse, ascribed to the early to mid-twentieth century, including glass beverage bottle fragments, as well as tableware fragments, brick fragments, and porcelain insulator fragments (Vader and Avila 2016). The site was noted as in poor condition and either heavily disturbed by construction or artifacts that washed into the basin from the river. The site is recorded immediately adjacent to the south-central portion of the proposed 36-inch pipeline route, just south of Main Street and east of Ramona Expressway. During the current survey, historic cultural materials consistent with those previously noted at the site were observed in the survey corridor along the east side of the Ramona Expressway, indicating that the site extends into the project area. Also noted during the survey was substantial disturbance in the site area from various previous construction activities, including roadway construction (Plate 11).



Plate 11. Overview of CA-SDI-12672, south of Main Street, east of Ramona Expressway; view to the north.

5.0 SUMMARY AND MANAGEMENT RECOMMENDATIONS

A study was undertaken to identify cultural resources that are present in the Purified Water Replenishment Project area and to determine the potential effects of the project on cultural resources. The results of records search and field investigation identified five previously recorded cultural resources within the project area, with two of the resources (segments of the Colorado Aqueduct and the San Diego Aqueduct) overlapping within the project area. No previously unrecorded resources were identified during the field survey. NRHP and CRHR eligibility of these resources is summarized in Table 4,

NRHP/CRHR Eligibility Recommendations of Cultural Resources Within the Project Area, and discussed below.

Table 4
NRHP/CRHR ELIGIBILITY RECOMMENDATIONS OF CULTURAL RESOURCES WITHIN THE PROJECT AREA

Resource Number	Description	NRHP/CRHR Eligibility Recommendation
P-33-003970 (CA-RIV-3970)	Historic refuse scatter; reidentified within project area	Previously assessed as not significant under CEQA (Smith 2006); limited research potential and high degree of disturbance; recommended as not NRHP/CRHR eligible
P-33-003971 (CA-RIV-3971)	Historic refuse scatter; reidentified within project area	Not formally evaluated; limited research potential and high degree of disturbance; recommended as not NRHP/CRHR eligible
P-33-011265 (CA-RIV-6726H)	Segment of Casa Loma Siphon Barrel 2 of the Colorado River Aqueduct; reidentified within project area	Colorado River Aqueduct is NRHP/CRHR eligible; within project area but will not be directly affected
P-33-015734 (CA-RIV-8195)	Segment of San Diego Aqueduct, same as segment of Casa Loma Siphon; reidentified within project area	San Diego Aqueduct is NRHP/CRHR eligible; within project area but will not be directly affected
P-33-028071 (CA-RIV-12672)	Historic refuse scatter; reidentified within project area	Not formally evaluated; limited research potential and high degree of disturbance; recommended as not NRHP/CRHR eligible

As previously described, the three historic trash scatters (CA-RIV-3970, CA-RIV-3971, and CA-RIV-12672) have all been subject to a great deal of past disturbance and have very limited research potential, if any, making them ineligible for the NRHP or CRHR. None of these three sites are associated with events that have made a significant contribution to the broad patterns of our history; and thus are not eligible under Criterion A (1). None can be shown to be associated with the lives of persons significant in our past; thus, are not eligible under Criterion B (2). These trash scatters do not embody the distinctive characteristics of a type, period, or method of construction; or represent the work of a master; or possess high artistic values; or represent a significant and distinguishable entity whose components may lack individual distinction; making them ineligible under Criterion C (3). Finally, as discussed above for each site individually, they are not likely to yield information important in prehistory or history; thus, they are not eligible under Criterion D (4). In addition, these three sites have been subject to a high degree of disturbance and do not retain the integrity necessary to qualify as eligible resources.

The two remaining resources within the project area are CA-RIV-6726H and CA-RIV-8195. As previously described, these are segments of the Colorado River Aqueduct and the San Diego Aqueduct, parts of which overlap within the project area. Both of these resources have been previously assessed as eligible for the NRHP (and by extension, the CRHR). A 2008 site record stated:

> The CRA is significant under Criterion A as its construction was a driving and enabling force for the economic development of southern California. The period of significance for Criterion A is from 1923 to the present. Previously the CRA has been recommended as being eligible under Criterion B for its association with William J. Mulholland (Neves and Goodman 2000; Dice 2001). Recent research undertaken in development of a Historic Property Treatment Plan (HPTP) for MWD (2006) demonstrates Mulholland was not directly involved in the designing, engineering, and construction of the CRA. It currently is not considered eligible under Criterion B. The CRA is significant under Criterion C as a marvel of civil engineering as outlined by Gruen (1998) who

> prepared HAER documentation of the CRA for the National Park Service. The American Society of Civil Engineers declared it one of seven modern U.S. civil engineering wonders, and, in 1955, designated it a National Historic Engineering Landmark (Gruen 1998). The system is also significant under Criterion D for its potential to yield information about living and working conditions during the time of survey and construction, as embodied in remnant survey and construction camps, as well as tailing piles, and associated refuse deposits. The period of significance for the CRA under Criteria C, and D begins in 1923 and ends in 1960, with completion of the second phase of construction [Beedle 2008].

Although a segment of the Aqueduct is within the project area, it will not be subject to direct impacts from the project. The EMWD pipeline to be sliplined parallels the Casa Loma Siphon, but the project will not affect the Siphon.

5.1 MANAGEMENT RECOMMENDATIONS

Based on the results of the current study, no historical resources (per CEQA) or historic properties (per NHPA) will be affected by the project. However, as discussed in this report, cultural resources are known in the immediate vicinity of the project area. In addition, the area is sensitive for cultural resources, as noted by the Soboba tribe. Soboba responded that the project location is in proximity to known sites, is a shared use area that was used in ongoing trade between the tribes and is considered culturally sensitive by the people of Soboba.

Based on the presence of cultural resources in proximity to the project, and the fact that portions of the area could not be surveyed due to active agricultural uses and other factors that may be obscuring cultural resources within the project area, it is recommended that an archaeological and Native American monitoring program be implemented, as detailed below.

Should the project limits change to incorporate new areas of proposed disturbance, archaeological survey of these areas will be required.

MM CULT-1 Cultural Resources Treatment and Monitoring Agreement. At least 30 days prior to the start of any ground-disturbing activities, EMWD shall contact the Consulting Tribe(s) to develop Cultural Resource Treatment Monitoring Agreement(s) ("Agreement"). The Agreement(s) shall address the treatment of archaeological resources inadvertently discovered on the project site; project grading; ground disturbance and development scheduling; the designation, responsibilities, and participation of tribal monitor(s) during grading, excavation, and ground disturbing activities; and compensation for the tribal monitors, including overtime, weekend rates, and mileage reimbursements.

MM CULT-2 Develop a Cultural Resources Monitoring Plan. Prior to any grading activities, a Cultural Resources Monitoring Plan shall be prepared by a qualified archaeologist in consultation with the Consulting Tribe(s). The plan shall also identify the location and timing of cultural resources monitoring. The plan shall contain an allowance that the qualified archaeologist, based on observations of subsurface soil stratigraphy or other factors during initial grading, and in consultation with the Native American monitor and the lead agency, may reduce or discontinue monitoring as warranted if the archaeologist determines that the possibility of encountering archaeological deposits is low. The plan shall outline the appropriate measures to be followed in the event of unanticipated discovery of cultural resources during project implementation (including during the survey to occur following vegetation removal and monitoring during ground-disturbing activities). The plan shall identify avoidance as the

preferred manner of mitigating impacts to cultural resources. The plan shall establish the criteria utilized to evaluate the historic significance (per CEQA) of the discoveries, methods of avoidance consistent with CEQA Guidelines Section 15126.4(b)(3), as well as identify the appropriate data recovery methods and procedures to mitigate the effect of the project if avoidance of significant historical or unique archaeological resources is determined to be infeasible. The plan shall also include reporting of monitoring results within a timely manner, disposition of artifacts, curation of data, and dissemination of reports to local and state repositories, libraries, and interested professionals. A qualified archaeologist and Consulting Tribe(s) tribal monitor shall attend a pre-grade meeting with EMWD staff, the contractor, and appropriate subcontractors to discuss the monitoring program, including protocols to be followed in the event that cultural material is encountered.

MM CULT-3 Tribal Monitoring Agreements. A qualified archaeological monitor and a Consulting Tribe(s) monitor shall be present for ground-disturbing activities associated with the Project, and both the project archaeologist and Tribal Monitor(s) will make a determination as to the areas with a potential for encountering cultural material. At least seven business days prior to project grading, EMWD shall contact the tribal monitors to notify the Tribe of grading/excavation and the monitoring program/ schedule, and to coordinate with the Tribe on the monitoring work schedule. Both the archaeologist and the tribal monitor shall have the authority to stop and redirect grading activities in order to evaluate the nature and significance of any archaeological resources discovered within the project limits. Such evaluation shall include culturally appropriate temporary and permanent treatment pursuant to the Cultural Resources Treatment and Monitoring Agreement, which may include avoidance of cultural resources, in-place preservation, data recovery, and/or reburial so the resources are not subject to further disturbance in perpetuity. Any reburial shall occur at a location predetermined between EMWD and the Consulting Tribe(s), details of which shall be addressed in the Cultural Resources Treatment and Monitoring Agreement in MM CR-1. Treatment may also include curation of the cultural resources at a tribal curation facility, as determined in discussion among EMWD, the project archaeologist, and the tribal representatives and addressed in the Cultural Resources Treatment and Monitoring Agreement referenced in MM CR-1.

MM CULT-4 Evaluation of Discovered Artifacts. All artifacts discovered at the development site shall be inventoried and analyzed by the project archaeologist and tribal monitor(s). A monitoring report will be prepared, detailing the methods and results of the monitoring program, as well as the disposition of any cultural material encountered. If no cultural material is encountered, a brief letter report will be sufficient to document monitoring activities.

MM CULT-5 Disposition of Inadvertent Discoveries. In the event that Native American cultural resources are recovered during the course of grading (inadvertent discoveries), the following procedures shall be carried out for final disposition of the discoveries with the tribe. EMWD shall relinquish ownership of all cultural resources, including sacred items, burial goods, and all archaeological artifacts and non-human remains as part of the required mitigation for impacts to cultural resources, and adhere to the following:

1) Preservation-in-place is the preferred option; preservation-in-place means avoiding the resources and leaving them in the place where they were found with no development affecting the integrity of the resource.

2) If preservation-in-place is not feasible, on-site reburial of the discovered items as detailed in the Monitoring Plan required pursuant to MM CR-2 is the next preferable treatment measure. This shall include measures and provisions to protect the future reburial area from any future

impacts in perpetuity. Reburial shall not occur until all legally required cataloging and basic recordation have been completed. No recordation of sacred items is permitted without the written consent of all Consulting Native American Tribal Governments.

3) In the event that on-site reburial is not feasible, EMWD will enter into a curation agreement with an appropriate qualified repository within Riverside County that meets federal standards per 36 Code of Federal Regulations 800 Part 79 and therefore would be curated and made available to other archaeologists/researchers for further study. The collections and associated records shall be transferred, including title, to an appropriate curation facility within Riverside County, to be accompanied by payment of the fees necessary for permanent curation.

MM CULT-6 Non-Disclosure of Reburial Locations. It is understood by all parties that unless otherwise required by law, the site of any reburial of culturally sensitive resources shall not be disclosed and shall not be governed by public disclosure requirements of the California Public Records Act. The Coroner, pursuant to the specific exemption set forth in California Government Code 6254(r), parties, and Lead Agencies will be asked to withhold public disclosure information related to such reburial.

MM CULT-7 Human Remains. If Native American human remains are encountered, Public Resources Code Section 5097.98 and California Health and Safety Code Section 7050.5 will be followed. If human remains are encountered no further disturbance shall occur until the Riverside County Coroner has made the necessary findings as to origin. Further, pursuant to California Public Resources Code Section 5097.98(b), remains shall be left in place and free from disturbance until a final decision as to the treatment and disposition has been made. If the Riverside County Coroner determines the remains to be Native American, the coroner shall contact the NAHC within 24 hours. Subsequently, the NAHC shall identify the person or persons it believes to be the "most likely descendant." The most likely descendant shall then make recommendations and engage in consultations concerning the treatment of the remains as provided in Public Resources Code Section 5097.98.

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Appendix A

Resumes of Key Personnel

Mary Robbins-Wade, RPA

Senior Archaeologist

Summary of Qualifications

Ms. Robbins-Wade has extensive experience in both archaeological research and general environmental studies. She oversees the management of all archaeological, historic, and interpretive projects; prepares and administers budgets and contracts; designs research programs; supervises personnel; and writes reports. Ms. Robbins-Wade has managed or participated in hundreds of projects in conformance with the California Environmental Quality Act (CEQA), Section 106, and the National Environmental Policy Act (NEPA). She has an excellent relationship with the local Native American community and the Native American Heritage Commission (NAHC). Ms. Robbins-Wade has worked in Southern California archaeology for 35 years. She has conducted archaeological studies for numerous local agencies, water districts/water agencies, Caltrans, SANDAG, U.S. Navy, SDG&E, educational institutions, non-profits, and a variety of other entities. Work for public projects has ranged from constraints studies for pipeline alternatives to survey, testing, and monitoring programs for public projects, such as roadways, parks, and various utilities. Ms. Robbins-Wade has also managed a range of mitigation monitoring projects in the public sector.

Selected Project Experience

Campo Creek Bridge (2016 - 2017). Project Manager/Principal Investigator for the cultural resources monitoring program for this emergency bridge replacement project on SR-94 in San Diego County. The project area is very sensitive in terms of Native American cultural resources, as well as historic resources. Responsible for development and implementation of the monitoring and discovery plan. The project requires effective communication and coordination with construction crews, Caltrans staff, and Native American monitors. Work performed as a subconsultant to the general contractor, with Caltrans as the lead agency.

Lilac Hills Ranch (2014 - 2016). Project Manager/Principal Investigator of a cultural resources survey and testing program for an approximately 608-acre mixed-use development in the Valley Center area of northern unincorporated San Diego County. Oversaw background research, field survey, testing, recording archaeological sites and historic structures, and report preparation. Responsible for development of the research design and data recovery program, the preservation plan, and Native American outreach and coordination. Project coordination is still underway while the project finishes the environmental review process. The proposed Specific Plan includes residential and commercial use, Town Center, park and private recreation areas, senior center, school site, waste recycling facility, wastewater reclamation facility, active orchards, and other supporting infrastructure. The project also included recording historic structures, development of a research design and data recovery program for a significant archaeological site, and coordination with the Native American community and the client to develop a preservation plan for a significant

Education

Master of Arts, Anthropology, San Diego State University, California, 1990

Bachelor of Arts, Anthropology, University of California, Santa Barbara, 1981

Registrations/ Certifications

Register of Professional Archaeologists #10294, 1991

County of San Diego, Approved CEQA Consultant for Archaeological Resources, 2014

NCTD, Roadway Worker ID #C02943

Professional Affiliations

Society for American Archaeology

Archaeological Society

cultural resource. The project changed over time, so new survey areas were added, and a variety of off-site improvement alternatives were addressed. Work performed for Accretive Investments, Inc.

Valiano Cultural Resources (2012 - 2015). Project Manager/Principal Investigator of a cultural resources survey and testing program for a 239-acre residential planned community in the Escondido area of the County of San Diego, following a burn affecting much of the project area. Oversaw background research, field survey, testing, recording archaeological sites and assessment of historic structures, Native American outreach and coordination, and report preparation. Archaeological testing was conducted at several sites that could not be avoided through project design. The project site is in an area that is of cultural importance to both the Kumeyaay and Luiseño people; HELIX archaeologists worked with Native American representatives from both groups. Coordination was conducted to determine the feasibility of preserving bedrock milling features by moving them to open space areas within the project. Other archaeological sites were retained in open space through project design. Work performed for Integral Partners Funding, LLC.

Mission Cove Data Recovery (2014 - 2016). Project Manager/Principal Investigator for a cultural resources data recovery program at a significant archaeological site with cultural significance to the Luiseño people in the City of Oceanside. Prior to the data recovery program, worked with the client and the San Luis Rey Band of Mission Indians to redesign the project (an affordable housing/mixed-use development) to avoid impacts to cultural resources to the extent feasible. Oversaw background research, excavation and related fieldwork, cataloging and analysis, coordination of ancillary studies (e.g. radiocarbon analysis and shell analysis), Native American coordination, and report preparation. Analysis and report preparation are currently underway. The data recovery program was conducted to mitigate impacts that could not be avoided through project design. Work performed for National Community Renaissance.

Mission Cove Monitoring (2014 - 2016). Project Manager/Principal Investigator of an archaeological monitoring program for the 14.47-acre Mission Cove Affordable Housing mixed-use project area in the City of Oceanside. Oversaw field monitoring and documentation of finds. A significant archaeological and cultural resource is within the project, and there is a potential for unknown buried resources, given the alluvial setting. Work performed for National Community Renaissance.

Village Park Recycled Water (2014 - 2015). Project Manager/Principal Investigator of a cultural resources study for a proposed recycled water system consisting of approximately 6.6 miles of pipelines and a pump station mainly within existing roadways in the City of Encinitas. Oversaw background research, field checks, Native American coordination, and report preparation. Work performed for Olivenhain Municipal Water District.

Espola Road Widening and Improvements (2002 - 2010). Project Manager/ Principal Investigator for historic study, historic structures assessment, and archaeological survey for road widening and improvements under the City of Poway and Caltrans. Oversaw field survey, historic study, structures evaluation, and report preparation.

Bear Valley/East Valley Parkways Road Widening, Realignment, and Improvements (2000 - 2004). Project Manager/Principal Investigator for historic study, historic structures assessment, archaeological survey, and archaeological testing for road widening, realignment, and improvements under City of Escondido and Caltrans. Oversaw field survey, testing, historic study and structures assessment, and report preparation.

Torrey Meadows Drive Overcrossing at SR-56 (2014). Project Manager/Principal Investigator on a cultural resources survey for a proposed bridge over SR 56, which would connect two existing termini of Torrey Meadows Drive in the Carmel Valley community of the City of San Diego. The project is being undertaken by the City, but includes some Caltrans right-of-way, necessitating Caltrans encroachment permits. Oversaw survey, report preparation, and coordination with Caltrans cultural resources staff. Work performed as subconsultant for an engineering prime, with City of San Diego as lead agency.

SR-163/Friars Road Widening and Interchange Improvements (2002 - 2007). Project Manager/Principal Investigator for historic study, historic structures assessment, and archaeological survey for road widening and interchange improvements under City of San Diego and Caltrans. Oversaw field survey, historic study and structures assessment, and report preparation. Reports included Archaeological Survey Report, Historic Resources Evaluation Report, and Historic Property Survey Report for Caltrans, as well as Archaeological Survey Report and Historic Evaluation for City of San Diego.

SR-76 East Mitigation Monitoring (2015 - 2017). Project Manager/Principal Investigator for a cultural resources monitoring project for roadway improvements at the SR-76/I-15 Interchange and on SR-76 along the San Luis Rey River in the Bonsall area of San Diego County. The area along the San Luis Rey River is quite sensitive in terms of cultural resources. Overseeing field monitoring, report preparation, and monitor coordination with Caltrans field staff. Responsible for Native American coordination and coordination with Caltrans cultural resources staff. Work is being conducted for Caltrans and SANDAG.

Campo Bus Yard (2015 - 2016). Cultural Resources Task Manager/Principal Investigator for a cultural resources survey for a proposed MTS bus yard in the Campo area of the County of San Diego. The project is immediately adjacent to a County-listed and National Register-eligible historic property (Camp Lockett), and features associated with that historic district extend into the project area. Oversaw background research, field survey, coordination, Native American outreach, and report preparation. Work was conducted under an as-needed contract with SANDAG.

Batiquitos Lagoon Double Track Project (2015). Senior Archaeologist for the addition of a second main track along a 2.7-mile-long segment of the LOSSAN Rail Corridor in Encinitas and Carlsbad. Overseeing the Federal Aviation Administration (FAA) Section 106 process for addition of antenna sites. Work performed for HNTB Corporation, with SANDAG as the local lead agency and Federal Transit Administration as the federal lead agency for the overall project, and FAA as the federal lead agency for the antenna sites.

Theodore G. Cooley, RPA

Senior Archaeologist

HELIX Environmental Planning

Summary of Qualifications

Mr. Cooley has over 45 years of experience in archaeological resource management. He has directed test and data recovery investigations, monitoring programs, and archaeological site surveys of large and small tracts, and has prepared reports for various cultural resource management projects. He is well-versed in National Historic Preservation Act, National Environmental Policy Act (NEPA), and California Environmental Quality Act (CEQA) regulations and processes. Mr. Cooley's experience also includes Native American consultation for monitoring of archaeological field projects, including some with human remains and reburial-related compliance issues.

Selected Project Experience

8016 Broadway Self Storage Project (2019 - Present). Senior Archaeologist for a Phase I pedestrian survey and cultural resource inventory program of the Lemon Grove Self-Storage project located in the City of Lemon Grove, San Diego County. Involvement included participation in the analysis of the results from the survey program and co-authorship of the technical report. Work performed for the Summit Environmental Group, Inc.

Briggs Road Walton Development Project (Assessor's Parcel Number 461-170-001) (2019 - Present). Senior Archaeologist for a Phase I pedestrian survey and cultural resource inventory program of the Briggs Road Residential project located in Riverside County. Involvement included participation in the analysis of the results from the survey program and co-authorship of the technical report. Work performed for the Walton International Group, LLC.

Brown Field and Montgomery Field Airport Master Plans (2019 - Present). Senior Archaeologist for Phase I cultural resource inventory and pedestrian survey programs at the Brown Field Municipal Airport and the Montgomery-Gibbs Executive Airport, in the City of San Diego, in support of updating of the Airport Master Plan and its Programmatic Environmental Impact Report. Involvement included participation in the analysis of the results from the survey programs and co-authorship of the technical reports. Work performed as a subconsultant to C&S Companies, with the City of San Diego as the lead agency.

Cubic Redevelopment Environmental Consulting (2019 - Present). Senior Archaeologist for a Phase I pedestrian survey and cultural resource inventory and assessment program in support of a 20-acre redevelopment project, located in the community of Kearny Mesa, City of San Diego. Involvement included participation in the analysis of the results from the survey program and preparation of the technical report. Work performed for Cubic Redevelopment Environmental Consulting, with the City of San Diego as lead agency.

Education

Master of Arts, Anthropology, California State University, Los Angeles, 1982

Bachelor of Arts, Anthropology, California State College, Long Beach, 1970

Registrations/ Certifications

Register of Professional Archaeologists #10621, 2019

City of San Diego, Certified Principal Investigator for Monitoring Projects

County or Riverside, Certified Cultural Resources Consultant Principal Investigator

County of Orange, Certified Cultural Resources Consultant Principal Investigator

County of San Diego, Approved Consultant for Archaeological Resources

Los Angeles, Ventura, San Luis Obispo, and Santa Barbara Approved Consultant

Theodore G. Cooley, RPA

Senior Archaeologist

French Valley 303 Project (2019 - Present). Senior Archaeologist for an archaeological construction monitoring program for the French Valley 303 Site residential development project, located in the French Valley area of unincorporated Riverside County. Involvement included participation in the analysis of the results from the monitoring program and co-authorship of the technical report. Work performed for Pulte Home Co., LLC.

Hiser Property Project (2019 - Present). Senior Archaeologist for a due diligence study prepared to summarize potential cultural resources constraints to the 9.2-acre Hiser Property development project, located in the Mission Gorge area of the City of Santee, San Diego County. The study consisted of background research including a record search and limited archival study, a field survey, and a review of the Sacred Lands File from the Native American Heritage Commission (NAHC). Involvement included participation in the analysis of the results and preparation of a summary letter report of the potential cultural resources-related constraints to the planned development. Work performed for KB Home.

Ponto Hotel Technical Studies (2019 - Present). Senior Archaeologist for a cultural resources assessment study for the Ponto Hotel development project in the City of Carlsbad, San Diego County, California. Involvement included participation in the analysis of the results from the assessment program and preparation of the technical report. Work performed for Kam Sang Company, with the City of Carlsbad as the lead agency.

R.M. Levy Water Treatment Plant Sewer Replacement (2019 - Present). Senior Archaeologist for a Phase I pedestrian survey and cultural resource inventory and assessment program in support of a water treatment plant, sewer pipeline, replacement project, located in the community of Lakeside, San Diego County. Involvement included participation in the analysis of the results from the survey program and preparation of the technical report. Work performed for HELIX Water District.

Salt Bay District Specific Plan EIR (2019 - Present). Senior Archaeologist for a Phase I pedestrian survey and cultural resource inventory program in support of the 46.6-acre Salt Bay Design District Specific Plan mixed-use wholesale/retail shopping and light industrial development project, in the cities of San Diego and Chula Vista. Involvement included participation in the analysis of the results from the survey program and co-authorship of the technical report. Work performed for M. & A. Gabaee, with the City of San Diego as lead agency.

San Jacinto Property Project (2019 - Present). Senior Archaeologist for a Phase I pedestrian survey and cultural resource inventory program of the 214 residential project located in Riverside County. Involvement included participation in the analysis

of the results from the survey program and co-authorship of the technical report. Work performed for the Walton International Group, LLC.

San Elijo Joint Powers Authority Roadway and Trail Addendum and Permitting (2019 - Present). Senior Archaeologist for Phase I cultural resource inventory, pedestrian survey, and resource testing at the San Elijo Water Reclamation Facility adjacent to San Elijo lagoon, in San Diego County, in support of the preparation by the San Elijo Joint Powers Authority of a Roadway and Trail Addendum for upgrades to the facility requiring verification of Nationwide Permit authorization from the U.S. Army Corps of Engineers (USACE). Involvement included participation in the analysis of the results from the survey and testing program and co-authorship of the technical report. Work performed as a subconsultant to Kimley-Horn & Associates, with the San Elijo Joint Powers Authority as lead agency.

Sycamore & Watson Project (2019 - Present). Senior Archaeologist for an archaeological construction monitoring program for the Sycamore & Watson residential development project, located in City of Vista, San Diego County. Involvement included participation in the analysis of the results from the monitoring program and preparation of the technical report. Work performed for Meritage Homes.

Sycamore Canyon/Goodan Ranch Public Access Plan IS/MND (2019 - 2019). Senior Archaeologist for Phase I pedestrian survey and cultural resource inventory in support of the preparation by the County of San Diego County Parks Department of a Public Access Plan for the Sycamore Canyon/Goodan Ranch Preserve located in coastal foothills of unincorporated west-central San Diego County. Involvement included participation in the analysis of the results from the survey program and co-authorship of the technical report. Work performed for the County of San Diego.

Sycuan/Sloane Canyon Trail IS/MND (2019). Senior Archaeologist for Phase I pedestrian survey and cultural resource inventory in support of the preparation by the County of San Diego County Department of a Parks and Recreation for the Sycuan/Sloane Canyon Trail project located in the coastal foothills of unincorporated southwestern San Diego County. Involvement included participation in the analysis of the results from the survey program and co-authorship of the technical report. Work performed for the County of San Diego.

The Enclave at Delpy's Corner Project (2019 - Present). Senior Archaeologist for a cultural resources monitoring and data recovery program in support of a proposed 124-unit townhome development project, in the City of Vista, San Diego County. Involvement included participation in the analysis of the prehistoric lithic artifacts and preparation of technical report sections containing the results of these analyses. Work performed for CalAtlantic Homes.

Julie A. Roy

Archaeologist

HELIX Environmental Planning

Summary of Qualifications

Ms. Roy has over 20 years of experience as an archaeologist, field lead, and supervisor on more than 130 projects throughout California, Nevada, Arizona, and Guam. Conducted archaeological studies for a wide variety of development and resource management projects including work on military installations, energy and transmission projects, commercial and residential developments, historic archaeology projects, and water projects. Competent in all areas of archaeology and efficient in report preparation for a range of cultural resource studies including monitoring projects and archaeological Phase I, II and III studies. Ms. Roy is proficient in laboratory activities including artifact preparation, cataloging, identification, and illustration. Accomplished in the initiation, coordination and completion of field assignments including survey, site testing, dry and wet screening, and data recovery projects. She is also knowledgeable in the preparation of proposals and report writing and research, client, contractor and subcontractor correspondence, laboratory, computer software including Microsoft, Adobe, Geographic Information System (GIS)/ArcView, Computer-Aided Design and Drafting (CADD), Global Positioning System (GPS) and total-station operations, as well as in the illustration of archaeological features, artifacts, and burials. Ms. Roy is established as a qualified archaeological monitor for the City and the County of San Diego. Her experience includes working closely with representatives of San Diego County Parks and Recreation for the past 10 years and she has received accolades from numerous county representatives for her work at park facilities. For the past 4 four years, she has served as the monitoring coordinator for the San Diego Gas & Electric Company (SDG&E) Fire Resource Mitigation Initiative (FiRM) project, where she regularly provided effective communication between field monitors, construction managers/foremen, and Principal Investigators for construction projects and assisted in scheduling and tracking of project progress.

Selected Project Experience

Blythe to Eagle Mountain TLRR Survey (2017). Field Director on this Southern California Edison (SCE) Survey project, which included supervising two crews during a period of two weeks. Conducted survey, mapping, recording new cultural resources and updating previously recorded sites along the transmission line corridor. Other responsibilities included report writing and completion of site records for distribution to SCE and the South Coastal Information Center (SCIC).

On-call Archaeological Services (Present). Archaeologist and Field Lead for SDG&E infrastructure operations and transmission line maintenance activities for over 12 years. Projects include survey, testing, excavations, and data recovery of both historic and prehistoric resources including Native American burial sites. Approved to monitor for City projects throughout San Diego and Imperial counties. Other duties include records search, survey, archaeological documentation and investigations, and

Education

Master of Arts, Archaeology, University of Leicester, England, In progress

Bachelor of Arts, Anthropological Archaeology, University of California San Diego, 2002

Associate of Arts, **P**sychology, San Diego City College, 2000

Registrations/ Certifications

OSHA 30-hour Construction Safety Training Certification

Competent Person Certification

Professional Affiliations

Society for California Archaeology

Society for American Archaeology

Association of Environmental Professionals

preparation of reports under California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) guidelines.

Fire Resource Cultural Resources Mitigation (Present). Monitoring Coordinator and Lead Archaeologist on this FiRM project for SDG&E. Monitoring Coordinator duties consist of close communication with SDG&E supervisors and staff, liaisons, and contractors in conjunction with the coordination of FiRM project activities associated with cultural and Native American archaeological and monitoring efforts throughout San Diego and Imperial Counties. Archaeological Supervisor duties consists of record search, survey, archaeological site documentation, testing, excavations, and data recovery projects, and preparing reports following CEQA and NEPA guidelines.

Archaeological Monitoring, Bird Rock Avenue Utility Undergrounding Project (2005). Archaeological Monitor for the undergrounding of residential utilities in the Bird Rock community of La Jolla. The project was conducted under CEQA and the City of San Diego guidelines while working closely with San Diego Gas and Electric Company and the construction contractor. No cultural resources were identified during this project.

Archaeological Monitoring and Data Recovery, Princess Street Utility Undergrounding Project (2005 - 2006). Archaeological Monitor/Crew Chief for utility undergrounding project, which included trenching through a major prehistoric and ethnohistoric Indian village site (the Spindrift Site/CA-SDI-39) in La Jolla. Crewmembers worked closely with Native American representatives during the recovery of human remains. A concurrent data recovery program incorporated all cultural material recovered from the trenching activities. This project was conducted pursuant to CEQA and City of San Diego guidelines while working closely with San Diego Gas & Electric Company and the construction contractor.

Environmental Impact Statement, Southern Nevada Supplemental Airport (2007 - 2009). Archaeologist on this project that included survey and recordation of the northern portion of Ivanpah Valley from the California state line to Henderson, Clarke County, Nevada. Cultural sites located within the project area included a section of the pacific railroad, historic roads, camps, railroad and construction debris, transmission lines, trash scatters and prehistoric sites and features. The project was surveyed and recorded in compliance with the Nevada State Historic Preservation Office (SHPO) and Bureau of Land Management (BLM) guidelines.

Monitoring, Genesis Solar Power Project (2011 - 2012). Supervisor-in-Charge of over 20 cultural monitors on this solar power project located in Blythe, California. Responsible for conducting safety meetings and coordinating cultural monitors to all areas of the project site, as well as leading test excavations of discovered resources during construction activities. Also responsible for representing firm during onsite meetings with Nextera officials, Bureau of Veritas, BLM, and safety liaisons for the project. Communicated directly with Native American supervisors and monitors on a daily basis. Recorded and collected artifacts located during construction activities with the use of Global Positioning Satellite technology. Completed daily field notes and collection logs for all collected artifacts, and reviewed all staff monitoring logs prior to daily submission to the California Energy Commission (CEC). Work performed for Nextera.

Survey and Monitoring, Palen Solar Power Project (2009 - 2010). Archaeologist for survey and cultural monitoring in Desert Center, California. Monitored contract and personnel activities during traveling to and from proposed project sites, including trenching and testing within the proposed project areas. Work performed for Solar Millennium.

Ridgecrest Solar Power Project (2009 - 2010). Archaeologist for surveys of the project area undertaken to determine if cultural resources are present and if there would be any project effects on these resources. Monitored contractor activities during the testing phase of the project to ensure that sites were not impacted during work activities. The project was located in Ridgecrest and work was performed for Solar Millennium.

On-Call Archaeological Services (Present). Archaeologist and Field Lead for County Parks infrastructure and maintenance activities for San Diego County Department of Parks and Recreation. Responsible for communication with County supervisors and contractors, and the coordination of project activities with cultural and Native American monitors for projects throughout San Diego and Imperial Counties. Other duties include records search, field survey, archaeological documentation and investigations including testing, excavations and data recovery projects and preparation of reports following CEQA and NEPA guidelines.

Pacifica Street Utility Undergrounding Project (2006). Archaeological Monitor/Crew Chief for residential utility undergrounding project in the community of Pacific Beach in San Diego. Trenches and cultural materials were documented in conjunction with a concurrent data recovery program. The project included working with Native American representatives and the discovery of human remains. The project was conducted under CEQA and City of San Diego guidelines while working closely with the construction contractor.

Archaeological Monitoring, 20A Julian Conversion Project (2006). Archaeological Monitor for undergrounding of utilities in the City of Julian. The project was conducted under the County of San Diego guidelines while working closely with the construction contractor.

Data Recovery, Hill Street Utility Undergrounding Project (2006). Archaeological Monitor participated in the data recovery for this residential utility undergrounding project in the community of Point Loma in San Diego. The project was conducted under CEQA and City of San Diego guidelines while working closely with the construction contractor.

Archaeological Monitoring, 30th Street Utility Undergrounding Project (2006). Archaeological Monitor for residential utility undergrounding project in the community of South Park in San Diego. The project was conducted under CEQA and City of San Diego guidelines while working closely with the construction contractor.

EIR Appendix E

Preliminary Design Report



EASTERN MUNICIPAL WATER DISTRICT

Purified Water Replenishment (PWR) Project

FINAL | Preliminary Design Report | May 2018

emwd EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT
Groundwater Reliability Plus

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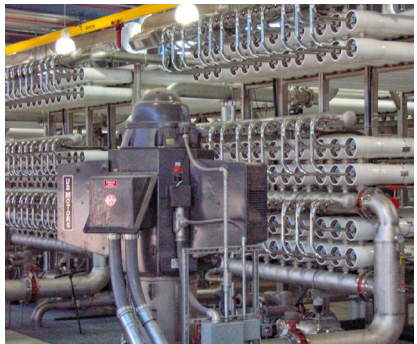



Purified Water Replenishment (PWR) Project
Preliminary Design Report

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Appendices

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Appendix C Conveyance Facilities Study Technical Memo
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Appendix E Survey
Appendix F Geotechnical Investigation Report
Appendix G Preliminary Design Drawings (See Separate Bound Drawings)
Appendix H SJVRWRF Secondary vs. Tertiary Effluent Evaluation
Appendix I Preliminary Cost Estimate Tables

Acronyms

AABC	Associated Air Balance Council
AASHTO	American Association of State Highway and Transportation Officials
ABA	Architectural Barriers Act
ABAAG	Architectural Barriers Accessibility Guidelines
ACGIH	American Conference of Governmental Industrial Hygienists
ACI	American Concrete Institute
ADA	American Disability Act
ADM	Aluminum Design Manual
AFY	acre-feet per year
AISC	American Institute of Steel Construction
ALR	action leakage rate
AMCA	Air Moving and Conditioning Association
AOP	advanced oxidation process
ASCE	American Society of Civil Engineers
ASD	Allowable Stress Design
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASTM	American Society for Testing and Materials
ATS	Automatic Transfer System
AWPF	Advanced Water Purification Facility
AWWA	American Water Works Association
Basin Plan	Santa Ana Region, Water Quality Control Plan
BDOC	biodegradable organic carbon
BEP	Business Emergency Plan
bgs	below ground surface
Cal/OSHA	California Occupational Safety and Health Agency
Caltrans	California Department of Transportation
CBC	California Building Code
CCR	California Code of Regulations
CDPH	California Department of Public Health
CEC	constituents of emerging concern
CIMIS	California Irrigation Management Information System
CEC	California Electric Code or constituents of emerging concern
CECC	California Energy Conservation Code
CEQA	California Environmental Quality Act
CFC	California Fire Code
CFE	Communication Front End
CFR	Code of Federal Regulations

CIMIS	California Irrigation Management Information System
CIP	clean-in-place
CIPP	clean-in-place pipe
City	City of San Jacinto
CLSM	Controlled Low Strength Material
CML&C	cement mortar lined and coated
CMU	concrete masonry units
County	Riverside County
CPC	California Plumbing Code
CPVC	Chlorinated Polyvinyl Chloride
CUP	Conditional Use Permit
DBP	disinfection byproducts
DDW	Division of Drinking Water
District	Eastern Municipal Water District
DOSH	division of Occupational Safety and Health Act
DWR	Department of Water Resources
EFZ	Earthquake Fault Zone
EIR	environmental impact report
EIS	environmental impact statement
ELSP	epoxy lined steel pipe
EMWD or District	Eastern Municipal Water District
EPDM	ethylene propylene diene monomer
FO	fiber optic
FRP	Fiberglass Reinforced Plastic
ft	feet or foot
GCL	geosynthetic clay liner
gfd	gallons per square foot per day
gpd	gallons per day
gpm	gallons per minute
GRP	Groundwater Reliability Plus
GRRP	Groundwater Replenishment Reuse Project
GRS	Galvanized Rigid Steel
GWR	Groundwater Recharge or Groundwater Replenishment
HA	Hydrologic Area
HAS	Hydrologic Subarea
HDR	High Density Residential
HDPE	high-density polyethylene
HRRO	High-Rate Recovery Reverse Osmosis
HRVRF	heat recovery variable refrigeration flow

HV	high voltage
I&C	Instrumentation and Control
ICCES	International Code Council Evaluation Service
IPR	Indirect Potable Reuse
IPS	Iron Pipe Sizing
IRP	Integrated Resources Plan
LCRS	leachate collection and removal system
LDS	leak detection system
LF	linear feet
LHMWD	Lake Hemet Municipal Water District
LRFD	Load Factor and Resistance Design
LV	low voltage
MCC	Motor Control Centers
MCE	maximum credible earthquake
MCLs	maximum contaminant levels
MDR	Medium Density Residential
MF	membrane filtration
mg/L	milligrams per liter
MG/year	million gallons per year (MG/year
MOVs	motor-operated valves
mph	miles per hour
MSL	mean sea level
MWD	Metropolitan Water District of Southern California
MZ	groundwater management zones
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NEPA	National Environmental Protection Act
NFPA	National Fire Protection Association Life Safety Codes
NESC	Nation Electrical Safety Code
NIPS	non-solvent induced phase separation
NL	Notification Levels
O&M	operations and maintenance
OIT	Operator Interface Terminal
OSHA	Occupational Safety and Health Act
OS-R	Open Space Recreation
PDR	preliminary design report
PLC	Programmable Logic Controller
PNMZ	Perris North Management Zone
PSMZ	Perris South Management Zone

PVC	Polyvinyl Chloride
PVDF	polyvinylidene fluoride
PWR	Purified Water Replenishment
RCFCWCD	Riverside County Flood Control and Water Conservation District
RLLR	Rapid and Large Leakage Rate
RMA	running monthly average
RO	reverse osmosis
ROP	reverse osmosis permeate
RRT	response retention time
RWC_{max}	Recycled Municipal Wastewater Contribution
RWQCB	Regional Water Quality Control Board
RWRF	regional water reclamation facility
SAT	soil aquifer treatment
SCADA	Supervisory Control and Data Acquisition
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SJ Basin	San Jacinto Groundwater Basin
SJI	Steel Joist Institute
SJLPMZ	San Jacinto Lower Pressure Management Zone
SJUPMZ	San Jacinto Upper Pressure Management Zone
SJVRWRF	San Jacinto Valley Regional Water Reclamation Facility
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
Soboba Tribe	Soboba Band of Luiseño Indians
SSW	south-southwest
STF	soil treatment factor
SWGR-1	main switchgear
SWPPP	Storm Water Pollution Prevention Plans
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TEPS	tertiary effluent pump station
Tertiary RW	tertiary recycled water
TIN	total inorganic nitrogen
TIPS	thermal induced phase separation
TM	Technical Memorandum
TOC	total organic carbon
TPER	thermoplastic elastomer rubber
TSS	total suspended solids
UF	ultrafiltration
UL	Underwriters Laboratory

µm	micrometer
UPS	interruptible power supply
U.S.	United States
UV	ultraviolet
VFDs	variable speed drives
VOCs	volatile organic compounds
VZMS	vadose zone monitoring system
WLA	Wasteload Allocation
WMWD	Western Municipal Water District
WPS	Waste Pump Station
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant/San Jacinto Valley Regional Water Reclamation Facility

Section 1
Introduction

This Preliminary Design Report (PDR) has been prepared for the Eastern Municipal Water District (EMWD or District) as part of the Purified Water Replenishment (PWR)[1] preliminary design project (PWR project or Project). The PWR project is a potential program under the overarching Groundwater Reliability Plus (GRP) initiative in the San Jacinto Valley.

EMWD has initiated the development of a potable water augmentation program using recycled water and advanced treated water to replenish local groundwater aquifers in the form of a Groundwater Replenishment Reuse Project (GRRP), as defined by the State, called the PWR project. Implementation of the PWR project is consistent with EMWD's objectives to fully utilize recycled water within its service area, maximize potable water offset through use of recycled water, create new local potable water supplies, minimize cost, and manage the salt balance in the groundwater basin.

1.1 District Background

EMWD is one of California's largest water agencies, providing water, wastewater, and recycled water services to approximately 804,000 people in a 555-square mile service area located in Riverside County, approximately 75 miles east of Los Angeles. EMWD is the fourth largest recycled water producer and fifth largest municipal water district in California, serving retail customers located in the cities of Moreno Valley, Perris, San Jacinto, Hemet, Temecula, Murrieta, and Menifee, as well as the unincorporated communities of Good Hope, Lakeview, Nuevo, Mead Valley, Murrieta Hot Springs, Valle Vista, and Winchester (collectively known as the "Municipalities"). EMWD also serves a number of wholesale customers.

Figure 1-1 shows the boundaries of EMWD's service area and the cities within EMWD's service area.

A primary reliable water supply located within EMWD's service area is from groundwater production. The northern portion of EMWD's service area lies within the San Jacinto Groundwater Basin (SJ Basin) which is a portion of the greater Santa Ana River Basin. The SJ Basin includes eight groundwater management zones (MZ), as defined by the Santa Ana Regional Water Quality Control Board. The eight (8) groundwater MZs that located in EMWD's service area include Perris North, Perris South, Lakeview/Hemet North, Menifee, Hemet South, San Jacinto Lower Pressure, San Jacinto Upper Pressure, and Canyon MZs.

[1] PWR project and indirect potable reuse (IPR) project are used interchangeably throughout this report and its appendices. The PWR project is the official name.

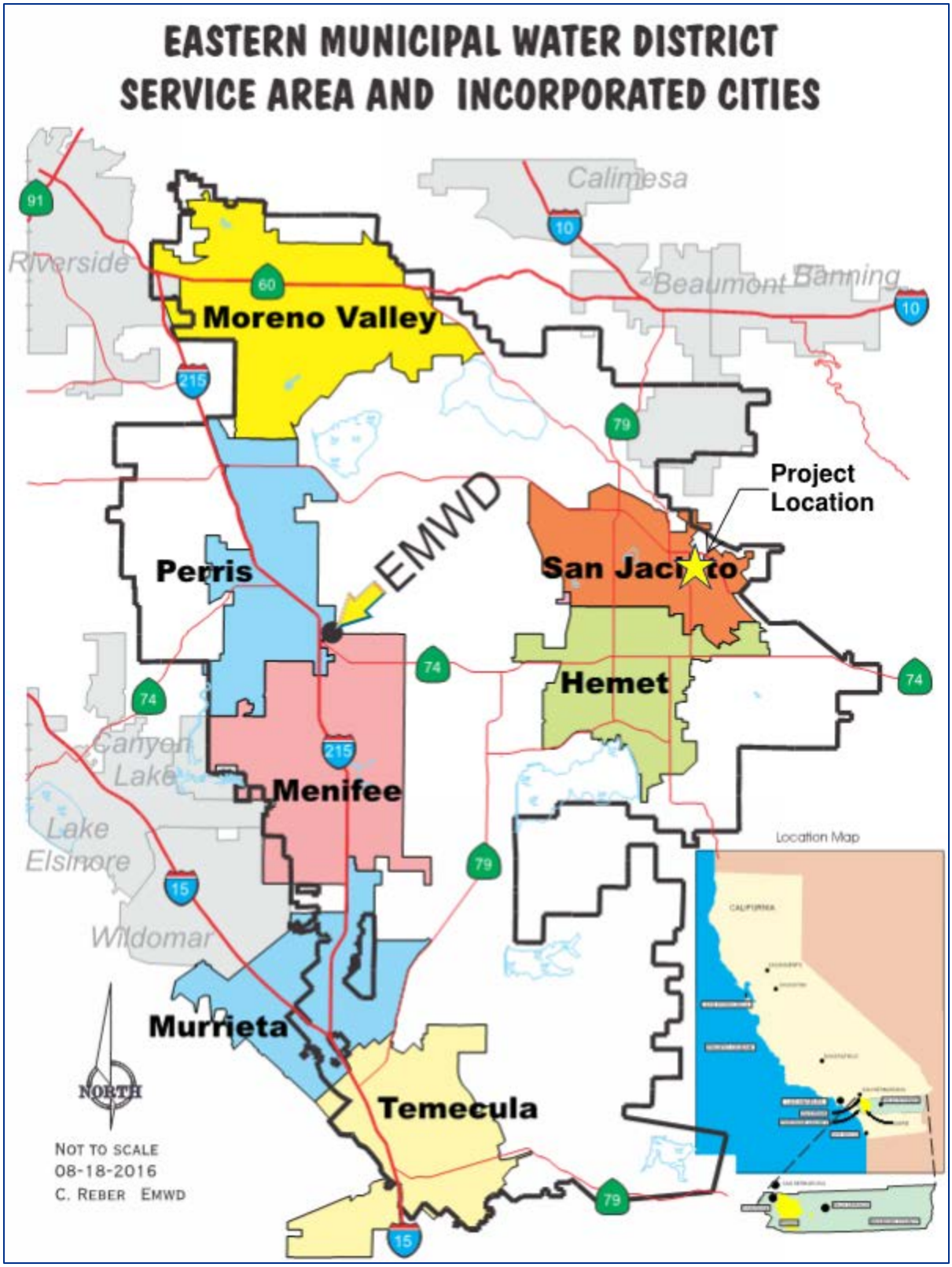

Figure 1-1 EMWD's Service Area and City Boundaries

The EMWD's water supply is a critical issue since there is a limited local surface water supply surface and groundwater supply, and with most of EMWD's supply the water used in EMWD is imported from watersheds in northern California and the Sierra Mountains Colorado River. Water demands within the EMWD's service area include residential, industrial and agricultural crops that are projected to be sustained (although with some decline) into the future. The majority of EMWD's demands are residential; this sector is expected to grow with continued urbanization. EMWD provides both retail and wholesale deliveries to a number of local cities and, neighboring water districts, and in addition to private wells utilized in the agricultural sector. Water supply to meet these demands is provided through a combination of direct EMWD retail and wholesale supplies, retail supplies by a number of local cities and water districts, and a number private wells, particularly in the agricultural sector.

1.2 PWR Program Objectives

In July 2011, EMWD completed the Integrated Resources Plan (IRP) to address future water supply challenges and develop an overall strategy for future water supply to meet multiple objectives, which are consistent with the EMWD mission "to deliver value to our customers and the communities we serve by providing safe, reliable, economical and environmentally sustainable water, wastewater and recycled water services." The Integrated Resources Plan is a flexible, long-term strategy for the development of water supplies, implementation of key facilities, and execution of inter-agency agreements needed to expand and operate EMWD's water, recycled water, and wastewater system.

The IRP recommended strategies for both expanded local water supplies and imported water supplies. The PWR project, using recycled water to recharge groundwater basins, was recommended as a key local water supply strategy for EMWD's future water supply portfolio. Indirect potable reuse supports many of the evaluation objectives established by the Integrated Resources Plan, most specifically the objectives of maximizing local resources and maximizing water use efficiency by minimizing discharges of recycled water outside of EMWD's service area.

Within the IRP, the specific program objectives that related to the PWR project include:

- Long-term sustainable water supply at a reasonable cost
- Increased water supply reliability (droughts and emergencies)
- Maximum sustainability and management of local water resources including groundwater and surface water
- One-hundred percent utilization of recycled water resources in an environmentally responsible manner (no discharge of recycled water outside EMWD)
- Regional salinity management pursuant to the Regional Water Quality Control Board (RWQCB) Basin Plan objectives and Maximum Benefit Analysis for the SJUPMZ
- Proactive compliance with all regulatory requirements and mandates
- Minimization of capital, operations and maintenance (O&M), and lifecycle costs

1.3 PWR Project Background

The PWR project began with the preparation of the San Jacinto Upper Pressure Management Zone (SJUPMZ) Indirect Potable Reuse Phase I Study (CDM Smith, January 2014). The Phase I Study included an evaluation of five (5) PWR project alternatives for recharge into the SJUPMZ, including recycle water treatment, recharge method and locations, conveyance and brine management recommendations for each alternative. The recommended alternatives were: Alternative No. 2, blend of recycled water and reverse osmosis (RO) permeate; and Alternative No. 5, phased approach with Phase I including only recharge of recycled water and Phase II including recharging a blend of recycled water and RO permeate.

Following the Phase I Study, an PWR Program Definition Study (Phase 2 Study) was prepared and included a comparison of projects for both the SJUPMZ and for the Perris South Management Zone (PSMZ) (CDM Smith, May 2016). This study evaluated five (5) alternatives with varying recharge into PSMZ and/or SJUPMZ. The study recommended recharge into SJUPMZ with a blend of recycled water and RO permeate.

EMWD established goals that anticipate a two-phase implementation program with a Phase I capacity of 4,000 acre-feet per year (AFY) and a Phase II expansion of 11,000 AFY for a 15,000 AFY total PWR project. The recharged flow will consist of RO permeate and tertiary media filtered recycled water (tertiary RW).

To accomplish these recharge goals, EMWD plans to install an Advanced Water Purification Facility (AWPF) for treating tertiary effluent from the San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF or WWTP) through membrane filtration (MF) and RO treatment processes. The RO permeate from the AWPF is proposed to be conveyed to the Alessandro Blending Station for blending with tertiary RW. The blended flow is than planned to be conveyed to the Mountain Avenue West Pond for percolation into the groundwater. Brine evaporation ponds were selected as the method for RO concentrate disposal. The project is planned to be construction in two phases for the two recharge scenarios described above.

Figure 1-2 shows the major facilities, including:

- SJVRWRF (existing)
- AWPF
- Brine Ponds
- RO Permeate Pipeline
- Alessandro Ponds Blending Station
- Recycled Water Conveyance Pipeline
- Mountain Avenue West Percolation Pond (not included in the PDR scope)

Other District facilities in the area include the Hemet Water Filtration Plant (potable water), a future raw water pipeline that will be used to bring diluent water to the future percolation ponds (Mountain Avenue East and North), and the IRRP ponds (percolate "Settlement" water only).



Figure 1-2 Major PWR Facilities

The AWPF will treat disinfected tertiary effluent using MF as a pretreatment step ahead of RO. The RO permeate will be blended with tertiary effluent to provide water for potable reuse. The MF backwash waste will be returned to the wastewater plant while the brine will be managed onsite. Percolation ponds will be implemented by EMWD as part of a parallel project. See **Figure 1-3** for schematic process flow diagram.

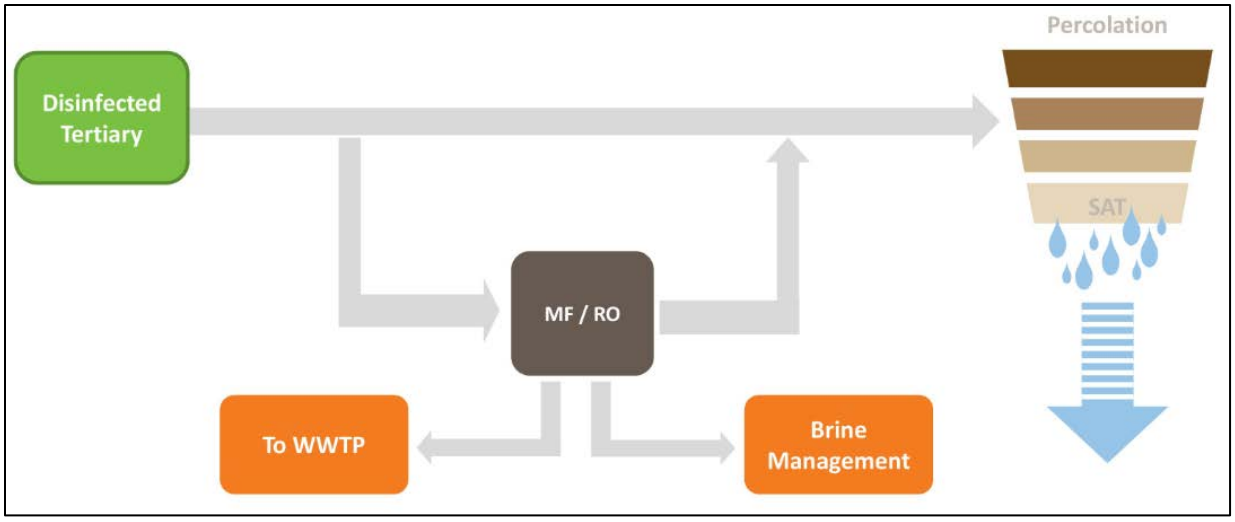

Figure 1-3 Idealized Process Flow Diagram

1.4 Outline of the Preliminary Design Report

This PDR provides information on the individual components included in the PWR project. The PDR is organized into the following sections:

- Section 1 - Introduction
- Section 2 – Flows and Water Quality
- Section 3 – Regulatory Requirements
- Section 4 – Preliminary Design Studies and Field Investigation
- Section 5 – AWPF Design Criteria
- Section 6 – Brine Evaporation Ponds Design Criteria
- Section 7 – Conveyance Pipelines Design Criteria
- Section 8 – Implementation Schedule
- Section 9 – Preliminary Cost Estimates
- Section 10 – Design Specification List

Section 2
Flows and Water Quality

This section documents the recharge requirements for the PWR project, the preliminary AWPF capacity, the existing water quality results and a discussion on the diluent water requirements.

2.1 PWR Flows

As noted above, EMWD established goals that anticipate a two-phase implementation program with a Phase I capacity of 4,000 AFY and a Phase II expansion of 11,000 AFY for a 15,000 AFY total PWR project. The design flows are a 50 percent RO permeate and 50 percent tertiary RW blend. This equates to approximately 2,000 AFY for tertiary RW and 2,000 AFY for RO permeate for Phase I, and 7,500 AFY for tertiary RW and 7,500 AFY for RO permeate for Phase II. The Project will only consider Phase I for permitting. The PWR project flows are summarized in **Table 2-1**.

Table 2-1 PWR Project Capacity Goals

	Phase I	Phase II
Total Recharge Capacity, AFY	4,000	15,000
Tertiary RW Contribution, AFY	2,000	7,500
RO Permeate Contribution, AFY	2,000	7,500

2.2 AWPF Flows

The AWPF will be sized to produce 2,000 AFY for Phase I and 7,500 AFY for Phase II. Assuming a 90 percent online factor, the AWPF will be sized for 2.0 MGD for Phase I and 7.5 MGD for Phase II. It is anticipated that the AWPF will run continuously when online. The AWPF flows are summarized in **Table 2-2**.

Table 2-2 AWPF Flows

	Phase I	Phase II
AWPF Capacity, MGD	2.0	7.5
Online Factor, %	90	90

The influent for the AWPF will be chlorinated tertiary effluent from the SJVRWRF. For Phase I of this project, SJVRWRF effluent is sufficient to meet AWPF demands. For Phase II and when the SJVRWRF's effluent flow does not meet the AWPF demands, additional flow from the existing RW distribution system will be provided to supplement the SJVRWRF flows.

2.3 Conveyance Flows

The project includes conveying RO permeate from the AWPF to the Alessandro Blending Station. At the Alessandro Blending Station the RO permeate is proposed to be blended with the tertiary RW prior to recharge in the Mountain Ave West Pond. EMWD intends to vary tertiary RW flows seasonally. Section 3.6 of this report includes more information on the seasonal operation investigation that was performed. The conveyance flows are summarized in **Table 2-3** through **Table 2-5**.

Table 2-3 Conveyance Flows for Wet Year

Recycled Water Type	Phase I	Phase II
Winter Flows (November-April)		
RO Permeate, AFY	2,000	7,500
Tertiary RW, AFY	7,430 (2)	13,930 (2)
Tertiary RW for Stabilization[1], AFY	200	750
Total, AFY	9,630	22,130
Summer Flows (May-September)		
RO Permeate, AFY	2,000	7,500
Tertiary RW, AFY	0	0
Tertiary RW for Stabilization[1], AFY	200	750
Total, AFY	2,200	8,250

1. Tertiary RW will be utilized for stabilizing RO permeate leaving the AWPF. See Section 5.2.11 of this Report for further details.
2. See Table 3-4 for annual flows for Phase 1. Since winter tertiary RW flows are assumed to be spread over 6 months, they are 2X the wet year tertiary RW flows shown in Table 3-4. Phase 2 flows are calculated in an equivalent manner but based on a 15,000 AFY recycled water project.

Table 2-4 Conveyance Flows for Dry Year

Recycled Water Type	Phase I	Phase II
Winter Flows (November-April)		
RO Permeate, AFY	2,000	7,500
Tertiary RW, AFY	0	0
Tertiary RW for Stabilization[1], AFY	200	750
Total, AFY	2,200	8,250
Summer Flows (May-September)		
RO Permeate, AFY	2,000	7,500
Tertiary RW, AFY	0	0
Tertiary RW for Stabilization[1], AFY	200	750
Total, AFY	2,200	8,250

1. Tertiary RW will be utilized for stabilizing RO permeate leaving the AWPF. See Section 5.2.11 of this Report for further details.

Table 2-5 Conveyance Flows for Average Year

Recycled Water Type	Phase I	Phase II
Winter Flows (November-April)		
RO Permeate, AFY	2,000	7,500
Tertiary RW, AFY	3,430 (2)	6,430(2)
Tertiary RW for Stabilization[1], AFY	200	750
Total, AFY	5,630	14,130
Summer Flows (May-September)		
RO Permeate, AFY	2,000	7,500
Tertiary RW, AFY	0	0
Tertiary RW for Stabilization[1], AFY	200	750
Total, AFY	2,200	8,250

1. Tertiary RW will be utilized for stabilizing RO permeate leaving the AWPF. See Section 5.2.11 of this Report for further details.
2. See Table 3-4 for annual flows for Phase 1. Since winter tertiary RW flows are assumed to be spread over 6 months, they are 2X the average year tertiary RW flows shown in Table 3-4. Phase 2 flows are calculated in an equivalent manner but based on a 15,000 AFY recycled water project.

2.4 SJVRWRF Effluent Water Quality

A Water Quality Review Technical Memorandum (TM) for this Project was prepared and is included in **Appendix A.** The Water Quality Review TM provides a summary of the current water quality data, a review of historical water quality data, a discussion of the potential water quality impacts to the design of the AWPF treatment processes, and an update of the anticipated water quality following soil aquifer treatment (SAT).

As noted above, tertiary effluent from the SJVRWRF is the source water for the AWPF. Between 2010 to 2015, the SJVRWRF was expanded from 11 MGD to 14 MGD and the treatment processes upgraded to meet more stringent state recycled water requirements. Current water quality data, representative of the only the SJVRWRF expansion effluent (October 2015 to December 2016), along with historical data were analyzed in the Water Quality Review TM.

A summary of general parameters, organics, metals and emerging containments are included in tables found within the memorandum. **Table 2-6** (original Table 2 in Water Quality Review TM) indicates the historical data comparison for some of the key parameters monitored for this Project.

Table 2-6 SJVRWRF – Comparison of Historical and Current Average Effluent Data

Parameter	Unit	2007-2012 Data	2008-2014 Data[2]	2013-2014 Data[2]	*Current* 2015-2016 Data
TOC	mg/L	8.8 [1]	7.9		6.9 [4]
TDS	mg/L	555 [3]	547		589 [4]
Nitrate as N	mg/L	13.1 [3]		5.7	12.1 [4]
Nitrite as N	mg/L			0.08	0.05 [4]
TKN	mg/L			8.8	2.4 [4]
TN	mg/L	13.1 [3]		14.5	13.1 [5]
TIN	mg/L			5.8	12.4 [4]

1. Data received from Indirect Potable Reuse Phase I Study for Eastern Municipal Water District by CDM Smith dated January 2014 (pg. 7-4 and 7-19)
2. Data received from Table 2-7 in Perris South IPR Feasibility Study and IPR Program Alternative Analysis for Eastern Municipal Water District by CDM Smith dated May 2016 (pg. 2-25)
3. Data received from Table 6-1 in Perris South IPR Feasibility Study and IPR Program Alternative Analysis for Eastern Municipal Water District by CDM Smith dated May 2016 (pg. 6-2)
4. SJVRWRF Effluent Data from October 2015 to December 2016. Data collected every few days.
5. SJVRWRF Effluent Data from October 2015 to December 2016. Data collected every few days. This value was estimated by EMWD.

To account for variations in the source water quality, the most conservative (highest) of the historical is assumed for the design of the AWPF indicated in the "Reclaimed Water Quality" column of **Table 2-7**. A discussion on the impact that total nitrogen, TDS, TOC, NDMA and chlorine have on the design of the AWPF is included in the Water Quality Review TM.

Finally, the Water Quality Review TM provides an update of the estimated water quality after SAT assuming the most conservative historical and current values for each parameter. Table 2-7 provides a summary of the estimated average water quality through SAT.

Table 2-7 Average Water Quality through SAT

Parameter	Unit	Reclaimed Water Quality	RO Permeate Quality	Blend Water Quality (Pre-SAT)[1]	Soil Treatment Factor (STF)	Blend Water Quality (Post-SAT)
TOC	mg/L	8.8	0.13	4.47	75%	1.1
TDS	mg/L	589	17	303	0%	303
TN	mg/L	14.5	1.97	8.23	60%	3.3
Nitrate a N	mg/L	13.1	1.94	7.52	60%	3.0

1. Assuming a 50% Tertiary RW and 50% RO Permeate flow contributions.

2.5 Diluent Water Flows

Diluent water is required to blend with the AWPF RO permeate to meet regulatory regulations further discussed in Section 3.1.4. Diluent water sources are assumed to include imported water and underflow. Underflow accounts for groundwater found upgradient that flows under recharge basins or through the area that receives recycled water.

EMWD has developed a water banking and conjunctive use program for implementation in the SJUPMZ to help provide diluent water and to take advantage of abundant imported water sources during wet years. The additional diluent water planned to be recharged to the SJUMPZ, as part of the water banking and conjunctive use programs, would provide sources of diluent water for the PWR project.

Water Banking Program. The District identified an optimum water bank of 21,000 AFY, which assumes that 7,000 AFY is banked over a 10-year period (assuming water banking recharge is available only during three wet years). The 21,000 AFY water bank would provide 21,000 AFY over three years during multi-year drought conditions. PWR water would be counted for the water bank and qualify as an Extraordinary Supply.

Conjunctive Use Program. The District is continuing to develop the agreements and plans for the conjunctive use program which would allow recharge of this source to the SJUMPZ up to the assumed recharge capacities of the recharge basins. The Conjunctive Use Program would recharge 49,000 AFY over ten years (assuming that conjunctive use recharge is available for seven out of the ten years). This would allow the 7,000 AFY to be extracted during the same years as recharged. There would be no conjunctive use during dry years.

See Figure 2-1 for a summary of the proposed recharge and extraction for the Water Banking and Conjunctive Use Programs along with the Soboba Settlement Recharge.

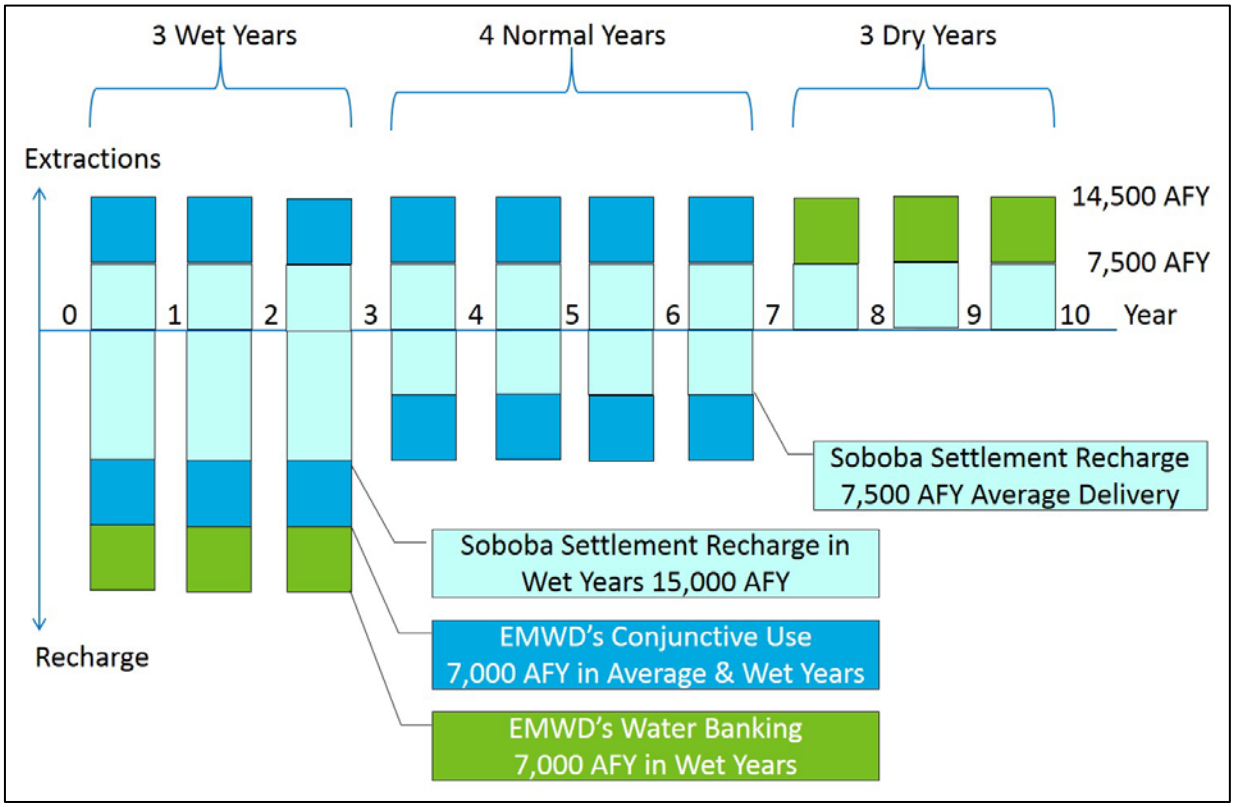

Figure 2-1 Proposed Recharge and Extraction for Settlement Recharge, Water Banking and Conjunctive Use

Table 2-8 provides a summary of proposed recycled water and diluent flows by phase depending on climatic conditions.

Table 2-8 Diluent Water Contribution

Phase	Climatic Condition	Recycled Water (AFY)[1]	Diluent AFY	Total AFY
Phase I	Dry	4,000	0	4,000
	Average		14,500	18,500
	Wet		29,000	33,000
Phase II	Dry	15,000	0	15,000
	Average		36,582	51,582
	Wet		44,082	59,082

1. Include RO permeate and tertiary RW contributions.

Section 3
Regulatory Requirements

To implement an indirect potable reuse (IPR) GRRP[2] using recycled water in California, regulatory approvals are required from the State Water Resources Control Board's (SWRCB's) Division of Drinking Water (DDW) and a permit must be secured from the Regional Water Quality Control Board (RWQCB). The proposed project must also comply with legal and institutional agreements applicable to issues such as water rights and brine disposal. Compliance with environmental requirements is a priority for obtaining the RWQCB permit and for the construction and operational phases of the project. Approval and implementation of an IPR project typically requires coordination with numerous federal, state, regional, and local entities. Currently, seven IPR projects are in operation in California and, while each one is unique, they share many similar regulatory, institutional, and environmental compliance experiences. Building upon this experience, EMWD is investigating the applicable regulations for the proposed PWR project recharging the SJUPMZ including:

- Title 22 Water Recycling Criteria (Title 22 Criteria), including requirements for groundwater replenishment using recycled water;
- SWRCB requirements;
- RWQCB, Santa Ana Region, Water Quality Control Plan (Basin Plan) requirements and groundwater rights; and,
- Environmental requirements.

Each of these topics is evaluated in the following sub-sections to determine how each applies to the proposed approach for the PWR project. A recommended permitting strategy is provided at the end of this section for EMWD to pursue during implementation of the Project. These regulatory requirements are updated from the previous PWR project reports.

3.1 Title 22 Water Recycling Criteria for Groundwater Replenishment

Water recycling is regulated by Title 22, Division 4, Chapter 3 of the California Code of Regulations (CCR, 2014). Requirements for groundwater replenishment with recycled water were added to Title 22 Water Recycling Criteria in June 2014. These provisions classify GRRP projects by their method of recharge:

- Surface application (spreading); and,
- Subsurface applications (injection or vadose zone wells).

[2] A GRRP is specifically defined in Title 22 as a project involving the planned use of recycled municipal wastewater that is operated for the purpose of replenishing a groundwater basin that is used as a potable water supply.

Surface application projects (Title 22, Article 5.1) are allowed to use recycled water that meets the Title 22 tertiary filtration and disinfection requirements with limitations on the amount of tertiary recycled water that can be applied and concomitant requirements for diluent (e.g.,dilution) water. Surface application projects can also use recycled water that has undergone advanced treatment as defined in the regulations and thus use higher quantities of recycled water relative to diluent water and potentially no diluent water (with DDW approval). For subsurface application projects (Title 22, Article 5.2), the full volume of recycled water applied must receive advanced treatment that consists of RO and an advanced oxidation process (AOP). The regulations establish performance criteria that must be met for RO and AOP.

3.1.1 Requirements for All GRRPs

The Title 22 Criteria contain a number of provisions that apply to all planned groundwater replenishment projects using recycled water (treated municipal wastewater). Several of these provisions have implications for an implementation strategy and the project schedule: submittal of an Engineering Report, source control, a plan to provide an alternative water supply, and collection of baseline groundwater data.

3.1.1.1 Engineering Report

An Engineering Report documenting how the project complies with the Title 22 Criteria must be reviewed and approved by DDW. Section 3.1.12 describes the Engineering Report in more detail.

3.1.1.2 Source Control

The recycled water must be from a wastewater agency that administers an industrial pretreatment and pollutant source control program that includes:

1. an assessment of the fate of DDW- and RWQCB-specified contaminants through the wastewater and recycled water treatment systems;
2. provisions for contaminant source investigations and contaminant monitoring that focus on DDW- and RWQCB-specified contaminants;
3. an outreach program to industrial, commercial, and residential communities with the aim of managing and minimizing discharges of contaminants at the source;
4. and an up-to-date inventory of contaminants that may be discharged into the wastewater collection system in the project area.

While many of these requirements may be already be addressed through EMWD's existing pretreatment program, compliance with the Title 22 Criteria may require some enhancements or modifications to the program. For example, it may be necessary to evaluate the current industrial local limits to ensure that all pollutants of concern are addressed, including drinking water maximum contaminant levels (MCLs). Thus, as part of the implementation schedule, EMWD will review its pretreatment program and assess the need for any potential changes to meet the Title 22 Criteria. A description of the source control program is a component of the Engineering Report.

3.1.1.3 Alternative Water Supply Plan

Prior to operation of a Project, the Project sponsor must obtain approval from DDW for an alternative water supply plan. The plan must describe the steps to provide an alternative source of potable water to all users possible affected by the Project. Those affected could obtain potable water from a producing drinking water well directly not impacted by the Project or from a DDW approved treatment system with source water from a well within the Project area. Instances requiring alternative water supplies include wells that violate drinking water standards, have been degraded so that it is no longer a safe source of drinking water, or fails to meet the pathogen control requirements. Typically, this subject is discussed in the Engineering Report, and thus EMWD would need to present available alternative water supply measures as part of the Engineering Report.

3.1.1.4 Collection of Baseline Groundwater Quality Data

Prior to operation, the Project proponent must collect at least four samples, at least one sample each quarter (e.g., a year's worth of data), from each potentially affected aquifer. The seasonal groundwater characteristics must be analyzed for nitrogen compounds, regulated contaminants and physical parameters, total organic carbon (TOC), priority toxic pollutants, chemicals that have notification levels, and any other DDW specified contaminants. EMWD would need to assess available wells from which to collect samples, existing data that could be utilized, and any data gaps, particularly any potential need to install monitoring wells. If additional data must be collected and/or new monitoring wells must be installed, these efforts should be factored into the Project implementation schedule.

3.1.2 Pathogen Control and Multiple Barrier Requirements for GRRPs

With regard to pathogenic microorganism control, the Title 22 Criteria establish pathogen reduction requirements for recycled water used for groundwater replenishment for both surface and subsurface application projects using a risk-based multiple barrier approach. Groundwater replenishment projects must achieve at least a 12-log enteric virus reduction, a 10-log *Giardia* cyst reduction, and a 10-log *Cryptosporidium* oocyst reduction using at least three treatment barriers, each of which must achieve at least a 1.0-log reduction. No individual treatment process can be credited with more than 6-log reduction.

Failure to meet the specified minimum pathogen reductions requires notification to DDW and RWQCB, investigation, and/or discontinuation of recycled water recharge until the problem is corrected. If the GRRP performance declines to less than 10-log virus, 8-log *Giardia* cyst, or 8-log *Cryptosporidium* oocyst reduction, recharge of recycled water must be discontinued. The Title 22 Criteria do not grant pathogen reduction credit for post-treatment of extracted groundwater. The Title 22 Criteria do, however, grant pathogen reduction credit for underground retention time.

For virus, reduction credit is given for residence time underground of up to 1-log/month (not to exceed 6 log) with the retention time from the point of recharge to the nearest downgradient drinking water well validated by a tracer test that is started within the first three months of operation (although tracer studies can be conducted before a project commences using a non-recycled water source). A tracer study using an added tracer would receive the full 1-log/month virus reduction credit. An intrinsic tracer may be used, if approved by DDW, in lieu

of an added tracer for this demonstration, albeit an intrinsic tracer test would receive only 0.67-log/month virus reduction credit.

The demonstration underground retention time is based on the difference in tracer concentration from where the water is recharged to the downgradient monitoring point as either: (1) two percent of the initial tracer concentration has reached the downgradient monitoring point, or (2) ten percent of the peak tracer concentration has been observed at the downgradient monitoring point.

The following are a list of tracers and some of their advantages/disadvantages for the tracer study:

- Bromide – approved by DDW as a groundwater tracer in 2014 (recommended).
- Lithium Chloride – stable without much assumed background concentration. A drawback is that it is relatively expensive.
- Sodium Chloride – inexpensive but can also have a high background concentration and a large quantity of chemical required.
- Fluoride – inexpensive but with issues related to accurate measurements.
- Rhodamine Fluorescent dye – inexpensive but with negative public perception.
- Boric Acid – not approved in the past by DDW due to difficultly with detection and higher background concentrations.

For project planning purposes, the Title 22 Criteria allow the use of groundwater flow models to evaluate underground retention time from the recharge point to the closest downgradient drinking water well and assignment of virus log-reduction credits using a safety factor based on the precision of the model utilized. A numerical model consisting of a computer model that has been calibrated and validated to simulate groundwater flow in the project area is credited with 0.5-log/month of virus reduction. An analytical model using equations (e.g., Darcy's Law) to estimate groundwater flow based on assumptions about the aquifer is credited with 0.25-log/month of virus reduction.

Thus, if a numeric model is used to estimate the underground travel time, and a 6-log credit for the underground retention time component is necessary to meet the overall 12-log virus reduction requirements, the required retention time estimated by the numerical model to be used for planning would be doubled (12 months at 0.5-log/month = 6-log credit) to account for uncertainty in the method of analysis.

In summary, virus reduction credits for underground retention time for tracers and models are as follows:

- Added tracer study – 1.0 log/month;
- Intrinsic tracer study – 0.67 log/month;

- Numerical modeling – 0.5 log /month; and
- Analytical modeling – 0.25 log/month.

For virus, DDW has indicated that simply meeting the Title 22 disinfection option of a 450 CT for combined chlorine (contact time and chlorine dose) does not confer an automatic 5-log virus reduction credit for that process. Thus, for most projects[3], meeting the total 12-log virus reduction will necessitate discussion with DDW on reduction credits allowed for primary, secondary, and tertiary treatment (filtration/chlorination) in conjunction with the proposed log reduction for underground retention time. Depending on performance of the specific project filtration and chlorination system, DDW may award 4-log virus reduction credit.

Lastly, for surface application projects, the Title 22 Criteria grant the required 10-log *Giardia* cyst and 10-log *Cryptosporidium* oocyst reductions if the recycled water meets the Title 22 filtered disinfected tertiary recycled water requirements and provides at least a six-month underground retention time as demonstrated by a tracer study. All five of EMWD's regional water reclamation facilities (RWRF) produce tertiary-filtered disinfected recycled water in compliance with Title 22 Criteria.3.1.3 Response Retention Time Requirements for GRRPs.

The Title 22 Criteria require a project sponsor to propose a response retention time (RRT) – a specified time that the recycled water must be retained underground before withdrawal for use as a drinking water supply to allow enough time to address problems. The RRT is intended to provide sufficient time to retain recycled water underground to identify any treatment failures so that inadequately treated recycled water that has inadvertently been recharged does not enter a potable water system. Sufficient time must elapse to allow for a response or actions to be taken that will protect the public from exposure to inadequately treated water and provide (if necessary) an alternative source of drinking water.

The RRT is the aggregate of time to identify that the recycled water quality is out of compliance, to collect and analyze confirmation samples, to make a decision regarding the appropriate response, to activate the response, and for the response to become effective. For recycled water quality, the primary focus is on chemical constituents that are acutely toxic, such as nitrate, nitrite, and perchlorate, and on pathogens. The minimum RRT allowed is 2 months; however, any proposed RRT must be justified by the project sponsor and approved by DDW. The RRT must be equal to or greater than the underground retention time demonstrated by a tracer study.

3.1.3 Buffer Areas for GRRPs

The Title 22 Criteria require that primary and secondary boundary zones, or buffer areas restricting drinking water well construction, be established around the recycled water recharge site(s). The primary buffer area is determined by the lowest underground retention time needed for pathogen reduction or the RRT (whichever is greater) and would form the basis for establishing a three-dimensional zone of controlled (i.e., restricted) potable well construction for a GRRP. Thus, the Title 22 Criteria create a primary boundary area within which the groundwater

[3] A project with an approved ultraviolet (UV) light disinfection system would receive 5-logs virus reduction credit for the filtration/disinfection process. Otherwise, reduction credits would be based on approvals for similar treatment systems, information found in the literature (which currently is not robust), or studies conducted by the project sponsor or other agencies (e.g., gray literature) to demonstrate virus reduction.

is not deemed suitable for use as a drinking water supply. A secondary buffer area, extending beyond (larger) must also be established that reflects an area where existing or proposed drinking water wells may be controlled and would require further evaluation of potential mitigating activities before a potable well could be constructed or operated.

3.1.4 Recycled Water Contribution and Diluent Water Requirements for GRRPs

Control of unregulated chemicals for all GRRPs is accomplished in part through requirements for the maximum allowable Recycled Municipal Wastewater Contribution (RWC_{max}).

The RWC is defined by two conditions. Firstly, RWC_{max} is defined on a volumetric basis as the fraction equivalent to the quantity of recycled water applied divided by the sum of the quantity of recycled water and credited diluent water.

$$RWC_{\max} = \frac{Q_{recycled\ water}}{Q_{recycled\ water} + Q_{diluent\ water}}$$

Compliance is based on the monthly running average RWC using the preceding 120-month averaging period. For new GRRPs, the calculation of the monthly running average RWC begins after 30 months of recycled water application based on the total volume of the recycled water and credited diluent water introduced during the preceding months.

Secondly, the maximum RWC is a function of the TOC concentration in the recycled water where:

$$RWCmax = \frac{0.5\ mg/L}{TOC}$$

For surface spreading projects, the initial maximum RWC cannot exceed 0.20 or an alternative value approved by DDW. A greater initial RWC_{max} up to 1.0 may be approved by DDW if the treatment processes preceding SAT demonstrate the ability to reliably achieve a TOC no greater than 0.5 milligrams per liter (mg/L) divided by the proposed initial RWC_{max}. For subsurface application projects, the initial maximum RWC allowed is "as determined by DDW," and potentially could be as great as 1.0.

A GRRP may increase its RWC_{max} provided:

- The increase is approved by DDW and RWQCB;
- For the previous 52 weeks, the TOC 20-week running average has not exceeded 0.5 mg/L divided by the proposed RWC_{max}; and,
- The RWQCB permit for the proposed GRRP allows for the increased RWC_{max}.

Thus, for tertiary treatment surface application projects, it may be possible to increase the RWC limit after a year depending on TOC measurements after SAT. For example, the RWC limits for the Inland Empire Utilities Agency Chino Basin Recycled Water Groundwater Recharge Project range from 24 percent to 50 percent based on a 120-month running average for individual, noncontiguous spreading basins. The Montebello Forebay Groundwater Recharge Project permit allows up to 45 percent recycled water for replenishment over a running 120-month period

based on allowable diluent water (there is no TOC based RWC in the permit at this time[4]); however, it is expected that achieving this 45 percent RWC goal would be only be allowed by DDW taking into account diluent water and TOC. Realistically, the 45 percent RWC would have to be based on the use of biodegradable organic carbon (BDOC) in lieu of TOC. BDOC is discussed in the next subsection.

Diluent water that is "credited" for a GRRP must be of non-wastewater origin (e.g., storm water, imported untreated water, potable water, or groundwater underflow) that meets water quality requirements as specified in Title 22. Except for potable water used as diluent, a source water evaluation of the diluent source must be approved by DDW. To receive diluent water credit in surface applications, the diluent water quality must not exceed drinking water standards including: primary MCLs, secondary MCLs (upper limits for MCLs in Title 22 Table 64449-B if not historically used to recharge a basin and MCLs in Table 64449-A excluding those for color, turbidity, and odor) and DDW Notification Levels (NLs). To receive diluent water credit in subsurface applications, the diluent water quality must not exceed a primary MCL, a secondary MCL (upper limit in Title 22 Table 64449-B) and DDW NLs.

In order to comply with the RWC_{max}, diluent water may be: (1) blended with recycled water or introduced separately into the GRRP spreading basins, injection wells, storage tanks, or piping; and/or (2) a source that indirectly co-mingles with the recycled water (e.g., in nearby spreading basins or as groundwater underflow in the recharge area). A method to account for underflow must be approved by DDW.

3.1.5 TOC Requirements for GRRPs

The Title 22 Criteria include provisions for the allowable TOC concentration in recycled water based on the following equation:

$$TOC_{max} = \frac{0.5}{RWC_{max}}$$

For surface spreading projects, the point of TOC compliance may be in the: (1) undiluted recycled water or within the percolation zone; (2) diluted percolating recycled water adjusted for dilution; or (3) undiluted recycled water with a DDW-approved SAT treatment factor, based on demonstrating TOC removal using SAT. TOC samples collected post-percolation must also account for any native groundwater dilution. The allowable TOC concentration for a surface spreading project operating with an initial RWC of 0.20 (or 20 percent) would be 2.5 mg/L. For a subsurface application project, the entire recycled water volume must undergo full advanced treatment that produces a TOC in recycled water less than or equal to 0.5 mg/L and therefore would allow an RWC up to 1.0 (or 100 percent). Compliance with the TOC limit is based on collection of weekly samples (i.e., at a minimum frequency of once per week), and a 20-week running average of all TOC results and the average of the last four TOC results.

The Title 22 Criteria allow for alternatives to TOC for establishing a project's RWC. The use of BDOC has been reviewed and sanctioned by a DDW-convened expert panel.[5] For surface

[4] The permit dates back to 1991, with amendments increasing the volume of recycled water based on available diluent water.

[5] See http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Recharge/NWRI_BDOCFinalPanelReport-09-26-2012.pdf.

spreading projects using disinfected tertiary recycled water, the TOC approach has a limiting effect on the RWC calculation since there may be some recalcitrant TOC that is primarily derived from the drinking water source that ultimately becomes wastewater. Thus, it is expected that the RWC would be higher by using BDOC in lieu of TOC. DDW has not yet approved a BDOC-based permitting approach for a GRRP; however, in accordance with an amendment to the Montebello Forebay GRRP's permit, the project sponsors intend to prepare a monitoring plan that includes BDOC and indicator monitoring should the actual RWC increase to 40 percent or higher (the current actual RWC is approximately 36 percent). The plan will include information on how to use BDOC and indicators in lieu of TOC to demonstrate RWC compliance.

3.1.6 Nitrogen Requirements for GRRPs

For surface and subsurface application projects, the total nitrogen concentration in the recycled water or recharge water before or after application must be equal to or less than 10 mg/L. Recharge water is defined as the blend of recycled water and credited diluent water. Compliance is based on two samples per week of the recycled water or recharge water (before or after application), collected at least three days apart. Reduced sampling frequencies may be approved for qualified applications that have demonstrated over the most recent 24 months an average total nitrogen concentration of less than 5 mg/L and no exceedances of the 10 mg/L limit.

3.1.7 Other Recycled Water Quality Requirements for GRRPs

The Title 22 Criteria establish requirements for regulated compounds (e.g., those with MCLs). For surface and subsurface application projects, the recycled water must meet all primary MCLs (except nitrogen compounds), action levels (i.e., lead and copper), and secondary MCLs (in Title 22 Table 64449-A, or the upper limit in Table 64449-B), with one exception – disinfection byproducts (DBPs).

For DBPs, compliance can be determined in the recharge water in lieu of recycled water if the fraction of recycled water in the recharge water is equal to or greater than the average fraction of recycled water in the recharge water applied over the quarter. For surface application projects, compliance with DBP MCLs can be determined in the recycled water or recharge water before or after application, thereby allowing for treatment credit via SAT. For subsurface application projects, compliance with DBP MCLs can be determined in the recycled water or recharge water.

For primary MCLs, samples must be collected and analyzed quarterly; for secondary MCLs, samples must be collected analyzed annually. For primary MCLs established for pollutants with chronic toxicity, compliance is based on a running annual average. For primary MCLs established for pollutants with acute toxicity (such as perchlorate), compliance is based on a running four-week average; weekly monitoring is required if the quarterly result exceeds the MCL, and shall continue until four consecutive results are lower than the MCL or action level.

For secondary MCLs, compliance is based on a single (and confirmation) annual sample. If the annual result exceeds the secondary MCL, quarterly monitoring shall be initiated for that contaminant. If the running average of quarterly results exceeds an MCL, the Project sponsor must describe the reason(s) and any corrective actions in a report submitted to DDW and RWQCB. Annual sampling may resume when the running annual average of quarterly results does not exceed a secondary MCL.

Recycled water must also be monitored quarterly for Clean Water Act Priority Pollutants (chemicals listed in 40 Code of Federal Regulations (CFR) Section 131.18 "Establishment of numeric criteria for priority toxic pollutants for the State of California") and chemicals specified by DDW and RWQCB based on information in the Engineering Report and source control program. Additional information is provided in the following section on SWRCB constituents of emerging concern (CEC) monitoring requirements.

For surface and subsurface application projects, the project must monitor recycled water or recharge water quarterly for DDW-specified chemicals having NLs. For surface application projects, recharge water may be monitored in lieu of recycled water if the fraction of recycled water in the recharge water applied over the quarter is equal to or greater than the average fraction of recycled water in the recharge water applied over the quarter. If a result exceeds an NL, a confirmation sample must be taken, and if the average of the initial and confirmation sample exceeds the NL, weekly monitoring shall be initiated. Weekly monitoring for that constituent shall continue until the running four-week average does not exceeds the NL. If the running four-week average exceeds the NL, a report shall be submitted to DDW and RWQCB describing the reason and schedule for corrective actions. After 16 weeks, if the running four-week average is greater than the NL, the project sponsor shall notify DDW and RWQCB.

Annual monitoring of indicator compounds specified by DDW and RWQCB shall be conducted based on review of the Engineering Report, source control inventory, the affected groundwater basin(s), and an indicator compound's ability to characterize the presence of pharmaceuticals, endocrine disrupting chemicals, personal care products, and presence of wastewater. Any detected compounds that are included in this additional monitoring program must be reported to DDW and RWQCB no later than the following quarter in which the results are received.

For surface application projects, prior to operation (and every five years after a project begins operation), the project sponsor must conduct a DDW approved study to determine the occurrence of indicator compounds (e.g., CECs) in the recycled water. Based on the results, the project sponsor would propose three indicator compounds that would be used when operations begin to assess SAT performance by monitoring the recycled or recharge water prior to the SAT process and at a point no farther than 30 days travel time downgradient of the spreading area. The indicators must show that SAT achieves a reduction of at least 90 percent. Thus, the occurrence study should be factored into the project implementation schedule. Additional information is provided in the following section on SWRCB CEC monitoring requirements.

3.1.8 Monitoring Well Requirements for GRRPs

The Title 22 Criteria require at least two monitoring wells for a GRRP:

- At least one monitoring well shall be located:
  - Between 2 weeks and 6 months underground travel time downgradient from and in an aquifer affected by the GRRP; and
  - At least 30 days upgradient of the nearest drinking water well.

- At least one monitoring well between the GRRP and the nearest downgradient drinking water well.
- The monitoring wells must be constructed to allow for collection of water from each aquifer receiving recycled water from the GRRP.

For surface spreading projects, a monitoring well (which could be one of the wells above) must be located no further than 30 days downgradient of a spreading area to assess SAT performance as specified by the Title 22 Criteria and Recycled Water Policy.

The approximate location of the proposed monitoring wells should be included in the Engineering Report. See Section 4.2 for a discussion of potential siting of the monitoring wells.

3.1.9 Specific Requirements for GRRP

For all groundwater recharge projects, the Title 22 Criteria require the Project sponsor to develop and implement a DDW plan for an alternative source of potable water or treatment at a drinking water well if a GRRP causes the well to no longer be safe for drinking purposes. In addition, the Project sponsor must demonstrate to DDW that it possesses adequate managerial and technical capability to implement the PWR program.

3.1.10 Provisions for Alternatives

Alternative approaches to meeting any of the requirements in the Title 22 Criteria may be submitted for review and approval by DDW. Unless waived by DDW, the alternative approach must also be reviewed by an expert panel. The Project sponsor must demonstrate that the alternative provides the same level of public health protection as the requirements set forth in the Title 22 Criteria. No Alternative approaches are requested at this time for this Project.

3.1.11 Proposed Regulatory Approach for San Jacinto GRRP

The proposed approach for the PWR project would rely on the existing provisions in Title 22. **Table 3-1** presents a summary of the proposed regulatory approach and the key provisions in Title 22.

Table 3-1 Proposed Approach for the PWR Project

Title 22 Section	Requirements	Description of Proposed Approach
60320.100 General Requirements	▪ Requires primary and secondary boundaries representing the zones of controlled drinking water well construction and potentially controlled drinking water well construction	▪ No exceptions will be taken to Title 22 Criteria. ▪ The SJUPMZ would be a zone of where EMWD has the legal authority to control groundwater extraction and drinking water well construction ▪ A primary buffer area would be established to restrict drinking water well construction within an area 12 months underground travel time from the recharge site. ▪ A secondary buffer area would be established to review and control construction of any potentially new drinking water wells within an area 18 months underground travel time from the recharge site.
60320.102 Public Hearing	▪ The Project sponsor must hold a public hearing prior to DDW submitting recommendations to the RWQCB	▪ No exceptions will be taken to Title 22 Criteria. ▪ A public hearing will be held.

Table 3-1 Proposed Approach for the PWR Project

Title 22 Section	Requirements	Description of Proposed Approach
60320.104 Lab Analyses	▪ Analyses must be performed per the requirements in this section	▪ No exceptions will be taken to Title 22 Criteria. ▪ All analyses will be performed by approved laboratories using drinking water methods.
60320.106 Wastewater Source Control	▪ Entities that supply recycled water to a GRRP must administer a comprehensive source control program	▪ No exceptions will be taken to Title 22 Criteria ▪ Enhancements to the existing source control program will be implemented to comply with Title 22 Criteria.
60320.108 Pathogenic Microorganism Control	▪ Requires 12-log virus and 10-log *Giardia* cyst and 10-log *Cryptosporidium* oocyst reduction ▪ Requires at least three separate treatment processes	Proposed reduction credits based on: o Primary/secondary treatment at RWRFs o Filtration at RWRFs o Disinfection at RWRFs o Underground retention time (at least six months) o No credit taken for partial stream RO treatment
60320.110 Nitrogen Compounds Control	▪ Requires total nitrogen to be equal to or less than 10 mg/L in recycled water, recharge water before or after subsurface application	▪ Can achieve < 10 mg/L for tertiary recycled water with treatment at the RWRFs, partial stream RO treatment, and SAT
60320.112 Regulated Contaminants and Physical Characteristics Control	▪ Requires quarterly and annual sampling of the recharged water	▪ No exceptions will be taken to Title 22 Criteria
60320.114 Diluent Water Requirements	▪ Requirements for diluent water quality	▪ Imported water (“Settlement Water and Water Banking Water) and underflow will be recharged as credited diluent
60320.116 Recycled Municipal Wastewater Contribution (RWC)	▪ Requires initial RWC of 0.20 or alternative initial RWC approved by DDW ▪ Alternative initial RWC may be approved based on the treatment process prior to SAT can achieve a TOC of no greater than 0.5 mg/L divided by the proposed RWC	▪ Proposed alternative approach whereby the RWC based on TOC (or BDOC) will be based on partial stream RO treatment and the effectiveness of SAT; ▪ The SAT system must consistently achieve a TOC< 0.5 mg/L
60320.118 Total Organic Carbon (TOC) and Soil-Aquifer Treatment (SAT) Process Requirements	▪ TOCmax = 0.5 mg/L ÷ running monthly average RWC based on (1) the 20-week running average of all TOC results; and (2) the average of the last four TOC ▪ SAT performance – quarterly monitoring prior to SAT and at a point no farther than 30 days downgradient of the spreading area for at least 3 indicators to show at least 90 percent reduction (excluding the effects of dilution	▪ Partial stream RO treatment will reduce recycled water TOC and SAT will achieve TOC less than designated maximum limit for corresponding RWC ▪ Corrective actions and/or suspension of surface application would be based on SAT performance and TOC or BDOC concentrations in the monitoring wells
60320.120 Additional Chemical and Contaminant Monitoring	▪ Requirements for recycled water and groundwater sampling	▪ No exceptions will be taken to Title 22 Criteria ▪ Monitoring will be conducted for Priority Pollutants designated by DDW, NLs, and other specified contaminants designated by DDW and RWQCB

Table 3-1 Proposed Approach for the PWR Project

Title 22 Section	Requirements	Description of Proposed Approach
60320.122 Operation Optimization and Plan	▪ Requires submittal and approval of an Operation Optimization Plan prior to project operation	▪ No exceptions will be taken to Title 22 Criteria ▪ An Operation Optimization Plan will be submitted for DDW and RWQCB review and approval prior to project start-up
60320.124 Response Retention Time	▪ To be proposed by project sponsor and cannot be shorter than 2 months ▪ For project planning can use modeling	▪ No exceptions will be taken to Title 22 Criteria ▪ Underground retention time will be based on computer modeling for project planning
60320.126 Monitoring Well Requirements	▪ Includes monitoring well requirements	▪ No exceptions will be taken to Title 22 Criteria
60320.128 Reporting	▪ Annual report and every five years updated Engineering Report	▪ No exceptions will be taken to Title 22 Criteria
60320.130 Alternatives	▪ Demonstration of at least the same level of protection to public health ▪ Review by an independent advisory panel ▪ Perform a health effects evaluation that assesses the health risks to consumers of water impacted by the GRRP	▪ Engage an independent advisory panel for review of proposed RWC and TOC limits

3.1.12 Engineering Report and RWQCB Permitting

For all groundwater recharge projects, per Title 22, the project sponsor must submit an Engineering Report prepared by licensed engineer that describes the GRRP and how it complies with the regulations. It must also include a contingency plan that will assure that no untreated or inadequately-treated wastewater will be delivered to the use area.

The draft Engineering Report must be submitted to DDW and the RWQCB for review and for approval by DDW. The project sponsor then holds a public hearing, after which DDW conditionally approves the project and submits recommendations to the RWQCB for permit conditions. The RWQCB, as the permitting and enforcement authority, then issues the permit, incorporating DDWs recommendations and applicable regional Basin Plan requirements or other pertinent requirements. The Engineering Report must be updated every five years or when the RWC or other significant changes are proposed. Throughout the operating life of the project, annual reports must be submitted to DDW and the RWQCB as well as nearby downgradient public water agencies.

The Title 22 Criteria do not include specific provisions for information to be included in the Engineering Report, nor is this addressed in the 2001 DDW Engineering Report Guidelines. However, several GRRP expansions or new GRRPs have submitted Engineering Reports since the Title 22 Criteria went into effect and could be used as the starting point by EMWD for preparation of a draft Engineering Report when appropriate.

3.2 SWRCB Requirements

The Recycled Water Policy was adopted by the SWRCB on February 3, 2009 and became effective on May 14, 2009. It was subsequently amended on January 22, 2013 with regard to CEC monitoring for Groundwater Recharge or Groundwater Replenishment (GWR) projects with an effective date of April 25, 2013. The Recycled Water Policy was a critical step in creating uniformity in how RWQCBs were individually interpreting and implementing SWRCB Resolution 68-16 (the Anti-degradation Policy) for landscape irrigation and GWR projects. The key applicable requirements that must be addressed pursuant to the Recycled Water Policy are:

- Development of a Salt and Nutrient Management Plan
- Groundwater evaluations
- CEC monitoring

A detailed description of the SWRCB requirements and the potential impacts on the PWR project can be found in the Phase 2 Study.

3.3 RWQCB and Institutional Requirements

In addition to the requirements summarized below, the Phase 2 Study provides a more detailed description of the RWQCB requirements.

3.3.1 EMWD Master Reclamation Permit

EMWD operates its regional recycled water system in accordance with the Master Reclamation Permit issued by the RWQCB as Order No. R8-2008-0008. The regional recycled water system includes five RWRFs, storage ponds, pump stations, and an extensive distribution system that produces and delivers disinfected tertiary effluent to customers in EMWD's service area. The RWRFs and their tertiary design capacities are listed in the Phase 2 Study and include the following facilities: SJVRWRF, MVRWRF, PVRWRF, SCRWRF (currently out of service) and the TVRWRF. The TVRWRF will not provide water for the PWR project.

Each of the plants features primary, secondary, and tertiary treatment and disinfection, producing recycled water in compliance with the Title 22 Criteria for filtered disinfected tertiary recycled water. The recycled water is stored in ponds at the RWRF or in off-site ponds and then pumped to customers for non-potable uses. Non-potable uses include agricultural irrigation, landscape irrigation at golf courses, parks, schools, green belts, and commercial businesses.

The Master Reclamation Permit addresses increasing salinity and nitrogen levels in groundwater in EMWD's service area. To evaluate the impact of increased recycled water in the San Jacinto River Watershed, EMWD completed an antidegradation analysis in compliance with California Antidegradation Policy (SWRCB, Resolution No. 68-16). The analysis concluded that for groundwater MZs mitigation measures for TDS and/or total inorganic nitrogen (TIN) would be needed in San Jacinto Upper Pressure groundwater MZs (e.g. some demineralization capacity would be required).

3.3.1.1 San Jacinto UPMZ TDS and TIN Basin Requirements

In the SJUPMZ, the Master Reclamation Permit requires EMWD to address elevated groundwater concentrations of both TDS and TIN by recharging lower salinity water and by working towards amending the water quality objectives. EMWD has the following TDS/TIN mitigation measures in the SJUPMZ:

- Recharging an average of 7,500 acre-feet per year of State Water Project water on an interim basis in the San Jacinto Riverbed; and
- Pursuing a Basin Plan amendment for maximum benefit water quality objectives in the SJUPMZ.

3.3.2 Maximum Benefit Basin Plan Amendment

As previously discussed, most of EMWD's service area is located within the jurisdiction of the RWQCB, Santa Ana Region. The RWQCB locally implements policies and regulations, develops long-range plans, issues water recycling and waste discharge permits, and takes enforcement actions against violators of State and federal water quality regulations. The Basin Plan establishes water quality standards for water bodies within the State's jurisdiction in the Santa Ana River watershed. The Basin Plan was initially adopted in 1975 and has been amended and revised several times; most recently in 2016. One of the most important issues in the watershed is the accumulation of salts and nitrates, which adversely impacts the designated beneficial uses of groundwater and surface water.

The Basin Plan establishes groundwater MZs with TDS and nitrate-nitrogen objectives. To support water recycling, the Basin Plan establishes "maximum benefit" water quality objectives for certain groundwater MZs that allow for lower water quality standards (i.e., higher TDS and nitrate-nitrogen concentrations) provided that the beneficial uses are protected. Recycled water agencies must achieve certain water resource commitments to implement projects using the "maximum benefit" objectives designated for specific groundwater MZs. The Basin Plan specifies maximum benefit implementation plans for the SJUPMZ. If "maximum benefit" commitments are not met, then the Basin Plan specifies that the more restrictive "antidegradation" water quality objectives would be enforced.

3.3.2.1 San Jacinto Upper Pressure Management Zone Requirements

After the 2008 Basin Plan was adopted and in accordance with its Master Reclamation Permit, EMWD submitted a proposal to the RWQCB requesting consideration of similar less stringent "maximum benefit" water quality objectives in the SJUPMZ to enable expansion of water reclamation in that area. In 2010 the RWQCB adopted Resolution No. R8-2010-0039, which amended the Basin Plan specifically in the SJUPMZ. The amendment incorporates "maximum benefit" TDS and nitrate-nitrogen water quality objectives and a Maximum Benefit Salt Management Plan for that portion of EMWD's service area.

The Basin Plan, as amended by RWQCB Resolution No. R8-2010-0039, establishes less stringent TDS and nitrate-nitrogen objectives that allow a managed lowering of the groundwater quality in the SJUPMZ area which complies with the State's Antidegradation Policy (State Water Resources Control Board Resolution No. 68-16). EMWD made specific commitments to implement the

"maximum benefit" objectives in accordance with the schedule set forth in the Basin Plan. EMWD's Management Plan calls for:

- Recharging high quality imported water;
- Using recycled water for agricultural irrigation in lieu of pumping groundwater from the SJUPMZ; and
- Importing high quality water for treatment at EMWD's water filtration plant to provide high quality potable water in the SJUPMZ.

Per the Basin Plan, EMWD must comply with the RWQCB's implementation schedule for the specific "maximum benefit" commitments. The "maximum benefit" objectives for the SJUPMZ are 500 mg/L TDS and 7.0 mg/L nitrate-nitrogen. The more stringent "antidegradation" objectives are significantly lower, 320 mg/L TDS and 1.4 mg/L nitrate-nitrogen.

A summary of EMWD's "maximum benefit" commitments and schedule for the SJUPMZ are provided in the Phase 2 Study. The seven commitments are comprised of steps with distinct compliance dates as follows:

1. Groundwater Monitoring Program
2. Ambient Groundwater Quality Determination
3. TDS and Nitrogen Wasteload Allocation (WLA)
4. Salinity Management Plan
5. Desalter(s) and Brine Disposal Facilities (or Equivalent Technologies)
6. Recycled Water Use
7. EMWD recycled water quality improvement plan and schedule

The PWR will meet the basin's nitrate requirements since the nitrate concentration after SAT is estimated to be 3 mg/l, well below the maximum-benefit objective for nitrate of 7 mg/L. Likewise, the PWR will reduce the future TDS concentrations projected in the basin with a blended TDS of approximately 300 mg/L, below the basin's maximum-benefit TDS objective of 500 mg/L.

3.3.3 Groundwater Rights and Sustainability

The SJUPMZ is one of the groundwater sub-basins in Hemet-San Jacinto area established by the Santa Ana RWQCB Basin Plan. Shown on **Figure 3-1**, four groundwater MZs comprising the Hemet-San Jacinto Groundwater Basin are: (1) SJUPMZ, (2) Canyon, (3) Hemet North, and (4) Hemet South. The SJUPMZ is the deepest and most productive of these sub-basins.

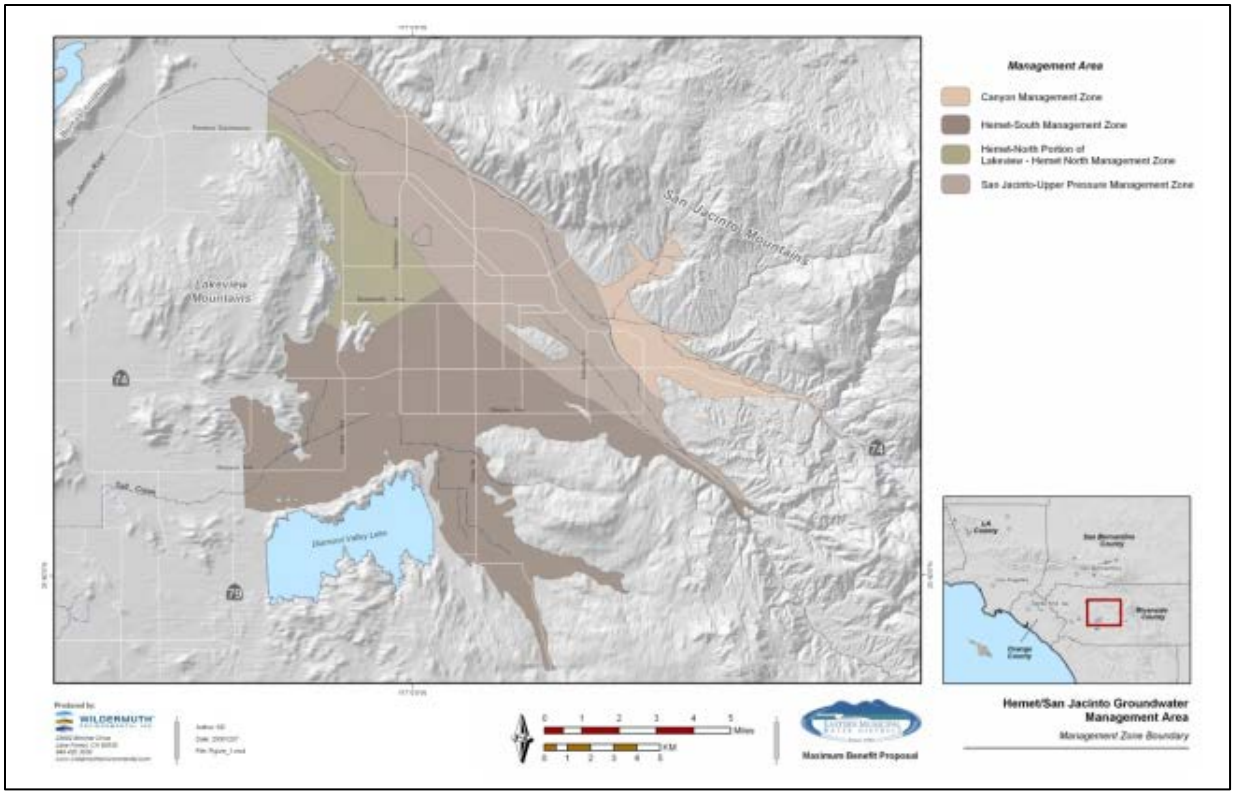

Figure 3-1 Hemet-San Jacinto Groundwater Management Area and Groundwater MZs

3.3.3.1 Groundwater Management Plan

In order to effectively manage the local groundwater supply, EMWD, Lake Hemet Municipal Water District (LHMWD), the City of Hemet, and the City of San Jacinto, along with the California Department of Water Resources, developed the Hemet/San Jacinto Groundwater Management Area Water Management Plan (WRIME, 2007). This Water Management Plan was completed in 2007 and covers the four groundwater MZs noted above. Technical information in the Water Management Plan provides guidance to (1) mitigate the basin overdraft; (2) enhance groundwater supplies to meet future water demands; (3) secure a Stipulated Judgment to define local water rights and establish a Watermaster to manage and protect groundwater supplies; and (4) resolve the water rights dispute with the Soboba Band of Luiseño Indians (Soboba Tribe). The purpose of the Water Management Plan is to replenish and protect the groundwater basins in the Hemet/San Jacinto Valley and implement the Soboba Settlement Act.

3.3.3.2 Soboba Water Rights Settlement

Long-term groundwater rights disputes between the Soboba Tribe and Southern California water agencies in the Hemet and San Jacinto Valley area were resolved in 2008. The resolution included a water rights settlement that established water rights for the Soboba Tribe and replenishment of the groundwater basin with imported water. The Soboba Water Rights Settlement provides the framework for regional water management for the San Jacinto River watershed and underlying aquifers.

In 2008, the Soboba Band of Luiseño Indians Settlement Act, Public Law 110-297, was passed by Congress and signed into law by the President on July 31, 2008, providing federal support for the water rights settlement agreement between the Soboba Tribe and three water agencies (EMWD, LHMWD, and Metropolitan Water District of Southern California (MWD)). The Soboba Settlement Act specifies that the Soboba Tribe has water rights in the San Jacinto groundwater basin; that MWD supplies water to EMWD to replenish the groundwater basin; and that EMWD, LHMWD, and MWD make "substantial additional contributions", including replacement lands and economic development funds, to the Soboba Tribe.

Under the terms of the Settlement, the Soboba Tribe is entitled to pump up to 9,000 AFY of groundwater from the San Jacinto River basin, subject to certain restrictions. The Soboba Tribe has agreed to limit its pumping to a maximum of 4,100 AFY for 50 years. During this period, the remaining 4,900 AFY of the Soboba Tribe's water rights will be available for use by the local agencies.

Furthermore, the Settlement calls for an average of 7,500 AFY of imported water to be provided until at least 2035 by MWD to recharge and reduce the groundwater basin overdraft. EMWD and MWD entered into a long-term water supply contract for this recharge water, and the contract requires EMWD to construct and operate recharge facilities, eventually storing up to 40,000 AF of water in the groundwater basin.

3.4 Environmental Requirements

Environmental documentation and compliance are important factors for any project, as highlighted below. A thorough discussion of the environmental requirements is included in the Phase 2 Study. The proposed PWR project must comply with State environmental requirements and federal requirements if federal funding is required to help implement the Project.

3.4.1 California Environmental Quality Act and National Environmental Policy Act

The environmental clearance plan for a proposed PWR project would, at a minimum, require preparation of a document in compliance with the California Environmental Quality Act (CEQA). However, it more likely would involve a joint environmental document prepared in compliance with the requirements of CEQA and the National Environmental Protection Act (NEPA) assuming federal funding is pursued. This joint document would be intended to provide sufficient CEQA and NEPA support for approval of a proposed PWR project and would also provide project-level approval of new treatment, conveyance, and spreading facilities, including site-specific mitigation, although additional site-specific environmental documents would likely be required for implementation of all other PWR project features. The United States (U.S.) Department of the Interior's Bureau of Reclamation Public Law 102-575, Title XVI, provides a mechanism for Federal participation and cost-sharing in water reuse projects. The potential provision of Federal funding for implementation of the PWR project would be considered a Federal Action and must conform to NEPA requirements.

For a combined joint environmental impact report/environmental impact statement (EIR/EIS), the design information for portions of a proposed PWR project, consisting of AWPF, conveyance facilities, brine evaporation ponds, new or modifications to existing spreading ponds, and

potential existing facility operational changes, would be available at a project level. The material provided in this PDR would provide relevant information for the EIR/EIS to analyze the potential environmental effects of these components.

3.4.2 Biological Resources and Permitting

Implementation of the PWR project would require the identification and mitigation of potential biological resources issues as required for the project review process under CEQA and NEPA. The biological resources strategy would focus on field surveys, aerial photograph interpretation, and database review of vegetation communities, wildlife habitat, and jurisdictional "waters of the United States" that occur or potentially occur in the action area, including habitats, plant communities, and special-status plants and wildlife. These studies and evaluations are not included in this PDR and will be performed separately by EMWD.

3.5 Permitting

The PWR project would likely require acquiring permits and approvals from the agencies listed in **Table 3-2**. Of these permits, the DDW approval of the project and issuance of the RWQCB permit have the longest estimated lead-times and the highest priority. The DDW approval is used for the RWQCB permit. Most RWQCBs require CEQA certification prior to issuing the GWR permit. Since there are no river crossings, neither a 401 permit nor a streambed alteration permit should be required. Similarly, since the pipelines aren't in or near any state highways, no California Department of Transportation (Caltrans) permit is needed. Brine ponds were selected as the method for disposing of RO concentrate (see Section 6) and will require a Title 27 – Environmental Protection – Division 2, Solid Waste permit from the RWQCB.

Table 3-2 Permit Requirements

Agency[1]	Permit/Approval	Purpose	Estimated Processing Time
State			
DDW	Title 22 Engineering Report, Summary of Public Hearing, Conditional Approval	Project approval and recommendations to RWQCB for permit	12-24 months
RWQCB	Producer/User Water Recycling Requirements	Operating permit	12 months
SWRCB/RWQCB	NPDES – Industrial General Permit - Storm Water Pollution Prevention Plans (SWPPP)	Stormwater discharged from AWT facilities	4 months
SWRCB/RWQCB	NPDES – Construction General Permit - SWPPP	Stormwater discharge during construction	3-4 months
RWQCB	Dewatering Water Discharge Permit	Dewatering during construction	2-4 months
RWQCB	Title 27 – Environmental Protection – Division 2, Solid Waste - Waste Management Units, Facilities and Disposal Sites	Brine Evaporation Pond construction and operation	12 months

Table 3-2 Permit Requirements

Agency[1]	Permit/Approval	Purpose	Estimated Processing Time
Regional			
SCAQMD	Permits to Construct and Operate	Applicable to processes and equipment with air emissions	12-24 months
Cal-OSHA	Construction Activities for Excavation, Trenching, Tunneling (Underground Classification)	Excavation safety for 5 ft deep and tunneling safety (if any)	1-2 months
Local			
County and/or DDW (Environmental Health and Resources)	Cross-connection and Backflow Prevention	On-site inspection(s)	1-2 months
County (Environmental Health and Hazardous Materials)	Underground Storage Tank Permit	Underground storage tank(s) (if any)	4-6 months
County (Roads)	Encroachment Permit(s)	Access to property	1-2 months
RCFCWCD	Encroachment Permit	Discharges (if any)	2-3 months
City (Fire Department)	Business Emergency Plan (BEP)	Hazardous materials, chemical	1-2 months
City (Building Department)	Building Permits	For occupied buildings, if any	4-6 months
City	Encroachment Permit(s)	Access to property	1-2 months
Private Property Owner(s)	Temporary Easements	Access to private property (if any)	3-4 months

1. Abbreviations:
Cal-OSHA – California Occupational Safety and Health Agency
DDW – California Division of Drinking Water
City –City of San Jacinto
County – Riverside County
SCAQMD – South Coast Air Quality Management District
RCFCWCD – Riverside County Flood Control and Water Conservation District
RWQCB – Regional Water Quality Control Board, Santa Ana Region
SWRCB – State Water Resources Control Board

EMWD has focused on keeping DDW and the RWQCB appraised of the Project's progress. The draft Engineering Report will be prepared during the final design and approved during construction. The goal is to obtain DDW approval of the Engineering Report prior to start-up and operation. Additional discussions will be held with other agencies/cities after completion of the PDR.

3.6 Seasonal Operation Investigation

In the prior planning evaluations for the PWR project, it was assumed that the recycled water would be recharged at a continuous rate throughout the year and that the same amount of recycled water would be recharged each year. In actuality, the current tertiary RW demands vary seasonally depending on the temperature and annually depending on the amount of rainfall during the year.

Tertiary RW supply to non-potable customers is highest in the summer months (May to October) and lower in the "shoulder" and winter months (November to April). Additionally, annual tertiary RW use for current non-potable demands (e.g. agriculture, landscaping, etc.) varies depending on

the annual rainfall; non-potable demands are higher in dry years, lower in wet years, and an average of the dry and wet years during years with average rainfall. To fully utilize the AWPF, the RO permeate would be recharged at a constant rate year-round and would be blended with at least 10 percent of tertiary recycled water (by volume) to stabilize the RO permeate (see Section 5.2.11 for further discussion about RO permeate stabilization). Media filtered tertiary RW from the SJVRWRF would be added as available for percolation.

An evaluation of the recycled water TOC concentration post-SAT was completed to confirm that the TOC regulatory requirements are met given the potential seasonal variations in available tertiary RW for recharge. The amount of tertiary RW recharged for the PWR project can vary seasonally to account for non-potable reuse demands and annually to account for the hydrologic cycle (i.e., dry, average, and wet years) where less tertiary RW is available for the PWR project in dry years and more tertiary RW is available in average and wet years. The regulatory requirements for TOC are included in Title 22 Section 60320.118 (c) TOC and SAT Process Requirements, which requires that the TOC shall not exceed 0.5 mg/L divided by the running monthly average (RMA) RWC based on the:

- 20-week running average of all TOC results, and
- Average of the last four TOC results.

The RMA RWC is calculated using the recycled water and diluent water for the preceding 120 months and the calculations starts after recycled water has been applied for the PWR project for 30 months. This information is also summarized in Section 3.1.4.

3.6.1 Assumptions

The assumptions for the TOC evaluation are presented below.

3.6.1.1 Timing

- The PWR flows will begin delivery to the recharge basin in the year 2022.

3.6.1.2 Hydrologic Cycle

- A 10-year hydrologic cycle is assumed with three dry years, followed by four average years, followed by three wet years. For conservatism, the TOC compliance evaluation assumed that the three dry years would occur when the project in 2022.
- Tertiary RW, Settlement Water, and diluent water annual recharge amounts vary depending on the year: no water is recharged in dry years, an average amount of water is recharged in average years and double the amount of water is recharged in wet years.

3.6.1.3 Recycled Water

- 50/50 blend of tertiary RW and RO permeate during average years.
- Tertiary RW
  - 10-year average of 2,000 AFY to produce a 50/50 blend of tertiary RW and RO permeate.

- For RO permeate stabilization, tertiary RW would be recharged year-round at a rate of 200 AFY (10 percent of the RO permeate flow).
- Annual variation assumption: 0 AFY during dry years, 1,714 AFY during average years, and 3,714 AFY during wet years (which account for the tertiary RW used year-round for stabilization).
- The evaluation was completed for two scenarios for seasonal variation:
  - *Scenario 1: Tertiary RW recharged seasonally, i.e., tertiary RW is recharged November to April and no recycled water is recharged from May to October (except for RO permeate stabilization).*
  - *Scenario 2: Tertiary RW recharged year-round.*
- TOC concentration = 6.9 mg/L.
- TOC in the tertiary RW is assumed to be reduced by 75 percent through SAT.

- RO Permeate
  - 2,000 AFY year-round during all dry, average, and wet years.
  - TOC concentration = 0.13 mg/L.

3.6.1.4 Diluent Water

- Settlement Water
  - 10-year average of 7,500 AF. The hydrologic variation is assumed to be 0 AFY during dry years, 7,500 AFY during average years, and 15,000 AFY during wet years.
  - A diluent water credit for Settlement Water for the 10-year period prior to the PWR project starting in 2022 was included in the evaluation. The actual quantities and assumptions for Settlement Water for 2012 through 2021 are summarized in **Table 3-3.**
- Water Banking water: 10-year average of 7,000 AF starting in 2022. The hydrologic variation is assumed to be 0 AFY during dry years, 7,000 AFY during average years, and 14,000 AFY during wet years.

Table 3-3 Settlement Water Recharge – Actual Quantities and Assumptions for 2012-2021

Calendar Year	Settlement Water Quantity Recharged (AFY)	Notes
2012	5,754	Actual
2013	7,527	Actual
2014	0	Actual
2015	0	Actual
2016	9,142	Actual
2017	19,800	Actual
2018	23,330	Goal
2019	7,500	Assumed
2020	7,500	Assumed
2021	7,500	Assumed

3.6.1.5 Recycled Water and Diluent Water Flow Assumptions

The recycled water and diluent water flow assumptions for the evaluation period, 2022-2051, are summarized in **Table 3-4**.

3.6.2 Evaluation

Based on the assumptions presented above, the TOC concentration of the recharged recycled water (tertiary RW and RO permeate) after SAT was calculated on a weekly basis for a 30-year period (2022-2051). Two scenarios were evaluated to assess the impact of seasonal tertiary RW recharge:

- Scenario 1: Tertiary RW recharged seasonally, i.e., tertiary RW is recharged November to April and no recycled water is recharged from May to October (except the tertiary RW used for RO permeate stabilization).
- Scenario 2: Tertiary RW recharged year-round.

For both scenarios, the following parameters were estimated to determine compliance with the Title 22 regulations:

- TOC concentration after SAT;
- 20-week running average of TOC results;
- Running average of the last four TOC results (for this analysis, it was assumed that TOC samples would be collected weekly so this is presented as a 4-week running average TOC results);
- Maximum allowable RWC;
- Actual RWC;
- 120-month RMA RWC; and,

- TOC compliance limit, which is equal to 0.5 mg/L/RMA RWC.

Table 3-4 Recycled Water and Diluent Water Flow Assumptions 2022-2051

Calendar Year	Assumed Climate	Recycled Water				Diluent Water		
		RO Permeate (AFY)	Tertiary RW for Stabilization (AFY)	Tertiary RW (AFY)	Total (AFY)	Settlement Water (AFY)	Water Banking Water (AFY)	Total (AFY)
2022	Dry	2.000	200	0	2,200	0	0	0
2023	Dry	2.000	200	0	2,200	0	0	0
2024	Dry	2.000	200	0	2,200	0	0	0
2025	Average	2.000	200	1,714	3,914	7,500	7,000	14,500
2026	Average	2.000	200	1,714	3,914	7,500	7,000	14,500
2027	Average	2.000	200	1,714	3,914	7,500	7,000	14,500
2028	Average	2.000	200	1,714	3,914	7,500	7,000	14,500
2029	Wet	2.000	200	3,714	5,914	15,000	14,000	29,000
2030	Wet	2.000	200	3,714	5,914	15,000	14,000	29,000
2031	Wet	2.000	200	3,714	5,914	15,000	14,000	29,000
2032	Dry	2.000	200	0	2,200	0	0	0
2033	Dry	2.000	200	0	2,200	0	0	0
2034	Dry	2.000	200	0	2,200	0	0	0
2035	Average	2.000	200	1,714	3,914	7,500	7,000	14,500
2036	Average	2.000	200	1,714	3,914	7,500	7,000	14,500
2037	Average	2.000	200	1,714	3,914	7,500	7,000	14,500
2038	Average	2.000	200	1,714	3,914	7,500	7,000	14,500
2039	Wet	2.000	200	3,714	5,914	15,000	14,000	29,000
2040	Wet	2.000	200	3,714	5,914	15,000	14,000	29,000
2041	Wet	2.000	200	3,714	5,914	15,000	14,000	29,000
2042	Dry	2.000	200	0	2,200	0	0	0
2043	Dry	2.000	200	0	2,200	0	0	0
2044	Dry	2.000	200	0	2,200	0	0	0
2045	Average	2.000	200	1,714	3,914	7,500	7,000	14,500
2046	Average	2.000	200	1,714	3,914	7,500	7,000	14,500
2047	Average	2.000	200	1,714	3,914	7,500	7,000	14,500
2048	Average	2.000	200	1,714	3,914	7,500	7,000	14,500
2049	Wet	2.000	200	3,714	5,914	15,000	14,000	29,000
2050	Wet	2.000	200	3,714	5,914	15,000	14,000	29,000
2051	Wet	2.000	200	3,714	5,914	15,000	14,000	29,000

The potential to comply with the regulatory requirements for TOC after SAT was assessed by:

- Determining whether the weekly value of the 20-week running average TOC concentration was less than or equal to the TOC compliance limit; and

- Determining whether the running average of the last four TOC results (4-week running average TOC concentration) was less than or equal to the TOC compliance limit.

If the two compliance criteria established above were met, the scenario was determined to have the potential to comply with the Title 22 requirements.

3.6.3 Results

The results of the seasonal operational evaluation are presented in **Figure 3-2** and **Figure 3-3** for Scenarios 1 and 2, respectively. Each figure shows the TOC compliance limit, which is 0.5 mg/L/RMA RWC, as well as the 20-week running average TOC after SAT and the running average of the last four TOC results after SAT.

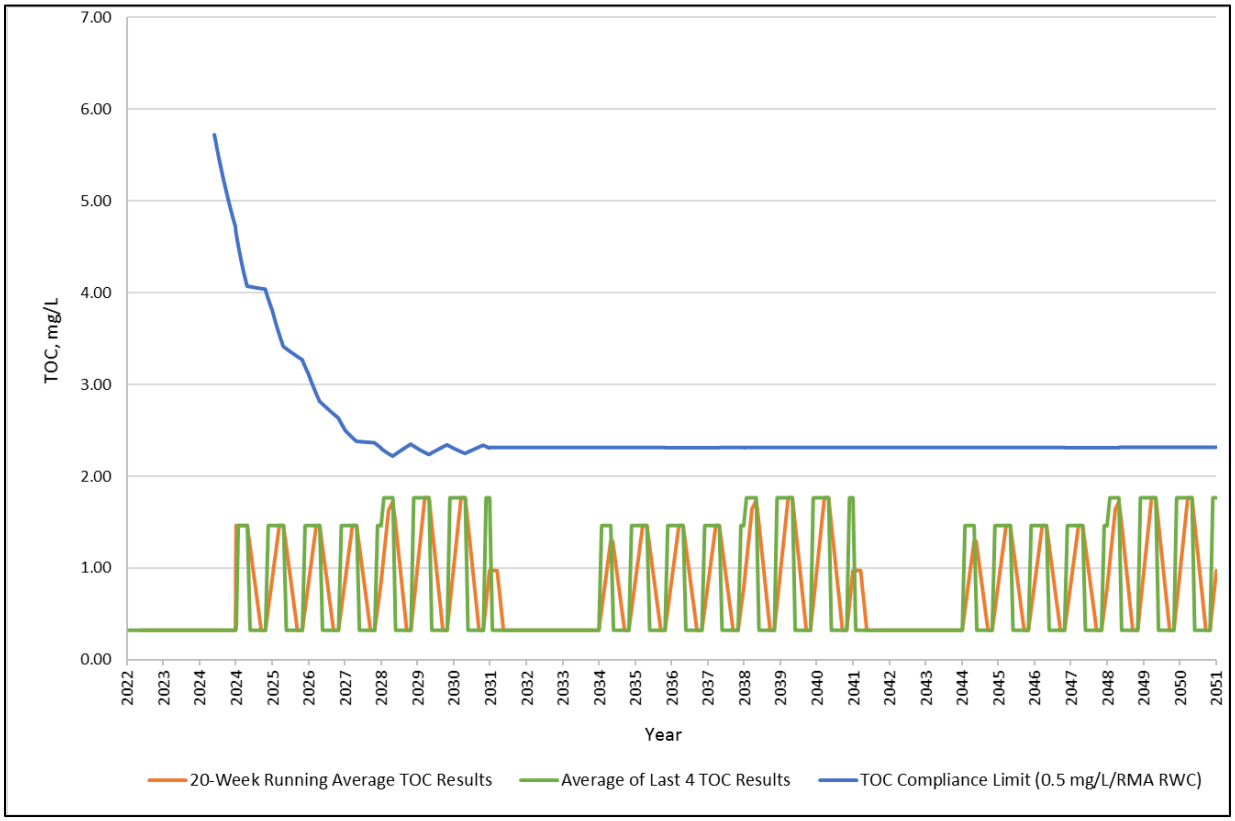

Figure 3-2 Scenario 1 (Tertiary RW Recharge Varies Seasonally) – TOC Compliance Limit and Results

Per the regulations, the RMA RWC is calculated using the recycled water and diluent water for the preceding 120 months and the calculations starts after recycled water has been applied for the GWR project for 30 months. Since the project is planned to start in January 2022, the RMA RWC calculation starts in June 2024. The TOC compliance limit starts at 5.7 mg/L in June 2024 and declines steadily until 2028 as the amount of recycled water increases in the 120-month (10-year) running average RMA RWC calculation. Since the recycled water and diluent water assumptions are based on a 10-year hydrologic cycle and the RMA RWC is calculated using 10-years of data, the TOC compliance limit settles at 2.3 mg/L once the project starts the eleventh

year of operation. The actual TOC compliance limit would increase and decrease based on actual hydrologic conditions and recycled water and diluent water recharge rates.

For both scenarios, the 20-week running average TOC concentration and the average of the last four TOC samples are less than the TOC compliance limit. For Scenario 1, the 20-week and 4-week running average TOC concentrations increase and decrease annually based on the seasonal recharge of tertiary RW (the TOC concentration is higher from May through October when both tertiary RW and RO permeate are recharged and lower from November to April when the recycled water recharge is predominantly RO permeate). For Scenario 2, the 20-week and 4-week running average TOC concentrations are constant year to year because it is assumed that the tertiary RW is recharged year-round, not seasonally. For both scenarios, the maximum average TOC concentration is less in dry years when no tertiary RW is recharged and highest in wet years when the maximum amount of tertiary RW is recharged.



Figure 3-3 Scenario 2 (Continuous Tertiary RW Recharge) – TOC Compliance Limit and Results

Based on this analysis, the PWR project can proceed with varying the tertiary RW recharge rate both annually to accommodate hydrologic conditions as well as seasonally to accommodate higher non-potable reuse demands during May through October. Once the project is started, then EMWD will monitor the actual recycled water and diluent water recharge rates and recycled water TOC concentrations to confirm that the TOC compliance level is being met for both the 20-week running average TOC and the average of the last four TOC samples.

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Section 4

Preliminary Design Studies & Field Investigations

Preliminary design studies prepared to support this PDR include a conveyance facilities study and a monitoring well site location evaluation in support of the GRRP requirements. Field investigations include a survey and a geotechnical study of the project facilities.

4.1 Conveyance Facility Studies

Conveyance facility studies have been prepared for both the RO permeate pipeline from the AWPF to the Alessandro Blending Station and for the blended flow pipeline from the Alessandro Blending Station to the Mountain Ave West pond. Each study is summarized in this section.

4.1.1 RO Permeate Conveyance Study (AWPF to Alessandro Blending Station)

A RO Permeate Conveyance Study TM for this project, found in **Appendix B,** has been prepared and previously submitted to EMWD. This memorandum provided an evaluation of the conveyance of RO permeate from the AWPF to the Alessandro Blending Station. The two alternatives considered for conveying the RO permeate from the SJVRWRF to the Alessandro Blending Station are to slip-line an existing 18-inch steel pipeline that is out-of-service with an HDPE pipe or to install a new 24-inch pipeline in parallel to the existing 36" tertiary water pipeline. The existing 18-inch pipeline is a cement mortar lined and coated (CML&C) steel pipe with a total length of approximately 3.5 miles.

The approximate proposed route for this RO Permeate pipeline can be found in **Figure 4-1** with preliminary design drawings of the proposed alignment in **Appendix G**.



Figure 4-1 Proposed Route of RO Permeate Pipeline

The RO Permeate Conveyance TM provides a summary of the various trenchless technologies, such as slip-lining and cured-in-place pipe (CIPP), and a technical review of previous slip-lining projects. An evaluation on the flow capacity for each alternative assuming a maximum velocity of 6 fps and an HDPE pipe capable 160 psi was provided as indicated in **Table 4-1** (original Table 1 in Reverse Osmosis Permeate [ROP] Conveyance TM).

Table 4-1 Flow Capacity Evaluation for Each Alternative

Alternative	Steel Pipe OD (in)[1]	Steel Pipe ID (in)[3]	Allowable HDPE Pipe OD Assuming Losses (in)	Chosen HDPE Pipe OD (in)[2]	Chosen HDPE Pipe ID (in) [2]	Max Flow at HDPE Pipe ID (MGD)*
New 24-in HDPE Pressure Pipe	N/A	N/A	N/A	24	20.231	8.66
Slip-lining Existing Pipe with HDPE	19.781 (existing)	18.000 (existing)	16.755	16	13.488	3.85

*Assume max velocity in pipe in 6 fps
1. Assume CML&C steel pipe. Pipe size data obtained from West Coast Pipe, Cement Lined Steel Pipe.
2. Pipe size data obtained from JM Eagle HDPE Water Pressure Piping Size Chart assuming 160 psi.
3. Calculated allowable HDPE slip-lined pipe OD assuming losses associated with existing and new piping.

The TM concluded that the proposed RO conveyance to the Alessandro Blending Station should be implemented as follows:

- Slip-lining the existing 18-inch pipeline will only provide enough capacity for Phase I of the PWR project.
- Installing a new 24-inch pipeline will be required to provide enough capacity for Phase II design or additional alternatives to avoid the construction of a new pipeline.

In addition to the criteria included for the RO permeate conveyance pipeline provided in Section 5.2.3, EMWD should also consider recommendations included in the TM for the final design.

4.1.2 Conveyance Facility Study (Alessandro Blending Station to Mountain Ave West Pond)

A conveyance facility study technical memorandum for this project found in **Appendix C** has been prepared and previously submitted to EMWD. This memorandum provided an evaluation of two (2) alternative conveyance alignments for recycled water from the Alessandro Blending Station to the Mountain Avenue West pond. **Figure 4-2** includes a flow schematic depicting conveyance from the AWPF to the Mountain Avenue East Pond and includes blending at the Alessandro Blending Station.

The two alternatives that were considered in this evaluation include:

1. Alternative No. 1 – Conveyance Along the Roadway
   This alternative conveys blended tertiary treated water from the Alessandro Blending Station to the Mountain Avenue West Pond primarily along the Ramona Expressway.

2. Alternative No. 2 – Conveyance Along the Creek
   This alternative conveys blended tertiary treated water from the Alessandro Blending Station to the Mountain Avenue West Pond along the trough located adjacent to raised roadway that runs along the San Jacinto River.

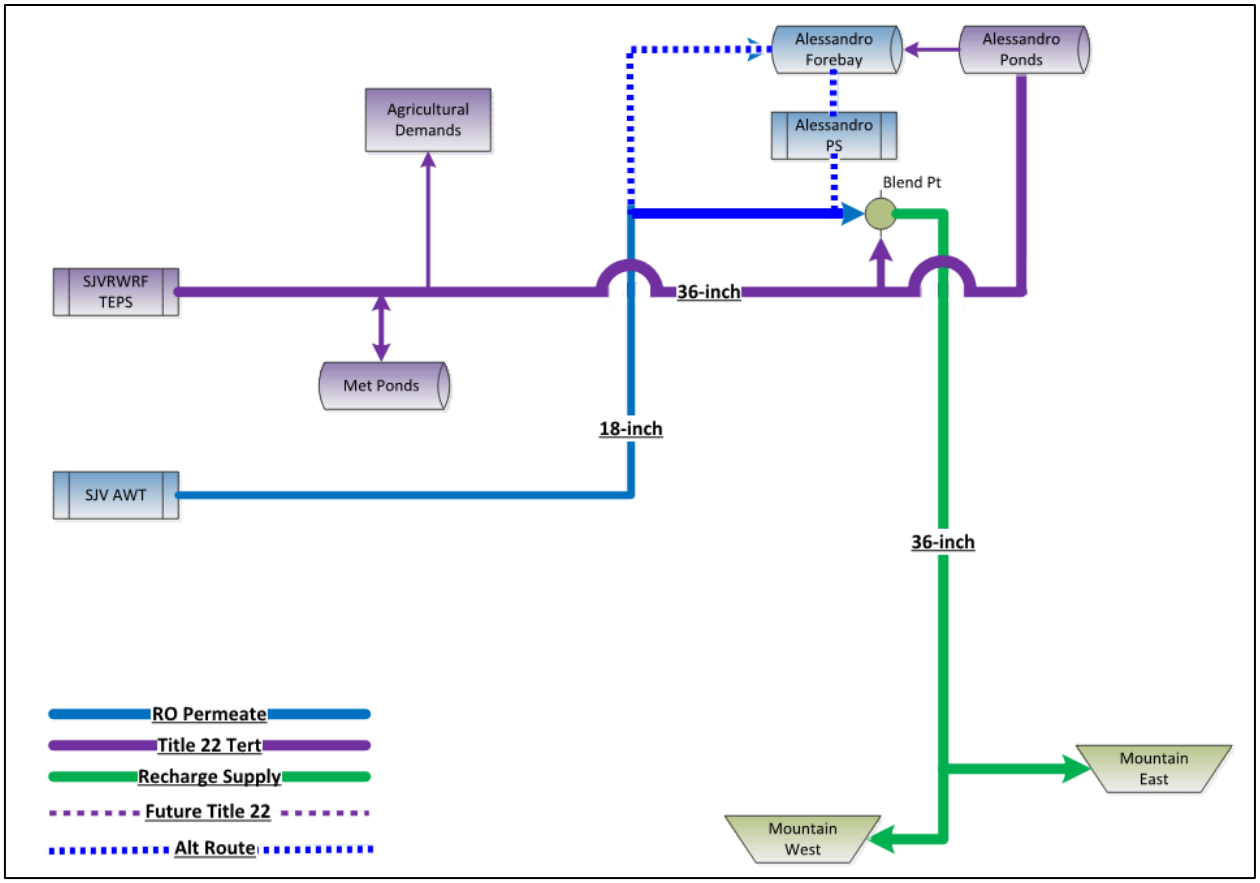

Figure 4-2 PWR Project Preliminary Design Flow Schematic

The approximate alternatives pipeline routes in relation to the proposed slip-lining pipe can be found in **Figure 4-3** with preliminary design drawings on the proposed alignment in **Appendix G**.

The alternatives analysis evaluated the following criteria:

- Minimization of Overall Length;
- Easements and Right-of-Way;
- Avoidance of Conflicts with Other Buried Utilities;
- Minimization of Traffic and Community Disruption;
- Avoidance of Sensitive Receptors (hospitals, schools, police, fire, other);
- Consideration of Pipeline Construction Techniques;
- Permitting Requirements;
- Environmental Impacts; and
- Construction and Capital Costs.

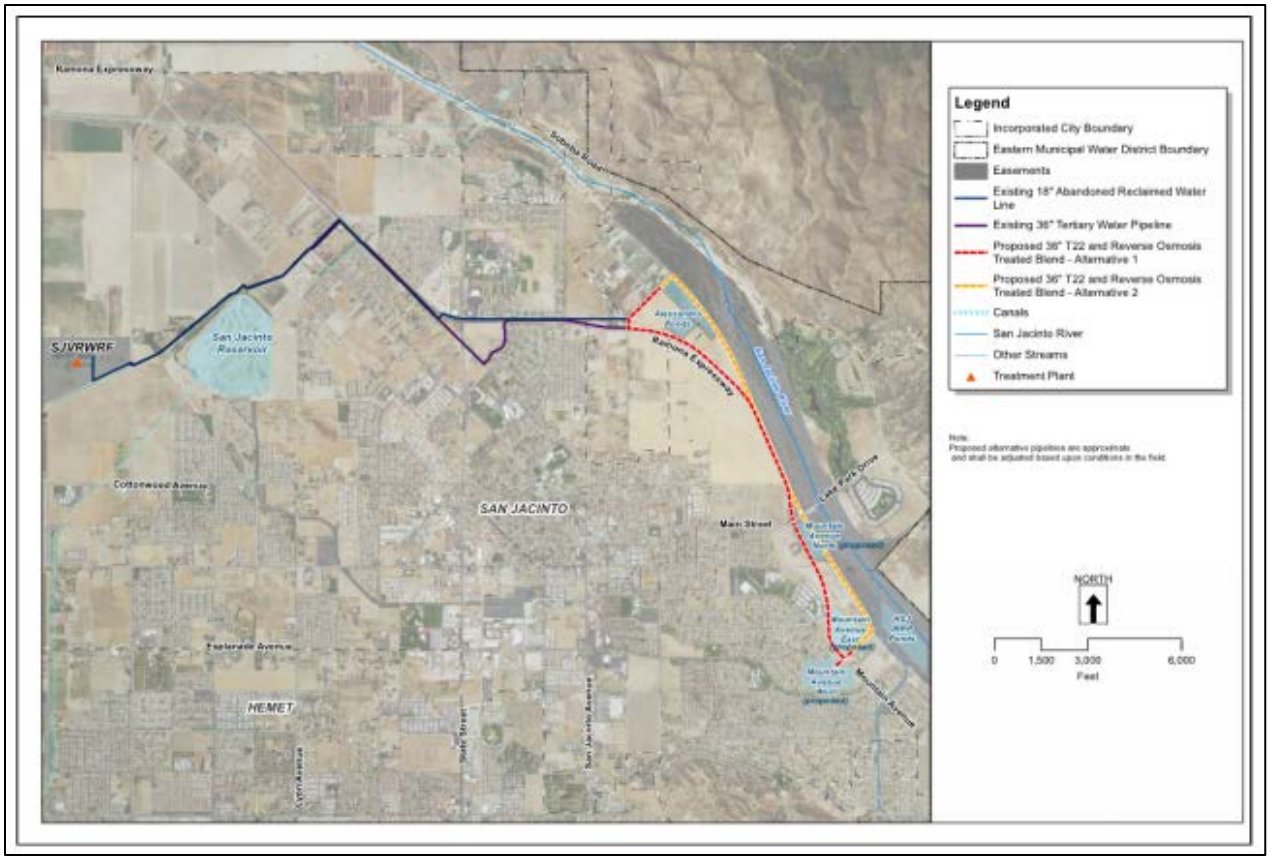

Figure 4-3 PWR Project Conveyance Alternatives

A summary of the alignment matrix evaluation is shown in **Table 4-2** (original Table 4.2 in the memorandum). It was agreed that the final recommendation was the alignment along the roadway.

Table 4-2 Alignment Matrix Evaluation

	Criteria	Easements and Right-of-way	Avoidance of Conflicts with other Buried Utilities	Min. of Traffic & Community Disruption/Avoidance of Sensitive Receptors	Consideration of Pipeline Construction Techniques	Permitting Req.	Environ Impacts	Construction & Capital Costs	Total Score
Alignment Alternative	***Weight***	***10%***	***10%***	***15%***	***10%***	***20%***	***15%***	***20%***	***10 max***
No. 1 - Along Roadway		8	4	5	9	9	5	7	6.8
No. 2 - Along Creek		3	8	8	3	2	6	4	4.7

4.2 Response Retention Time (RRT)

As discussed in Section 3, Section 60320.224 in the GWR Regulations includes provisions for RRT. Recycled water must be retained underground, between recharge and extraction to allow a project sponsor ample time to identify treatment failures and implement appropriate actions to protect public health from inadequately treated recycled water or recharge water. The proposed RRT must be approved by DDW. The GWR regulations also require that the RRT must be validated using an added tracer study or with DDW approval, an intrinsic tracer study under hydraulic conditions representative of normal recharge operations.

4.2.1 Monitoring Wells and Recycled Water Travel Time

The RRT will be based on the aggregate of the following: (1) travel time to the closest monitoring well, which would serve as an early warning instrument; (2) time needed to collect and analyze samples and confer with DDW and SARWQCB regarding necessary response action; and 3) time necessary to provide relief measures or alternative source of water to nearby affected well owners.

There are seven existing or planned drinking water wells in the immediate vicinity of the Mountain Avenue percolation pond with more wells further from the pond. Recycled water will spread into the aquifer with water movement to be estimated by the groundwater model.

Groundwater modeling will be performed to determine the travel time for the recycled water. The development of the local groundwater model as well as the results will be documented separately from the PDR with a summary included in the future Engineering Report.

4.2.2 Monitoring Well Locations

The location(s) of the monitoring wells must be determined to confirm the movement of the recycled water through the aquifer. Monitoring well location requirements were provided in Section 3.1.8. Based on the groundwater modeling, potential monitoring well sites will be located in the area around the Mountain Avenue West percolation pond. Monitoring wells can be existing potable water wells or dedicated monitoring wells. Sites for new monitoring wells would probably be located on EMWD's property, when possible, or in street right-of-way.

The monitoring wells locations will be discussed with DDW to confirm that they meet the regulatory requirements. The feasibility of the procurement of properties not owned by EMWD, easements, and encroachment permits should be considered in the site selection, costs and implementation schedule. Approved monitoring well locations will be provided in future the Engineering Report.

4.3 Survey

A survey for this project, found in **Appendix E**, including the AWPF site and the proposed conveyance pipeline from Alessandro Blending Station to Mountain Ave West pond was prepared by Cozad and Fox, Inc in September 2017. The project control and aerial targets were established by Cozad and Fox, Inc on August 15, 2017. Aerial photogrammetry was performed by Inland Aerial Surveys, Inc on September 14, 2017. Additional field surveying was also performed by Cozad and Fox, Inc throughout August and September 2017.

The basis of bearings for the survey is the California Coordinate System, Zone 6, based locally on continuous operating reference station NAD83 (2011). Existing utility information was provided to the surveyor and not all utilities were verified in the field. Further verification of existing utilities is recommended for final design.

4.4 Geotechnical Investigation and Report

A Geotechnical Engineer Services Report, found in **Appendix F**, was prepared by Kleinfelder in November 2017 for the AWPF/brine pond site and the proposed conveyance pipeline. The report summarized subsurface investigations performed on August 23, 2017 and September 1, 2017.

The subsurface exploration consisted of the excavation, sampling, and logging of nine small diameter hollow-stem auger borings. Seven of the borings were drilled to depths of approximately 20 to 35 feet below ground surface along the proposed pipeline alignments (approximately one boring per 1,000 linear feet). Two borings were drilled to depths of approximately 50 feet bgs near the proposed AWPF and brine evaporation ponds.

A description of the field exploration, the logs of the borings, and laboratory testing results are included in the report. Laboratory testing included moisture content, unit weight, sieve analysis, Atterberg limits (plasticity index), direct shear, consolidation, collapse potential, R-values, and preliminary corrosion testing.

Based on the geotechnical investigations, recommendations were made for:

- Suitability of the pipe alignment from a geotechnical perspective;
- Depth to groundwater;
- Site seismicity and applicable CBC seismic design coefficients;
- Characteristics of on-site materials, including excavation characteristics, caving potential, and oversize material handling;
- Requirements for spread footings, including allowable bearing capacity, lateral resistance, embedment depth, and anticipated settlement;
- Fill material and compaction requirements;
- Retaining wall lateral earth pressures and appropriate subsurface drainage; and
- Corrosion potential of on-site soils.

Significant findings in the report include the following:

1. The subsurface conditions of the proposed conveyance pipeline include artificial fill (2.5-8.5 feet below ground surface (bgs)) underlaid by alluvium (maximum boring depth of 26.5 feet bgs).

2. The subsurface conditions of the proposed AWPF/brine ponds include undocumented fill (4.5-foot thickness) underlaid by alluvium (maximum boring depth of 51.5 feet bgs).

3. Regional groundwater is estimated to be at depths greater than 150 feet bgs below the pipeline and the AWPF sites. Groundwater was not encountered in any of the borings at the AWPF/brine ponds site. Groundwater was only encountered in one of the borings for the proposed conveyance pipeline. Boring B-7, near the Alessandro Ponds, encountered groundwater at 23 feet bgs which is likely caused by a perched condition base on great depths to groundwater experienced in nearby wells.

4. Both the conveyance pipeline and the AWPF project sites are located within an area designated as having "moderate" potential for liquefaction "active subsidence" by the Riverside County. The area around the Alessandro Blending Station is designated as having a "High" potential for liquefaction. Due to the lack of groundwater, the potential for liquefaction induced settlement is considered relatively low and unlikely to impact the project. Settlement of up to 4-7 inches is possible if the groundwater elevation rises to less than 50 feet bgs and there is a strong earthquake. Non-seismically induced total and differential settlement of structures supported on spread footings is anticipated to be less than 1-inch and 1/2 inch respectively.

5. The pipeline alignment is in an area designated by FEMA as an area that is protected from the 1-percent-annual-chance or greater flood hazard by a levee system. The AWPF project site is located within an area designated at Zone X outside the 0.2 percent annual chance floodplain.

6. The sites are relative flat, level and away from any significant topographic relief so landslides and the potential for debris flow hazards are considered to be very low.

7. The northeast corner of the AWPF and brine ponds site is situated within the Earthquake Fault Zone (EFZ) for the Casa Loma fault of the San Jacinto fault zone. In accordance with the Title 27 regulations, the brine ponds will need to be located 200 feet from a known Holocene fault. Seismic deign considerations including seismic design parameters, liquefaction-induced settlement, dynamic compaction and seismic settlement are included in the report, see **Figure 4-4**.

8. Based on the results of the resistivity testing, the soils along the proposed pipeline alignment are considered moderately to highly corrosive for buried ferrous metal piping, cast iron pipes, or other objects made of these materials. In the vicinity of the proposed AWPF and brine ponds, the soils are considered extremely corrosive to buried ferrous metal piping, cast iron pipes, and other objects made of these materials. It is recommended that during final design, a corrosion engineer be consulted to recommend appropriate protection measures. In both the proposed pipeline and AWPF/brine ponds site, no special provisions are required for the selection of cement type.

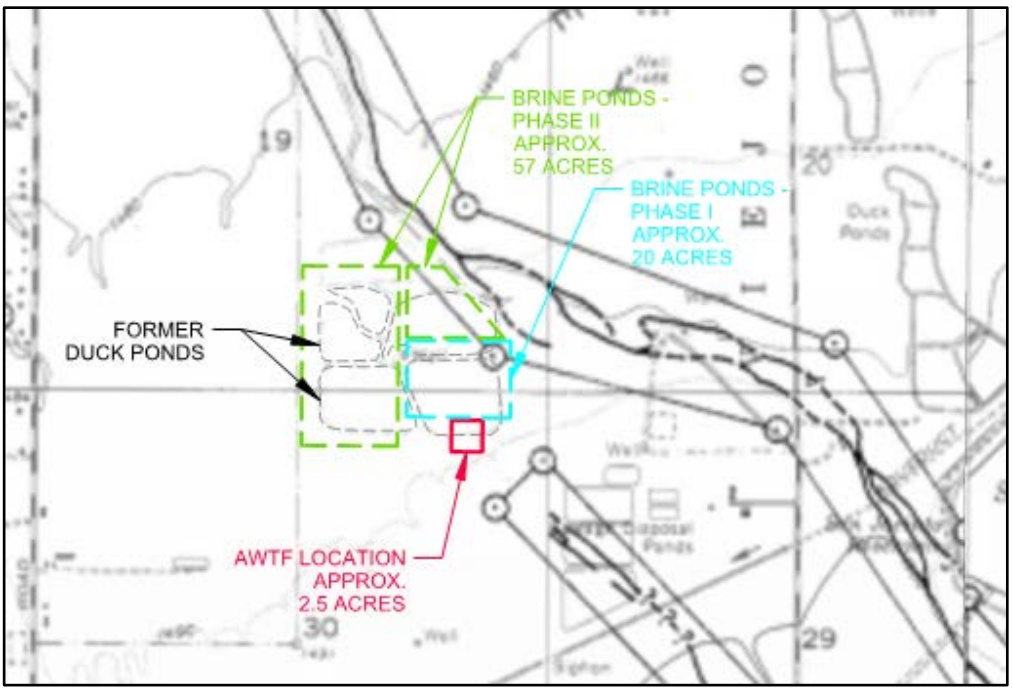

Figure 4-4 Location of Loma Prieto Zone near AWPF site

9. Proposed structures associated with the AWPF are suitable for shallow spread foundations. The allowable bearing pressure for footings is 2,000 psf.

10. Allowable passive resistance values of 240 psf per foot of depth may be used but should not exceed 2,400 psf total with an allowable coefficient of friction of 0.30.

11. On-site soils may be reusable as engineered fill once organic vegetation, debris and oversized materials are removed. Overexcavation and recompaction of the upper fill and native materials will be required. Oversized materials greater than 3-inches in maximum dimension should be stripped and disposed of outside the construction limits.

12. Site soils at the AWPF shall be over excavated and replaced as engineered fill to a depth of 5 feet below existing grades and at least 3 feet below the bottom of footings. Engineered fill shall be compacted to at least 90 percent of the dry density (ASTM D 1557).

13. Moisture content for fine grained soils should be within 1 to 5 percent above optimum moisture while granular soils should have a moisture content of within 2 percent.

14. Temporary cut slopes up to 15 feet may be sloped back at an inclination of not steeper than 1.5:1 (horizontal to vertical). Permanent slopes on the order of 20 feet in height should be no steeper than 2:1 H:V.

15. Due to the granular nature of the near surface soils, the expansion potential for the near surface soils is considered low.

16. Using a design R-value of 50, flexible asphalt concrete pavement sections should range from 3-inches AC/4.5 inches AB (TI 5) to 4-inches AC/7.5 inches AB (TI 8).

Section 5
AWPF Design Criteria

This Section includes a definition of the AWPF processes, design criteria for each AWPF process and discipline requirements.

5.1 Process Definition

Figure 5-1 shows the proposed process flow diagram for the AWPF. Tertiary RW from the SJVRWRF will undergo MF and RO treatment located at the AWPF. MF - either microfiltration or ultrafiltration, will be used as pretreatment to the reverse osmosis system. Ahead of the MF units, influent pumping, chemical addition and automatic strainers will condition the Title 22 feed supply. MF filtrate will flow to a storage tank from which it will be pumped to the reverse osmosis system. Waste backwash from the microfiltration system and automatic strainers will be discharged to waste. Figure 5-1 indicates the process flow diagram.

Sulfuric acid and threshold inhibitor will be dosed upstream of both the primary and secondary reverse osmosis systems. RO permeate will be dosed with varying amounts of sodium hydroxide and calcium chloride depending on the amount of the Title 22 tertiary recycled water will be blended with the finished water. Finished water will be transferred to the product water pumping station.

Final product water pumps will transfer water from the AWPF to the recharge ponds. Chemical feed facilities will be included for sodium bisulfite, ammonium sulfate, sodium hypochlorite, sulfuric acid, threshold inhibitor, sodium hydroxide, calcium chloride and chemicals associated with the microfiltration and reverse osmosis cleaning systems.

The AWPF will include one building divided into two major areas: control/visitor center and process, the site layout is included in Drawings found in **Appendix G**. Detailed process flow diagrams for the PWR project listing major process stream flows, chemical applications, and waste discharges are included with the Drawings are also provided in **Appendix G**.

The overall system will be implemented in two phases as discussed above in Section 2. Phase I of this project is designed to provide 2,000 acre-feet of RO permeate per year or 2.0 MGD, based on a 90 percent plant on-line operating factor. Phase II of this project is designed to provide 7,500 acre-feet of RO permeate per year or 7.5 MGD, based on a 90 percent plant on-line operating factor. **Figure 5-2** and **Figure 5-3** indicates the preliminary site plans, **Figure 5-4** indicates the process layout and the hydraulic profile can be found in **Figure 5-5**.

Pipelines will be required to convey RO permeate from the SJVRWRF to the Alessandro Blending Station as well as blended water (RO permeate and Title 22 recycled water) from the Alessandro Blending Station to the Mountain Avenue Percolation Ponds. The overall conveyance plan can be found in **Figure 5-6**.

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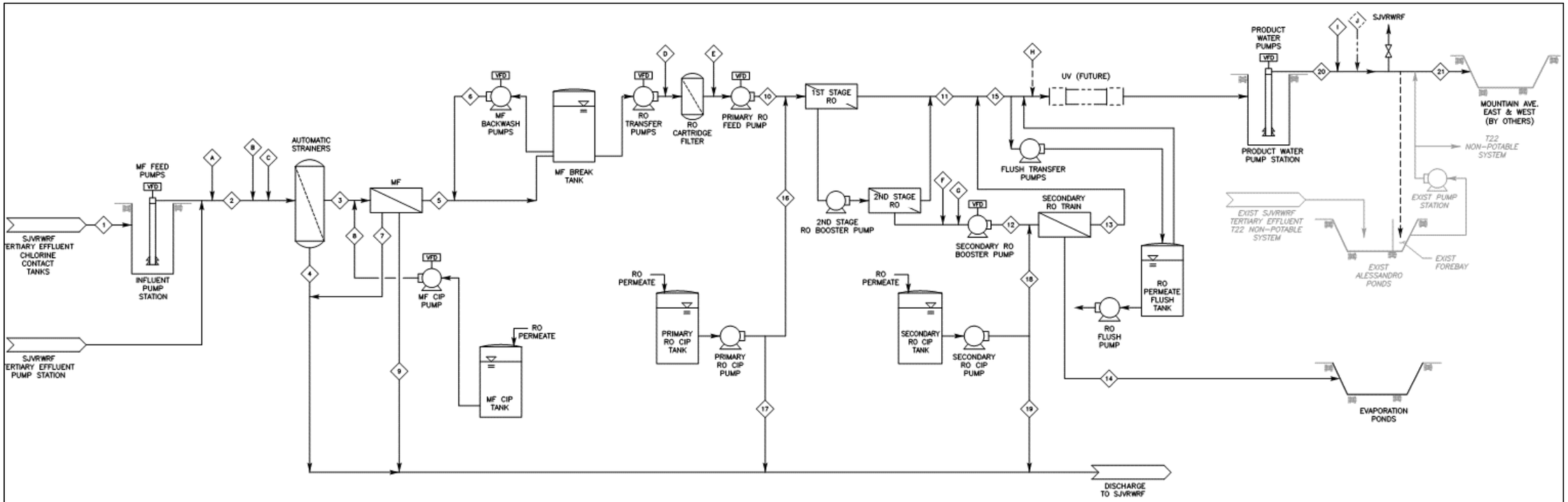


PRELIMINARY FLOW BALANCE

Automatic Strainer Recovery	98%
MF Recovery	94%
Primary RO Recovery	85%
Secondary RO Recovery	52%
Overall RO Recovery	92.8%
Online Factor	90%

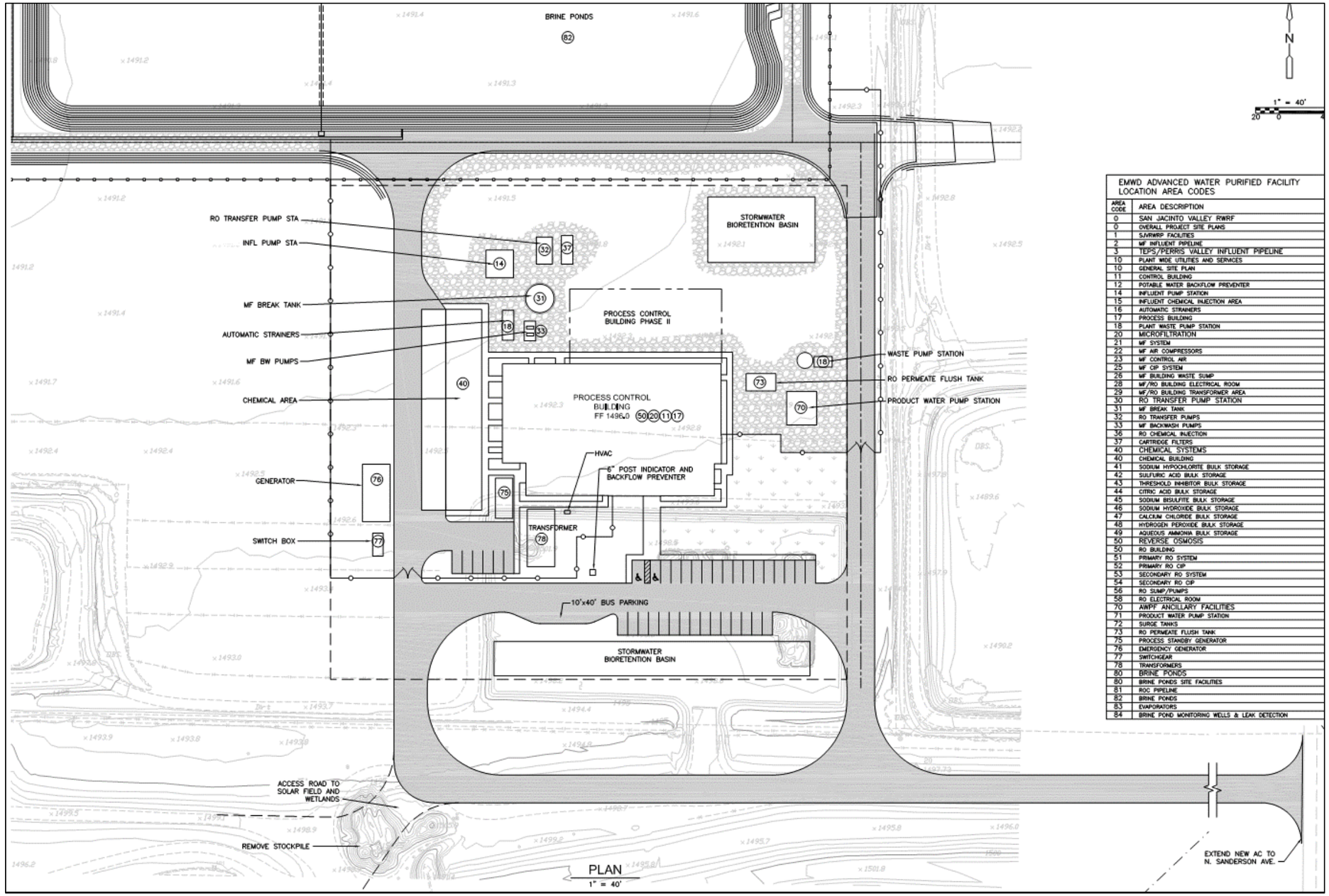
FLOW STREAM (MGD)	AWTF FEED	AUTOMATIC STRAINER FEED	MF FEED	AUTOMATIC STRAINER WASTE	MF FILTRATE	MF BACKWASH FEED	MF BACKWASH WASTE	MF CIP FEED	MF CIP WASTE	PRIMARY RO FEED	PRIMARY RO PERMEATE	SECONDARY RO FEED	SECONDARY RO PERMEATE	SECONDARY RO CONCENTRATE	COMBINED RO PERMEATE	PRIMARY RO CIP FEED	PRIMARY RO CIP WASTE	SECONDARY RO CIP FEED	SECONDARY RO CIP WASTE	AWTF PRODUCT	BLENDED WATER FOR RECHARGE
PROCESS STREAM ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Design Flow-2,000 AFY (2.0 mgd)	2.3	2.3	2.3	0.05	2.3	0.15	0.15	0.01	0.01	2.155	1.8	0.323	0.17	0.1552	2.000	0.01	0.01	0.01	0.01	2.0	4.0
Design Flow-7,500 AFY (7.5 mgd)	8.7	8.7	8.6	0.17	8.6	0.55	0.55	0.02	0.02	8.052	6.844	1.208	0.628	0.5798	7.473	0.01	0.01	0.01	0.01	7.4	15.0

CHEMICAL	SODIUM BISULFITE	AMMONIUM SULFATE	SODIUM HYPOCHLORITE	SULFURIC ACID	THRESHOLD INHIBITOR	SULFURIC ACID	THRESHOLD INHIBITOR	HYDROGEN PEROXIDE (FUTURE)	SODIUM HYDROXIDE	CALCIUM CHLORIDE
CHEMICAL STREAM ID	A	B	C	D	E	F	G	H	I	J
Bulk Chemical Concentration	50%	40%	12.5%	93%	100%	93%	100%	27%	25%	35%
Estimated Max Chemical Dose	29 mg/L	1.5 mg/L	6.0 mg/L	20 mg/L	3.0 mg/L	60 mg/L	3.0 mg/L	5 mg/L	19 mg/L	40 mg/L

Figure 5-1 Overall Process Flow Diagram



Figure 5-2 Overall Site Plan



EMWD ADVANCED WATER PURIFIED FACILITY
LOCATION AREA CODES

AREA CODE	AREA DESCRIPTION
0	SAN JACINTO VALLEY RWRF
0	OVERALL PROJECT SITE PLANS
1	SJVRWRP FACILITIES
2	MF INFLUENT PIPELINE
3	TEPS/PERRIS VALLEY INFLUENT PIPELINE
10	PLANT WIDE UTILITIES AND SERVICES
10	GENERAL SITE PLAN
11	CONTROL BUILDING
12	POTABLE WATER BACKFLOW PREVENTER
14	INFLUENT PUMP STATION
15	INFLUENT CHEMICAL INJECTION AREA
16	AUTOMATIC STRAINERS
17	PROCESS BUILDING
18	PLANT WASTE PUMP STATION
20	MICROFILTRATION
21	MF SYSTEM
22	MF AIR COMPRESSORS
23	MF CONTROL AIR
25	MF CIP SYSTEM
26	MF BUILDING WASTE SUMP
28	MF/RO BUILDING ELECTRICAL ROOM
29	MF/RO BUILDING TRANSFORMER AREA
30	RO TRANSFER PUMP STATION
31	MF BREAK TANK
32	RO TRANSFER PUMPS
33	MF BACKWASH PUMPS
36	RO CHEMICAL INJECTION
37	CARTRIDGE FILTERS
40	CHEMICAL SYSTEMS
40	CHEMICAL BUILDING
41	SODIUM HYPOCHLORITE BULK STORAGE
42	SULFURIC ACID BULK STORAGE
43	THRESHOLD INHIBITOR BULK STORAGE
44	CITRIC ACID BULK STORAGE
45	SODIUM BISULFITE BULK STORAGE
46	SODIUM HYDROXIDE BULK STORAGE
47	CALCIUM CHLORIDE BULK STORAGE
48	HYDROGEN PEROXIDE BULK STORAGE
49	AQUEOUS AMMONIA BULK STORAGE
50	REVERSE OSMOSIS
50	RO BUILDING
51	PRIMARY RO SYSTEM
52	PRIMARY RO CIP
53	SECONDARY RO SYSTEM
54	SECONDARY RO CIP
56	RO SUMP/PUMPS
58	RO ELECTRICAL ROOM
70	AWPF ANCILLARY FACILITIES
71	PRODUCT WATER PUMP STATION
72	SURGE TANKS
73	RO PERMEATE FLUSH TANK
75	PROCESS STANDBY GENERATOR
76	EMERGENCY GENERATOR
77	SWITCHGEAR
78	TRANSFORMERS
80	BRINE PONDS
80	BRINE PONDS SITE FACILITIES
81	ROC PIPELINE
82	BRINE PONDS
83	EVAPORATORS
84	BRINE POND MONITORING WELLS & LEAK DETECTION

Figure 5-3 AWPF Site Plan

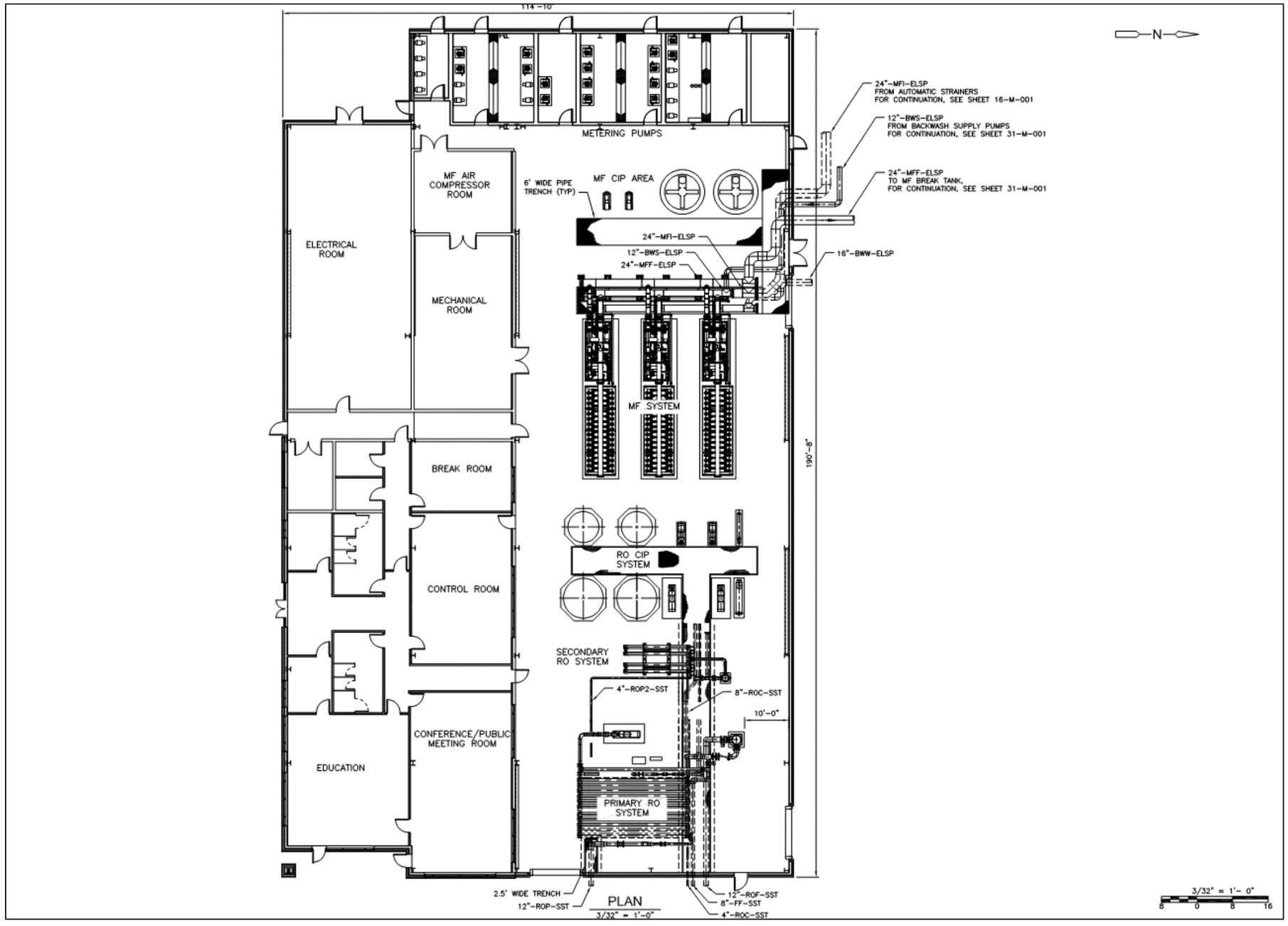


Figure 5-4 Preliminary Process Area Layout

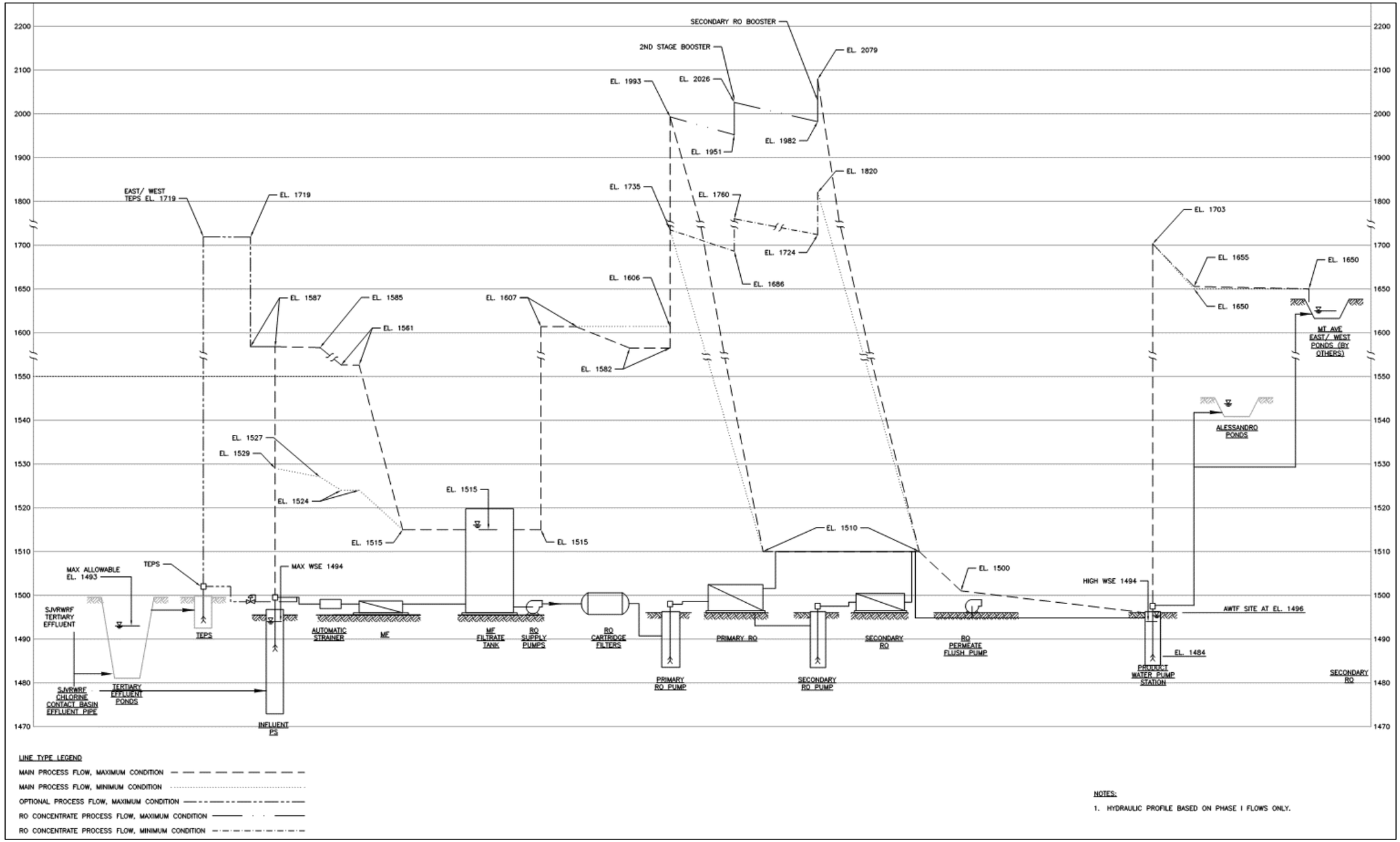


Figure 5-5 Hydraulic Profile

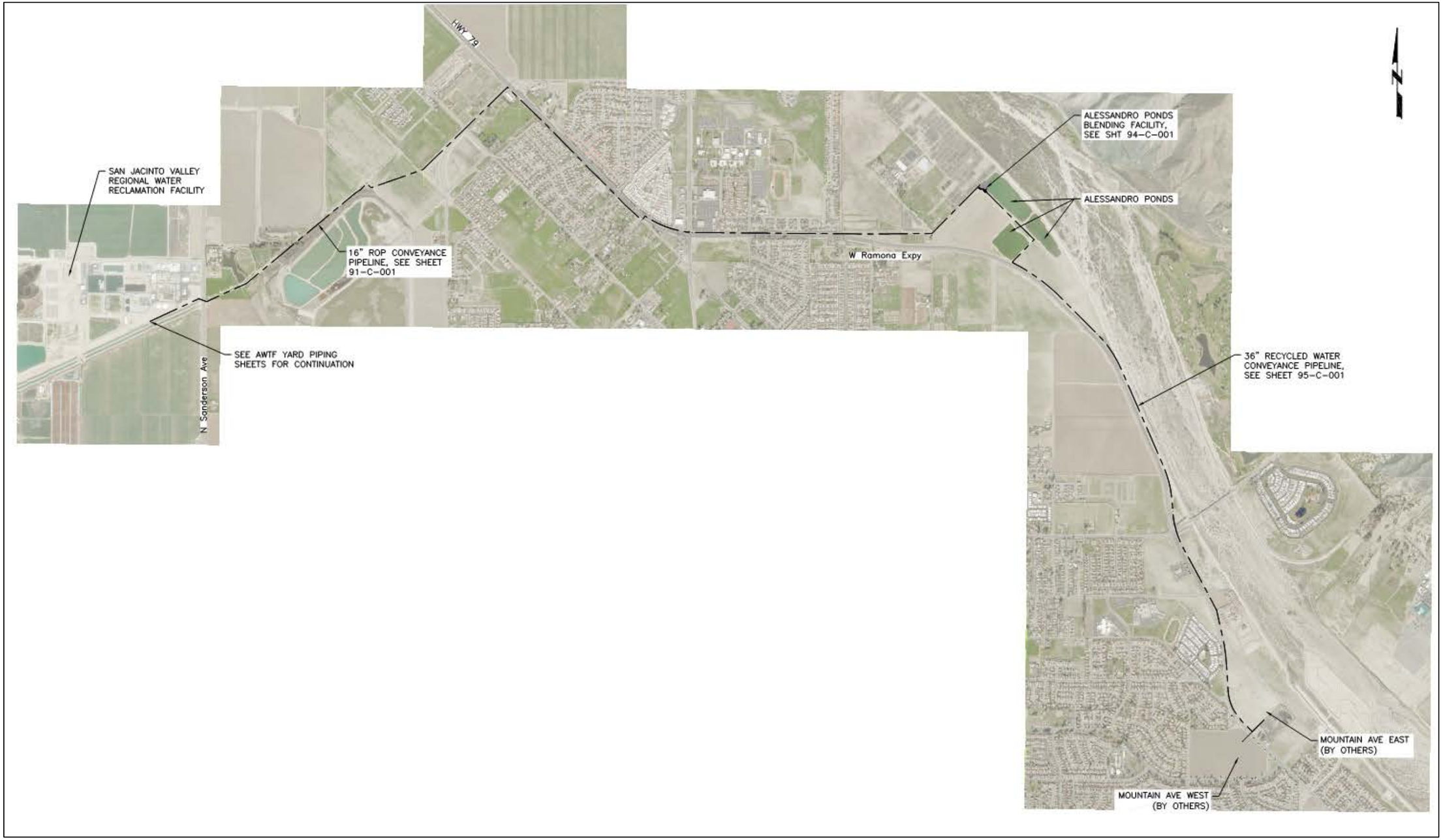


Figure 5-6 Overall Conveyance Plan

5.2 Process Design Criteria

This Section provides preliminary design criteria for the AWPF processes, the brine ponds, the conveyance pipelines and for the ancillary facilities and disciplines for each.

The AWPF includes the following major process equipment: influent pumps, automatic strainers, microfiltration, MF break tank, MF backwash pumps, RO transfer pumps, cartridge filters, primary RO pumps, primary RO system, 2nd stage RO booster pumps, secondary RO system, RO flush system, and product water pumps. The major equipment preliminary design criteria are provided herein.

5.2.1 Influent Water Source

An evaluation on the alternative influent water sources for the AWPF was submitted to EMWD on August 8, 2017. This SJVRWRF Secondary vs. Tertiary effluent Evaluation TM is included in **Appendix H**. This evaluation was initiated for two reasons:

- Concerns over polymer used at SJVRWRF and the impact this polymer carryover may have on fouling the MF membranes.
- For the tertiary effluent, there are two potential locations where for connection to the AWPF, which are tertiary recycled water after the chlorine contact tank or the tertiary effluent pump station (TEPS).

The two potential locations for tertiary effluent are the existing chlorine contact tank or the TEPS. The two sources could have different water quality as the TEPS pumps from the tertiary effluent storage ponds and could contain algae. Connecting at the TEPS would eliminate the need for an influent pump station at the AWPF, but the existing pumps are oversized for the required AWPF influent pressure.

It was concluded that the source of the AWPF would be tertiary effluent taken just downstream of the chlorine contact basins. This approach was the most cost-effective and had the fewest significant disadvantages. EMWD also requested that a connection also be made to the existing TEPS to utilize existing pumping capacity at SJVRWRF. Based on this TM, the main source water for the AWPF includes tertiary effluent from just downstream of the chlorine contact basins. An alternate connection is proposed for direct connection to the TEPS.

Polymer is currently used at SJVRWRF in their solids handling process and tertiary treatment (rapid mix process). Polymer has been shown to create problems with fouling of the MF membranes at other AWPFs. In addition, alum is used at SJVRWRF in the tertiary treatment (rapid mix process) and has been shown to create problems with fouling the RO membranes.

Initially, polymer addition used in the tertiary treatment processes (rapid mix process) at SJVRWRF was the main concern and the use of secondary effluent may have been a solution to mitigate this potential problem. Polymer was also found to be used in the biosolids processing, where the biosolids sidestreams are returned to the either the primary influent or primary effluent splitter boxes, as well as added upstream of the secondary clarifiers. Thus, residual polymer is also expected in the secondary effluent and the impact on the MF membranes is likely to be similar for secondary and tertiary effluent.

It is recommended that during final design, EMWD consider pilot testing the proposed AWPF processes using existing SJVRWRF effluent to determine whether the membranes are impact by the SJVRWRF chemical addition. In addition, it is recommended that MF manufacturers are prequalified by piloting their individual systems on the SJVRWRF effluent and determining the impact that polymer addition used at the SJVRWRF facility will have on the overall membrane performance. This final design recommendation will be critical in determining the overall performance of the AWPF.

5.2.2 Influent Pump Station

The influent pump station will take suction from the tertiary effluent from the chlorine contact basins at SJVRWRF. An alternate connection to the TEPS will also be provided. There will be two main connection points for the influent pump station: one at the chlorine contact basin and one on the TEPS effluent pipeline as indicated on the preliminary civil design drawings. If the flow is taken off the TEPS, the influent pump station will not be used since the TEPS has greater pressure than is required at the influent to the AWPF. It is assumed that the loss through the automatic strainers can range from 1 to 10 psi and the loss through the MF system can range from 4 to 20 psi depending on the time within a backwash cycle. To account for added loss through the piping and static head, the pressure required to provide a continuous, stable flow through the automatic strainers and MF system is assumed to be between 20 to 50 psi.

Listed pump capacities are based on the Phase II AWPF feed flow requirements with turndown to achieve the Phase I flow requirements. The pumps will be variable speed and will accommodate variations in flow during startup and shutdown flush sequences by changing speeds.

The influent wet well will be built for Phase I flows only. The wet well will be expanded for Phase II flows, in the future. Due to the pumps being on variable speed drives (VFDs), the wet well is designed to provide a reduced residence time of approximately three to five minutes. The wet well is also designed per the Hydraulic Institute 9.8 Standards Preliminary design criteria for the influent pumps are listed in **Table 5-1** and preliminary drawing of the Influent Pump Station can be found in **Figure 5-7**.

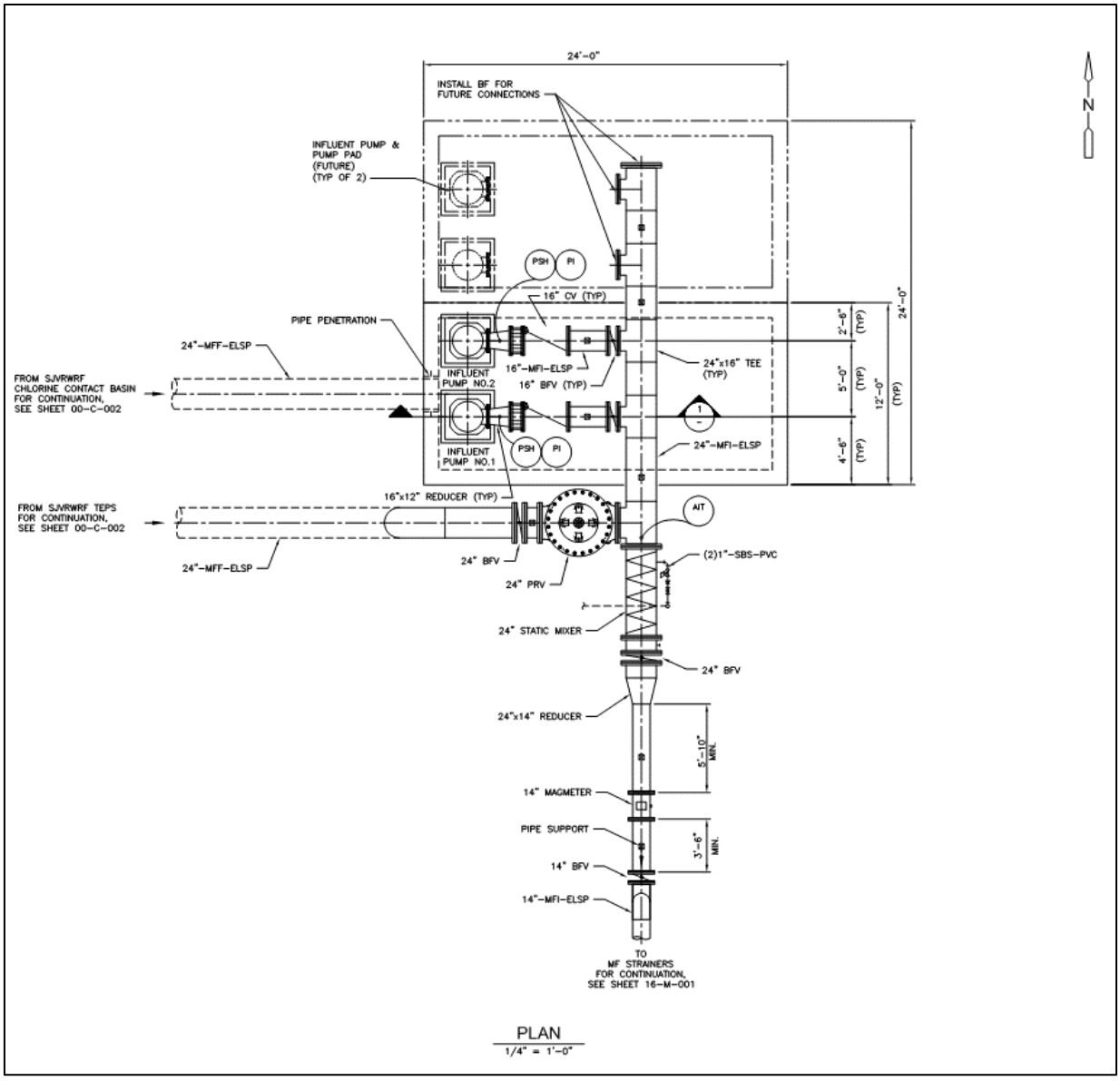


Figure 5-7 Influent Pump Station

Table 5-1 Influent Pump Station Design Criteria

	Phase I	Phase II
AWPF Feed	2.3 MGD, 1,620 gpm	8.7 MGD, 6,070 gpm
Equipment Numbers	PMP-14010, PMP-14020	PMP-14010, PMP-14020, +2 additional pumps
Configuration	1 operating, 1 standby	3 operating, 1 standby
Type	Vertical Turbine	Vertical Turbine
Rated Capacity, gpm	2,000	2,000
Rated Head, feet	120	120
Minimum Continuous Flow, gpm	1,600	2,000
Materials	Manufacturer's standard all iron with nickel, aluminum, bronze impeller, EPR seals	Manufacturer's standard all iron with nickel, aluminum, bronze impeller, EPR seals
Drive	Variable	Variable
Motor Size, hp	100	100
Wet Well Width, ft	12	24
Wet Well Length, ft	24	24
Min Wet Well Depth per HI 9.8 Standards, ft	4	4
Design Depth w/ 5-ft of headboard, ft	14	14

5.2.3 MF Pretreatment Chemical Injection

Following influent pumping, the MF feed water will be treated with sodium bisulfite to remove free chlorine and protect the membranes from damage. The exact amount of free chlorine and sodium bisulfite to be dosed in the influent water will vary depending on whether the flow is taken off the chlorine contact basins (higher residual chlorine) or off the TEPS (lower to no residual chlorine) as described in Section 5.2.1 above.

Once the free chlorine is removed, chloramination (using free chlorine (sodium hypochlorite) and ammonium sulfate) is needed to control bio-fouling of the MF membranes. Final design should consider optimizing the control of the sodium bisulfite addition to limit sodium hypochlorite usage. **Table 5-2** summarizes the chemical dose requirements of the MF pretreatment chemical addition. See Section 5.2.13 for chemical facilities design criteria.

Table 5-2 MF Pretreatment Chemical Injection Design Criteria

	Phase I	Phase II
AWPF Feed	2.3 MGD, 1,620 gpm	8.7 MGD, 6,070 gpm
Chemical	Sodium Bisulfite	Sodium Bisulfite
Concentration, %	50	50
Avg. Dose, mg/L- assuming 10 mg/L of free chlorine residual	14.6	14.6
Chemical	Ammonium Sulfate	Ammonium Sulfate
Concentration, %	19	19
Avg. Dose, mg/L	1.25	1.25
Chemical	Sodium Hypochlorite	Sodium Hypochlorite
Concentration, %	12.5	12.5
Avg. Dose, mg/L	5	5

5.2.4 Automatic Strainers

To protect downstream membrane treatment systems from large particles, feedwater to the plant will undergo 200 micron straining. The strainers will be the motor operated, automatic backwash, stationary basket, rotating arm type. Straining elements will be weave wire/wire mesh rather than wedge wire or perforated screens due to the improved performance of wire mesh on waters containing algae which could be possible in source water from the TEPS which draws from the tertiary effluent ponds that have experienced algae problems in the past. Backwashing will be accomplished by venting feedwater to waste through a backwash valve. Initiation of backwash will be by differential pressure, fixed time, or remote initiation from the supervisory control system. The addition of a second standby strainer should be considered during final design due to frequent cleanings experienced at similar facilities. Preliminary design criteria for the strainers are provided in **Table 5-3**.

Table 5-3 Automatic Strainers Design Criteria

	Phase I	Phase II
Automatic Strainer Feed	2.3 MGD, 1,620 gpm	8.7 MGD, 6,070 gpm
Equipment Numbers	STR-16010, STR-16020	STR-16010, STR-16020, +3 additional strainers
Configuration	1 operating, 1 standby	4 operating, 1 standby
Design Flow each, gpm	1,700	1,725
Inlet and Outlet Connections, in	12	12
Max. Clean Strainer Pressure Drop at Rated Flow, psig	1.0	1.0
Minimum Feedwater Recovery, %	98, on a 24-hour basis	98, on a 24-hour basis
Screen Size (Rating), microns	200	200
Screen Type	Low fouling, weave wire/wire mesh	Low fouling, weave wire/wire mesh
Max. Backwash Flow	220 gpm	220 gpm
Motor Size, hp	½	1/2
Strainer Element Material	316 stainless steel	316 stainless steel

5.2.5 Membrane Filtration System

The MF system will pretreat water ahead of the RO system and provide log-removal credits for the overall treatment system. The MF system will be comprised of core treatment units incorporating MF or ultrafiltration (UF) membrane modules. The modules will be installed on support racks with connecting pipe headers for feed, filtrate, backwash and compressed air. The module racks will connect to valve racks at one end having connections for feed, filtrate, backwash supply, backwash waste, cleaning solution (feed and return) and compressed air (both air scour and instrument/test air). The assembled valve and module racks constitute an MF/UF unit. Multiple units will be provided to treat the flow under Phase I and Phase II operating conditions.

In addition to the MF units, the system will share resources for membrane cleaning, backwash and compressed air. Compressed air is used for backwashing the MF/UF modules as well as for instrument air to unit pneumatic valve actuators and test air for verifying membrane integrity.

5.2.5.1 Microfiltration/Ultrafiltration (MF/UF) Units

The MF/UF units are the core process of the filtration system and will be comprised of three MF/UF units in Phase I, expanding to eight units in Phase II. MF/UF is a proven filtration technology for recycled water, with over 25-years of experience in California. At its advent and up until 2010 or so, MF/UF systems were furnished by manufacturers who either produced the process membranes themselves or had exclusive licensing agreements to a particular membrane. These were effectively proprietary systems, in which the manufacturer designed the skids and support systems to suit their particular membrane modules.

In 2010 modules by independent manufacturers could be retrofitted into existing proprietary systems. Over time, this came to include new membrane modules produced by manufacturers who relied on third party system suppliers or original equipment manufacturers (OEMs) licensed to build systems and use their membranes.

The pool of licensed OEMs along with module manufactures has continued to grow and evolved to what is effectively open platform or universal MF/UF systems. The development here is in valve and module racks that connect to the MF/UF membrane modules being built to accommodate modules from more than one manufacturer. The advent of this development was largely made possible by a confluence of module topology among manufacturers—a general standard that employs module housings in vertical orientation, with close to common feed, filtrate and compressed airport locations, and diameters from 5-in to 10-in.

The universal system approach for MF/UF systems generally follows the development of RO membrane systems, which in the 1970's arrived at a standard membrane module—the spiral wound element. The elements themselves then became separated from the suppliers designing and manufacturing systems. The approach offers one primary benefit—competitive membrane procurements. When MF/UF membrane modules were furnished as part of proprietary systems, their warranty and replacement terms were not consistent, which made it difficult to compare bids is a competitive procurement process. Competitive procurements could be organized around several different manufacturers at project inception, but once a system was installed, new and replacement modules had to be sourced from the selected manufacturer on an effectively sole

source basis. Many owners complained about this arrangement as pricing and warranty terms became non-negotiable and non-competitive. The universal system approach offers competitive selections of process membranes at both the project inception and for future replacements. It also affords the owner the benefit of incorporating new modules that come to the marketplace in the future.

For this project, it is proposed that a universal system be specified and that membranes should be used that share the thermal induced phase separation (TIPS) manufacturing process. Experience at West Basin Municipal Water District and Orange County Water District has shown that membranes manufactured of polyvinylidene fluoride (PVDF) perform best when treating wastewater effluents similar to EMWD's supply. There are two primary manufacturing processes for PVDF hollow membrane fibers—TIPS and non-solvent induced phase separation (NIPS). The TIPS process effectively forms the fibers in a thermal melting process, while the NIPS technique forms them in a low temperature solution. In wastewaters, the TIPS membrane fibers have shown improved performance over NIPS products.

TIPS module manufacturers currently include Pall/Asahi, Toray, and Scinor. The Pall/Asahi Microza modules are roughly 5-in diameter, while Toray and Scinor offer larger modules. At this time, the MF/UF module market is moving towards standardizing on the larger diameter modules. Therefore, it is recommended to include the Scinor and Toray modules as candidate membranes for the initial system. In the absence of site specific piloting, a conservative design flux for the membranes is recommended. The primary concern is the potential for polymers to enter the MF feed water stream at unknown concentrations. Most commercial cationic and anionic polymers are known to foul PVDF process membranes, and periodic chemical cleaning using typical hypochlorite, citric acid and caustic soda solutions is only partially effective at restoring the flux rate. With this in mind, a conservative design flux of 25 gfd is proposed. Pilot testing on the MF membranes is recommended and discussed in Section 5.2.1 above. Design criteria for the MF units are provided in **Table 5-4** and preliminary drawing of the MF System can be found in **Figure 5-8.**

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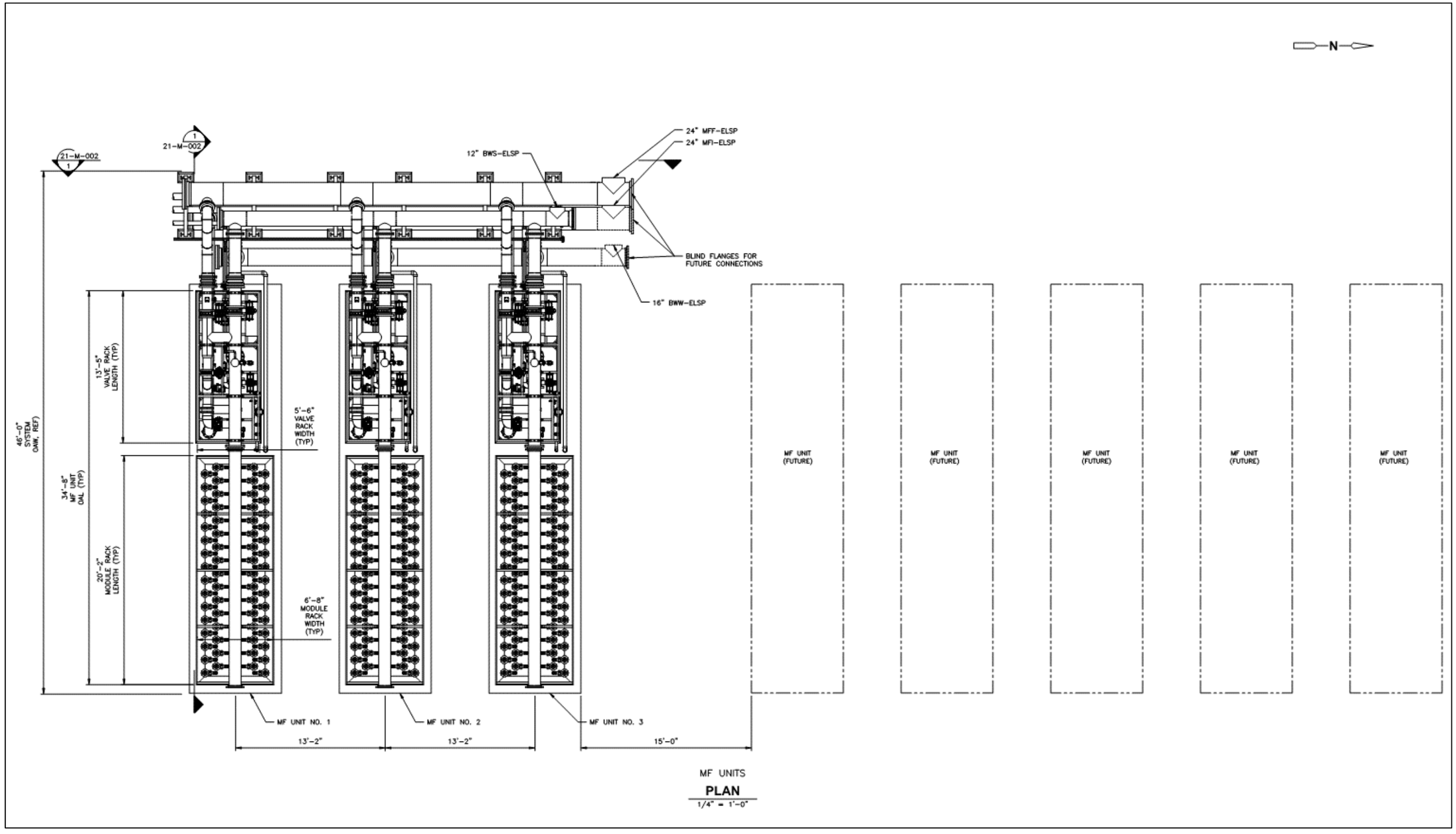

Figure 5-8 MF System

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Table 5-4 MF System Design Criteria

	Phase I	Phase II
MF Feed	2.3 MGD, 1,590 gpm	8.6 MGD, 5,950 gpm
Equipment Numbers	MFUNIT-21100, MFUNIT-21200, MFUNIT-21300	MFUNIT-21100, MFUNIT-21200, MFUNIT-21300, plus 5 additional units
Configuration	2 operating, 1 standby	7 operating, 1 standby
System Rated Capacity, mgd	2.17	8.15
System Recovery, percent	94	94
Design Flux, gfd	25	25
Module Manufacturer/Model Info	Pall, Scinor P72; Toray HFU-2020	Pall, Scinor P72; Toray HFU-2020
No. of Modules per Unit	63	73
Area per Module, ft^2	775	775
Instantaneous Flow per Module, gpm/mod	13.5	13.5
Backwash Flow per Module, gpm/mod	20	20
Air Scour Flow per Module, scfm/mod	3.5 – 5.0	3.5 – 5.0
Cleaning Flow per Module, gpm/mod	7	7

Module integrity will be verified by a pressure decay test using compressed air. Compressed air will also be used for unit and system pneumatic valves. Design criteria for the compressed air system are provided in **Table 5-5**.

Table 5-5 Compressed Air System Design Criteria

	Phase I	Phase II
Equipment Numbers	CMPR-22010, CMPR-22020	CMPR-22010, CMPR-22020, plus 3 additional units
Configuration	1 operating, 1 standby	4 operating, 1 standby
Type	Oil Free Scroll	Oil Free Scroll
Design Flow each, scfm	20	20
Design Discharge Pressure, psig	112	112
Motor Size, hp	7.5	7.5
Test Air Receiver, gallons	600	200
Control Air Receiver, gallons	200	200

5.2.5.2 MF Backwash System

At periodic intervals, the membrane modules on each unit will go through a backwashing process. Backwash for the modules under consideration include a low pressure compressed air scour of the external hollow fiber as well as reverse flow backwash through the fiber interior. The actual sequence steps are determined by the specific modules installed on the unit. The control system will be configured such that the parameters for backwash are easily reconfigurable to suit different modules in the future. Compressed air used for backwash will be provided by oil-free blowers, while the backwash flow will be provided by centrifugal pumps drawing from the MF

filtrate storage tank. Both components are sized to serve the modules in questions and will be fitted with variable speed drives to allow specific flow settings for the installed modules.

The backwashing process will be initiated automatically by the control system based on the amount of water processed in gallons with a secondary elapsed time of filtration trigger. During backwash the unit will exit filtration mode. Only one unit will be backwashed at a time. Units requesting backwash will be placed in a queue for sequencing. Design criteria for components of the MF backwash system are summarized in **Table 5-6**.

Table 5-6 MF Backwash System Design Criteria

	Phase I	Phase II
Equipment Numbers	P-33010, P-33020	P-33010, P-33020
Configuration	1 operating, 1 standby	1 operating, 1 standby
Pump Type	Horizontal Centrifugal	Horizontal Centrifugal
Pump Capacity, gpm	1,460	1,460
Pump Head, feet	115*	115*
Pump Materials	Standard Fitted	Standard Fitted
Pump Motor, hp	60	60
Pump Drive	Variable Speed	Variable Speed
Blower Type	Oil Free Scroll	Oil Free Scroll
Blower Capacity, scfm	383	383
Blower Discharge Pressure, psig	13	13
Blower Motor, hp	15	15
Blower Drive	Variable Speed*	Variable Speed*

*MF manufacturers may request variations to these requirements.

5.2.5.3 MF Clean in Place (CIP) System

Even with regular backwashing of the membranes, fouling and loss of permeability will occur over time. These materials are removed using the MF clean-in-place (CIP) system. The system will be used for both short duration, maintenance cleaning operations as well as more robust cleaning of the membranes. Cleanings will be conducted with both caustic and acidic cleaning solutions. Each solution type will be made up in a dedicated tank. The system typically employs a common circulation pumping system shared between the two tanks. The solutions will be made up with permeate from the RO system. Chemicals for the caustic solutions will include sodium hydroxide and sodium hypochlorite, while acid solutions will be made up with citric acid.

A caustic chlorine solution will be used for daily maintenance cleans on each unit, with a citric acid solution used once a week. Maintenance cleans will be conducted with the unit off line for roughly 60 minutes. When permeability decreases further without effective removal by the maintenance cleans, a more robust cleaning will be conducted. In this case the cleaning process can take up to four hours. Caustic chlorine solutions will be prepared with both sodium hydroxide and sodium hypochlorite, while the acidic solution is prepared using citric acid, though at a higher concentration. In all cases, cleaning solutions will be heated to improve the efficacy of the cleaning process. Sodium hydroxide and sodium bisulfate will be used for neutralization prior to

discharge to process waste system. Design criteria for the system components are included in **Table 5-7**.

Table 5-7 MF CIP System Design Criteria

	Phase I	Phase II
Equipment Numbers	T-25010, T-25030, P-25110, P-25120	T-25010, T-25030, P-25110, P-25120
No. of Pumps	2	2
Pump Configuration	1 operating, 1 standby	1 operating, 1 standby
Pump Type	Horizontal Centrifugal	Horizontal Centrifugal
Pump Materials	FRP	FRP
Pump Capacity, gpm	500	500
Pump Head, feet	50	50
Pump Motor, hp	15	15
Pump Drive	Variable Speed	Variable Speed
No. of Tanks	2	2
Tank Configuration	2 operating	2 operating
Tank Capacity	3,400	3,400
Tank Materials	FRP	FRP
Tank Heater Size, Kw	72	72

5.2.6 MF Break Tank

The MF break tank will provide intermediate storage between the MF and RO) systems. Storage is required for two primary reasons. First, it helps de-couple operation of the MF and RO systems to a certain degree, limiting the impact of short-term flow transients and mismatches between MF system production and reverse osmosis demand due to unit backwash, integrity testing, and maintenance cleaning activities. The break tank also supplies filtrate for membrane backwashing and reverse flow.

The design basis is for approximately ten minutes of residence time at the Phase II required MF filtrate flow of 8.15 mgd. This results in a minimum net tank volume requirement of 56,600 gallons. Using Phase I MF filtrate flows, the tank will have approximately 40 minutes of residence time. The size of the tank should be confirmed with MF Manufacturers during final design with a minimum of ten minutes of residence time. Preliminary design criteria for the tank are summarized in **Table 5-8**.

Table 5-8 MF Break Tank Design Criteria

	Phase I	Phase II
Equipment Number	TK-31010	TK-31010
Type	Vertical, cylindrical, above grade, welded steel	Vertical, cylindrical, above grade, welded steel
Gross Volume, gallons	73,400	73,400
Diameter, feet	25	25
Height, feet	20	20
Net usable volume, gallons	62,400	62,400
Usable depth, feet	17	17
Approx. Residence Time Provided, min	41	11
Accessories	Ladder, safety cage, tank top walkway, railing	Ladder, safety cage, tank top walkway, railing

5.2.7 RO Transfer Pump Station

The RO transfer pumps will take suction from the MF filtrate tank and provide a continuous, stable flow through the cartridge filters to the vertical turbine RO feed pumps. Listed pump capacities are based on the Phase II RO system feed flow requirements with turndown to achieve the Phase I RO system feed flow requirements. The pumps will be variable speed and will accommodate variations in flows due to variations in production rates. Preliminary design criteria for the RO transfer pumps are listed in **Table 5-9**. The listed operating head is based on allowing up to 15 psig of pressure drop across the cartridge filters and providing at least 20 psig of residual head at the RO feed pump suction.

Table 5-9 RO Transfer Pump Station Design Criteria

	Phase I	Phase II
Primary RO Feed	2.2 MGD, 1,500 gpm	8.1 MGD, 5,590 gpm
Equipment Numbers	PMP-32010, PMP-32020	PMP-32010, PMP-32020, +2 additional pumps
Configuration	1 operating, 1 standby	3 operating, 1 standby
Type	Horizontal Centrifugal, End Suction	Horizontal Centrifugal, End Suction
Rated Capacity, gpm	1,900	1,900
Rated Head, feet	100	100
Minimum Continuous Flow, gpm	1,500	1,900
Materials	Manufacturer's standard all iron with stainless steel or bronze impeller, EPR seals	Manufacturer's standard all iron with stainless steel or bronze impeller, EPR seals
Drive	Variable	Variable
Motor Size, hp	60	60

5.2.8 RO Pretreatment Chemical Injection

Sulfuric acid and threshold inhibitor are added upstream of the primary RO feed pump and secondary RO feed pump to control scaling of the RO membranes. The goal of the chemical addition for primary RO is to depress the pH for the RO feed from approximately 7.4 to 6.9. The goal of the chemical addition for secondary RO is to depress the pH for the RO feed from approximately 7.7 to 7.2. **Table 5-10** summarizes the chemical dose requirements of the RO pretreatment chemical addition. See Section 5.2.13 for chemical facilities design criteria.

Table 5-10 RO Pretreatment Chemical Injection Design Criteria

	Phase I	Phase II
Primary RO Feed	2.2 MGD, 1,500 gpm	8.1 MGD, 5,590 gpm
Chemical	Sulfuric Acid	Sulfuric Acid
Concentration, %	93	93
Avg. Dose, mg/L	14	14
Chemical	Threshold Inhibitor	Threshold Inhibitor
Concentration, %	100	100
Avg. Dose, mg/L	2	2
Secondary RO Feed	0.3 MGD, 220 gpm	1.2 MGD, 840 gpm
Chemical	Sulfuric Acid	Sulfuric Acid
Concentration, %	93	93
Avg. Dose, mg/L	40	40
Chemical	Threshold Inhibitor	Threshold Inhibitor
Concentration, %	100	100
Avg. Dose, mg/L	2	2

5.2.9 Reverse Osmosis System

While RO is used for purification and desalination in water treatment, it also has a long history of being effectively utilized in wastewater treatment processes for removal of a wide array of dissolved constituents. RO has also proven to be effective at removing dissolved organic material, including regulated synthetic organic compounds, volatile organic compounds (VOCs), and unregulated CECs, such as pharmaceutical compounds, personal care products, pesticides, herbicides, and other industrial products. RO is recognized as the best available technology for reducing total dissolved solids (TDS) and most trace organic constituents in wastewater effluent intended for groundwater replenishment.

The primary RO system is sized using the RO model from the Integrated Membranes Solution Design Software (2017) by Hydranautics, Nitto Group Company. The model was run for both Phase I and Phase II flows.

The RO system includes the following components:

- 5 - 10 micron Cartridge filtration;

- Primary RO feed pumps;
- 2nd Stage RO booster pumps;
- Primary RO units (pressure vessel racks, pressure vessels, membrane elements, pipe manifolds, valves, instrumentation);
- Secondary RO feed pumps;
- High-rate recovery RO/Secondary RO units (pressure vessel racks, pressure vessels, membrane elements, pipe manifolds, valves, instrumentation);
- RO flushing system;
- RO clean-in-place (CIP) system;
- Interconnecting piping and valves; and
- Instrumentation and controls.

The main components of the RO system will be sized for Phase I requirements with available space for Phase II equipment. However, common interconnecting pipe manifolds for all RO process streams (feed, permeate, concentrate, flush feed, flush waste, cleaning solution feed/return, etc.) will be sized for Phase II flows and will be provided with appropriate interconnecting and blind flanges for future expansion. Primary components of the system (excluding chemical feed systems, piping, valves, instrumentation and controls) are summarized below.

5.2.9.1 Cartridge Filters

The cartridge filter will consist of a stainless-steel pressure vessel housing a bank of cylindrical wound depth all food grade polypropylene, 5-10 micron pore size filter elements. It is not intended for heavy duty filtration service but will be used to protect the membrane feed pumps and RO membrane elements from unforeseen upsets in the pretreatment system. Estimated replacement rate for filter elements is once every 9 months or sooner if determined that headloss exceeds 5 psi over clean filters. A standby filter will be provided. Filter changes will be coordinated with normal facility maintenance periods. **Table 5-11** provides design criteria for the cartridge filters.

5.2.9.2 Primary RO Feed Pumps

Each primary RO unit will be equipped with a dedicated, duty vertical turbine feed pump. The pump will be sized to deliver the required feed flow at a recovery of 85 percent. Anticipated operating pressures range from an average of 160 psig with a 3-year old membrane up to a maximum of 230 psig (6-year old). Each pump will be equipped with a variable frequency drive to allow maintenance of unit permeate flow as required operating pressures increase and flow differences between Phase I and Phase II. Maximum pump motor speed will be limited to 1800 rpm to minimize pump noise and extend operating life. **Table 5-12** shows the design criteria for the Primary RO feed pumps.

Table 5-11 Cartridge Filters Design Criteria

	Phase I	Phase II
Cartridge Filtration		
Primary RO Feed	2.2 MGD, 1,500 gpm	8.1 MGD, 5,590 gpm
Equipment Numbers	CFT-37010, CFT-37020	CFT-37010, CFT-37020, plus two future filters
Configuration	1 operating, 1 standby	3 operating, 1 standby
Type	Cylindrical wound depth cartridge elements	Cylindrical wound depth cartridge elements
Rated Capacity Each, gpm	3,000	3,000
Max. Loading Rate, gpm/40-inch equivalent	17.0	17.0
Min. Cartridge Filter Size, microns	5 to 10	5 to 10
Materials: ▪ Housing ▪ Cartridge Elements	 Type 316L stainless steel with EPR seals All food grade polypropylene	 Type 316L stainless steel with EPR seals All food grade polypropylene

Table 5-12 Primary RO Feed Pumps Design Criteria

	Phase I	Phase II
Primary RO Feed Pumps		
Primary RO Feed	2.2 MGD, 1,500 gpm	8.1 MGD, 5,590 gpm
Equipment Numbers	PMP-51050	PMP-51050, plus two future pumps
Configuration	1 operating, 0 standby	3 operating, 0 standby
Type	Vertical turbine	Vertical turbine
Capacity @ 1st Operating Point, gpm	1,870	1,870
Head @ 1st Operating Point, feet	508	508
Capacity @ 2nd Operating Point, gpm	1,870	1,870
Head @ 2nd Operating Point, feet	347	347
Materials	Manufacturer's standard all 316 stainless steel; EPR secondary seals; babitted carbon bearings	Manufacturer's standard all 316 stainless steel; EPR secondary seals; babitted carbon bearings
Drive	Adjustable speed	Adjustable speed
Motor Size, hp	350	350

5.2.9.3 2nd Stage RO Booster Pumps

Each primary RO unit will be equipped with a dedicated, 2nd stage booster, horizontal centrifugal end suction pump to boost flow between the 1st and 2nd stage RO membranes. The 2nd stage booster pumps are designed to provide a maximum pressure of 20 psi. Each pump will be equipped with a variable frequency drive to allow maintenance of unit permeate flow as required operating pressures increase and flow differences between Phase I and Phase II. 2nd Stage RO booster pump design criteria are shown in **Table 5-13**.

Table 5-13 2nd Stage RO Booster Pumps Design Criteria

	Phase I	Phase II
2nd Stage RO Booster Pumps		
Primary RO Feed	0.7 MGD, 510 gpm	2.78 MGD, 1,930 gpm
Equipment Numbers	PMP-51230	PMP-51230, plus two future pumps
Configuration	1 operating, 0 standby	3 operating, 0 standby
Type	Horizontal centrifugal, end suction	Horizontal centrifugal, end suction
Capacity, gpm	644	644
Head, feet	46	46
Materials	Manufacturer's standard all 316 stainless steel; EPR secondary seals; babitted carbon bearings	Manufacturer's standard all 316 stainless steel; EPR secondary seals; babitted carbon bearings
Drive	Adjustable speed	Adjustable speed
Motor Size, hp	15	15

5.2.9.4 Primary RO System

A single RO unit will be provided under Phase I of the project, with a nominal permeate capacity of 1.8 mgd. It is anticipated that two additional, duty units will be installed for Phase II of the project each having a nominal permeate capacity of 2.3 mgd. The existing Phase I primary RO unit will be expanded to 2.3 MGD capacity by installing additional vessels. In summary, 1 duty primary RO unit will be installed for Phase I and 3 duty primary RO units will be installed for Phase II.

The unit will be designed to operate continuously without substantial variations in flow during normal operation. Primary RO product water recovery will be at 85 percent for primary RO.

Pressure vessels for each unit will be arranged horizontally in a 36:18 array for Phase I and 44:22 for Phase II, as indicated on the Drawings found in **Appendix G**. 1st stage vessels will be split in half with two main, horizontal headers with each half stacked on top of the other. 2nd stage vessels will be located on top of the 1st stage vessels with one common header. Each vessel will contain seven, 8-inch diameter 40-inch long spiral wound membrane elements, resulting in an average nominal operating flux of roughly 12.1 gallons per square foot per day (gfd). Pressure vessels will be arranged on racks supporting 11 vessels, limiting vessel row height to 6 vessels maximum for both 1st and 2nd stage RO. This will account for total height of 10-feet from finished floor to the top of highest vessel.

RO units feed and concentrate manifolds will be constructed of welded Schedule 10 Type 316L stainless steel pipe and fittings. Horizontal permeate headers collecting permeate from each vessel will be constructed of welded Schedule 10S Type 316L stainless steel pipe. Fittings for grooved connections will be Schedule 40. Main permeate headers as well as other process lines (cleaning feed and return, flush feed, flush waste, permeate dump) will be constructed of Schedule 80 Polyvinyl Chloride (PVC) pipe and fittings. Low pressure unit isolation valves will be Class 150 ethylene propylene diene monomer (EPDM) lined butterfly valves with stainless steel discs and manual or power actuators, as required. Isolation valves in high pressure lines or interconnected to high pressure lines will be Class 300 stainless steel butterfly valves. Concentrate control valves will be cage guided globe type constructed of duplex or super duplex

stainless steel or other appropriate corrosion resistant material. **Table 5-14** includes design criteria for the Primary RO System and preliminary drawing of the Primary RO System can be found in **Figure 5-9**.

Table 5-14 Primary RO System Design Criteria

	Phase I	Phase II
Primary RO System		
Primary RO Feed	2.2 MGD, 1,500 gpm	8.1 MGD, 5,590 gpm
Number of Units	1	3
Permeate Capacity, mgd	1.8	6.8
Recovery, percent	85	85
Pressure Vessels: ▪ Type ▪ Arrangement ▪ Size ▪ Vertical Spacing within unit, inches ▪ Horizontal Spacing between vessels on same header, inches	 FRP, feed/concentrate side port Horizontal To contain (7) seven 40-inch long x 8-inch diameter membrane elements 14 (on center) 12 (on center)	 FRP, feed/concentrate side port Horizontal To contain (7) seven 40-inch long x 8-inch diameter membrane elements 14 (on center) 12 (on center)
Membrane Elements: ▪ Number (per unit) ▪ Element Type ▪ Membrane Type ▪ Element Length, inches ▪ Element Diameter, inches ▪ Min. Surface Area, square feet ▪ Average Flux at Rated Capacity, gfd	 ▪ 378 ▪ Spiral wound ▪ High rejection, polyamide composite ▪ 40 ▪ 8 ▪ 400 ▪ 12.1	 ▪ 462 ▪ Spiral wound ▪ High rejection, polyamide composite ▪ 40 ▪ 8 ▪ 400 ▪ 12.4
Pressure Vessel Racks: ▪ Number (per unit) ▪ Type ▪ Materials ▪ Size	 36 (Stage 1) 18 (Stage 2) T-style frames Welded steel To support 6 vessels high by 11 wide (Stage 1 and 2) and associated horizontal pipe headers	 44 (Stage 1) 22 (Stage 2) T-style frames Welded steel To support 6 vessels high by 11 wide (Stage 1 and 2) and associated horizontal pipe headers

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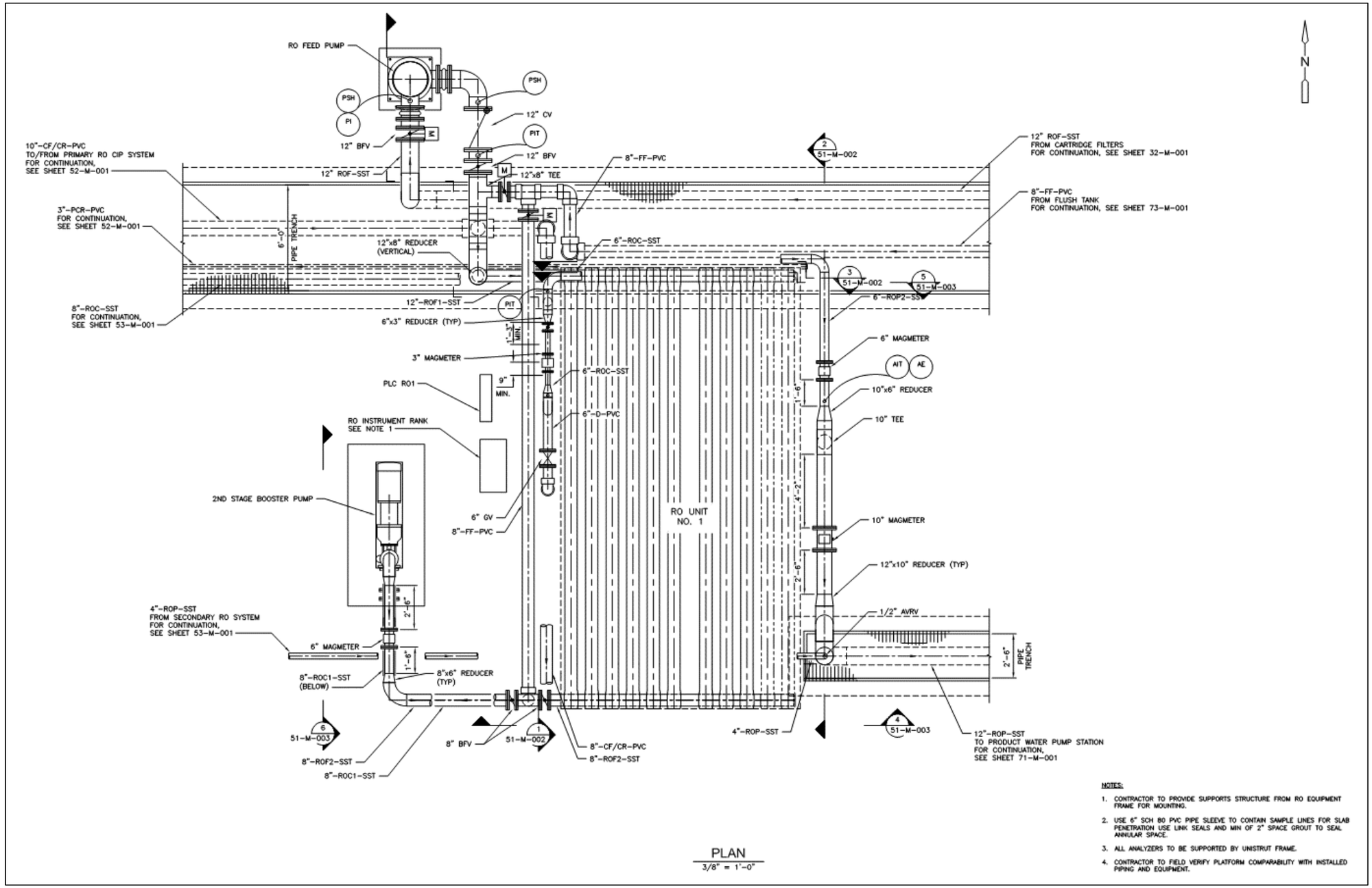

Figure 5-9 Primary RO System

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5.2.9.5 Secondary RO Feed Pumps

Each secondary RO unit will be equipped with a dedicated, duty vertical turbine feed pump. The pump will be sized to deliver the required Phase I feed flow at a recovery of 52 percent. A new pump will need to be installed for the Phase II feed flow. Anticipated operating pressures range from an average of 180 psig with a 3-year old membrane up to a maximum of 240 psig (6-year old). Each pump will be equipped with a variable frequency drive to allow maintenance of unit permeate flow as required operating pressures increase and flow differences between Phase I and Phase II. Maximum pump motor speed will be limited to 1800 rpm to minimize pump noise and extend operating life. Secondary RO feed pump design criteria are shown in **Table 5-15**.

Table 5-15 Secondary RO Feed Pumps Design Criteria

	Phase I	Phase II
Secondary RO Feed Pumps		
Secondary RO Feed	0.3 MGD, 220 gpm	1.2 MGD, 840 gpm
Equipment Numbers	PMP-53030	PMP-53030, plus two future pumps
Configuration	1 operating, 0 standby	3 operating, 0 standby
Type	Vertical turbine	Vertical turbine
Capacity @ 1st Operating Point, gpm	224	419
Head @ 1st Operating Point, feet	92	92
Capacity @ 2nd Operating Point, gpm	224	419
Head @ 2nd Operating Point, feet	140	140
Materials	Manufacturer's standard all 316 stainless steel; EPR secondary seals; babitted carbon bearings	Manufacturer's standard all 316 stainless steel; EPR secondary seals; babitted carbon bearings
Drive	Variable speed	Variable speed
Motor Size, hp	15	25

5.2.9.6 High-Rate Recovery RO (HRRO)/Secondary RO

A single RO unit will be provided under Phase I of the project, with a nominal permeate capacity of 0.2 mgd. The Phase I unit will be split into a duty and standby vessels. It is anticipated that two additional units will be installed for Phase II of the project each having a nominal permeate capacity of 0.4 mgd. The existing Phase I primary RO unit will be expanded to 0.4 MGD capacity by operating the duty and standby halves together. In summary, 1 secondary RO unit split into duty and standby will be installed for Phase I and 2 duty, 1 standby primary RO units will be installed for Phase II.

The unit will be designed to operate continuously without substantial variations in flow during normal operation. Product water recovery for the unit will be held constant at 52 percent for secondary RO based on pilot testing conducted at Vander Lans.

10 pressure vessels for each unit will be arranged in two vertical columns, 5 vessels high for Phase I (duty and standby) and Phase II (duty only) th2 20 pressure vessels will be arranged in four columns five pressure vessels high, as indicated on the Drawings found in **Appendix G**. Each vessel will contain four, 8-inch diameter 40-inch long spiral wound membrane elements, resulting in an average nominal operating flux of roughly 10.6 gfd. The four element vessels will

run in series with the ability to add cleaning solution in between the 10-vessel array allowing for equal cleaning of all vessels. Pressure vessels will be arranged on racks supporting 4 vessels, limiting vessel row height to 5 vessels maximum for both 1st and 2nd stage RO. This will account for total height of 6-feet from finished floor to the top of highest vessel.

RO units feed and concentrate manifolds will be constructed of welded Schedule 10 Type 316L stainless steel pipe and fittings. Horizontal permeate headers collecting permeate from each vessel will be constructed of welded Schedule 10S Type 316L stainless steel pipe. Fittings for grooved connections will be Schedule 40. Main permeate headers as well as other process lines (cleaning feed and return, flush feed, flush waste, permeate dump) will be constructed of Schedule 80 PVC pipe and fittings. Low pressure unit isolation valves will be Class 150 EPDM lined butterfly valves with stainless steel discs and manual or power actuators, as required. Isolation valves in high pressure lines or interconnected to high pressure lines will be Class 300 stainless steel butterfly valves. Concentrate control valves will be cage guided globe type constructed of appropriate corrosion resistant materials. See **Table 5-16** for Secondary RO design criteria and the Secondary RO system of the can be found in **Figure 5-10**.

Table 5-16 Secondary RO System Design Criteria

	Phase I	Phase II
Secondary RO System		
Secondary RO Feed	0.3 MGD, 220 gpm	1.2 MGD, 840 gpm
Number of Units	1 (plus 1 standby)	2 (plus 1 standby)
Permeate Capacity, mgd	0.2	0.6
Recovery, percent	52	52
Pressure Vessels: ▪ Type ▪ Arrangement ▪ Size ▪ Vertical Spacing In Racks, inches ▪ Horizontal Spacing within Unit, inches	 FRP, feed/concentrate side port Vertical To contain (4) four 40-inch long x 8-inch diameter membrane elements 12 (on center) 17 (on center)	 FRP, feed/concentrate side port Vertical To contain (4) four 40-inch long x 8-inch diameter membrane elements 12 (on center) 17 (on center)
Membrane Elements: ▪ Number (per unit) ▪ Element Type ▪ Membrane Type ▪ Element Length, inches ▪ Element Diameter, inches ▪ Min. Surface Area, square feet ▪ Average Flux at Rated Capacity, gfd	 80 (half are standby) Spiral wound High rejection, polyamide composite 40 8 400 10.6	 80 Spiral wound High rejection, polyamide composite 40 8 400 9.8
Pressure Vessel Racks: ▪ Number (per unit) ▪ Type ▪ Materials ▪ Size	 20 T-style frames Welded steel To support 5 vessels high by 4 wide (Duty and Standby) and associated vertical pipe headers	 20 T-style frames Welded steel To support 5 vessels high by 4 wide and associated vertical pipe headers

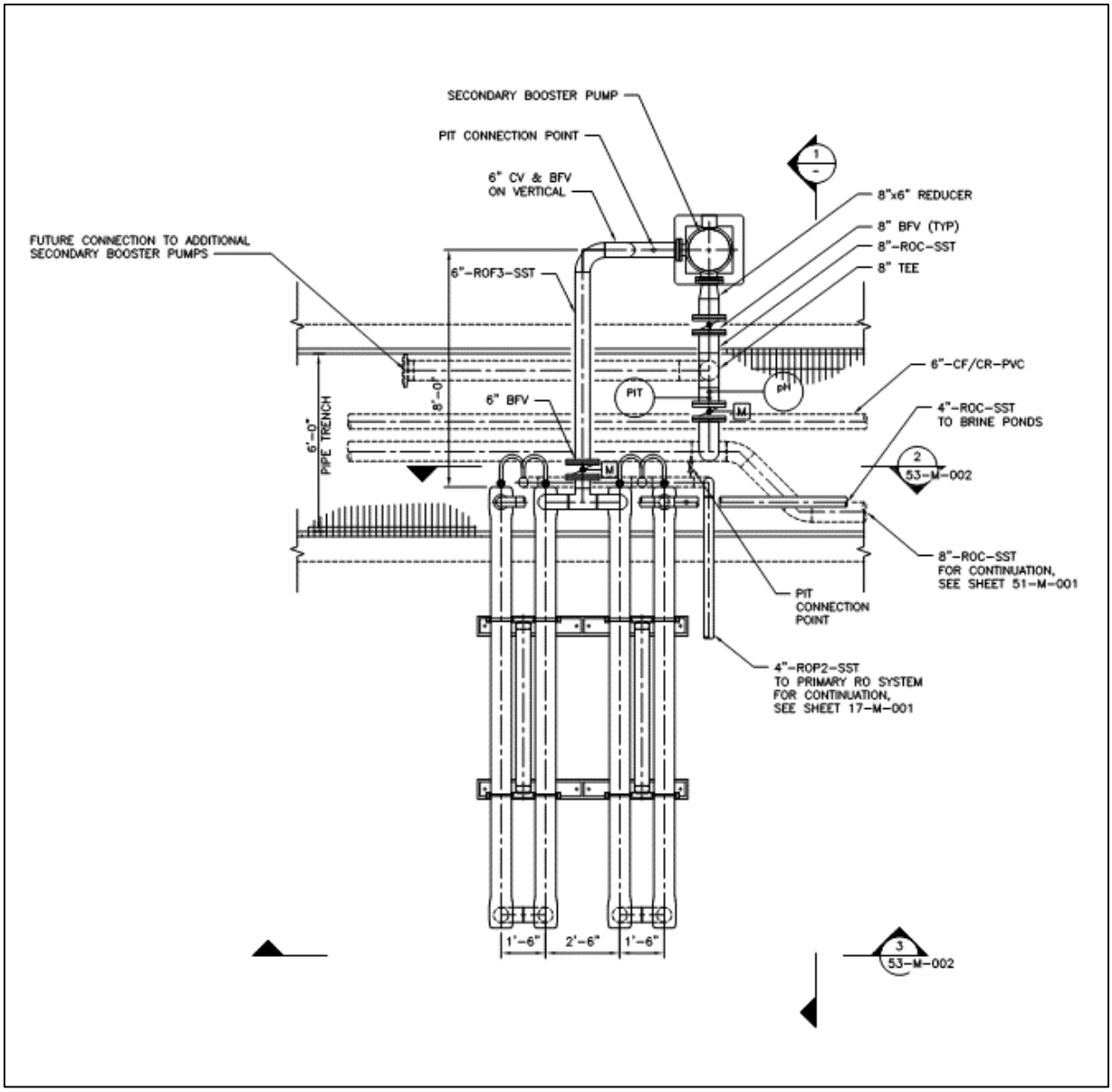

Figure 5-10 Secondary RO System

5.2.9.7 RO CIP System

A permanently piped CIP system will be provided for both the primary and secondary RO system to allow cleaning of the RO membranes in-situ. Each CIP system will consist of two tanks, two CIP pumps, interconnecting piping, valves, instrumentation, and controls. The primary CIP systems will be designed for manual operation by an operator. The secondary CIP systems will be designed for manual operation by an operator or automatic operation.

Cleanings will be conducted with both caustic and acidic cleaning solutions. Each solution type will be made up in a dedicated tank. The solutions will be made up with permeate from the RO system. Chemicals for the caustic solutions will include sodium hydroxide, while acid solutions

will be made up with citric acid. Cleaning solutions will be heated to improve the efficacy of the cleaning process. CIP tanks can be utilized to neutralize CIP waste and rinse water. Neutralization chemicals will include either sodium hydroxide or citric acid, depending on whether the solution is basic or acidic. Spare tank can be utilized to batch other cleaning chemical.

Because of the size of the primary RO unit, the first stage is cleaned in two equal parts. Therefore, the primary RO CIP system is sized based on cleaning up to 22 pressure vessels (Stage 2, Phase II) at a time. CIP tanks are sized to accommodate one pressure vessel volumes (22 pressure vessels) and two rinse volume. Calculations were based on 18.7 gallons per element (or 2 flushes) plus a twenty percent safety factor for the volume connection piping.

The secondary RO CIP system will be sized to clean up to 20 pressure vessels with 4 elements. CIP tanks are sized to accommodate one pressure vessel volumes (20 pressure vessels) and two rinse volume. Calculations were based on 18.7 gallons per element (or 2 flushes) plus a twenty percent safety factor for the volume connection piping.

Each tank will be fitted with flanged immersion heaters and access platform. The cleaning pump will be used to recirculate the tank contents for mixing and feed to/from the vessels in the unit being cleaned. Estimated cleaning frequency for the primary RO unit is once to twice per year and for the secondary RO unit is once per month.

A CIP process will follow these general steps:

- Isolate one stage or portion of a stage of an RO unit;
- Fill the appropriate CIP tank to desired level with permeate;
- Mix the appropriate chemical in the appropriate CIP tank;
- Heat up the CIP solution to the desired temperature while re-circulating back to the CIP tank;
- Switch the valves to re-circulate through the membrane pressure vessels for the appropriate time;
- Adjust the return flow with the flow control valve;
- Flush RO unit once or twice, as required, with RO permeate;
- Neutralize the CIP waste and one or two flush volumes in the CIP tank;
- Pump the neutralized CIP solution to the waste system; and
- Sequence to the next unit section or the next cleaning chemical utilizing the second preheated CIP tank.

Design criteria for the main components of the CIP system are in **Table 5-17**.

Table 5-17 CIP Systems Design Criteria

	Phase I	Phase II
Clean-in-Place (CIP) Systems		
Primary RO CIP System		
Equipment Numbers: ▪ RO CIP Tanks and Control Panels ▪ RO CIP Pump	TNK-52000, TNK-52100 PMP-52110, PMP-52120	TNK-52000, TNK-52100 PMP-52110, PMP-52120
CIP Tanks:		
Number	1 operating, 1 standby	1 operating, 1 standby
Type	FRP, vertical, cylindrical, sloped bottom, flat top	FRP, vertical, cylindrical, sloped bottom, flat top
Gross Volume, gallons	6,000	6,000
Diameter, feet	9	9
Side Height, feet	12	12
Net usable volume, gallons	5,200	5,200
Accessories	Top access platform, access hatch, internal pipe returns, siphon outlet	Top access platform, access hatch, internal pipe returns, siphon outlet
RO CIP Tank Heaters:		
Number	4 (2 per tank)	4 (2 per tank)
Type	Flanged immersion	Flanged immersion
Size, kW	175	175
Enclosure	Contains heater contactors & controls; control power transformer NEMA 4X stainless steel	Contains heater contactors & controls; control power transformer NEMA 4X stainless steel
RO CIP Pump:		
Number	1 operating, 1 standby	1 operating, 1 standby
Type	Horizontal end suction centrifugal, ANSI process	Horizontal end suction centrifugal, ANSI process
Rated Capacity, gpm	880	880
Rated Capacity, feet	160	160
Materials	Manufacturer's standard all 316 stainless steel with EPR elastomers	Manufacturer's standard all 316 stainless steel with EPR elastomers
Drive	Variable speed	Variable speed
Motor Size, hp	50	50
Secondary RO CIP System		
Equipment Numbers: ▪ RO CIP Tanks and Control Panels ▪ RO CIP Pump	TNK-54000, TNK-54100 PMP-54110, PMP-54120	TNK-54000, TNK-54100 PMP-54110, PMP-54120
CIP Tanks:		
Number	1 operating, 1 standby	1 operating, 1 standby
Type	FRP, vertical, cylindrical, sloped bottom, flat top	FRP, vertical, cylindrical, sloped bottom, flat top
Gross Volume, gallons	3,200	3,200
Diameter, feet	7	7

Table 5-17 CIP Systems Design Criteria

	Phase I	Phase II
Side Height, feet	10	10
Net usable volume, gallons	2,700	2,700
Accessories	Top access platform, access hatch, internal pipe returns, siphon outlet	Top access platform, access hatch, internal pipe returns, siphon outlet
RO CIP Tank Heaters:		
Number	4 (2 per tank)	4 (2 per tank)
Type	Flanged immersion	Flanged immersion
Size, kW	175	175
Enclosure	Contains heater contactors & controls; control power transformer NEMA 4X stainless steel	Contains heater contactors & controls; control power transformer NEMA 4X stainless steel
RO CIP Pump:		
Number	1 operating, 1 standby	1 operating, 1 standby
Type	Horizontal end suction centrifugal, ANSI process	Horizontal end suction centrifugal, ANSI process
Rated Capacity, gpm	400	400
Rated Capacity, feet	116	116
Materials	Manufacturer's standard all 316 stainless steel with EPR elastomers	Manufacturer's standard all 316 stainless steel with EPR elastomers
Drive	Variable speed	Variable speed
Motor Size, hp	20	20

5.2.9.8 RO Flushing System

The RO Flush System will be utilized for 3 main operations:

1. Flushing individual units following a CIP cycle.
2. Flushing individual units prior to shutdown, as necessary.
3. Flushing all units online during an emergency shutdown. The flush tank will be sized to store only enough RO permeate to flush the 2nd stage and Secondary RO units (e.g. 3rd Stage RO vessels). If shutdown exceeds 1 week, the 1st Stage RO system will require flushing utilizing potable water supply treated with sodium bisulfite.

For sizing of the RO Flush Tank, the 3rd condition requires the greatest volume as it accounts for all 3 units.

Upon shutdown of the RO Units, flushing is required to remove concentrated inorganic compounds from the feedwater side if the membranes, this reduces the potential for precipitation of concentrated salts and minerals on the surface of the membrane elements while also reducing the possibility of biological growth in the membrane element. RO permeate will be stored near the discharge of the facility for RO unit flushing operations. The tank will be sized to allow emergency flushing of 3 RO units. A reduced flush tank scenario is proposed that will provide a smaller footprint and savings in the capital cost of the tank. Instead of providing a flush tank large enough to flush all the units and all the stages in an emergency shutdown situation it has been

determined that a flush tank sized to accommodate only flushing Stage 2 and Stage 3. A reduced flush scenario is accomplished by adding an additional valve to the feed piping of Stage 2 fed from the flush pumps. One of the risks associated with the smaller flush tank is if the RO units were to shut down unexpectedly for more than one week. This scenario would require subsequent flushing of the first stage on each unit. Without the extra RO permeate storage, the flush tank would need to be filled with potable water that would require sodium bisulfite to dechlorinate the water before flushing the membranes. It is expected that in most cases the plant would be able to resume operations of at least one unit within 24 hours of an unexpected shutdown and be able to perform a normal flush. In an extended and unexpected shutdown situation, flushing of the first stage would also require the use of potable water to fill the flush tank if the operation of one unit could not be restored within a week.

The RO Flush Pumps will be utilized following RO unit shut down or cleaning operations. The pumps will be horizontal centrifugal installed at grade with a common manifold configuration. They will provide enough head to force RO permeate through the RO units to the waste system. There will be two flush valves on each membrane unit. The first flush valve will allow flushing of the whole unit under normal operating conditions and the second flush valve will allow emergency flushing of stage 2 and stage 3 only. The Flush Pump will be activated for 15 to 30 minutes or until approximately twice the RO unit volume is attained. During the flush sequences the RO permeate dump valve, RO concentrate flush valve and concentrate dump valve are opened. The RO permeate and RO concentrate valves dump to the RO waste system. Nominally 40 to 60 psi is sufficient to achieve the desired flow. The flush pumps will be sized for Phase II RO unit requirements with the ability to turndown to achieve Phase I unit requirements. The flush pump and flush tank data is provided in **Table 5-18**.

The normal flush sequence will be used during the removal of a membrane unit from service. The emergency flush sequence will be used during a power failure where all units are taken out of service. During a power failure the permeate dump valve, concentrate dump valve and flush pumps will be powered by emergency power. The flush pumps will be controlled by the PLC. The SCADA system will have separate normal and emergency flush flow modes and monitor the totalized permeate and concentrate flow for each unit during the flush sequence. Upon completing the flush sequence for one unit the PLC will sequence to the next unit requiring a flush. Flushing will continue until all units in the queue are completed.

5.2.10 UV System (Future)

The UV disinfection system is currently not proposed for Phase I design. The UV system has been included on the site layout and in the electrical design, in case future system is required.

Table 5-18 RO Flushing System Design Criteria

	Phase I	Phase II
RO Flush System		
Normal Flush volume, gallons per unit	7,800	10,100
Emergency flush volume, gallons per unit	9,300	13,100
Flush Pumps:		
Equipment Number	PMP-73110, PMP-73120	PMP-73110, PMP-73120
Number	1 operating, 1 standby	1 operating, 1 standby
Type	Horizontal end suction centrifugal, ANSI process	Horizontal end suction centrifugal, ANSI process
Rated Capacity, gpm	680	680
Rated Head, feet	140	140
Materials	Manufacturer's standard all 316 stainless steel with EPR elastomers	Manufacturer's standard all 316 stainless steel with EPR elastomers
Drive	Constant speed	Constant speed
Motor Size, hp	30	30
Flush Tank:		
Equipment Number	TNK-73010	TNK-73010
Type	FRP, vertical, cylindrical, above grade	FRP, vertical, cylindrical, above grade
Quantity	1	1
Material	FRP	FRP
Gross Volume, gallons	15,100	15,100
Diameter, feet	12	12
Height, feet	18	18
Net usable volume, gallons	13,100	13,100
Accessories	Ladder, safety cage, tank top walkway, railing	Ladder, safety cage, tank top walkway, railing
Flush Transfer Pumps:		
Equipment Number	PMP-73010, PMP-73020	PMP-73010, PMP-73020
Number	1 operating, 1 standby	1 operating, 1 standby
Type	Horizontal end suction centrifugal, ANSI process	Horizontal end suction centrifugal, ANSI process
Rated Capacity, gpm	150	150
Rated Head, feet	16	16
Materials	Manufacturer's standard all 316 stainless steel with EPR elastomers	Manufacturer's standard all 316 stainless steel with EPR elastomers
Drive	Constant speed	Constant speed
Motor Size, hp	1.5	1.5

5.2.11 Post Treatment Chemical Injection

Caustic soda and/or calcium chloride are added upstream of the product water pump station to stabilize RO permeate and protect surfaces. The dose of caustic soda and calcium chloride is dependent on the percent of T22 water that will be blended with the RO permeate. With the blending of 10 percent T22 water flow, calcium chloride addition is no longer required. Caustic soda is still required for all blending scenarios for pH adjustment. The chemical systems are designed to assume maximum dose for both caustic soda and calcium chloride. **Figure 5-11** provides the stabilization graph showing chemical requirements varying with percentage of T22 water contribution for stabilization.

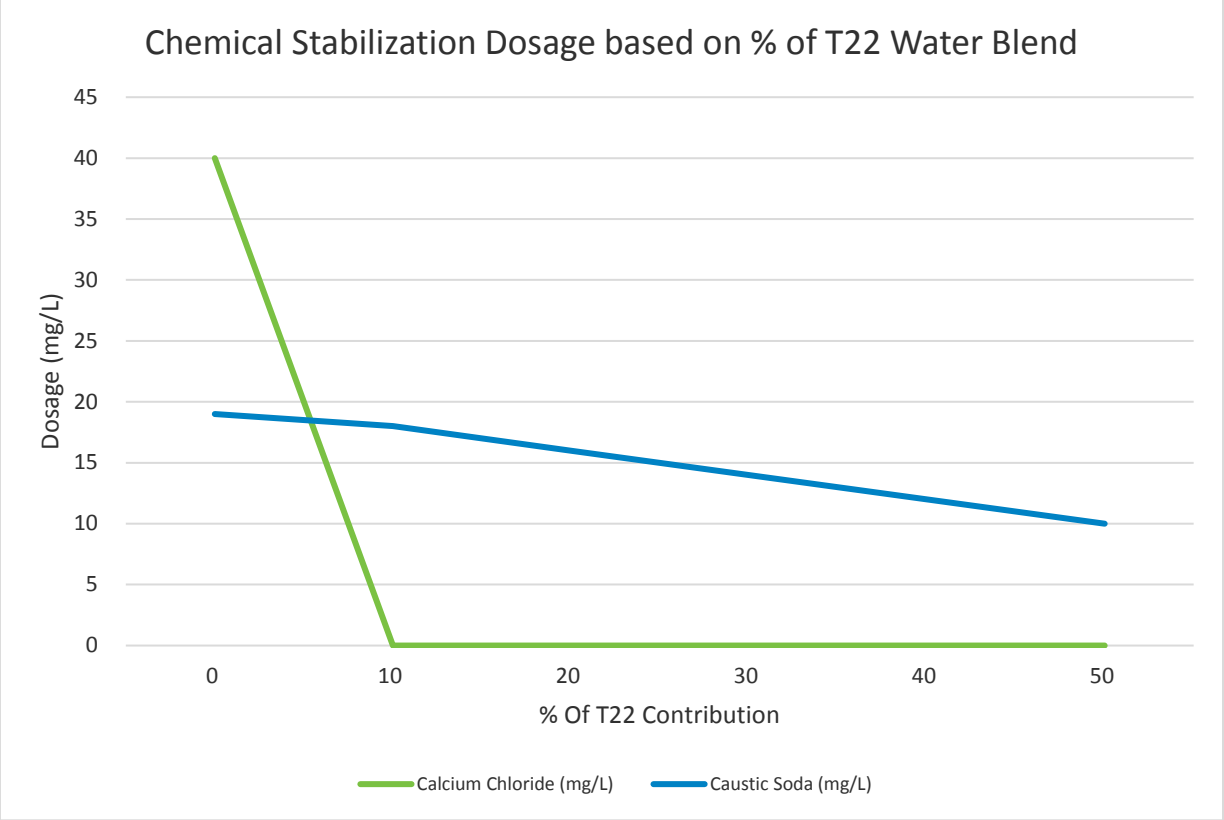

Figure 5-11 Chemical Stabilization Dosage based on % of T22 Water Blend

Table 5-19 summarizes the chemical dose requirements of the RO pretreatment chemical addition. See Section 5.2.13 for chemical facilities design criteria.

Table 5-19 RO Pretreatment Chemical Injection Design Criteria

	Phase I	Phase II
AWPF Product Water	2.0 MGD, 1,390 gpm	7.5 MGD, 5,190 gpm
Chemical	Calcium Chloride	Calcium Chloride
Concentration, %	35	35
Avg. Dose, mg/L	20	20
Chemical	Sodium Hydroxide	Sodium Hydroxide
Concentration, %	25	25
Avg. Dose, mg/L	14	14

5.2.12 Product Water Pump Station

Preliminary design criteria for components of the product water pump station for the AWPF are summarized in **Table 5-20**. The product water pump station will take suction from the RO system or the UV system, depending on future requirements. The pressure required to provide a continuous, stable flow to the Mountain Ave Ponds for recharge is approximately 100 psi.

Table 5-20 Product Water Pump Station Design Criteria

	Phase I	Phase II
AWPF Product Water	2.0 MGD, 1,390 gpm	7.5 MGD, 5,190 gpm
Equipment Numbers	PMP-71010, PMP-71020	PMP-71010, PMP-71020, +2 additional pumps
Configuration	1 operating, 1 standby	3 operating, 1 standby
Type	Vertical Turbine	Vertical Turbine
Rated Capacity, gpm	1,730	1,730
Rated Head, feet	225	235
Minimum Continuous Flow, gpm	1,380	1,730
Materials	Manufacturer's standard all 316 stainless steel with EPR elastomers	Manufacturer's standard all 316 stainless steel with EPR elastomers
Drive	Variable	Variable
Motor Size, hp	130	130
Wet Well Width, ft	12	24
Wet Well Length, ft	24	24
Min Wet Well Depth per HI 9.8 Standards, ft	4	4
Design Depth w/ 2-ft of headboard, ft	7	7

Listed pump capacities are based on the Phase II AWPF feed flow requirements with turndown to achieve the Phase I flow requirements. The pumps will be variable speed and will accommodate variations in flow and distribution pressure requirements.

The product water wet well will be built for Phase I flows only. The wet well will be expanded for Phase II flows, in the future. Due to the pumps being on variable speed drives, the wet well will

provide approximately 4 minutes of storage Phase II flows and approximately 8 minutes of storage for Phase I flows.

5.2.13 Chemical Storage and Feed Systems

Chemicals proposed for the AWPF include the following:

- Sodium Bisulfite;
- Ammonium Sulfate;
- Sodium Hypochlorite;
- Sulfuric Acid;
- Threshold Inhibitor;
- Sodium Hydroxide;
- Calcium Chloride;
- Citric Acid; and
- Hydrogen Peroxide (future).

The following **Table 5-21** provides a summary of all chemical and their relative injection location. The preliminary drawing of the overall chemical system can be found in **Figure 5-12**.

For all systems, metering components (pumps and accessories) will be installed for the Phase II plant requirements. Chemical systems will be designed to allow for flushing of the chemical feed lines for maintenance. Most of systems will include one (1) storage tank sized to provide a minimum 30 days storage at Phase I plant requirements. An additional storage tank will be provided for Phase II plant requirements. Metering pumps are proposed to be located indoors with this the AWPF building. The tanks are proposed to be located outdoors. Containment areas are sized to contain one (1) bulk storage tank plus 24-hour, 25-year storm rainfall event. Individual systems are discussed separately below.

Table 5-21 Chemical Use and Injection Points Summary

Chemical	Use	Injection Location
Sodium Bisulfite	Free Chlorine Removal	Upstream of MF
Ammonium Sulfate	MF Pretreatment	Upstream of MF
Sodium Hypochlorite	MF Pretreatment	Upstream of Primary MF
	MF CIP	MF CIP System
Sulfuric Acid	RO Pretreatment for Scale Control	1st and 2nd Stage RO Feed, 3rd Stage RO Feed
Threshold Inhibitor (Antiscalant)	RO Pretreatment for Scale Control	1st and 2nd Stage RO Feed, 3rd Stage RO Feed
Sodium Hydroxide (Caustic Soda)	Treated Water Stabilization	Upstream of Product Water Pump Station
	MF CIP and CIP Waste Neutralization	MF CIP System
	RO CIP and CIP Waste Neutralization	1st and 2nd Stage RO CIP system, 3rd Stage RO CIP System
Calcium Chloride	Treated Water Stabilization	Upstream of Product Water Pump Station
Hydrogen Peroxide (future)	Advanced Oxidation with UV	UV/AOP Influent
Citric Acid	MF CIP and CIP Waste Neutralization	MF CIP System
	RO CIP and CIP Waste Neutralization	1st and 2nd Stage RO CIP system, 3rd Stage RO CIP System

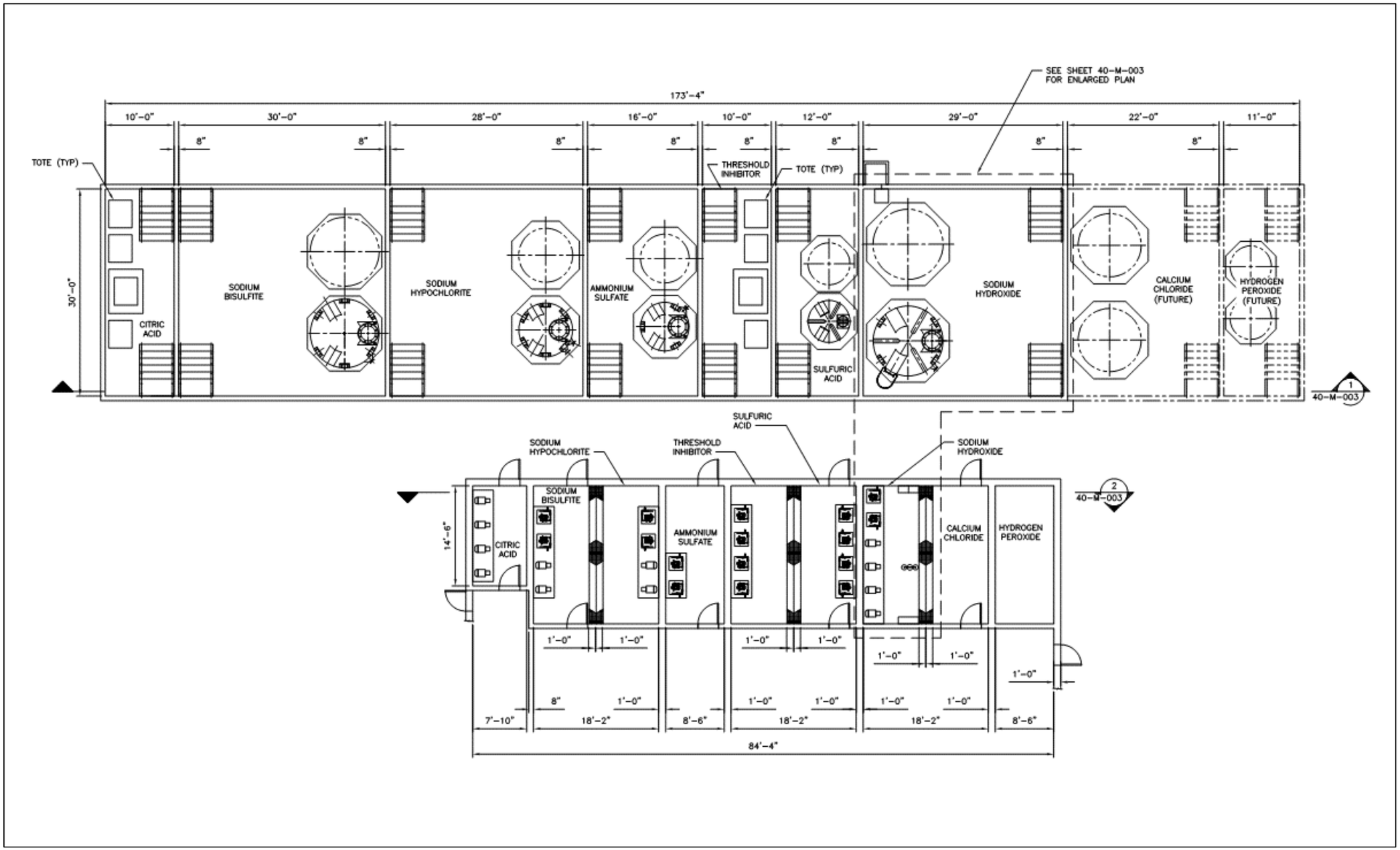

Figure 5-12 Chemical Systems

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5.2.13.1 Sodium Hypochlorite

Table 5-22 summarizes the design of the sodium hypochlorite storage and feed system.

Table 5-22 Sodium Hypochlorite Storage and Feed System Design Criteria

Design Criteria	Phase I	Phase II
Chemical Characteristics		
Chemical	Sodium Hypochlorite	Sodium Hypochlorite
Concentration, % by weight, %	12.5%	12.5%
Specific Gravity	1.2	1.2
Feed Requirements		
MF Feed		
Dose, mg/L	Min: 4.0 mg/L Avg: 5.0 mg/L Max: 6.0 mg/L	Min: 4.0 mg/L Avg: 5.0 mg/L Max: 6.0 mg/L
Flow, mgd	2.3 mgd	8.6 mgd
Feed Rate, gph	Min: 2.9 gph Avg: 3.6 gph Max: 4.4 gph	Min: 10.8 gph Avg: 13.5 gph Max: 16.3 gph
MF CIP		
Final Solution Strength (mg/L)	300 mg/L	300 mg/L
Storage		
Bulk Storage		
Equipment Numbers	TNK-41020	TNK-41020, plus future tank
No. of Units	1 Duty, 0 Standby	2 Duty, 0 Standby
Type	XLPE w/ HDPE Liner or FRP	XLPE w/ HDPE Liner or FRP
Capacity, Each, gallons	6,100	6,100
Dimensions, D'xH'	10' x 12.5'	10' x 12.5'
Metering Pumps		
MF Feed		
Equipment Numbers	PMP-41110, PMP-41120	PMP-41110, PMP-41120
No. of Units	1 Duty, 1 Standby	1 Duty, 1 Standby
Type	Hydraulic Actuated Diaphragm	Hydraulic Actuated Diaphragm
Capacity, Each, gph	19 gph	19 gph
Motor Size, Each, hp	1/2 hp min.	1/2 hp min.
Drive	Adjustable speed	Adjustable speed
Materials	PVC head; Teflon diaphragm; Ceramic ball check valves	PVC head; Teflon diaphragm; Ceramic ball check valves
Transfer Pumps		
MF CIP		
Equipment Numbers	PMP-41250, PMP-41260	PMP-41250, PMP-41260
No. of Units	1 Duty, 1 Standby	1 Duty, 1 Standby
Type	Mechanically Actuated Diaphragm	Mechanically Actuated Diaphragm
Capacity, Each, gph	7 – 70 gph	7 – 70 gph
Motor Size, Each, hp	1/2 hp min.	1/2 hp min.
Drive	Adjustable speed	Adjustable speed
Materials	PVC head; Teflon diaphragm; Ceramic ball check valves	PVC head; Teflon diaphragm; Ceramic ball check valves

5.2.13.2 Sodium Bisulfite

Table 5-23 summarizes the design of the sodium bisulfite storage and feed system.

Table 5-23 Sodium Bisulfite Storage and Feed System Design Criteria

Design Criteria	Phase I	Phase II
Chemical Characteristics		
Chemical	Sodium Bisulfite	Sodium Bisulfite
Concentration, % by weight, %	25%	25%
Specific Gravity	1.33	1.33
Feed Requirements		
MF Feed	Assume 4.5 mg/L free chlorine	
Dose, mg/L	Min: 0 mg/L Avg: 14.6 mg/L Max: 29.2 mg/L	Min: 0 mg/L Avg: 14.6 mg/L Max: 29.2 mg/L
Flow, mgd	2.3 mgd	8.6 mgd
Feed Rate, gph	Min: 0 gph Avg: 4.3 gph Max: 8.6 gph	Min: 0 gph Avg: 16 gph Max: 32 gph
Feed Requirements		
MF CIP Neutralization		
Final Solution Strength (% by weight)	2%	2%
Storage		
Bulk Storage		
Equipment Numbers	TNK-45020	TNK-45020, plus future tank
No. of Units	1 Duty, 0 Standby	2 Duty, 0 Standby
Type	XLPE	XLPE
Capacity, Each, gallons	8,500	8,500
Dimensions, D'xH'	10' x 16.8'	10' x 16.8'
Metering Pumps		
MF Feed		
Equipment Numbers	PMP-45110, PMP-45120	PMP-45110, PMP-45120
No. of Units	1 Duty, 1 Standby	1 Duty, 1 Standby
Type	Hydraulic Actuated Diaphragm	Hydraulic Actuated Diaphragm
Capacity, Each, gph	36 gph	36 gph
Motor Size, Each, hp	1/2 hp min.	1/2 hp min.
Drive	Adjustable speed	Adjustable speed
Materials	PVC head; Teflon diaphragm; Ceramic ball check valves	PVC head; Teflon diaphragm; Ceramic ball check valves
Transfer Pumps		
MF CIP Neutralization		
Equipment Numbers	PMP-45150, PMP-45170	PMP-45150, PMP-45170
No. of Units	1 Duty, 1 Standby	1 Duty, 1 Standby
Type	Mechanically Actuated Diaphragm	Mechanically Actuated Diaphragm
Capacity, Each, gph	TBD by MFSS	TBD by MFSS
Motor Size, Each, hp	1/2 hp min.	1/2 hp min.
Drive	Adjustable speed	Adjustable speed

5.2.13.3 Ammonium Sulfate

Table 5-24 summarizes the design of the ammonium sulfate storage and feed system.

Table 5-24 Ammonium Sulfate Storage and Feed System Design Criteria

Design Criteria	Phase I	Phase II
Chemical Characteristics		
Chemical	Ammonium Sulfate	Ammonium Sulfate
Concentration, % by weight, %	40%	40%
Specific Gravity	1.2	1.2
Feed Requirements		
MF Feed	Assume 5 mg/L free chlorine feed	
Dose, mg/L	Min: 1.0 mg/L Avg: 1.25 mg/L Max: 1.5 mg/L	Min: 1.0 mg/L Avg: 1.25 mg/L Max: 1.5 mg/L
Flow, mgd	2.3 mgd	8.6 mgd
Feed Rate, gph	Min: 0.8 gph Avg: 1.0 gph Max: 1.2 gph	Min: 3.5 gph Avg: 4.4 gph Max: 5.2 gph
Storage		
Bulk Storage		
Equipment Numbers	TNK-49020	TNK-49020, plus future tank
No. of Units	1 Duty, 0 Standby	2 Duty, 0 Standby
Type	XLPE	XLPE
Capacity, Each, gallons	2,000	2,000
Dimensions, D'xH'	7.1' x 8.5'	7.1' x 8.5'
Metering Pumps		
MF Feed		
Equipment Numbers	PMP-49110, PMP-49120	PMP-49110, PMP-49120
No. of Units	1 Duty, 1 Standby	1 Duty, 1 Standby
Type	Hydraulic Actuated Diaphragm	Hydraulic Actuated Diaphragm
Capacity, Each, gph	6 gph	6 gph
Motor Size, Each, hp	1/2 hp min.	1/2 hp min.
Drive	Adjustable speed	Adjustable speed
Materials	PVC head; Teflon diaphragm; Ceramic ball check valves	PVC head; Teflon diaphragm; Ceramic ball check valves

5.2.13.4 Sulfuric Acid

Table 5-25 summarizes the design of the sulfuric acid storage and feed system.

Table 5-25 Sulfuric Acid Storage and Feed System Design Criteria

Design Criteria	Phase I	Phase II
Chemical Characteristics		
Chemical	Sulfuric Acid	Sulfuric Acid
Concentration, % by weight, %	93%	93%
Specific Gravity	1.83	1.83
Feed Requirements		

Table 5-25 Sulfuric Acid Storage and Feed System Design Criteria

Design Criteria	Phase I	Phase II
Primary RO Feed	Assumed feedwater pH and Target pH	
Dose, mg/L	Min: 10 mg/L Avg: 14 mg/L Max: 20 mg/L	Min: 10 mg/L Avg: 14 mg/L Max: 20 mg/L
Flow, mgd	2.2 mgd	8.1 mgd
Feed Rate, gph	Min: 0.5 gph Avg: 0.7 gph Max: 1.1 gph	Min: 2.0 gph Avg: 2.8 gph Max: 3.9 gph
Secondary RO Feed		
Dose, mg/L	Min: 30 mg/L Avg: 40 mg/L Max: 60 mg/L	Min: 30 mg/L Avg: 40 mg/L Max: 60 mg/L
Flow, mgd	0.3 mgd	1.2 mgd
Feed Rate, gph	Min: 0.2 gph Avg: 0.3 gph Max: 0.5 gph	Min: 0.9 gph Avg: 1.2 gph Max: 1.8 gph
Storage		
Bulk Storage		
Equipment Numbers	TNK-42020	TNK-42020, plus future tank
No. of Units	1 Duty, 0 Standby	2 Duty, 0 Standby
Type	XLPE w/ 1.8 specific gravity of adequate thickness for up to 5,000 gallon tank	XLPE w/ 1.8 specific gravity of adequate thickness for up to 5,000 gallon tank
Capacity, Each, gallons	1,700	1,700
Dimensions, D'xH'	6' x 10'	6' x 10'
Metering Pumps		
Primary RO Feed		
Equipment Numbers	PMP-42110, PMP-42120	PMP-42110, PMP-42120
No. of Units	1 Duty, 1 Standby	1 Duty, 1 Standby
Type	Hydraulic Actuated Diaphragm	Hydraulic Actuated Diaphragm
Capacity, Each, gph	5 gph	5 gph
Motor Size, Each, hp	1/2 hp min.	1/2 hp min.
Drive	Adjustable speed	Adjustable speed
Materials	PVC head; Teflon diaphragm; Ceramic ball check valves	PVC head; Teflon diaphragm; Ceramic ball check valves
Secondary RO Feed		
Equipment Numbers	PMP-42210, PMP-42220	PMP-42210, PMP-42220
No. of Units	1 Duty, 1 Standby	1 Duty, 1 Standby
Type	Mechanically Actuated Diaphragm	Mechanically Actuated Diaphragm
Capacity, Each, gph	2 gph	2 gph
Motor Size, Each, hp	1/2 hp min.	1/2 hp min.
Drive	Adjustable speed	Adjustable speed
Materials	PVC head; Teflon diaphragm; Ceramic ball check valves	PVC head; Teflon diaphragm; Ceramic ball check valves

5.2.13.5 Threshold Inhibitor

Table 5-26 summarizes the design of the threshold inhibitor storage and feed system.

Table 5-26 Threshold Inhibitor Storage and Feed System Design Criteria

Design Criteria	Phase I	Phase II
Chemical Characteristics		
Chemical	Threshold Inhibitor	Threshold Inhibitor
Concentration, % by weight, %	100%	100%
Specific Gravity	1.1	1.1
Feed Requirements		
Primary RO Feed		
Dose, mg/L	Min: 1.0 mg/L Avg: 2.0 mg/L Max: 3.0 mg/L	Min: 1.0 mg/L Avg: 2.0 mg/L Max: 3.0 mg/L
Flow, mgd	2.2 mgd	8.1 mgd
Feed Rate, gph	Min: 0.08 gph Avg: 0.16 gph Max: 0.24 gph	Min: 0.31 gph Avg: 0.61 gph Max: 0.92 gph
Secondary RO Feed		
Dose, mg/L	Min: 1.0 mg/L Avg: 2.0 mg/L Max: 3.0 mg/L	Min: 1.0 mg/L Avg: 2.0 mg/L Max: 3.0 mg/L
Flow, mgd	0.3 mgd	1.2 mgd
Feed Rate, gph	Min: 0.01 gph Avg: 0.02 gph Max: 0.04 gph	Min: 0.05 gph Avg: 0.09 gph Max: 0.14 gph
Storage		
Bulk Storage		
No. of Units	1 Duty, 0 Standby	2 Duty, 0 Standby
Type	Totes on scale	Totes on scale
Capacity, Each, gallons	275	275
Dimensions, D"xH"	40" x 48"	40" x 48"
Metering Pumps		
Primary RO Feed		
Equipment Numbers	PMP-43110, PMP-43120	PMP-43110, PMP-43120
No. of Units	1 Duty, 1 Standby	1 Duty, 1 Standby
Type	Hydraulic Actuated Diaphragm	Hydraulic Actuated Diaphragm
Capacity, Each, gph	2 gph	2 gph
Motor Size, Each, hp	1/2 hp min.	1/2 hp min.
Drive	Adjustable speed	Adjustable speed
Materials	PVC head; Teflon diaphragm; Ceramic ball check valves	PVC head; Teflon diaphragm; Ceramic ball check valves
Secondary RO Feed		
Equipment Numbers	PMP-43210, PMP-43220	PMP-43210, PMP-43220
No. of Units	1 Duty, 1 Standby	1 Duty, 1 Standby
Type	Mechanically Actuated Diaphragm	Mechanically Actuated Diaphragm
Capacity, Each, gph	1 gph	1 gph

Table 5-26 Threshold Inhibitor Storage and Feed System Design Criteria

Design Criteria	Phase I	Phase II
Motor Size, Each, hp	1/2 hp min.	1/2 hp min.
Drive	Adjustable speed	Adjustable speed
Materials	PVC head; Teflon diaphragm; Ceramic ball check valves	PVC head; Teflon diaphragm; Ceramic ball check valves

5.2.13.6 Sodium Hydroxide

Table 5-27 summarizes the design of the sodium hydroxide storage and feed system.

Table 5-27 Sodium Hydroxide Storage and Feed System Design Criteria

Design Criteria	Phase I	Phase II
Chemical Characteristics		
Chemical	Sodium Hydroxide	Sodium Hydroxide
Concentration, % by weight, %	25%	25%
Specific Gravity	1.27	1.27
Feed Requirements		
AWPF Product Water	Assumed final product water pH	
Dose, mg/L[1]	Min: 10 mg/L Avg: 14 mg/L Max: 19 mg/L	Min: 10 mg/L Avg: 14 mg/L Max: 19 mg/L
Flow, mgd	2.0 mgd	7.5 mgd
Feed Rate, gph	Min: 2.6 gph Avg: 3.7 gph Max: 3.4 gph	Min: 9.8 gph Avg: 13.7 gph Max: 18.6 gph
MF CIP		
Final Solution Strength (% by weight)	0.4%	0.4%
RO CIP		
Final Solution Strength	pH 12	pH 12
Storage		
Bulk Storage		
Equipment Numbers	TNK-46020	TNK-46020, plus future tank
No. of Units	1 Duty, 0 Standby	2 Duty, 0 Standby
Type	XLPE w/ HDPE Liner or FRP	XLPE w/ HDPE Liner or FRP
Capacity, Each, gallons	7,300	7,300
Dimensions, D'xH'	10.2' x 14.2'	10.2' x 14.2'
Metering Pumps		
AWPF Product Water		
Equipment Numbers	PMP-46110, PMP-46120	PMP-46110, PMP-46120
No. of Units	1 Duty, 1 Standby	1 Duty, 1 Standby
Type	Hydraulic Actuated Diaphragm	Hydraulic Actuated Diaphragm
Capacity, Each, gph	21 gph	21 gph
Motor Size, Each, hp	1/2 hp min.	1/2 hp min.
Drive	Adjustable speed	Adjustable speed
Materials	PVC head; Teflon diaphragm; Ceramic ball check valves	PVC head; Teflon diaphragm; Ceramic ball check valves

Table 5-27 Sodium Hydroxide Storage and Feed System Design Criteria

Design Criteria	Phase I	Phase II
Transfer Pumps		
MF CIP		
Equipment Numbers	PMP-46150, PMP-46160	PMP-46150, PMP-46160
No. of Units	1 Duty, 1 Standby	1 Duty, 1 Standby
Type	Mechanically Actuated Diaphragm	Mechanically Actuated Diaphragm
Capacity, Each, gph	TBD by MFSS	TBD by MFSS
Motor Size, Each, hp	1/2 hp min.	1/2 hp min.
Drive	Adjustable speed	Adjustable speed
Materials	PVC head; Teflon diaphragm; Ceramic ball check valves	PVC head; Teflon diaphragm; Ceramic ball check valves
RO CIP		
Equipment Numbers	PMP-46170, PMP-46160	PMP-46150, PMP-46180
No. of Units	1 Duty, 1 Standby	1 Duty, 1 Standby
Type	Mechanically Actuated Diaphragm	Mechanically Actuated Diaphragm
Capacity, Each, gph	2-20 gph	2-20 gph
Motor Size, Each, hp	1/2 hp min.	1/2 hp min.
Drive	Adjustable speed	Adjustable speed
Materials	PVC head; Teflon diaphragm; Ceramic ball check valves	PVC head; Teflon diaphragm; Ceramic ball check valves

1. Dose in dependent on the amount of T22 water blended with RO permeate.

5.2.13.7 Calcium Chloride (Future)

Calcium Chloride for post treatment is currently not proposed for Phase I design since the chemical addition is not required assuming a 10% tertiary RW blend with the RO permeate for stabilization. The calcium chloride system area requirements have been included on the site layout, in case future system is required. **Table 5-28** summarizes the design of the calcium chloride storage and feed system.

Table 5-28 Calcium Chloride Storage and Feed System Design Criteria

Design Criteria	Phase I	Phase II
Chemical Characteristics		
Chemical	Calcium Chloride	Calcium Chloride
Concentration, % by weight, %	35%	35%
Specific Gravity	1.38	1.38
Feed Requirements		
AWPF Product Water	Final Product Water Calcium Concentration	
Dose, mg/L[1]	Min: 0 mg/L Avg: 20 mg/L Max: 40 mg/L	Min: 0 mg/L Avg: 20 mg/L Max: 40 mg/L
Flow, mgd	2.0 mgd	7.5 mgd
Feed Rate, gph	Min: 0.0 gph Avg: 3.4 gph Max: 6.8 gph	Min: 0.0 gph Avg: 12.8 gph Max: 25.7 gph
Storage		
Bulk Storage		
Equipment Numbers	TNK-47020	TNK-47020, plus future tank
No. of Units	1 Duty, 0 Standby	2 Duty, 0 Standby
Type	Double-walled HDPE	Double-walled HDPE
Capacity, Each, gallons	5,300	5,300
Dimensions, D'xH'	9' x 13'	9' x 13'
Metering Pumps		
AWPF Product Water		
Equipment Numbers	PMP-47110, PMP-47120	PMP-47110, PMP-47120
No. of Units	1 Duty, 1 Standby	1 Duty, 1 Standby
Type	Hydraulic Actuated Diaphragm	Hydraulic Actuated Diaphragm
Capacity, Each, gph	29 gph	29 gph
Motor Size, Each, hp	1/2 hp min.	1/2 hp min.
Drive	Adjustable speed	Adjustable speed
Materials	Alloy 20 or CPVC head; Teflon diaphragm; Alloy 20 or CPVC ball check valves	Alloy 20 or CPVC head; Teflon diaphragm; Alloy 20 or CPVC ball check valves

1. Dose in dependent on the amount of T22 water blended with RO permeate.

5.2.13.8 Citric Acid

Table 5-29 summarizes the design of the citric acid storage and feed system.

Table 5-29 Citric Acid Storage and Feed System Design Criteria

Design Criteria	Phase I	Phase II
Chemical Characteristics		
Chemical	Citric Acid	Threshold Inhibitor
Concentration, % by weight, %	50%	50%
Specific Gravity	1.3	1.3
Feed Requirements		
MF CIP		
Final Solution Strength (% by weight)	2%	2%
RO CIP		
Final Solution Strength	pH 2	pH 2
Storage		
Bulk Storage		
No. of Units	1 Duty, 0 Standby	2 Duty, 0 Standby
Type	Totes on scale	Totes on scale
Capacity, Each, gallons	275	275
Dimensions, D"xH"	40" x 48"	40" x 48"
Transfer Pumps		
MF CIP		
Equipment Numbers	PMP-44130, PMP-44140	PMP-44130, PMP-44140
No. of Units	1 Duty, 1 Standby	1 Duty, 1 Standby
Type	Mechanically Actuated Diaphragm	Mechanically Actuated Diaphragm
Capacity, Each, gph	TBD by MFSS	TBD by MFSS
Motor Size, Each, hp	1/2 hp min.	1/2 hp min.
Drive	Adjustable speed	Adjustable speed
RO CIP		
Equipment Numbers	PMP-44110, PMP-44120	PMP-44110, PMP-44120
No. of Units	1 Duty, 1 Standby	1 Duty, 1 Standby
Type	Mechanically Actuated Diaphragm	Mechanically Actuated Diaphragm
Capacity, Each, gph	2-20 gph	2-20 gph
Motor Size, Each, hp	1/2 hp min.	1/2 hp min.
Drive	Adjustable speed	Adjustable speed

5.2.13.9 Hydrogen Peroxide (Future)

Hydrogen peroxide as required for the UV disinfection system is currently not proposed for Phase I design. The hydrogen peroxide system area requirements have been included on the site layout, in case future system is required. **Table 5-30** summarizes the design of the hydrogen peroxide storage and feed system.

Table 5-30 Hydrogen Peroxide Storage and Feed System Design Criteria

Design Criteria	Phase I	Phase II
Chemical Characteristics		
Chemical	Hydrogen Peroxide	Hydrogen Peroxide
Concentration, % by weight, %	27%	27%
Specific Gravity	1.2	1.2
Feed Requirements		
AWPF Product Water		
Dose, mg/L	Min: 2.0 mg/L Avg: 3.0 mg/L Max: 5.0 mg/L	Min: 2.0 mg/L Avg: 3.0 mg/L Max: 5.0 mg/L
Flow, mgd	2.0 mgd	7.5 mgd
Feed Rate, gph	Min: 0.5 gph Avg: 0.8 gph Max: 1.3 gph	Min: 1.9 gph Avg: 2.9 gph Max: 4.8 gph
Storage		
Bulk Storage		
Equipment Numbers	TNK-48020	TNK-48020, plus future tank
No. of Units	1 Duty, 0 Standby	2 Duty, 0 Standby
Type	XLPE	XLPE
Capacity, Each, gallons	1,250	1,250
Dimensions, D'xH'	7' x 6'	7' x 6'
Metering Pumps		
AWPF Product Water		
Equipment Numbers	PMP-48110, PMP-48120	PMP-48110, PMP-48120
No. of Units	1 Duty, 1 Standby	1 Duty, 1 Standby
Type	Peristaltic	Peristaltic
Capacity, Each, gph	6 gph	6 gph
Motor Size, Each, hp	1/2 hp min.	1/2 hp min.
Drive	Adjustable speed	Adjustable speed
Materials	Santoprene hose	Santoprene hose

5.2.14 Reject Streams Management

The purpose of this section is to summarize the design criteria and the development of plans to control and manage the reject streams resulting from the AWPF treatment processes. This section also summarizes other non-process, stormwater, sewage collection/disposal and construction related reject streams.

Treatment process waste streams will be collected and routed for discharge to SJVRWRF. Intermittent streams will be equalized to prevent peaking discharge flows. Process waste collection facilities will include a plant process waste equalization sump and the containment sumps within the process area. The equalization sump will be used to equalize waste discharges from non-continuous sources to avoid sending short-term peak flows to SJVRWRF. The proposed location of plant waste equalization sump, process area sump and connection to SJVRWRF will be determined during final design.

5.2.14.1 Design Criteria

All discharges to the EMWD sanitary sewers from the AWPF must comply with Regulations for Waste Discharge and Sewer Use Ordinance No. 59. All site piping and appurtenances shall be designed in accordance with EMWD Design Standards.

The reject streams excluding RO concentrate will be transmitted off site to the SJVRWRF. The RO concentrate will be transmitted to the Brine Evaporation Ponds adjacent to the AWPF (See Section 6).

The reject stream water discharged to the SJVRWRF via the Waste Pump Station (WPS) shall meet the water quality parameters outlined in **Table 5-31**. Periodic monitoring of water quality of the discharge of the WPS will be performed to ensure compliance.

Table 5-31 EMWD Sanitary Sewer Discharge Criteria

Constituent	Maximum Concentration (mg/L)	Condition
pH	5.0-11.0, and shall not cause corrosive structural damage to the POTW	
Solid or Viscous Substances	Shall not be greater than 3/8 inches in any dimension	Shall not cause obstruction of the flow in the POTW resulting in blockage or Interference
Temperature	Shall not exceed 140°F (60°C), inhibit biological activity, or cause the plant influent to exceed 104°F (40°C)	
Local Limits Applicable to Permitted Users[1] (Source: Resolution No. 3003.3)		
Arsenic (As)	0.38	
Biochemical Oxygen Demand (BOD)	250 lbs/day or 300 mg/L	If discharge meets domestic waste quality at 300 mg/L then no flow restriction.
Boron (B)[2]	5.8	
Cadmium (Cd)	0.32	
Chloride (Cl)[2]	700 mg/L for less than 275 lbs/day or 250 mg/L	If discharge meets domestic waste quality at 250 mg/L then no flow restriction.
Chromium Total (Cr)	5.0	
Copper (Cu)	5.1	
Cyanides, Total (CN)	0.54	
Iron (Fe)[2]	125	
Lead (Pb)	1.7	
Manganese (Mn)[2]	2.3	
Mercury (Hg)	0.2	
Molybdenum (Mo)	1.47	
Nickel (Ni)	4.2	
Selenium (Se)	0.37	
Silver (Ag)	4.2	
Sulfate (SO_4)[2]	450 mg/L for less than 275 lbs/day or 250 mg/L	If discharge meets domestic waste quality at 250 mg/L then no flow restriction.

Table 5-31 EMWD Sanitary Sewer Discharge Criteria

Constituent	Maximum Concentration (mg/L)	Condition
Total Dissolved Solids (TDS)	2200 mg/L for less than 250 lbs/day or 250 mg/L over source water	If discharge meets domestic waste quality at 250 mg/L plus source water quality then no flow restriction.
Total Inorganic Nitrogen (TIN)	30 lbs/day or 60 mg/L	If discharge meets domestic waste quality at 60 mg/L then no flow restriction.
Total Suspended Solids (TSS)	Narrative[3]	
Zinc	4.23	

Notes:
1. Not applicable to permitted Liquid Waste Haulers.
2. Only applies to the Temecula Valley Regional Water Reclamation Facility.
3. Wastewater containing TSS in such quantities to cause or contribute significantly to (1) disruptions of treatment plant operations; or (2) exceedances of discharge limitations for TSS is prohibited. Significant dischargers, as identified by EMWD, of TSS must implement best practicable technologies for reducing the TSS content of their discharges.

5.2.14.2 Reject Streams Sources

The waste generated at the AWPF will consist of domestic and industrial wastes. The domestic wastes from lavatories will be routed to the WPS which will discharge to the WPS discharge force main. Floor drain, sumps and cleaning systems will also be discharged to the WPS. It is anticipated that the WPS will discharge via an 8-inch force main to the existing 24-inch influent sewer in Sanderson Road on the east side of the SJVRWRF, which will then flow to the headworks at the SJVRWRF.

The MF system start-up test water, RO concentrate as well as the complete plant testing and off-spec-water will be discharged via a 36-inch force main to the existing 36-inch DIW pipeline at the SJVRWRF.

Table 5-32 presents the anticipated reject stream sources from each unit process or area and the pump station or forcemain the reject stream will be routed to. **Figure 5-13** is a Schematic of Reject Stream System.

Table 5-32 AWPF Waste Streams Sources and Discharge Locations

Unit Process	Stream Source	Routed To
Strainers	Backwash/Rinse	WPS
MF	Backwash	WPS
	CIP	WPS
	Base Chemical Drain	WPS
	Acid Chemical Drain	WPS
	Forward Flush	WPS
MF Break Tank	Tank Overflow	Onsite Dry stormwater retention ponds
	Drain	WPS
RO System	Concentrate	Reject Line to Brine Ponds
	Flush	WPS
	Permeate Dump	WPS
	RO Area Sump	WPS
	CIP	WPS
	Sumps	WPS
Process and Control Building	Sanitary Flow	WPS
Chemical Area	Sumps	WPS

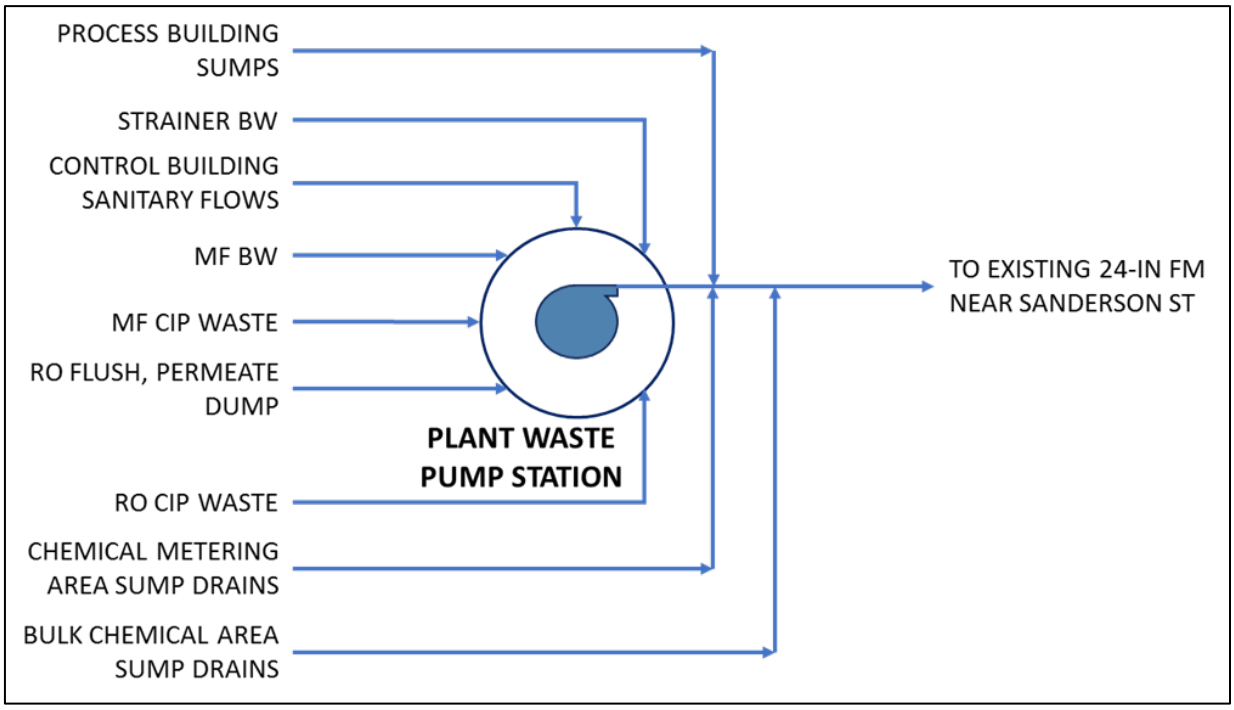

Figure 5-13 Schematic of Reject Stream System

Summary of Sewer Flows and Process Waste Streams to the Waste Pump Station (WPS)

The control area is anticipated to have sanitary facilities including the restrooms and the lunch room. The anticipated flows and water quality of the reject streams to be routed to the WPS are summarized in **Table 5-33** and a preliminary drawing of the WPS is shown in **Figure 5-14.**

Table 5-33 Anticipated Sewer Flows and Process Waste Stream Flows Routed to the WPS

Unit Process	Stream Source	Routed To	Stream Quality	Frequency/ Quantity	Assumed Flow[1] (gpm)
Control Area	Sanitary Flow	WPS	Large solids sanitary flow	Periodic	2
Strainers	Backwash/ Rinse	WPS	Some TSS	Periodic, daily (47,000 gpd)	220
MF	Backwash	WPS	Water, some TSS	Periodic, daily (146,000 gpd)	1,460
	Base Chemical Drain	WPS	Chemical flow	Infrequent (3,400 gal per CIP)	500
	Acid Chemical Drain	WPS	Chemical flow	Infrequent (3,400 gal per CIP)	500
MF Break Tank	Drain	WPS	Water	Infrequent (maintenance, shutdowns)	200
RO System	CIP	WPS	Citric acid, sodium hydroxide, sodium dodecilbenzene sulfonate and sodium tripolyphosphate	Once per month, (6,000 gal per CIP for Primary RO; 3,200 gal per CIP for Secondary RO)	880
	Flush	WPS	Water with high TDS	Shutdown procedure, 15 minutes per module	680
	Permeate Dump	WPS	ROP dumped during RO Unit shutdown	Infrequent	100
Process Area Sumps	Sumps	WPS	Equipment sample drains, trench/slab drains, housekeeping, fire water	Continuous	150
Chemical Metering Area	Sumps	Chemical Bulk Storage Area Chemical sumps	Citric acid, sodium bisulfite, sodium hypochlorite, ammonium sulfate, threshold inhibitor, sulfuric acid, sodium hydroxide, calcium chloride, hydrogen peroxide, fire water	Infrequent	300
Chemical Bulk Storage Area	Sumps	WPS	Citric acid, sodium bisulfite, sodium hypochlorite, ammonium sulfate, threshold inhibitor, sulfuric acid, sodium hydroxide, calcium chloride, hydrogen peroxide, stormwater	Infrequent	210

Notes:
1. Instantaneous flows

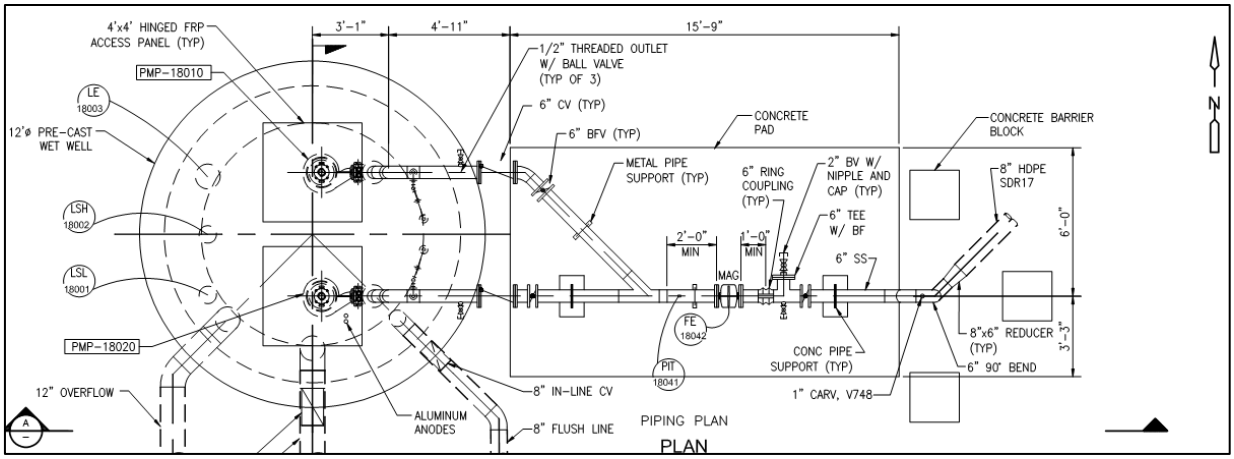

Figure 5-14 Waste Pump Station Preliminary Design Drawing

The design criteria for WPS is summarized in **Table 5-34**.

Table 5-34 Waste Pump Station Design Criteria

	Phase I	Phase II
Equipment Numbers	TBD	TBD
Configuration	1 operating, 1 standby	TBD
Type	Submersible	TBD
Rated Capacity, gpm	400	TBD
Rated Head, feet	35	TBD
Materials	TBD	TBD
Drive	Constant	TBD
Motor Size, hp	5	TBD
Wet Well Width, ft	10	TBD
Wet Well Length, ft	10	TBD
Design Depth w/ 5-ft of headboard, ft	18	TBD

Summary of Process Waste Streams to the Brine Evaporation Ponds

The RO concentrate will be transmitted to the Brine Evaporation Ponds adjacent to the AWPF for natural and mechanically enhanced evaporation (see Section 6). It is anticipated that the RO concentrate will have sufficient residual pressure to not require an additional pump station to discharge directly to the Brine Evaporation Ponds. The RO concentrate will be monitored with on-line instruments for flow, pH, and conductivity. A summary of anticipated flows and water quality of the reject streams to be routed to the brine evaporation ponds is presented in **Table 5-35**.

Table 5-35 Anticipated Flows Routed to the Brine Evaporation Ponds

Unit Process	Stream Source	Routed To	Stream Quality	Frequency/ Quantity	Assumed Flow (gpm)
RO System	Concentrate	Reject Line to DIW	Water with high TDS	Continuous, 0.16 mgd	108

Construction Phase Discharges

Stormwater is considered a reject stream and will be handled separately via on-site retention and infiltration. There will be some reject streams from the plant testing prior to completion of construction as well as the possibility of construction related dewatering.

5.3 Civil Design Criteria

The proposed site for the AWPF is located on a 100-acre parcel of land to the northwest of SVRWRF and east of Odell St., in San Jacinto, California. The parcel is owned by EMWD. The parcel will be used for the AWPF site, the brine evaporation ponds, and a solar farm as shown above in Figure 5-2. The AWPF is located on approximately 5 acres at the southeast corner of the parcel with the brine evaporation ponds located north of the AWPF site. The solar farm (by others) will be constructed in an 'L-shaped' arrangement located west of both the AWPF and the brine ponds.

5.3.1 Site Plan

The proposed site plan for the AWPF is shown on Figure 5-3. The site plan was arranged based on the following criteria:

- Centralized process area to minimize overall plant footprint;
- Proximity to chemical storage and feed systems;
- Maintenance access;
- Easy vehicle access for cars and buses; and
- Allowance for future expansion.

Alternative site plans were discussed with EMWD, including having the processes located individually outside under canopies, a single building to house both Phase I and Phase II facilities, and an expandable building for constructed only Phase I. It was agreed that all of the major treatment processes would be located inside a single process building to reduce dust and make operation easier. The process area would house the MF, RO, and CIP systems. The process area would also include the electrical room and a compressor/ mechanical room. While the chemical pumps would be located inside the process area, the bulk storage chemical storage tanks would be located outside like as implemented at the Perris Desalter facility. The influent and effluent pump stations, the MF break tank, automatic backwashing strainers, cartridge filters and other miscellaneous tanks and pump stations would be constructed outside with no canopies.

It was agreed that the control area and the process area should be connected with a common wall separating the divergent use areas. The control area would include an educational component consisting of a conference room, an education room, and an education supervisor's office. See Section 5.4 for additional description of the architectural programming of the control area. The control area would be constructed to its full buildout area while the process area would only be constructed for Phase I facilities. An extension of the process area would be constructed in the future when the plant is expanded from 2 mgd to 7.5 mgd.

The major facilities are located on the site as follows with a further description provided below:

- Access to the AWPF facilities will be from Sanderson Road, approximately 3,000 feet east of the treatment plant site.
- The combined Process and Control Building is located in approximately the center of the approximately 5-acre AWPF site.
- The control area is situated to the south of the building with the process area on the north side of the building.
- The main processes are located in the combined Process and Control Building.
- The chemical bulk storage area is located west of the process area.
- The influent pump station, automatic backwashing strainers, MF backwash pump station, MF filtrate tank, RO transfer pump station, and RO cartridge filters are located on the northwest side of the AWPF site.
- The RO permeate flush tank and effluent pump station are located on the east side of the process area.
- Maintain landscape berm and buffer around the perimeter of the site.

Space is provided on the north side of the process area for Phase II expansion of the process facility. The cartridge filters, RO pump station, automatic backwashing strainers, RO cartridge filters, and MF backwash pump station pads are sized to allow for Phase II expansion of the process equipment. Influent and effluent pump stations will have space next to the Phase I wetwells for Phase II pump station expansion.

5.3.2 Yard Piping Plan

The influent pump station will take suction from the tertiary effluent from the chlorine contact basin at SJVRWRF via a 24-inch epoxy lined steel pipe (ELSP) as shown in Figure 5-2. The AWPF product water is conveyed to the 18-inch steel pipe at SJVRWRF via a 24-inch ELSP. Brine is conveyed to the Evaporation Ponds via a 4 to 6-inch HDPE pipe. Process waste is conveyed back to the SJVRWRF via a 24-inch ductile iron pipe.

In general, the process water pipeline will be ELSP, DIP, HDPE, and PVC. Various chemical feed lines and other process piping will be PVC, copper, EPDM, stainless steel, fabricated steel, and polypropylene as appropriate for chemical resistance. Chemical outside of the containment area will be located in a secondary containment piping system. The material for each major pipeline is indicated in **Table 5-36.**

Table 5-36 Yard Pipeline Schedule

Processes	Nominal Pipe Dia. (in)	Material	Type of Joints	Protective Coating		Polyethylene encasement?
				Interior	Exterior	
Tertiary Effluent to AWPF Influent Pump Station	24	Steel	Welded/Flanged	EL	CM	No
Influent Pump Station to Strainers	14/24	Steel	Welded/Flanged	EL	CM	No
Strainers to MF/UF	14/24	Steel	Welded/Flanged	EL	CM	No
MF/UF system to Break Tank	12	Steel	Welded/Flanged	EL	CM	No
Break Tank to RO System	24	Steel	Welded/Flanged	EL	CM	No
RO System to Cartridge Filters	24	Steel	Welded/Flanged	EL	CM	No
Cartridge Filters to MF/RO	12/24	SST/HDPE	Welded/Flanged	--	--	No
RO/MF to Flush Tank	8	PVC	Mechanical Joint	--	--	No
Flush Tank to Product Water Pump Station	4-24	PVC	Solvent Weld/ Mechanical Joint	--	-	No
RO to Product Water PS	12/24	PVC	Mechanical Joint	--	--	No
RO/MF to Brine Ponds	4 to 6 (TBD during Final Design)	SST/HDPE/ PVC	Welded/ Flanged/ Solvent Weld/ Fusion Weld	--	--	No
Chemical Feed Piping	Varies	PVC/CPVC/ PVDF/PP	Solvent Weld / Flanged	--	Double Contained	No
Plant, Potable, and Fire Water System (Outside Building)	6 - 12	DIP/ C-900 PVC	Bell & Spigot/ Flanged/ Restrained	CML/EL (DIP only)	AC/CM (DIP only)	Yes (DIP only)
Potable Water Service to Building	2	Copper Type L or K	Soldered/ Flare Fitting	--	--	No
Storm/Sewer Drains	36 or less	RCP/CMP/ HDPE	O-Ring/ Bell & Spigot/ Flanged	--	--	No

Notes:
AC – Asphaltic Coating
CM – Cement Mortar
CML – Cement Mortar Lined
EL – Epoxy Lined

Stormwater drains will convey stormwater runoff to the new stormwater bioretention basin located on the north and south side of the AWPF site. Sanitary sewer pipeline will convey sanitary waste to a waste pump station.

5.3.3 Earth Slope and Grading Requirements

The grading design and cut/fill slopes will conform to the geotechnical report prepared for the site (see Section 4.5 and **Appendix F**). **Table 5-37** provides a summary of slope requirements for this site.

Table 5-37 Slope Requirements

Description	Cross Slope		Longitudinal	
	Maximum	Minimum	Maximum	Minimum
Street – Curbed	3 %	2 %	0.3 %	10 %
Sidewalk	2 %	2 %	12:1	20:1
Landscape Area	-	-	-	2%
Landscape Between Buildings & Street	-	--	3:1	--

The following are additional grading requirements:

- All access ramps must meet state California Handicap Standards and the American Disability Act (ADA),
- Finished grades around structures, slabs and buildings must be six (6) inches below the finished or slab elevation. If vehicle access is required, the dive approach must slope away from the building.

Erosion control of earth slopes during construction will be required. A SWPPP will be prepared during final design to control stormwater runoff during construction activities.

5.3.4 Stormwater Management

The entire AWPF is located outside of the 100-year storm zone. While the RCFCD stormwater masterplan shows future storm drains north of the AWPF site, there are not any existing storm drain facilities on EMWD's parcel. Therefore, it is assumed that the AWPF parcel must manage the rainfall that falls on the site.

Rainwater from the Process and Control Building will be collected in gutters and discharged at ground level. This rainwater, along with other miscellaneous site drainage, will be collected in a site drainage system and discharged to two on-site stormwater bioretention basins. The drainage system may consist of a combination of pipes, catch basins, manholes, dry conveyance/storage swales, overflow structures and wet retention/detention basins. Capture runoff will be routed to the stormwater bioretention basins. One basin may be located south of the Process and Control Building while the second basin may be located between the AWPF and the brine evaporation ponds. Final design of the stormwater management system will be sized during the design phase and may be coordinated with the stormwater management system from the future solar site.

It should also be noted that the brine evaporation basins should be designed for a 1,000 year storm as detailed in Section 6.1.

5.3.4.1 Stormwater Quantity

Typically flood routing calculations are required to identify combinations of site conditions and rainfall frequencies which might result in impacts to the site and or surrounding properties. Off-site discharge rate is limited to rates not causing adverse impacts to existing off-site properties, and:

- Historic discharge rates; or

- Rates determined in previous permit actions; or
- Rates as determined by State of California Stormwater Industrial General Permit.

This site is currently undeveloped; therefore, existing discharges are minimal.

5.3.5 Access

5.3.5.1 Vehicular Access

Access to the AWPF will be via a new 24-foot wide paved access road north of the SJVRWRF. Two access point are provided on the south side of the AWPF. The primary entrance is on the east side of the site while a secondary entrance is provided on the west side of the plant. Site access is laid out to accommodate chemical delivery trucks and fire trucks around the Process and Control Building and passenger cars and buses around the parking area. Site access road around the facility is a minimum of 24 feet' wide paved road with 65-foot turning radius for fire trucks, chemical delivery trucks, and buses. Vehicle access to the brine evaporation ponds north of the AWPF are from the AWPF site access roads on both the west and east sides of the plant.

5.3.5.2 Parking

Various parking space designations and types will be required. Provisions will be made for regular spaces, accessible spaces, and preferred spaces for car/van pools. Standard parking spaces will be a minimum of 9' wide by 19'-0" long; van accessible parking spaces will be a minimum of 1'-0" wide by 19'-0" long, passenger car accessible parking space with aa minimum of 8'-0" wide by 19'-0" long. Accessible parking spaces will share a 5'-0" wide access aisle - Driveways of 90-degree parking will be a minimum of 25'-0" wide.

Parking requirements may be calculated by two methods; (1) as required by the local Zoning Code for similar uses or (2) based on the projected number of employees and visitors.

Parking capacity was determined through discussion with EMWD. It was agreed that 30 visitor parking and one (1) bus parking will be provided for visitors. They also asked for private parking for six (6) staff parking. Two ADA parking spaces will meet ADA requirements. Figure 5-3 shows the proposed breakdown of the parking spaces at the site. The 30 parking spaces, two ADA parking spaces, and the single bus parking space are provided on the south side of the AWPF site for visitor parking. The six private parking spaces for staff are provided on the west side of the AWPF for plant operators and EMWD's staff.

5.3.5.3 Chemical Delivery Requirements

Chemical deliveries are required for the following chemicals the chemicals described above in Section 5.2. The estimated tanker truck volume and the number of chemical truck deliveries per month for Phase I to the site is shown in **Table 5-38**.

The chemical delivery trucks will enter the site from the Sanderson Street entrance and exit using the same path. On average for Phase I, there will be 1-2 chemical delivery trucks per month per chemical at the site.

Table 5-38 Phase I Monthly Chemical Delivery Trucks

Chemicals	Avg. Daily Demands – Phase I (gal/day)	Average Monthly Demands – Phase I (gal/month)	Normal Storage Tank Capacity (gal)	Delivery Vol. (gal)	No. of Trucks per Month - Phase I (Rounded)
Ammonium Sulfate	39.2	1,200	3,000	2,000	1
Sodium Hypochlorite	128	3,900	6,600	4,000	1
Threshold Inhibitor	5	140	275 (Tote)	Tote	1
Sulfuric Acid	25	800	1,700	1,000	1
Hydrogen Peroxide (Future)	19	570	1,250	1,000	1
Sodium Hydroxide	120	3,500	6,600	4,000	1
Calcium Chloride (Future)	82	2,470	5,300	4,000	1
Citric Acid	5.8	173	275 (Tote)	Tote	1
Sodium Bisulfite	140	4,300	10,300	4,000	1-2

5.3.6 Security

This is a completely new facility that affords design flexibility in order to provide different levels of security. The site will be secured by a 6-foot tall perimeter chain link fence. Key pads and Knox boxes will be provided at the two entrances for access into the AWPF site. Perimeter security cameras and lighting will be provided to secure the perimeter.

The buildings will also have card access per EMWD's standard security protocols.

5.3.7 Landscaping

Landscaping will be an important feature in the development of the site due to the potential for visitors to visit the site on regular basis. Much of the landscape detail will be focused on the main entrance of the site as well as the area surrounding the AWPF site, parking lot, Process and Control Building. The goal would be to create an aesthetically welcoming environment for EMWD's staff and visitors. To promote water efficiency, priority should be given to incorporating indigenous plants into the landscape design while minimizing or eliminating the usage of turf grass on site. Landscaping concepts will be developed as part of the Final Design.

5.4 Architectural Design Criteria

An architectural programming technical memo was prepared and used as the basis for determining what was to include in the control area. **Table 5-39** summarizes the approved control area requirements.

Table 5-39 Control Area Architectural Programming & Defined Use

Purpose	Desired
Offices/cubicles	1/only in control room
Control Room	Yes
Small Dry/Wet Laboratory	No
Rest Rooms	Yes – separate men's and women's
Showers/locker room	No
Equipment/file Storage	Yes (small)
Lunch Room/kitchenette	Yes (combined)
Server Room	Yes
Copy Room	No
Process Electrical Room	Yes
Mechanical (HVAC) room	Yes
Lobby	Yes
Conference Room	Yes (40-50 people)
Educational space	Yes
Public Outreach offices	1
Warehouse	No
Shops	No
Janitor closet	No

It was agreed that the total area of the conference rooms, control area and educational facilities should be approximately 5,000 square feet. The exterior of the control area should be similar to the Perris Desalter administration building shown in **Figure 5-15** while the exterior of the process area should be similar to the process facilities at the Perris Desalter (see **Figure 5-16**). It was agreed that the building would include the ability to see from the conference room into the process area, thereby requiring the control area and the process area to be located together in the same building.



Figure 5-15 Perris Desalter Administration Building



Figure 5-16 Perris Desalter Process Building

5.4.1 Building Aesthetics

The building design for the Process and Control Building will be divided based on function. The control and education portion of the building will utilize masonry on light gage metal framing, aluminum storefront and standing seam metal roof. This will draw the appropriate level of articulation and focus for this building. The control and education portion of the building will sit adjacent to the public parking area off the access road to Sanderson Ave. Exterior walls of the control area will be a mixture of concrete masonry units (CMU), both split faced and color specific

and a standing seam metal roof on metal framing encompassing the pre-engineered steel structure. It will also incorporate aluminum doors and windows with insulated, Low-E glazing.

The process portion of the building will use vertical metal siding for a more utilitarian feel and level of detail. The process portion of the building will again utilize light gage framing with vertical metal siding for this part and an insulated membrane EPDM flat roof system. Insulated overhead doors and hollow metal doors and frames will be used for ingress and egress.

5.4.2 Code Analysis

The life-safety, egress, and fire-protection as well as the strength, serviceability, and quality of materials will be designed to meet the expectations of the currently adopted building codes and standards for the City of San Jacinto, California as follows:

- 2016 California Building Code (CBC);
- 2016 California Fire Code (CFC);
- 2016 California Mechanical Code (CMC);
- 2016 California Plumbing Code (CPC);
- 2016 California Electric Code (CEC);
- 2016 California Energy Conservation Code (CECC);
- National Fire Protection Association Life Safety Codes (NFPA); and
- The division of Occupational Safety and Health Act (Cal/OSHA or DOSH).

The project will be designed in accordance with the CBC, the NFPA, and the Architectural Barriers Accessibility Guidelines, (ABAAG), using industry standard materials and efficient practices. In general, the buildings will utilize non-structural veneer walls, steel roof beams or trusses, and metal deck construction.

Process and Control Building - The Process and Control Building has three separate functional concerns. There is (1) a public conference and educational area; (2) a security protected administrative/control work area for EMWD's operations staff, and (3) process and ancillary facility areas. The first two areas make up the "Control" portion of the building while the process systems make up the "Process" portion of the building. This would support evaluating the code requirements for the building as unseparated mixed use. Business in the public and occupied spaces, and H4 in the process portion of the building.

Chemical Storage Structure - The bulk chemical storage area is separate from the Process and Control Building and will be classified in accordance with the CBC as an H4, High-Hazard Group occupancy based on the quantity of hazardous material being stored. The H4 occupancy will require an automatic sprinkler system if a canopy is provided.

In conformance with EPA guidelines and NFPA standards, incompatible chemicals will be separated into groups including acids, bases, salts & polymers, oxidizing powders, and

compressed gasses. Incompatible chemical rooms will then be separated with one-hour fire rated separation walls.

Chemicals will be stored in conformance with the CFC and the CMC and will include approved storage containers, mechanical ventilation, spill control and secondary containment, and appropriate hazardous chemical storage signage. Where required, the chemical storage areas will also include monitor control equipment, gas detection systems and fire detection systems.

The construction type for both buildings will be non-combustible, unprotected construction or Type II-B construction. This construction category does not require fire-resistance rated exterior or interior walls or roofs.

5.4.3 Space Requirements

The overall size for the Process and Control Building will be established by the uses described above. The combined public and staff area make up the control area and have approximate dimensions of 51 feet by 96; or 4,900 square feet. The process area is irregularly shaped and has an area of approximately 16,000 square feet.

Figure 5-17 shows the preliminary building layout using the space requirements outlined below.

More precise areas for each room are provided below. Preliminary architectural plans and elevations are included in **Appendix G**.

5.4.3.1 Process and Control Building

The major Process and Control Building areas are generally described as follows:

- **Control Area -** The Process and Control Building will include also include two distinct control areas, (1) public area and (2) EMWD's administrative staff area. The east portion of this area is the public area while the west portion is reserved for EMWD's staff. Each subarea is described as follows:
    - Public Area - A public/administrative area will have a footprint of approximately 51 feet by 60 feet; or 3,050 square feet. It will be located on the southwest corner of the Process and Control Building. The public area includes an entry lobby, an education/exhibit area, a conference and public meeting room, men's and women's restrooms, a private EMWD public outreach staff person's office and access hallways.
    - EMWD's Administrative Staff Area - Just west of the public area is a security restricted administrative area for EMWD's staff. This administration area will have an irregular shaped footprint of approximately 51 feet by 36 feet; or 1,850 square feet. The administrate staff area includes the operation's supervisor's office, control room, break room, server room, storage room, and mechanical/rise room.

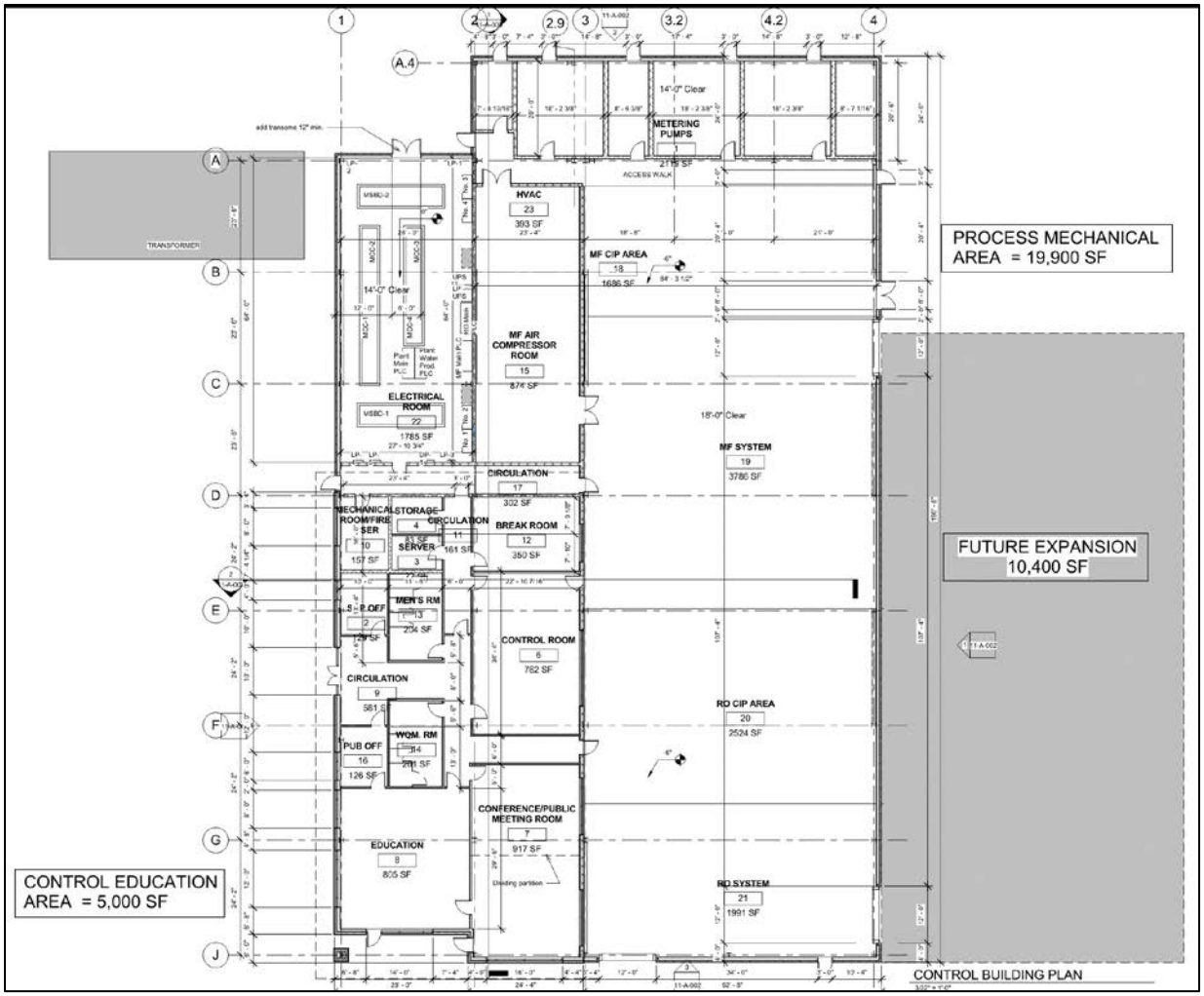

Figure 5-17 Preliminary Process and Control Building Layout

- **Process Area** – The Process and Control Building will include also include three distinct process areas, (1) major process area, (2) ancillary facilities area, and (3) chemical pump area. Each are described as follows:

  - Major Process Area - The major process area will be located north of the control areas. The process area dimensions are approximately 61 feet by 167 feet; or 10,200 square feet. The process area will house the MF system, MF CIP system, RO system (primary and secondary), and R) CIP system.

  - Ancillary Facilities Area – The electrical, MF compressor and building mechanical rooms make up the ancillary facilities included in the Process Area. The ancillary facilities dimensions are approximately 51 feet by 72 feet; or 3,700 square feet located west of and adjacent to the EMWD's administration staff area.

- Chemical Pump Area – The chemical pumps will be located in the Process and Control Building while the chemical bulk storage tanks will be located in a separate structure. The chemical pump area will be located west of and connected to the major process area. The approximate dimensions will be 81 feet by 24 feet; or 2,000 square feet.

The height of the Process and Control Building will be determined by the necessary clear height for an occupied office space for the control area and by the clear height above any process equipment or the necessary clear height for the process area.

Preliminary architectural Program Space Requirements for the Process and Control Building are included in **Table 5-40**.

Table 5-40 Architectural Program Space Requirements [1]

Room No.	Room Name	Area (Square foot)	Room No.	Room Name	Area (Square foot)
	Control Area (Public)	**2,834**		**Process Area (EMWD)**	**15,592**
9	Circulation	581	17	Circulation	302
16	Public Office	126	22	Electrical Room	1,820
7	Conference/Public Meeting Room	917	15 & 23	MF Air Compressor Mechanical Room	1,630
8	Education Room	805	18	MF CIP Area	1,660
13	Men's Restroom	204	19	MF System	3,800
14	Women's Restroom	201	20	RO CIP Area	2,500
	Control Area (EMWD Staff)	**1,719**	21	Pump Room	2,100
2	Supervisor Office	129	1	Metering Pumps	1,780
6	Control Room	762			
11	Circulation	161			
12	Break Room	350			
10	Mechanical/Riser Room	157			
3	Server Room	77			
4	Storage	83			
	Subtotal Control Area	**4,553**			
		TOTAL		**Approximately 20,553 sf**	

Notes:
1. Areas do not include walls
2. Room Number 5 was eliminated

5.4.3.2 Chemical Bulk Storage Structure

The chemical bulk storage structure will be separate from the Process and Control Building and be located directly west of the building. The dimensions of the chemical bulk storage structure will be 30 feet by 140 feet; or 4,200 square feet. This structure will be an open concrete containment structure with no canopies or walls. See Section 5.2 for additional chemical bulk storage structure design criteria.

5.4.4 Building Design

5.4.4.1 Exterior Walls

Exterior walls of the control area of the Process and Control Building will be composed of 4-inch face masonry CMU with a combination of spilt-face and ground face textures on light gage metal framing, covering a pre-engineered structural system. The exterior CMU will enhance the overall appearance of the facility as well as provide durability and low maintenance, hardening against vandalism and damage by delivery and/or maintenance vehicles.

The exterior wall of the process areas of the Process and Control Building will be composed of vertical metal panels on light gage metal framing, covering a pre-engineered structural system.

5.4.4.2 Exterior Doors and Windows

Storefront systems will be provided at the entrance lobby at the control area of the Process and Control Building. The entrance system will be aluminum, thermally broken, Kynar coated, double-insulated glazing system with low-E coating for energy efficiency. All other exterior doors will be hollow metal with matching hollow metal frames.

Windows for the rest of the Process and Control Building will be provided for natural day-lighting and ventilation to the greatest extent possible using insulated translucent panels where applicable. Exterior windows will be aluminum, thermally broken, Kynar coated, double-insulated windows with low-E coating for energy efficiency. All windows and doors will be inset from the face of the masonry wall system to create a recessed shadow line at exterior walls.

Overhead doors at the process area of the Process and Control Building will be electrically operated, overhead coiling Kynar coated insulated steel slat doors.

Since there is no building at the chemical bulk storage structure, there will be no windows or doors.

5.4.4.3 Roofs

The roof over the control areas of the Process and Control Building will be a standing seam roof system on top of a low pitch steel frame. The process portion of the Process and Control Building will have an EPDM membrane over a flat roof system. No canopies are anticipated for the chemical bulk storage structure.

5.4.4.4 Floors

Concrete floors will be provided throughout the Process and Control Building. Corrosion resistance epoxy coatings will be provided in the chemical feed metering pump area as well as for the chemical bulk storage structure. Finish materials, such as carpet tile and ceramic tile, will be provided in the public and EMWD's administration staff portions of the Process and Control Building. A capillary break and moisture retarder will be provided where concrete floors have epoxy coating, carpet, or tile.

5.4.4.5 Interior Walls

Interior walls in the Control and Process Building will be metal studs with gypsum wall board. Interior partition walls of the process portion will be painted impact-resistant gypsum wall board on light-gauge metal framing system to provide code compliant fire-resistant rating where required. Partition walls at the chemical storage areas will be full height CMU to provide proper corrosion resistance. A CMU partition wall will also be provided between the control areas and the major process area to provide a secure separation from public areas.

5.4.4.6 Ceilings

All public and EMWD's administration staff areas, including the conference room, the education room, the control room, the break room, office spaces, and circulation hallways will have a 10-foot ceiling height that will consist of square edge 2-foot by 2-foot ceiling tiles.

Restrooms will have gypsum board ceilings with a paint finish.

Mechanical, server, and storage rooms associated with EMWD's administration staff areas of the Control and Process Building, major process system areas, and chemical metering pump areas will also be exposed to the building roof structure.

5.4.4.7 Interior Doors

All interior doors at the control area of the Control and Process Building will have hollow metal frames and wood door panels. All interior doors at the in the process areas of the Control and Process Building will be hollow metal doors and frames with a paint finish. All interior doors between the control areas and the process areas will have hollow metal doors and frames with a paint finish.

5.4.4.8 Hardware

All hardware for the exterior doors will be ADA compliant with lever-type handles. Lock cylinders are planned for all doors, except toilet room doors.

In addition, card reader access where provided on exterior doors will be compatible with plant security system hardware. Card reader access will be provided for the interior doors of the corridors that separate the public portion of the control area from EMWD's administration staff area of the control area. There will also be and additional card reader to access the control room.

Exterior and interior door locksets will be commercial duty conforming to the ANSI/BHMA A156.13. Exterior doors, fire doors and entrance lobby doors will have automatic closers in compliance with exit and emergency code requirements.

5.4.4.9 Accessibility Design Criteria

Compliance with the accessibility and barrier free requirements of ADA and Architectural Barriers Act (ABA) will be required for all public and EMWD's administrative staff areas within the Control and Process Building. All other process areas frequented only by personnel for maintenance, repair or monitoring of equipment will not be required to be ADA accessible.

The criteria providing the appropriate barrier-free design will be used. The accessibility requirements apply to the following:

- Parking Spaces;
- Access to the Site;
- Signage;
- Alarm Systems;
- Placement of Built-in fixtures and Cabinetry; and
- Life Safety Systems.

5.4.5 Proposed Finish Schedule

Table 5-41 provides a summary of the architectural finishes proposed for the project floors, walls and ceilings. Proposed ceiling heights by room are also detailed.

Table 5-41 Finish Schedule

Room No.	Room Name	Floor	Walls	Ceiling	Ceiling Height
9	Entry Vestibule	Porcelain Tile	Paint	Acoustic Tile	9’-0”
7	Conference Room	Carpet Tile	Paint	Acoustic Tile	9’-0”
12	Break Room	Porcelain Tile	Porcelain Tile	Acoustic Tile	9’-0”
13 & 14	Restrooms	Porcelain Tile	Porcelain Tile	Gypsum/Paint	9’-0”
10	Mechanical & Riser Room	Sealed Concrete	Paint	Unfinished	9’-0”
3	Server	Sealed Concrete	Paint	Unfinished	9’-0”
4	Storage Room	Sealed Concrete	Paint	Unfinished	9’-0”
22	Electrical Room	Sealed Concrete	Paint	Unfinished	10’-0”
15 & 23	MF Air Compressor Mechanical Room	Sealed Concrete	Paint	Unfinished	10’-0”
6	Control Room	Carpet Tile	Paint	Acoustic Tile	10’-0”
2 & 16	Offices (2)	Carpet Tile	Paint	Acoustic Tile	9’-0”
11 & 17	Circulation	Resilient Flooring	Paint	Acoustic Tile	9’-0”
8	Education Room	Resilient Flooring	Paint	Acoustic Tile	9’-0”
18-21	Process Areas	Sealed Concrete	Paint	Unfinished	Open to Structure
1	Chemical Storage	Chemical Resistant Epoxy	Paint	Unfinished	Open to Structure

5.5 Structural Design Criteria

The following outlines structural design criteria used for the project facilities. These design criteria provide minimum requirements and are used as a guide in the design and construction of all facilities. Criteria may be modified with approval by the structural engineer where appropriate for specific circumstances.

5.5.1 Applicable Codes, Standards, and References

The strength, serviceability, and quality for materials and design procedures will meet the expectations of the following codes, standards, and references:

- 2016 CBC;
- American Society for Testing and Materials (ASTM) Standards;
- American Concrete Institute (ACI) ACI 318-2014 -- Building Code Requirements for Structural Concrete;
- American Society of Civil Engineers (ASCE) 7-2010: Minimum Design Loads for Buildings and Other Structures. American Society of Civil Engineers/Structural Engineer Institute;
- American Water Works Association (AWWA):
  - AWWA D100-05: Welded Carbon Steel Tanks for Water Storage.
  - AWWA D103-09: Factory-Coated Bolted Carbon Steel Tanks for Water Storage.
  - AWWA D110-04: Wire- and Strand-Wound, Circular, Prestressed Concrete Water Tanks.
- Code of Federal Regulations, 29 CFR Part 1910, OSHA;
- ACI 350-2006/350R-2006: Code Requirements for Environmental Engineering Concrete Structures, ACI;
- ACI 350.3-2001: Seismic Design of Liquid-Containing Concrete Structures, ACI;
- ACI 350.4R-2004: Design Considerations for Environmental Engineering Concrete Structures, ACI;
- ACI 530-2013: Building Code Requirements for Masonry Structures, ACI;
- ADMI-2015: Aluminum Design Manual (ADM), The Aluminum Association;
- American Institute of Steel Construction (AISC): AISC (14th Ed): Steel Construction Manual;
- Specification for Structural Steel Building: AISC 360-10;
- Seismic Provisions for Structural Steel Buildings: AISC 341-10;
- American Association of State Highway and Transportation Officials (AASHTO): LRFD Bridge Design Specifications 2012;
- SJI Standards;
- SDI Standards;

- Current International Code Council Evaluation Service (ICCES) reports for specific products; and
- Project Geotechnical Report.

5.5.5.1 General

Design loads for each structure are in accordance with the applicable codes and standards previously presented. The below criteria are a partial summary of the requirements. Risk category III is used for all project facilities.

5.5.5.2 Dead Loads

Dead loads will consist of the weight of the structure and all equipment of a permanent or semi-permanent nature, including but not limited to; mechanical equipment, HVAC equipment and ductwork, electrical equipment, and wiring and lighting. Typical collateral load on underside of roof = 10 psf.

5.5.5.3 Live Loads

Live loads will consist of uniform live loads and equipment live loads. Uniform live loads are assumed to be sufficient to provide for movable and transitory loads such as the weight of people, small equipment, and stored materials. These uniform live loads need not be applied in addition to equipment loads to floor areas that are permanently covered with equipment. Floors are designed for the uniform live load or actual equipment load, whichever is greater.

Uniform and concentrated live loads will conform to CBC Section 1607and ASCE 7. Typical design live loads are:

- Process area floors & slabs = 200 psf;
- Non-Process Areas = 100 psf;
- Gratings and Platforms = 100 psf;
- Electrical room floor areas = 300 psf; and
- Roof Live Load = 20 psf (reducible).

5.5.5.4 Wind Loads

Wind loads will conform to the requirements of the CBC and ASCE 7.

For the purposes of design, the wind pressure is taken upon the gross area of the vertical projection of the building or structure measured above the average level of the adjoining ground. The design basic wind speed is 115 mph (ultimate), Exposure Category C.

5.5.5.5 Snow Loads

Snow loads will conform to the requirements of the CBC and ASCE 7. For the purposes of design, the design ground snow load is zero.

5.5.5.6 Seismic Loads

The seismic design for building structures will conform to the CBC and ASCE 7. The site is located in close proximity of a fault line.

The coefficients used for calculating the design base shear for buildings and structures in accordance with ASCE 7 and CBC are:

- Spectral Response Accelerations:
  - SS = 2.455g
  - S1 = 1.069 g
- Site Class D
- Earthquake Spectral Response Acceleration Parameters
  - SDS = 1.637 g
  - 1.069 g
- Seismic Design Category E
- Seismic Importance Factor I_E = 1.50 (for Occupancy Cat. IV for any structure that provides fire water)
- Seismic Importance Factor I_E = 1.25 (Occupancy Cat. III for all other structures)
- Response Modification Factor, R and Over-strength Factor Ω in accordance with ASCE 7 and CBC requirements

Seismically induced hydrodynamic loads are considered in the design of water-retaining structures. Hydrodynamic loads include forces produced by accelerations of the mass of the contained liquid (impulsive forces) and forces produced by oscillations (sloshing) of the liquid within the tank (convective forces). One half of the impulsive and convective forces are applied to each opposite wall of the containment structure. The seismic design of liquid-containing concrete structures is based on ACI 350.3

5.5.5.7 Equipment Loads

Loads from equipment are considered live loads. The maximum loads and support details for each major piece of equipment will be provided by the designing or specifying discipline. Preliminary weights of building service equipment (HVAC, plumbing, and electrical) will be established during preliminary design, and confirmed during final design.

In addition to the mechanism's static dead load, design is performed for other effects, such as those due to operation, maintenance and malfunction. Examples include, but are not limited to, the following.

- Rotating agitator equipment (mixers, flocculators, and mechanical aerators): Design is performed for moment, torque, and lateral/vertical thrust.
- Rotating clarifier mechanisms: Design is performed for stalling torque.
- Vertical turbine pumps: Design is performed for suction load plus the weight of the suspended water column in the riser.
- Sluice gates, non-self-contained: Design is performed for a load equal to the breaking strength of the operating stem, or the stalling torque of the motorized operator, in the event the gate is frozen.
- All equipment: Design is performed for required maintenance procedures, such as the removal of a large component and the placing of it temporarily on the adjacent structure.

5.5.5.8 Impact Loads

Static loads are increased for the effects of impact by the following percentages:

- Vehicular loads: In accordance with the AASHTO Specification.
- Light machinery supports, shaft or motor driven: 20 percent of the operating weight (minimum) or manufacturer's recommendation.
- Reciprocating machinery or power-driven unit supports: 50 percent of the operating weight (minimum) or manufacturer's recommendation.
- Hangers supporting floors or balconies: 33 percent of live load reaction.
- Monorails and bridge cranes: conform to the requirements set forth in ASCE 7 Section 4.9.

5.5.5.9 Construction Live Loads

The contractors are responsible for maintaining loads on partially or fully complete structures at or below the design live loads noted on the drawings, or for providing supplemental support. However, in certain cases, if the service load on a structural element is negligible, a design load is used which would accommodate reasonable construction activities.

When it is necessary to provide particular restrictions on construction sequencing, special loads conditions may result. This is particularly applicable to work involving the modification of existing structures. These cases are evaluated and appropriate criteria established during final design. Such restrictions will be indicated in the drawings or specifications.

5.5.5.10 Process Liquid Loads

Design is performed for liquid loads assuming liquid surface at the maximum working level using normal allowable stresses, or the load factor for a live load, as appropriate. In addition, design is performed assuming the liquid surface at the maximum possible level under surcharge conditions using an increase in allowable stresses, or the load factor for a dead load, as appropriate.

Where cells of a tank communicate so that one cannot be isolated from an adjacent cell (by valves, gates, stoplogs, or other normal operational means), the separating walls will not be designed for

liquid on one side only. However, design will be performed for a 12-inch minimum water level differential on either side of the wall to account for flow lag and minor dynamic effects, unless hydraulic or seismic analyses indicate different level.

Elements acting as or affected by screens (which remove trash or other solids from flow) is designed for liquid to its maximum level, assuming the screen is completely blocked. Elements acting as flow baffles (at which blockage is unlikely) is designed for a 12-inch minimum water level differential, unless hydraulic or seismic analyses indicate a different level.

Closed liquid containing structures will, whenever possible, be vented to preclude pressurization or depressurization. However, certain structures may experience pressure or vacuum effects due to particular mechanical or process systems, or the malfunction of systems or components. In such cases, design is performed for the maximum water, air or gas pressure as provided by the mechanical-process discipline in preliminary design.

5.5.5.11 Lateral Earth Loads

Below grade walls are designed per the recommendations in the project geotechnical report.

5.5.5.12 Thrust Loads

Where pumps and pipes penetrate walls or slabs with embedded flange or collar, pipe thrust is considered. The method of transfer of thrust load into the structure is considered including local shear stresses, as well as overall stresses in the element. The greater of the maximum surge pressure and internal piping test pressure is the basis for calculated thrusts.

5.5.3 Combination of Loads

5.5.3.1 General

Design is performed for combinations of loads, along with appropriate load factors or allowable stresses, in accordance with the governing code[s]. In the absence of specific direction by the code, the most severe distribution, concentration and combination of design loads and forces is used. These combinations may be limited by practical considerations, such as the following:

- Combination of certain loads will not be considered when the probability of their simultaneous occurrence is negligible. Such loads include wind and seismic on superstructures, and seismic, live load surcharge, and flood on substructures.
- The effects of any load type (other than dead load) will not be used to reduce the effects of another load type. A maximum of 90 percent of the dead load is used in any combination where it reduces the effects of another load type.

5.5.3.2 Liquid Containing or Below-Grade Structures

Design is performed for structures that contain liquids, extend below grade, or both, for the following load combinations:

- Liquid-containing compartments full, no backfill for liquid-containing compartments. No reduction is made for any counteracting soil pressure on the face remote from a contained liquid unless approved.

- Backfill and groundwater with liquid-containing compartments empty and full.
- Liquid-containing compartments empty or full in any combination.
- Temporary surcharge loads will not be combined with seismic forces.

5.5.4 Serviceability

Additional requirements for serviceability is considered as provided in subsequent sections and referenced standards for specific materials.

5.5.4.1 Deflection

Design is performed to limit deflections to the following. In cases indicated with an asterisk (*), deflection limit will apply to live load effects only. For monorails and cranes, impact need not be included.

- Floor plates and gratings* L/360
- Beams, lintels or slabs supporting masonry L/600 (3/8-inch maximum at windows)
- Roofs without plastered ceilings* L/240
- Roofs with plastered ceilings* L/360
- Floors, steel framed* L/360
- Floors, concrete in accordance with ACI 318
- Exterior walls and interior partitions with brittle finishes L/360 lateral includes stucco, plaster and cement board
- Exterior walls and interior partitions with flexible finishes L/240 lateral includes EIFS and metal siding
- Exterior walls and interior partitions with brick veneer L/600 lateral

5.5.4.2 Ponding

Ponding refers to water retention due to the effects of deflection on a flat roof. For flexible roof systems, sufficient stiffness is provided to prevent successive water retention and deflection leading to failure.

5.5.4.3 Vibration

Design is performed for the effects of vibration to provide appropriate protection against structural deterioration, mechanical deterioration, and significant occupant discomfort. Under normal circumstances, the guidelines below will generally be followed. If deemed necessary by the supervising structural personnel, a dynamic analysis of the system is performed.

Mechanical Vibration

Concern for mechanical vibration is greatest for equipment such as blowers, induced-draft fans, generators, compressors, steady bearings at pump shafts and centrifuges. Operating frequencies,

unbalanced loads, and specific design recommendations will be obtained from the manufacturer by the discipline specifying the equipment.

To avoid resonant vibration, the ratio of the structure's natural frequency to the operating frequency of the equipment will be restricted to less than 0.70 or greater than 1.30. Where practical, the latter will be used to avoid resonance during equipment startup and shutdown. Consideration will be given to applicable modes of vibration, including vertical, lateral, and rotational.

Design will be performed in accordance with the following guidelines for equipment which produce significant vibrational effects, where possible and appropriate.

- Equipment will be mounted on concrete foundations or supporting systems rather than metal supporting systems.
- Major equipment foundations and supporting systems will be isolated by expansion joints or independent supports from the remaining structure to minimize vibrational transmission.
- Vibration isolators, dampeners, and/or inertia blocks will be provided where appropriate.
- Anchorage to foundations will be provided by embedded anchor bolts. Drilled anchors will not be used.

5.5.5 Foundation Design

Foundation design will be performed in accordance with the facility Geotechnical Report.

5.5.5.1 Geotechnical Report

Geotechnical recommendations are provided in "Geotechnical Engineering Services Indirect Potable Reuse Preliminary Design Eastern Municipal Water District, San Jacinto, California", by Kleinfelder dated November 3, 2017.

The recommendations indicate that the proposed structures associated with the AWPF are suitable for shallow spread footings provided the recommendations within the geotech report are followed.

Section 4.2.4 of the geotech report presents liquefaction-induced settlement. The report assumes that groundwater levels would increase at the site overtime, however the percolation ponds that would raise the ground water levels are located off site. It is not anticipated that groundwater would raise high enough to produce a liquefaction event.

5.5.5.2 Foundation Support

Design of foundation elements (footings and mats), including excavation and backfill limits and details, will be performed in accordance with the recommendations of the geotechnical report.

To the extent possible, buried piping and ductbanks will be maintained outside the influence zone of the foundation elements. Limits of this zone will be established based on bearing materials' characteristics as documented in the geotechnical report. At a minimum, this zone will be defined

by a line extended outward and downward from the bottom corners of a foundation element at a 1 vertical to 1 horizontal slope. A reinforced concrete encasement or other appropriate protection will be provided for any utilities extending into this zone.

5.5.5.3 Buoyancy

Structures will be designed to resist buoyancy considering only the structure dead load, soil directly above the structure and footing extensions. The effects of live loads, liquid contents, vertical soil friction and soil cohesion will be neglected. When anchorage systems are used, they will be designed to resist the net uplift force transmitted to the components of the anchorage. Structures will be designed to provide a minimum factor of safety of 1.10, calculated as the ratio of total resisting force to total buoyant force.

5.5.6 Concrete Design

5.5.6.1 General

Concrete design for structures will be in accordance with ACI 318 and ACI 350. Special requirements for seismic design are found in CBC Chapter 19.

Structures that convey, store or treat liquid, are subjected to severe exposures, or have restrictive leakage requirements will be designed as environmental engineering structures.

Environmental engineering structures will be designed by the Strength Design Method (Ultimate Strength) with the modified allowable stresses, durability coefficients and serviceability requirements recommended in ACI 350 for the appropriate sanitary exposure. Structures other than environmental engineering structures will be designed by the Strength Design Method.

5.5.6.2 Floor Flatness

Floor flatness tolerances will be moderately flat classification as measured by the straight edge system as specified in paragraph 4.8.4 of ACI 117/117R, using a 10-foot straightedge, within 72 hours after floor slab installation and before shores and/or forms are removed.

5.5.6.3 Joints

Joint Types

Design will be performed using the following joint types:

- Isolation joints are formed discontinuities in or between structures which allow movement in any direction. They are not considered to be load-transferring joints. The movement may be due to anticipated settlements, differential deflections, or temperature and shrinkage.
- Contraction joints function as a plane of weakness for crack formation to dissipate shrinkage stresses and are not considered to be load-transferring joints. They may be formed by use of a bond breaker between concrete placements, discontinuing reinforcing steel, forming or sawing a partial depth groove, or by a combination of these methods. Keys will not be used in contraction joints.

- Partial Contraction joints are a form of contraction joint often used specifically for environmental engineering structures. They are usually not employed as load transferring joints, but do have a limited capacity for load transfer, and can be used as such with caution. A bondbreaker is applied to the joint plane and only 50 percent of the reinforcing steel passes through the joint. Keys will not be used in control joints.
- Construction joints are formed joints between adjacent concrete placements and are designed to be load-transferring joints. Bond between the placements is promoted and reinforcing steel is continuous through the joint so that the section behaves as though it was monolithically constructed. The surface of the first placement will be roughened to promote bond. Keys will not be used unless project requirements dictate and use is approved.

Layout and Design

The jointing system layout will be determined during design. Joint types, locations, and related criteria will be selected. All joints will go through the entire structure in one plane whenever possible. Staggers and offsets will not be used for expansion, control and contraction joints, and avoided for construction joints unless absolutely necessary.

Slab-on-grade control joints shall be located at a spacing no greater than 24 feet on center each direction. The length of this area shall not exceed 1 1/4 times the width. The joints can be either contraction joints (weakened plane joints) or construction joints. Crack control joints may be construction joints, contraction joints, expansion joints, or isolation joints.

5.5.6.4 Waterstops

Continuous waterstops will be provided in all joints in walls, slabs, and other elements separating the following spaces. Additional installations may be required by special project conditions.

- Between liquid containing areas and dry, habitable areas;
- Between liquid containing areas and external areas (air, water, or soil);
- Between below-grade dry, habitable areas and external areas (water or moist soil); and
- Between adjacent liquid containing areas when one can be drained while the other remains full.

6” PVC waterstops will be used in the construction joints and partial contraction joints while 9” ribbed with centerbulb PVC waterstops will be used in the expansion joints for all liquid containment and below-grade structures. Six-inch (6-inch) thermoplastic elastomer rubber (TPER) waterstops will be used in the construction joints and partial contraction joints of chemical containment areas. Premolded adhesive waterstop may be used in lieu of 6-inch PVC waterstop where hydrostatic head is no more than 50 percent of manufacturer’s recommended values, and wall thickness is enough to avoid honeycombing.

5.5.6.5 Reinforcement

Spacing

In general, 6 inches and 12 inches will be used as the basic spaces for detailing on continuous elements such as walls and slabs.

Splices

Splices in deformed reinforcing bars will be lap splices conforming to ACI 318, unless otherwise indicated. In circular tanks designed for ring tension, splice locations will be staggered. Mechanical splices will be the threaded-type mechanical splices.

Preferred Reinforcing

To the extent possible, the preferred (outermost) reinforcing in continuous members (slabs and walls) within a system will remain consistent even if the spanning direction of the various members within the system varies.

Minimum Shrinkage Reinforcement

The minimum area of reinforcement is mainly a function of the distance between the movement joints (those which dissipate shrinkage and temperature stresses) in the direction of the reinforcement. It is also a function of the concrete mix, element thickness, and environmental conditions.

A minimum total area of reinforcement will be provided in accordance with the recommendations of ACI 350 for normal cement and service conditions. A minimum bar size of #5 (except for ties and stirrups) and a maximum spacing of 12 inches will be used for all elements functioning as continuous liquid containment elements.

5.5.6.6 Anchors and Embedments

Anchor Types

Design will be performed using the following anchor types:

- Cast-in anchors are set prior to casting of the concrete. Anchor bolts are the most common type, used in applications such as anchoring of steel columns. Other types include bolts with embedded plates, strap anchors, and headed anchor studs.
- Expansion anchors are generally drilled-in bolts that engage the concrete substrate by using a sloping mandrel to force wedges into the sides of the hole during tightening.
- Adhesive anchors are generally drilled-in bolts that engage the concrete substrate through the chemical bonding by a resin. Reinforcing dowels may also be anchored in this manner.

Selection

Cast-in anchors generally provide the greatest assurance of adequacy and will be used whenever practical. Cast-in inserts (threaded receptacles set below the concrete surface) will be avoided unless necessary, due to the difficulty of verifying adequate thread engagement. Drilled-in anchors will be used when greater flexibility is required in positioning the anchored elements. Expansion anchors will be used in non-critical applications only and not for tensile or vibratory loads.

Design

Anchor bolts may be designed using the allowable loads and location restrictions provided in the ACI 318, Appendix D. Otherwise, design for allowable loads will be performed by either an analysis that considers the controlling failure mode (including anchor failure, bond failure, and substrate failure), or in accordance with the results of an independent testing program. In determining allowable loads, the effects of anchor spacing, edge distance, and combined loadings will be considered.

5.5.6.7 Concrete Fill

Concrete fill (f'_c = 2500 psi) will be used mainly in environmental engineering structures to contour liquid containing spaces for flow and drainage purposes, unless it is more expedient or economical to contour the structural concrete. Concrete fill will not be considered as a structural element for resisting stresses or providing support. However, it will be considered as permanent dead load for the resistance of hydrostatic uplift.

5.5.7 Masonry Design

Design of reinforced concrete masonry will be in accordance with the requirements of ACI 530 and Chapter 21 of the CBC.

Vertical control joints will be provided at approximately 24 feet maximum, and at corresponding control joints in supporting concrete. Control joint locations will be considered in design of shear walls. Reinforcing in all bond beams at floor or roof levels will be continuous across control joints.

Masonry walls will be solid grouted and special inspection will be provided. Walls will be reinforced with vertical and horizontal reinforcement. Reinforced masonry lintels will be used across openings. Tall slender walls and door jambs for roll up doors will be designed with due consideration given to the P-delta effects on out-of-plane bending. Reinforcing for masonry will be shown on the structural drawings.

5.5.7.1 General Design and Detailing

Reinforcing

Deformed bar reinforcing will be provided in load bearing and exterior masonry. All courses and cells containing bars will be fully grouted.

In all masonry, horizontal reinforcing will be provided spaced at a maximum of 48 inches vertically. Horizontal bond beams shall be provided at floor and roof levels and at the tops of walls. Minimum bond beam reinforcing is two #5 bars.

Below Grade and Submerged Applications

Masonry will not be used in submerged applications unless dictated by project requirements and approved. When required, solid or fully grouted hollow units will be used with an appropriate coating for protection and leak prevention.

Veneer

Non-structural masonry veneers will be selected, detailed and specified by the architectural discipline. The structural adequacy of veneer attachments and the weights used in dead load calculations will be verified.

Control Joints

In general, the spacing of control joints in masonry walls will be controlled by other building components and architectural requirements. The layout of control joints will be reviewed for its effect on the structural design of the masonry, particularly in regard to structural elements such as masonry lintels bond beams functioning as tension chords in "box system" buildings.

5.5.8 Structural Steel Design

Structural steel design will be in accordance with the AISC Manual of Steel Construction. Special requirements for seismic design are found in the AISC Seismic Provisions for Structural Steel Buildings. All welding will conform to the requirements of AWS D1.1.

Steel joists and steel decking will not be used in applications in regions of aggressive corrosive atmospheres or for floor supports. Where steel deck is used it will be 20 gage minimum. Design values for diaphragm and load forces will be obtained from the associated ICC-ES report.

5.5.8.1 Design Methods

General

Design of structural metals will be performed in accordance with Allowable Stress Design (ASD) methods or Load Factor and Resistance Design (LRFD) methods specified in the referenced codes and standards.

Steel Deck

Deck sizes, profiles and connections will be selected from load tables in the referenced standards.

Joists and Joist Girders

Sizes will be selected from load tables in the referenced standards. Design loads will be provided in the contract documents. For loads other than uniform loads, a load diagram will be provided.

Grating

Sizes of metal gratings will be selected in accordance with the manufacturer's load tables for uniform loads and limited concentrated loads defined in the tables. For other loads, design will be performed in accordance with ASD methods specified in the appropriate material standards.

5.5.8.2 General Design and Detailing

Structural Steel

Types of Construction

Steel structures will be designed as one of two types defined by the AISC Specification. In Type 1 construction, commonly referred to as "rigid frame," it is assumed that beam-to-column connections have sufficient rigidity to hold virtually unchanged the original angles between intersecting members. In Type 2 construction, commonly referred to as "conventional" or

"simple" framing (unrestrained, free-ended) it is assumed that, for gravity load, the ends of beams and girder are connected for shear only and are free to rotate under load.

Connections

Ensuring the design of connections for strength will be the responsibility of the design engineer. Structural steel connections which can be detailed by the fabricator directly from the AISC Manual-ASD will be so noted on the Drawings. Standard framed beam connections (such as bolted clip angles) will be specified to be designed by the fabricator using the standard tables in the Steel Design Manual for one half the total uniform allowable load for the given span. Similarly, pure tension or compression bolted connections, such as for bracing, will be designed using the standard tables in the Steel Design Manual for the force noted on the Drawings. All other connections will be designed and detailed in the contract documents.

Whenever possible, shop welded - field bolted connections will be used. Where possible, 3/4-inch diameter high strength bolts, 3/4-inch diameter anchor bolts, and 3/16-inch (minimum) fillet welds will be used.

Lateral Support

Bracing of the compression flange against lateral-torsional buckling will be considered adequate when design and details provide resistance equal to or greater than 2-1/2 percent of the flange force. This will normally be provided by welded or screwed metal decks designed as diaphragms. Metal grating will not be considered to provide bracing.

Column Bases

Steel column plates will be designed and detailed using anchor bolts with shims or leveling nuts and shop welded base plates. Nonshrink grout will be provided as necessary under base plates.

Steel Roof Deck

Where possible, 1-1/2-inch Type WR (wide rib), 20-gauge (minimum) deck will be used. For diaphragm action, welded or screwed connections will be provided in a minimum 36/3 pattern at supports and at 18-inches on center at sidelaps.

Steel Joists

Bridging will be provided at all joists in accordance with Steel Joist Institute (SJI) provisions. Concentrated loads will only be allowed at panel points of the joists.

5.5.9 Miscellaneous Metals and Other Materials

Aluminum will be used for gratings, cover plates, hatches, guardrails, ladders, etc. continuously exposed to water unless inappropriate for the application. Where other materials are to be used, material type will be identified on the drawings. Aluminum supports will be designed in accordance with engineering data and specifications published by the Aluminum Association.

Stairways and guardrails will meet the minimum requirements of the CBC for structures, unless otherwise approved. Ladders will meet the minimum requirements of OSHA and will conform to the CBC when used for roof access.

The minimum grating depths with associated maximum spans will be shown on the drawings for typical applications. Where special gratings are required, bearing bar depth and thickness will be noted on the drawings.

Fiberglass Reinforced Plastic (FRP) may be considered where additional corrosion resistance is required. Specific manufacturer data will be evaluated for design. Generally, FRP elements will be schematically shown on the drawings and design requirements defined in the specifications.

5.5.10 Pre-engineered Metal Structures

Pre-engineered metal structures will be in accordance with Metal Building Systems technical specification and additional requirements described herein.

Columns and beams of rigid frame will be designed as primary structural supports, providing required clear inside height and width. Primary and secondary members and roof panels will be designed for all applicable loads and combinations of these loads. Collateral loads from lighting, conduit, soffit and process piping will be included in the design.

Column reactions will be vertical and horizontal only. No bending moments will be allowed at the column bases.

Bracing in roof and between columns will be located and designed to provide lateral load resistance against wind and seismic loads. Canopy will be designed for a maximum drift of 0.01 times the canopy height. Cast-in-place ASTM F1554 anchors will be used for concrete anchorage and ASTM A325 bolts will be used for frame connections as necessary.

Exterior covering will be galvanized steel conforming to ASTM A653, G90 coating designation, factory color finished.

The structural layout for column and beam locations are shown in Figure 5-17 and on the preliminary architectural drawings provided in **Appendix G**.

5.5.11 Seismic Design Criteria

5.5.11.1 Seismic Stability Requirements

The entire structure will be designed to resist sliding and overturning due to loads induced by seismic activity. Resistance to sliding may include frictional resistance between the soil and base of the structure, the frictional resistance between the below-grade walls and surrounding soil, as well as passive pressure on the structure's opposite wall.

When the horizontal and vertical accelerations are in phase, it will only be for a short period of time and the cycle will reverse in direction before stability becomes an issue, especially for near-fault situations. Therefore, the vertical acceleration effects may be omitted when evaluating global stability (soil bearing, sliding, and overturning).

5.5.11.2 Environmental Durability Factors

When the strength design method is used to analyze or design a concrete structure subjected to seismic loads, the environmental durability factors presented in ACI 350, may be omitted in the analysis or design combinations including seismic forces.

5.5.11.3 Lateral Force on Structural Elements, Nonstructural Components, Equipment Supported by Structures, and Chemical Storage Tanks

Structural elements, nonstructural components, equipment supported by structures, and chemical storage tanks will be designed to resist a minimum lateral seismic force F_p as presented in ASCE 7 Ch. 13 and CBC. Friction from gravity loads may not be used to resist seismic loads for nonstructural components.

The attachment and anchorage of the following equipment needs not be detailed:

- Components with a center of mass 4 feet or less above a floor level and weigh 400 pounds or less;
- Temporary equipment.;
- Components weighing 20 pounds or less;
- Distribution systems weighing 5 lb/ft or less; and
- Additional expectations listed in ASCE 7-10 Chapter 13.

5.5.12 Materials

5.5.12.1 Concrete

All concrete materials will conform to the requirements of ACI 318 and ACI 350. Specific requirements for the project are as follows:

- Class A Concrete: f'c = 2,500 psi for concrete fill, duct encasement, and where noted;
- Class B Concrete: f'c = 3,000 psi for pavement, and where noted;
- Class C Concrete: f'c = 4,000 psi for structural concrete;
- Class D Concrete: f'c = 4,500 psi for Liquid Containing Structures;
- One-inch nominal maximum aggregate size (maximum, for design); and
- Reinforcing Steel: ASTM A706 or ASTM A615, Grade 60.

5.5.12.2 Masonry

The minimum specifications for the design of structural masonry is in accordance with the requirements of Chapter 21 of the CBC for reinforced masonry and as presented below:

- Concrete Masonry Units: ASTM C90;
- Mortar: ASTM C270, Type S, minimum compressive strength = 1,800 psi at 28 days;
- Grout: ASTM C476, minimum compressive strength, f'm = 2,500 psi at 28 days;
- Specified prism compressive strength, f'm = 1,500 psi; and
- Reinforcing Steel: ASTM A706 or ASTM A615, Grade 60.

5.5.12.3 Structural Steel

Materials for structural steel will conform to the requirements of Chapter 22 of the CBC. Specific additional requirements for the project are:

- Structural wide-flange shapes: ASTM A992;
- Other structural shapes: ASTM A36;
- Structural plates and bars: ASTM A36 or ASTM A572, Grade 50;
- Structural steel tubes: ASTM A500, Grade B;
- High-strength steel bolts will have a minimum diameter of 5/8 inch and conform to the requirements of ASTM A325, unless noted otherwise;
- Embedded anchor bolts will have a minimum diameter of 3/4 inch and conform to the requirements of ASTM F1554, Grade 36, unless noted otherwise;
- Where stainless steel is required for both dry and wet conditions, Type 316 or 304 stainless steel is used; and
- All welding is designed for electrodes that deposit weld metal with a tensile strength of 70ksi.

5.5.12.4 Aluminum

Aluminum materials will conform to the requirements of the CBC and Aluminum Design Manual. Specific requirements for the structural components used on this project are as follows:

- Alloy 6061-T6 for structural shapes and plates; and
- Alloy 6063-T6 for extruded aluminum pipe.

Note: Fasteners for aluminum connections are Type 304 or 316 stainless steel with proper dielectric isolation unless otherwise approved.

5.5.12.5 Concrete Anchors

Unless stainless steel anchors are specifically required, galvanized steel anchors will be used for structural connections to concrete. Where stainless steel is required, Type 304 will be used unless Type 316 is specifically required. In general, 316 stainless steel anchors will be required in submerged conditions.

5.6 Electrical Design Criteria

This section addresses electrical design concepts and design criteria that will be applied throughout this project. Section 5.6.1 refers to those aspects of the electrical design that apply to general operational considerations. Preliminary electrical drawings are provided in **Appendix G**.

5.6.1 General

The electrical design shall be based on the National Electrical Code (NEC-NFPA 70) throughout. The 2014 NEC became effective January 1, 2017 for the State of California and will be assumed to be in effect for the PWR preliminary design project. Additional applicable codes include the Nation Electrical Safety Code (NESC), Occupational Safety and Health Act (OSHA) standards and applicable local utility requirements. Underwriter's Laboratories listing (or comparable) will be required for all equipment and materials where such listing is offered. Materials and equipment electrical requirements follow below:

- Conduit: Galvanized Rigid Steel (GRS) for general use; PVC coated GRS for corrosive areas; non-metallic (PVC) for use in direct buried or concrete encased duct bank. Underground duct banks will include reinforcing steel at roadway crossings, manhole/vault interfaces and intersections with building structures. Duct banks will incorporate 20 percent spare conduit capacity dedicated for Phase I use. Conduits installed under Phase I for future Phase II construction will include pull-strings and plugs/caps. Future Phase II conduits installed under Phase I shall be stubbed up in close proximity to their respective future load locations.

- Conductors: Conductors shall be provided in accordance with EMWD's Specification 16050-2.02.

- Medium Voltage Switchgear: The switchgear shall be metal-clad, two-high breaker arrangement with draw-out vacuum circuit breakers and shall be factory assembled and tested. The switchgear shall be rated at 15kV, 3-phase, 3-wire, solidly grounded, 60Hz system. Switchgear and circuit breakers shall be rated on a symmetrical current basis. Integrated withstands and interrupting rating shall be the same as the highest rated circuit breaker ratings. Switchgear shall be in a non-walk-in NEMA 3R enclosure. The switchgear shall have a dedicated service entrance section (SES) per Southern California Edison (SCE) requirements.

- Medium Voltage Pad Mounted Transformers: Pad mounted medium voltage transformers shall have KVA ratings as shown on the drawings, ONAN, 55°/65° temperature rise. Impedance shall be NEMA standard, +7-1/2% tolerance. The high voltage (HV) side shall be 12.47kV, Delta connected with taps (2) @ ±2-1/2% above and below the rated voltage. The low voltage (LV) side shall be 480V, solidly grounded Wye connected. Both HV and LV BIL ratings shall be NEMA standard. Transformers shall be fluid filled using Envirotemp FR 3 fluid. Primary fuses shall be drawout load break current-limiting type.

- Low Voltage Switchboards: The manufacturer of the low voltage switchboards shall also be the manufacturer of the circuit breakers. The switchboard shall consist of vertical sections bolted together to form a rigid assembly. Circuit breakers shall be rated for 600 volt, 3-phase, 3-wire, 60Hz. Circuit breakers shall have a minimum symmetrical interrupting capacity of 100,000 amperes at the system voltage unless otherwise noted on the drawings.

- Low Voltage Motor Control Centers (MCC): MCC's shall be suitable for 480V, 3-phase, 3-wire, 60Hz operation. Structures shall be totally enclosed, dead-front, free-standing assemblies. Structures (sections) shall be capable of being bolted together into a single assembly. Indoor rate enclosures shall be NEMA 1A (gasketed general purpose).
- VFD: VFDs shall be provided in accordance with EMWD's Specification 16160.
- Motors: Premium efficiency for all process motors.
- Motor Control Equipment: NEMA (not IEC) rated relays and starters.
- Building Transformers: Provide suitable "K" rated units for low-voltage, non-linear loads.
- Interior Lighting: LED; Comply with the following codes and standards as applicable: California Title 24 regulations, state and local codes, ASHRAE 90.1 and LEED. All interior LED luminaires shall be provided with a 100-0% dimmable driver capability and selected for factory installed occupancy/motion and photocell with daylight harvesting sensors as applicable to the space/environment for which the luminaire is to be installed. Lighting level requirements will meet or exceed minimum IESNA requirements.
- Exterior Lighting: Comply with the following codes and standards as applicable: California Title 24 regulations, state and local codes, ASHRAE 90.1 and LEED. Photocell controlled LED building wall-packsand pole mounted fully cut-off luminaries for parking area, entrance walkways, security gates (as required) and roadway (as required). Exterior lighting shall utilize a lighting contactor with astronomical Time-of-Day, 24hr timeclock. Timeclock shall include a programmable skip-day feature. Lighting level (footcandle) requirements will meet or exceed minimum IESNA requirements.
- Harmonics: Mitigate electrical harmonics generated from solid state/non-linear devices such as UPS systems, computer power supplies and VFD's. Harmonic output shall be design mitigated to limitations defined per IEEE 519 standard.
- Arc-Flash: Design of electrical distribution system shall include system coordination of protective devices to reduce potential arc-flash incident energies to at or below NFPA 70E, Category II for Plant Operator safety. In instances where Category II levels may be exceeded such as at the service entrance (line-side of main breaker) of the main switchgear, a maintenance switch will be incorporated as part of the design to remove any time delay of the protective device and reduce the potential incidence energy to the lowest possible levels while the device is being maintained. If a coordination study determines that a protective device's incidence energy levels remain excessive (Category III) or dangerous (Category IV), that protective device will be labeled as "DANGEROUS" and will need to be de-energized while being maintained for plant operator safety.
- Power Failure: A medium voltage, 12.47kV diesel standby generator with belly tank to provide 24hrs of fuel, will be provided and sized to support critical loads defined **Table 5-42**.

Table 5-42 Standby Generator Loads

No.	Equipment	Hp	Type
1	RO Flush Pump No. 1 (Duty) (Phase I)	30	HP-VFD
2	RO Flush Pump No. 2 (Standby) (Phase I)	30	HP-VFD
3	RO Flush Pump No. 3 (Duty) (Phase II)	30	HP-VFD
4	RO Flush Pump No. 4 (Standby) (Phase II)	30	HP-VFD
5	CU-1 (Main Electrical Room)	46	FLA
6	CU-2 (Main Electrical Room)	46	FLA

The 12.47kV standby generator allows standby power to be delivered throughout the plant distribution system giving flexibility to choose which loads may be powered during loss of utility. Under the current design, the critical loads defined under Table 5-42 are all powered from the Process and Control Building Electrical Room. A future designer may consider providing a 480V standby generator connected to Switchboards MSBD-1 and MSBD-2 in lieu of the 12.47kV standby generator to power critical loads as a cost savings measure. Additionally, a future designer may elect to add provision for connection of a portable 480V standby generator at Switchboard MSBD-3 to allow for standby power to be delivered to the Brine Pond Control Building equipment.

120/208V, 3-phase UPS systems will also be provided to support critical control systems as defined by the process design engineer.

5.6.2 Power Distribution

For reference, a power plan and preliminary single line drawings are included in **Appendix G**.

5.6.2.1 Medium Voltage Switchgear and Standby Generator

Electrical distribution at the PWR facility will be comprised by a 1200A, 12.47kV, 3-phase, 3-wire, main switchgear (SWGR-1) receiving a single-ended power feeder from Southern California Edison (SCE). Coordination will need to take place with SCE to verify available power capacity for the project as well as the demarcation/connection point to the SCE distribution system. Standby power will be provided in the form of a 400kW, 12.47kV, 3-phase, 3-wire generator connected to the switchgear and controlled via an Automatic Transfer System (ATS). The generator will provide standby power to the plant at initially the Main Switchgear SWGR-1 12.47kV at the switchgear bus, then stepped down to 480V at the low voltage MCC distribution level to distribute standby power throughout the plant. Both switchgear and generator are sized to handle Phase I and Phase II loads.

5.6.2.2 Medium Voltage Pad Mounted Transformers

From the 12.47kV switchgear/generator distribution level, medium voltage power is distributed to three pad-mounted 12.47kV-480V transformers:

- XFMR-PH1: 2000kVA;
- FUTURE XFMR-PH2: 2000kVA; and
- XFMR-BP: 1250kVA.

Transformer's XFMR-PH1 and XFMR-BP will be installed under the Phase I project while Future XFMR-PH2 will be installed later under Phase II.

Transformer XFMR-PH1 will provide power for the Process and Control Building. This power will be distributed via main switchboard MSBD-1 to Phase I motor control centers: MCC-1 and MCC-2.

Transformer XFMR-BP will provide power for the Brine Pond Control Building and Brine Pond area equipment. This power will be distributed via main switchboard MSBD-3 to Phase I motor control center: MCC-5.

Transformer XFMR-PH2 will be installed under Phase II of the project and will provide power for the Process and Control Building. This power will be distributed via future (Phase II) main switchboard MSBD-2 to future (Phase II) motor control centers: MCC-3 and MCC-4. Conduit will be provided under the Phase I project and stubbed up between the future XFMR-PH2 transformer location and the future main switchboard MSBD-2 pull section location to facilitate future construction.

5.6.2.3 Low-Voltage Switchboards

Main switchboards MSBD-1 and future (Phase II) MSBD-2 will be located in the Electrical Room of the Process and Control Building. MSBD-1 is a 2500A, 480V, 3-phase, 3-wire, 60Hz switchboard. MSBD-1 will provide 480V power to 350HP, Primary RO Pumps No. 1 & 2. MSBD-1 will also provide 480V power to 1600A, MCC's No. 1 & 2. Future main switchboard MSBD-2 will be configured similarly and will provide 480V power to future Primary RO Pumps No. 3 & 4 and future MCC's No. 3 & 4. Conduit will be provided under the Phase I project and stubbed up between the future MSBD-2 location and the future Primary RO Pumps 3 & 4 and future MCC's No. 3 & 4 main sections to facilitate future construction.

Main switchboard MSBD-3 will be located in the Brine Pond Control Building. MSBD-3 is a 1600A, 480V, 3-phase, 3-wire, 60Hz switchboard. MSBD-3 will provide power to (3) manufacturer provided Machine Control Panels for the brine pond area evaporator and blower equipment. MSBD-3 will also provide power to motor control center: MCC-5.

5.6.2.4 Low-Voltage Motor Control Centers

Motor control centers: MCC-1, MCC-2 and future (Phase II) MCC's No. 3 & 4 are located in the Process and Control Building Electrical Room. MCC's No. 1 & 2 are 1600A, 480V, 3-phase, 3-wire, 60Hz motor control centers providing 480V power to all Phase I equipment located at the Process and Control Building. Phase I process loads have been segregated as much as possible to maintain all "Duty" designated process loads onto MCC-1 and all "Standby" designated process loads onto MCC-2 to allow plant operators to easily shift equipment from "duty" to "standby" state. Future (Phase II) motor control centers: MCC's No. 3 & 4 are configured similarly. See **Table 5-43** for details.

Table 5-43 Motor Control Center (MCC) Connected/Demand Load Table

MCC-1		MCC-2		MCC-3		MCC-4		MCC-5	
CONN	OPER DEMAND	CONN	OPER DEMAND	CONN	OPER DEMAND	CONN	OPER DEMAND	CONN	OPER DEMAND
KVA	*KVA*	*KVA*	*KVA*	*KVA*	*KVA*	*KVA*	*KVA*	*KVA*	*KVA*
1221.0	867.4	1107.7	194.8	756.2	527.3	756.2	94.8	564.0	445.8

Motor control center: MCC-5 is located in the Brine Pond Control Building. MCC-5 is an 800A, 480V, 3-phase, 3-wire, 60Hz motor control center providing power to the Brine Pond area LCRS Sample pumps and Inter-Pond Transfer pumps. There are no Phase II designated loads for the Brine Pond area.

5.6.2.5 Distribution Panels and Panelboards

In addition to the 480V motor control centers, the following distribution panels/panelboards will be provided for 480V- 120/208V, 3-phase, 4-wire power needs:

Process and Control Building:

- (1) 400A, 480V, 3-phase, 3-wire, 42-pole, distribution panel.
- (5) 100A, 120/208V, 3-phase, 4-wire, 42-pole lighting panels (30kVA transformer).
- (1) 10kVA UPS system for PLC backup power.

Brine Pond Control Building:

- (1) 100A, 120/208V, 3-phase, 4-wire, 42-pole lighting panels (30kVA transformer).

The Electrical Room at the Process and Control Building is designed to physically accommodate all necessary distribution equipment for both Phase I and Phase II plant operating capacities.

Electrical legend and abbreviation sheets, a preliminary electrical site plan, single-line diagrams for SWGR-1, MSBD-1, MSBD-3, MCC-1, MCC-2, MCC-5 and Machine Control Panels No. 1, 2 and 3 are included with this report.

The EMWD's standard specifications have been reviewed for much of the equipment described above. The specifications have also been reviewed and utilized during this preliminary design. Standard specifications provided by EMWD are under review by Will Kinniebrew (EMWD's Plant Electrical) and further coordination must take place before a determination can be made to use the EMWD's standard specifications received for the final design.

EMWD has indicated (per EMWD's standard specification) the following preferred distribution equipment:

- Eaton/Cutler-Hammer
- Schneider Electric/Square-D
- Allen Bradley

- General Electric

No additional substitutes are acceptable.

5.7 Instrumentation and Control (I&C)

5.7.1 Design Overview

Information in this section forms the preliminary engineering design for the Process Instrumentation and Control System, which will include instruments for monitoring and control of the process, a plant Supervisory Control and Data Acquisition (SCADA) System for the AWPF, and integration of AWPF cameras and access card readers onto existing Security/Camera System at the nearby WWTP, SJVRWRF.

Smart VFD(s) and MCC will be included in the design, with hardwired I/O for start/stop, running and fail signals, and Ethernet Modbus TCP/IP communication to PLC for VFD(s) and starters miscellaneous error codes.

Include interruptible power supply (UPS) – Panelboard, for the SCADA System, PLC(s) and instruments. The UPS backup time will be 10 minutes. At minimum, UPS low battery, AC power fail and On-Standby power will be monitored by the SCADA System.

The design and construction of the instrumentation and control of the processes and the SCADA System will be based upon criteria, codes and standards described herein. Preliminary P&IDs are provided in **Appendix G**.

5.7.1.1 Codes and Standards

The codes and standards that will guide the SCADA and control systems design include the following:

- NEC (NFPA 70)
- ISA–RP60.6 Nameplates, Labels, and Tags for Control Centers
- ISA-RP 7.1 Pneumatic Control Circuit Pressure Test
- ISA-RP 12.6 Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations
- ISA-S5.1 Instrument Symbols and Identification
- ISA-S5.4 Instrument Loop Diagram
- ISA-S20 Specification Forms for Process Measurement and Control Instrumentation; Primary Elements and Control Valves
- OSHA
- Underwriters Laboratory (UL) 508A

Equipment, materials, and installation will also comply with the requirements of the local authority having jurisdiction, State of California.

5.7.1.2 Design Criteria

It was determined that the AWPF will be a standalone plant, and that the AWPF will not be controlled from the SJVRWRF. However, it was agreed that alarms will be observed at the SJVRWRF. The AWPF's SCADA screens should be mirrored at the SJVRWRF and OMC Control Center. Diagram 00-I-003 shows the preliminary Control System Architecture schematic shown below in **Figure 5-18**.

AWPF SCADA System

The AWPF SCADA System shall be compatible with the existing WTP SCADA System. This stand-alone SCADA System shall consist of the followings:

- Schneider Electric OASyS (Open Architecture SyStem) Server.
- Storage Disk, with Maximum Raw Capacity of 12TB, which could store data for a couple years.
- Engineering workstation.
- Operator workstation.

PWR AWPF Communication Front End (CFE) – Kingfisher RTU

- A Kingfisher RTU, with CP-12 processor module, shall be provided at AWPF as communication front end to communicate with EMWD's OASyS SCADA System at OMC Control Center.
- The Kingfisher shall be equipped with Ethernet Communication board as required for communications over the fiber optic (FO) link to EMWD's RTUs Network at SJVRWRF.

Programmable Logic Controller (PLC) - Plant PLC and Vendor Supplied PLC

- Design will be based on Allen Bradley PLC for the plant and vendor supplied PLCs, ControlLogix PLC for major and CompactLogix for minor process, and Ethernet/IP will be communication protocol for Allen-Bradley PLCs' communication.
- Ethernet Modbus TCP/IP will be communication protocol for Allen-Bradley PLC to smart VFD and MCC.
- The Discrete Input and Output cards shall be 120 Vac.
- PLC Local Ethernet shall use CAT-6 cable.

Operator Interface Terminal (OIT)

- Vendor Supplied OIT shall be PanelView Plus 7 Series.

Field Device

- Instruments will be selected to maximize interchangeability across similar process functions within the plant, thus minimizing maintenance training and spare parts.

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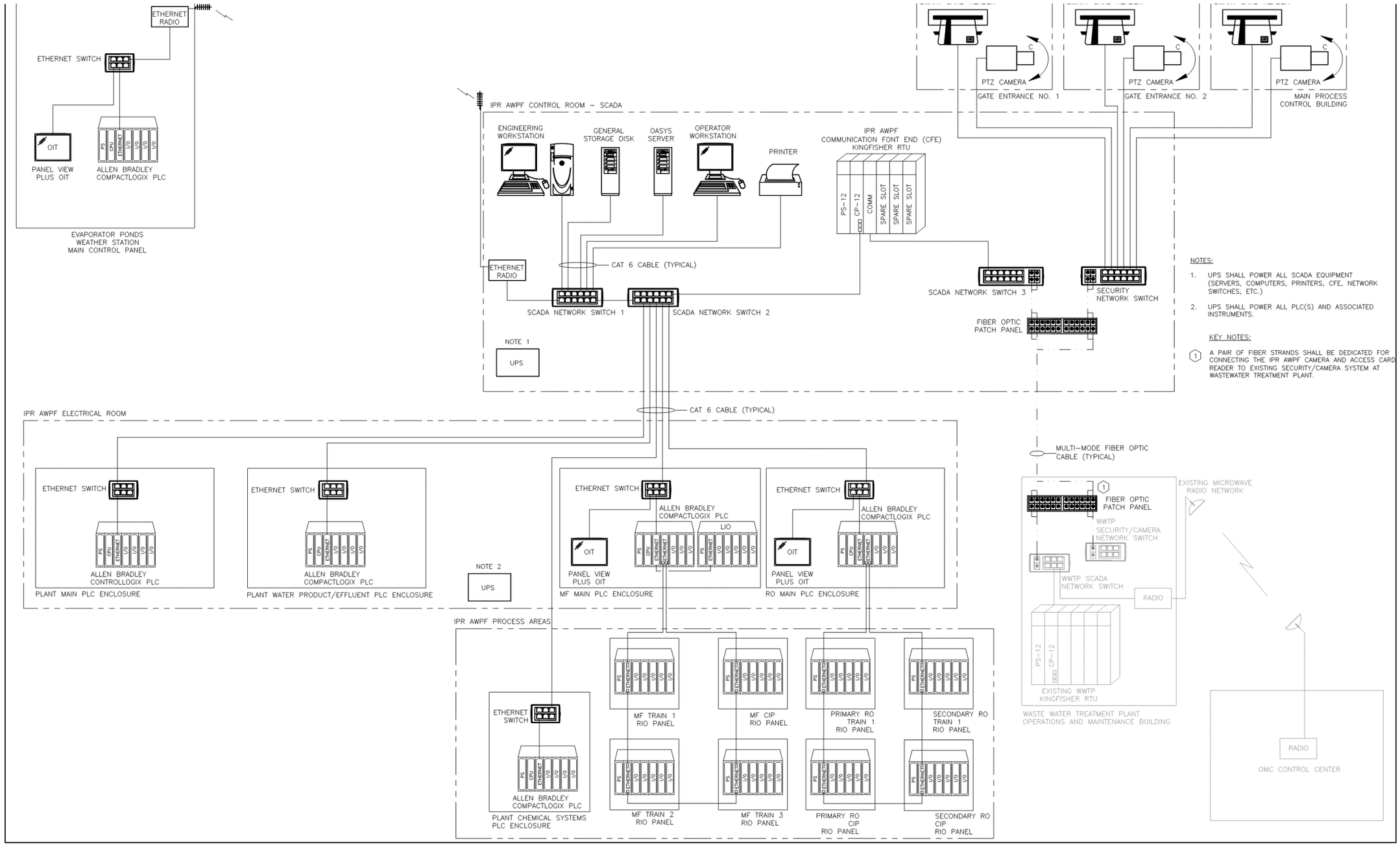

Figure 5-18 System Architecture

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Evaporator Ponds - Radio Communication

- Evaporator Ponds Weather Station Vendor Package System will include Antennas and IP Radios to send data stream from the evaporator ponds' main control panel to the AWPF SCADA System.
- Radio shall be MDS iNET 900 Series.

Fiber Optic Communication Links Between AWPF and SJVRWRF

- FO cable between AWPF and SJVRWRF shall be 12-Fiber, 62.5/125 micrometer (µM), Multi-Mode Fiber Optic Cable.
- Dedicated FO links between PWR Plant and existing SJVRWRF are for the following purposes:
  - Viewing AWPF SCADA screens at SJVRWRF;
  - In addition to fiber link, utilizing existing Microwave Radio Network at SJVRWRF to OMC Control Center for viewing PWR AWPF SCADA screens and sending alarms to WTP OASyS SCADA System at OMC Control Center; and
  - Connecting (Ethernet connection) the cameras and card readers at AWPF onto existing Security/Camera System at SJVRWRF.

5.7.2 Device Tag Naming Convention

The basic code to define tag names is as below:

[AAAA]-[NNNNN]

Where,

AAAA: Equipment Abbreviation, up to 4 alpha characters

NNNNN: Loop number, 5-digit number (First two for process area and last three for device sequential number)

5.7.3 SCADA Naming Convention and Facility Codes

SCADA tag shall consist of EMWD's Facility Code for AWPF, Instrument tag name and number, and Tag Function. Only alpha and numeric characters (except for an underscore _) can be used, with a maximum length of 31 characters. All alpha characters must be in capital letter.

The facility codes for the AWPF are shown on Figure 5-3.

5.7.4 HMI Graphic Display - Color Convention

The HMI graphic display shall follow EMWD's color convention as shown below in **Figure 5-19**.

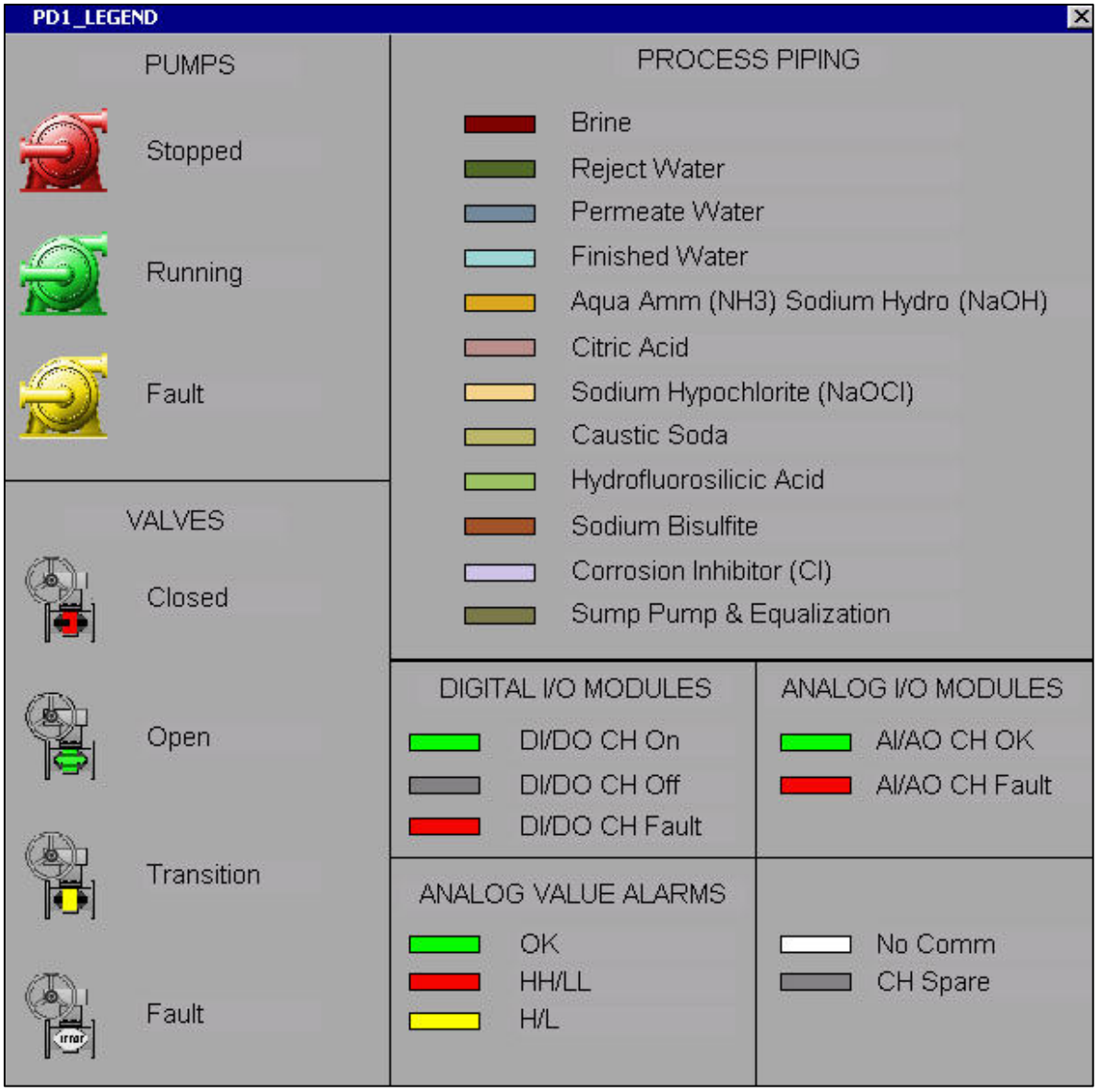

Figure 5-19 HMI Graphic Screen

5.8 HVAC, Plumbing, and Fire Protection Design Criteria

5.8.1 HVAC Design Criteria

5.8.1.1 Codes and Standards

The following codes and standards shall apply:

- California Building Code, 2016 Edition
- California Mechanical Code, 2016 Edition
- California Fire Code, 2016 Edition

- California Plumbing Code, 2016 Edition
- California Energy Code, 2016 Edition
- American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Handbooks
- Sheet Metal and Air Conditioning Contractors National Association (SMACNA) Duct Construction Manuals
- NFPA
- Air Moving and Conditioning Association (AMCA)
- Associated Air Balance Council (AABC)
- National Environmental Balancing Bureau (NEBB)
- American Conference of Governmental Industrial Hygienists (ACGIH)

5.8.1.2 Design Criteria

Design conditions are selected based on Appendix JA2 of the California Energy Code for San Jacinto.

Outdoor Conditions

- Climate Zone: 10
- Latitude: 33.8° North
- Longitude: 117° West
- Elevation: 1535 feet above Mean Sea Level

Cooling Design Criteria[6]

- 0.1% Dry Bulb / Mean Coincident Wet Bulb: 110°F / 70°F
- 0.5% Dry Bulb / Mean Coincident Wet Bulb: 105°F / 69°F
- 1% Dry Bulb / Mean Coincident Wet Bulb: 104°F / 69°F

Heating Design Criteria[7]

- 0.2% Design Dry Bulb: 26°F
- 0.6% Design Dry Bulb: 29°F

[6] Actual temperature is equal to or above the design criteria X percent of the time. For 1% criteria, this works out to 88 hours of the total year. The 0.1% and 0.5% criteria are used for high outdoor air applications.

[7] Actual temperature is equal to or below the design criteria X percent of the time. For 0.6% criteria, this works out to 52.6 hours of the total year. The winter median of extremes criteria is used for high outdoor air applications.

- Winter median of extremes: 20°F

Outdoor air ventilation rates and design temperatures for the Process and Control Building are based on the California Energy Code. Process area ventilation rates and design temperatures are based on the requirements of the process equipment and the California Energy Code and shown in **Table 5-44**.

Table 5-44 Indoor Conditions Based on Type of Area

Room No.	Type of Area	Temperature °F Summer/Winter	Outdoor Air Ventilation Minimum Criteria	Comments
	General Areas			
3	Server Room	78 68	15 cfm/person	Cooling/Heating
22	Electrical Room	78 68	0.15 cfm/ft^2	Cooling/Heating
6	Control Room	78 68	15 cfm/person	Cooling/Heating
12	Break Room	78 68	15 cfm/person	Cooling/Heating
9	Circulation (East Corridor)	78 68	0.15 cfm/ft^2	Cooling/Heating
7	Conference Room	78 68	15 cfm/person	Cooling/Heating
2	Supervisor Office	78 68	15 cfm/person	Cooling/Heating
10	Mechanical & Riser Room	78 68	0.15 cfm/ft^2	Cooling/Heating
4	Storage Room	78 68	0.15 cfm/ft^2	Cooling/Heating
11	Circulation (West Corridor)	78 68	0.15 cfm/ft^2	Cooling/Heating
13	Men's Restroom	78 68	50 cfm/fixture	Cooling/Heating
14	Women's Restroom	78 68	50 cfm/fixture	Cooling/Heating
16	Public (PGA) Office	78 68	15 cfm/person	Cooling/Heating
	Process Areas			
19-21	Process Area	A+10°F A	6 ACH[1]	Ventilation/No heat
22	Electrical Room	85 65	0.15 cfm/ft^2	Cooling/Heating
23 15	Compressor Room Mechanical Room	A+10°F A	6 ACH[1]	Ventilation/No heat
1	Metering Pump Rooms	A+10°F	A	6 ACH1
17	Circulation (North/South Corridor)	78 68	0.15 cfm/ft^2	Cooling/Heating

1. Ventilation systems will be designed on the basis of the air changes per hour, or a space temperature of 10°F above ambient outdoor air temperature for heat removal, whichever results in the greater air flow.

Notes:
A = Outdoor Ambient Temperature
Cfm = Cubic feet of air per minute
ACH = Air changes per hour

5.8.1.3 Heating/Cooling

Requirements for heating and cooling of the control and process areas in the Process and Control Building are provided below.

Control Areas

The control area of the Process and Control Building will be heated and cooled using a heat recovery variable refrigeration flow (HRVRF) system. This unit is selected to exceed the California Energy Code requirements, the low maintenance requirement and to minimize the floor space required for the mechanical equipment. The HRVRF system allows each zone to be in heating or cooling as required, providing superior comfort for the building occupants.

Above the ceiling fan coil terminal units will be used in the 8 heating and cooling zones. The preliminary location for the outdoor unit is to the south of the electrical room. Tentative outdoor unit size is 15 tons of cooling.

The zones group together rooms with like exposures and locate the thermostat in the most temperature sensitive room. The tentative zone groupings are as follows:

- Zone 1: Control Room (T)
- Zone 2: Break Room (T), East West Corridor (T)
- Zone 3: Conference Room (T)
- Zone 4: Ops Supervisor Office (T), West Corridor, Mechanical & Riser Room, Storage Room, Server Room
- Zone 5: Women's Restroom (T), Men's Restroom
- Zone 6: Education Room (T)
- Zone 7: PGA Office (T)
- Zone 8: Circulation and East Corridor

Note (T) indicates location with the zone thermostat.

The server room will also have a mini split HVAC unit to provide redundant cooling. The preliminary size is 3/4-ton of cooling.

Process Areas

The electrical room will be cooled using two Direct Expansion (D/X) heat pump units with indoor fan coil units. Each unit will be sized for half of the maximum peak day cooling load to provide redundancy. The outdoor condensing units will be located to the west of the electrical room. Preliminary sizing for the redundant units is 15 tons of cooling each.

The process room and the air compressor room will be ventilated only and will not have heating or cooling. The metering pump rooms will be ventilated only and will not have heating or cooling unless the chemicals being metered have specific temperature requirements. Ventilation systems will be separated based on the compatibility of the chemicals in the rooms.

5.8.1.4 Ventilation

Control Areas

Outdoor air for the Process and Control Building will be provided by an inline fan. The air will be filtered using MERV 13 filters and delivered to the return air duct at each HRVRF terminal unit. The terminal units effectively condition the ambient outdoor air, so not outdoor air handling unit is required. Building pressure will be balanced to slightly positive.

Exhaust air will be taken from the restrooms and the break room to control odors and to control building pressurization.

Process Areas

Outdoor air will be ducted to the electrical room units. The units will be equipped with integrated economizers to use outdoor air for cooling anytime it is cooler than the room air.

The process area and the compressor room will be ventilated with no heating or cooling of the outdoor air. The ventilation system will be designed for a minimum of 6 air changes per hour. Depending on the heat gain in the space, the design ventilation rate will be increased to limit the temperature rise in the space to no more than 10°F above the outdoor ambient temperature. The ventilation fans will have manual and thermostatic control.

Outdoor air intakes will be located to prevent intake of vehicle exhaust emissions, and short circuiting of exhaust air from exhaust discharges. Exhaust discharge points will be located away from outdoor air intakes. With the exception of clean ventilation exhaust air, exhaust discharges will not be located where they will discharge on to people. Louvers will not be used over doors for exhaust.

5.8.1.5 Piping Systems

The HRVRF piping system piping will be copper with brazed fittings, sized to the manufacturers requirement.

The HRVRF fan coil units will require condensate drains. A sloped copper drain system will be installed above the ceiling to collect the condensate and direct it to a tailpiece fitting in the men's restroom. Vinyl tubing will be used between the fan coil unit condensate pumps and the sloped condensate drain system.

5.8.1.6 Duct Work

In general, rectangular ductwork will be used above ceilings to save clear space. Where rectangular ductwork is used, the aspect ratio will not exceed 4 to 1. Ductwork will be designed for a maximum pressure drop of 0.10-in water gauge per 100-ft of duct. Maximum velocities will be as follows:

- Control areas - offices and administration 1500 fpm
- Process areas - general process areas 1800 fpm

Sheet metal ductwork will be constructed of galvanized steel using the gages or thicknesses and reinforcing called for by SMACNA. Galvanized steel ductwork will be constructed of hot dip galvanized sheet steel, per ASTM, A525 and A527.

Ductwork will be fabricated and erected in accordance with SMACNA requirements, and rigidly supported and secured.

5.8.1.7 Fans and Air Handling Units

The supply and exhaust fans and air handling units will be commercially available products constructed of galvanized or epoxy coated steel or aluminum. Coils will be copper tube with aluminum fins. The electrical room air handling units shall be equipped with integrated 100 percent outdoor air economizers.

The selection of fans, air handling units, air conditioners, heating, ventilating and air conditioning machinery and mechanical equipment and the installation of system components such as ductwork and piping will be such as not to create noise that will exceed the levels of permissible noise exposures for occupational areas as established by the Occupational Safety and Health Act and other Federal, State and local safety and health standards, codes and ordinances.

5.8.1.8 Electrical Equipment

Electrical enclosures and panels, to include automatic temperature control panels and components will be suitable for the environment and electrical classification for the space they are located in.

5.8.1.9 Equipment Vibration Isolation

Unless otherwise specified, all HVAC machinery and vibrating HVAC system components will be isolated from the building structure by vibration isolators with a minimum absorption efficiency of 90 percent for the lowest disturbing frequency of the particular vibration source. Special types of vibration isolators such as piping and ductwork flexible connectors and flexible wiring conduits, will be provided where connections are made to system components that vibrate or generate noise. When exposed to the weather or wet environments isolators will be provided with corrosion protection.

5.8.1.10 Flame and Smoke Ratings

All materials, including adhesives, surface coatings, sealers, assemblies of several materials, insulations, jacketing, finish, etc., will have flame spread ratings not over 25 (fire resistive), and smoke development ratings not over 50 and fuel contributed rating not over 50, as established by tests conducted in accordance with the Federal Standard 00136B, National Bureau of Standards Radiant Energy Fire Test and the National Fire Code of the NFPA. These requirements will apply to all circumstances whether the materials are field applied or applied by a manufacturer in his/her shop, or elsewhere, prior to delivery to the project.

Bearings

Equipment will be furnished with bearings suitable for the intended equipment service. Extended lube lines with pressure reliefs will be provided for all bearings which are not readily accessible from outside the equipment.

5.8.1.11 Hangers, Supports and Anchors

All piping will be supported at a maximum of 10 ft-0 in intervals. Hangers or rings will be sized to fit outside the insulation. Rectangular, Round and Flat Oval Ductwork support spacing and size of hangers will be as called for in the SMACNA standards. All duct hanger and fastener materials will be of same finish as ductwork which they serve, e.g., galvanized, aluminum, black steel.

Design of all hangers will include the effect of all loads applied to the duct and pipe as well as the load of the duct or pipe. These loads include, but are not limited to wind, snow, seismic and internal dirt or liquid buildup.

5.8.1.12 Automatic Temperature Controls

The control system for the HRVRF system will be provided and programmed by the system vendor to ensure the proper operation of the system. The controls for the electrical room air conditioners will be provided by the equipment manufacturer and comply with the California Energy Code. The process area ventilation fans will be equipped with stand-alone controls to select on, off or thermostatic control. Office and administrative areas that are not continuously occupied will be provided with timed occupied/unoccupied control and temperature set back.

A non-proprietary building management system based on BacNET protocol will be provided with a dedicated operators workstation. This system will be the interface for monitoring and control of all environmental conditions.

All sensing devices, transmitters, controllers, not mounted in a clearly labeled panel, or which are not on obvious part of a clearly labeled device, will be provided with an engraved plastic plate containing the name, function, and system or system number of the device.

5.8.2 Plumbing Design Criteria

5.8.2.1 Codes and Standards

The following codes and standards will apply

- California Building Code, 2016 Edition
- California Mechanical Code, 2016 Edition
- California Fire Code, 2016 Edition
- California Plumbing Code, 2016 Edition
- California Energy Code, 2016 Edition
- American Society of Plumbing Engineers Data Book
- American Gas Association Standards
- National Fire Protection Association

5.8.2.2 Design Criteria

- EMWD water is available at a minimum flow of 30 gallons per minute at 60 psi for the domestic plumbing fixtures
- EMWD water main is located at the front of the building in the access road
- Waste flow will go to the onsite waste pump station
- Winter outdoor design temperature 26°F with a winter median of extremes of 20°F

5.8.2.3 Special Conditions

- All piping and fixtures exposed to freezing conditions will be protected with heat tracing or other forms of freeze protection

5.8.2.4 Plumbing Systems Included

The plumbing system to be included in the final design will consist of the following:

- Sanitary (regular plumbing and toilet fixtures)
- Building Waste (floor drains and equipment drains)
- Roof Drainage and Roof Overflow Drains
- Potable Cold Water
- Potable Hot Water
- Protected Cold Water (non-potable)
- Safety Showers and Eye Wash Units
- Tempered Safety Shower Water

5.8.2.5 Description of Plumbing Systems

Sanitary (regular plumbing and toilet fixtures)

The sanitary systems will serve all regular plumbing fixtures to include toilets, urinals, lavatories, sinks, water coolers and regularly used drains. Plumbing fixtures of all types including drinking fountains will be furnished and installed to conform to handicapped feature requirements. The sanitary waste will, in general, leave the building as a gravity drain and will terminate at a point approximately 10-ft-0-in outside of the building foundation wall. Continuation of the exterior portion of the system will be included under the civil, underground piping sections of the work (see Section 5.3).

Building Waste (floor drains and equipment drains)

The building waste system will be installed to serve all process areas requiring floor drains serving low points, wash down areas, and for specific pieces of process equipment.

Rain Water

Roof drainage will be collected by roof drains and roof overflow drains. The collected rainwater will be conveyed through interior piping connected to an underground storm water collection system. The overflow drains will be conveyed through interior piping, terminate outside of the building and spill on grade.

Potable Cold Water

The potable cold water system will extend throughout the building to serve all regular plumbing fixtures. The water entrance to the building will consist of a reduced pressure back flow preventer and shut-off valve. Plumbing fixtures of all types including drinking fountains will be furnished and installed to conform to handicapped feature requirements. It is assumed that the water supply remains above 60°F and is suitable for use in the emergency showers without tempering with hot water. This assumption will be validated during the next design phase.

Potable Hot Water

The potable hot water system will use a tank type storage system with piping extending throughout the building to serve all regular plumbing fixtures. Alternatively, point of use, under counter, instant water heaters may be used.

Protected Cold Water (non-potable)

The protected water system connects to the potable water system at the service entrance downstream of the shut-off valve but upstream of the potable water backflow preventer. The protected water system will be protected from cross connection by a reduced pressure zone type back flow preventer. A reduced pressure back flow preventer will be installed in both the main and the by-pass connections. The system will extend throughout the building with valving as required to supply all process and mechanical systems, wash hose stations and external wall hydrants.

Safety Showers and Eye Wash Units

Safety shower eyewash units will be provided in chemical areas indoors and outdoors. Units will be provided with water flow sensors to provide audible and visual alarms. Alarms will be local and report to the plant control system. Units located outdoors will be insulated and provided with electrical heat tracing.

Tempered Safety Shower Water

It is assumed that the local water supply remains above 60° F throughout the year and meets the ANSI guidelines for tempered water. This assumption must be validated during the next design phase. If the emergency shower supply requires tempering to reach 60F, separate tempered water systems will be provided located adjacent to the areas where chemicals are stored and used such as the storage tank area, the chemical pump area, and the CIP areas. Multiple showers will be connected to each 120-gallon storage tank. Each system will have a 120-gallon tank with water stored at 140°F, and a thermostatic mixing valve. This arrangement provides adequate flow for one shower at a time. The tempered water systems will be designed to meet the requirements of ANSI and OSHA to serve emergency showers and eyewash units.]

5.8.3 Fire Protection Design Criteria

5.8.3.1 Codes and Standards

The following codes and standards will apply

- California Building Code, 2016 Edition
- California Mechanical Code, 2016 Edition
- California Fire Code, 2016 Edition
- California Plumbing Code, 2016 Edition
- National Fire Protection Association

5.8.3.2 Design Criteria

A fire sprinkler system is required for the Process and Control Building. The water source for the fire sprinklers will be from the municipal water system. The EMWD water main located in the access road in front of the building will supply the fire sprinkler system. There is no existing preliminary pressure/flow data for this main. To determine the available pressure a hydrant test will be completed during the next phase of design.

5.8.3.3 Fire Sprinkler Systems

The Riverside County Local Amendments to the California Fire Code require fire sprinklers in all buildings over 3,600 square feet regardless of building occupancy classification. The system will be a wet sprinkler system. The hazard classification and area/density water flow requirements are as shown in the **Table 5-45** below:

Table 5-45 Fire Sprinkler System Hazard Class and Design Area/Density Criteria

Room No.	Area	Hazard Class	Area (sqft)	Design Area (sqft)	Design Density (gpm/sqft)
2-17	Control Area	Light	5000	1500	0.10
23 15	Compressor Room Mechanical Room	Ordinary, Group 1	1200	1500	0.15
22	Electrical Room[1]	No Sprinklers	1800	N/A	N/A
1	Chemical Metering Pumps	Ordinary, Group 2	1800	1500	0.2

1. Fire sprinklers omitted from the electrical room per NFPA 13, Paragraph 8.15.11.3.
2. Areas are approximate. See Section 5.4 for areas.

The design sprinkler flow requirement is determined by the chemical metering pump area to be 300 gpm. No inside hose connections are planned, and an outside hose stream allowance of 250 gpm is required to be added at the hydrant.

Where there is a dropped ceiling, like in the control area of the Process and Control Building, fire sprinklers may be required above and below the ceiling. This requirement will be evaluated in the final design phase.

An above grade testable double check detector assembly with integral indicating valve and fire department connection will be located close to the property line at the front of the building and adjacent to the parking lot in a location accessible to the fire department. The fire riser will be located inside the building. A wet pipe system will be used throughout. Even though the outdoor design temperatures are below freezing, the process equipment and lights will keep the unheated process area above freezing.

The post indicator valve and other indicating valves, along with the system water flow switch, will be monitored by the building fire alarm system.

5.8.3.4 Description of Fire Protection System

Piping

- Schedule 40 black steel, grooved fittings 2" and above, screwed fittings below 2"

Sprinklers

- Finished Areas: Recessed chrome pendant type, fusible link or glass bulb
- Non-Corrosive Unfinished Areas: Brass upright heads with fusible link or glass bulb
- Corrosive areas: Wax dipped upright heads with fusible link

Trim

- Wet pipe fire alarm check valve
- Flow switch
- Tamper switches
- Fire alarm bell

Section 6

Brine Evaporation Ponds Design Criteria

The RO used for treating the recycled water generates a concentrated brine stream that must be properly managed and disposed. The range of brine management options includes both brine disposal and brine minimization options. Brine disposal options are an ultimate solution and would manage all of the brine. Brine minimization processes would reduce the amount of brine produced, but the minimized brine stream would still need to be discharged through a disposal option. Brine disposal options were investigated as part of the San Jacinto Upper Pressure Management Zone (SJUPMZ) Indirect Potable Reuse Phase I Study included extending the Inland Empire Brine Line (IEBL), evaporation ponds, enhanced evaporation, deep well injection, blending with Title 22 water in the existing tertiary recycled water system, and zero liquid discharge (ZLD) treatment systems. In addition to brine disposal options, a number of brine volume minimization options were also investigated including: high recovery RO, interstage lime addition, and Desalitech's Closed Circuit Desalination (CCD) process.

Brine minimization technologies would be combined with the brine disposal options for a complete brine management program. The brine minimization options would reduce the size of the required brine disposal options. EMWD currently uses the regional IEBL for disposal of concentrate from their groundwater desalters and from other industrial customers in the District.

The brine disposal options that were considered feasible viable for the PWR project included connecting to the IEBL, evaporation, deep well injection, and Title 22 blending. There is a significant amount of new study and development work being conducted on brine minimization technologies as more and more arid regions struggle with the ability to dispose of brine waste streams, with new technologies and other applications likely being developed in the future. The IEBL connection with high recovery RO and the semi-enhanced evaporation pond with high recovery RO were determined to be the most feasible options and investigated in more detail.

The IEBL connection option would require a 15.6-mile pipeline with an initial capital cost of approximately $50 million. Connecting to the existing IEBL is a proven brine disposal method, able to be permitted, and few impacts to the community after construction. The cost is high and IEBL capacity may not be available. The estimate for the required brine pond evaporation area was approximately 21 acres at an initial cost of less than $7 million. Brine ponds are also a proven technology and have a lower cost than the IEBL connection. Overspray off-site must be prevented and the deposition of settled salt in the basin must be considered.

Based on the advantages and disadvantages and the cost comparison of these two brine management options, semi-enhanced evaporation ponds with high recovery RO was selected as the brine management approach. To minimize the land requirements for the evaporation ponds, the evaporation ponds will be designed only for Phase 1 flows and incorporate semi-enhanced evaporation (i.e. floating evaporators). It is recommended that both currently feasible brine management options continue to be evaluated for the Phase 2 project, as well as continuing to research and monitor advancements in brine minimization technologies.

The concentrate (or brine) from the RO treatment process will be discharged to five lined surface impoundments. The RO concentrate contains high concentrations of TDS and other constituents. The discharge to the surface impoundments is subject to regulation under California Code of Regulations (CCR), title 27. The requirements of title 27 are discussed herein. To obtain a permit under title 27, information about the existing site, influent brine water quality, climatic data, brine evaporation pond design, leak detection and water quality monitoring is required. This section provides this background information.

6.1 Pond Site Description

This section presents information about the existing site includes site geology, hydrogeology, stormwater, water quality, seismic activity, topography, climatology and land use. The preliminary brine evaporation ponds site layout is found in **Figure 6-1.**

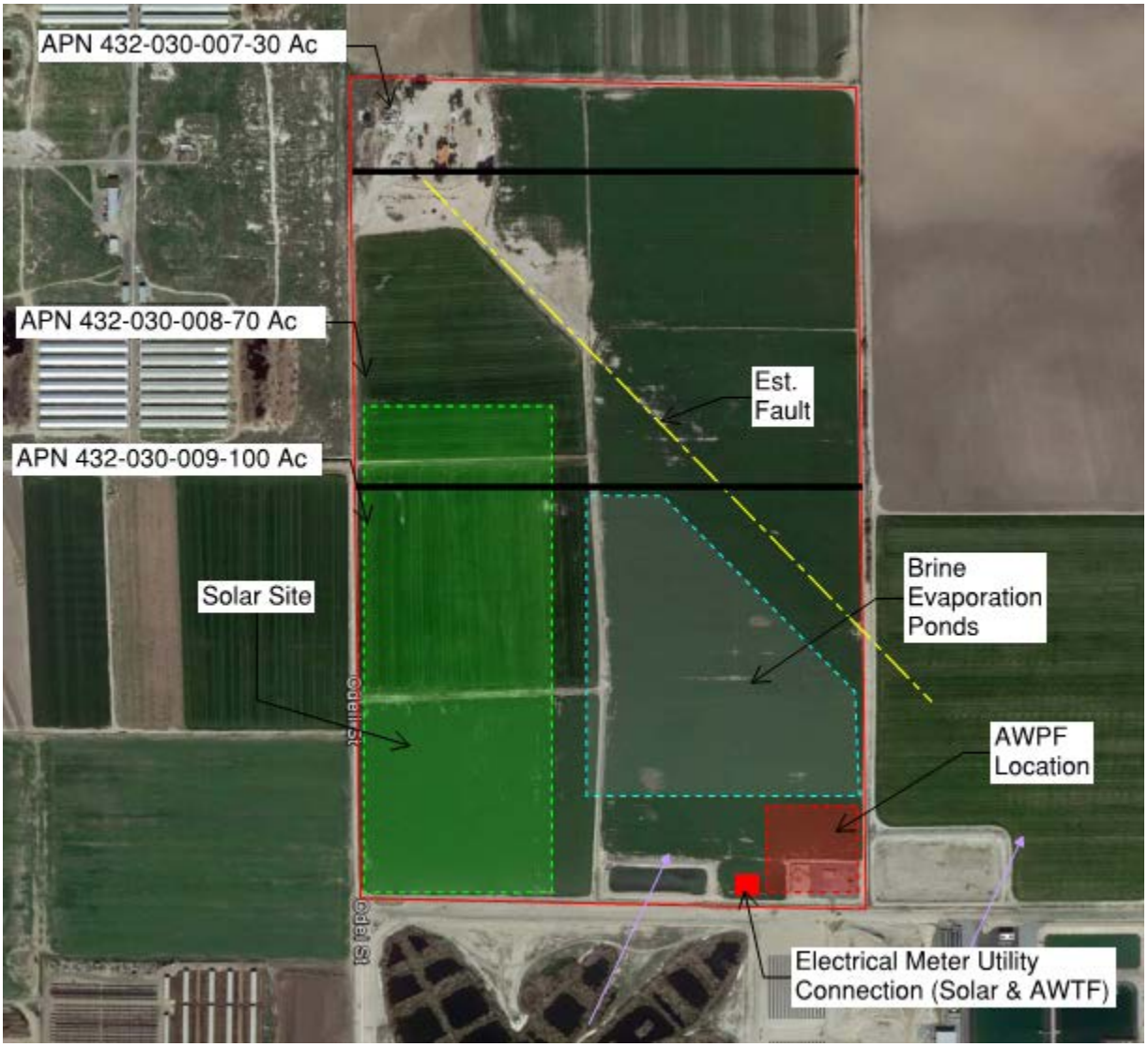

Figure 6-1 Brine Evaporation Ponds Plan

6.1.1 Location

The brine evaporation ponds will be located on a 100-acre parcel of land (APN 432-030-009), to the north of SJVRWRF and east of Odell St., in San Jacinto, California. The site is located on the western margin of the Gilman Hot Springs Hydrologic Subarea (HSA), which is part of the San Jacinto Hydrologic Area (HA). **Figure 6-2** shows the location of the project site in the San Jacinto HA.

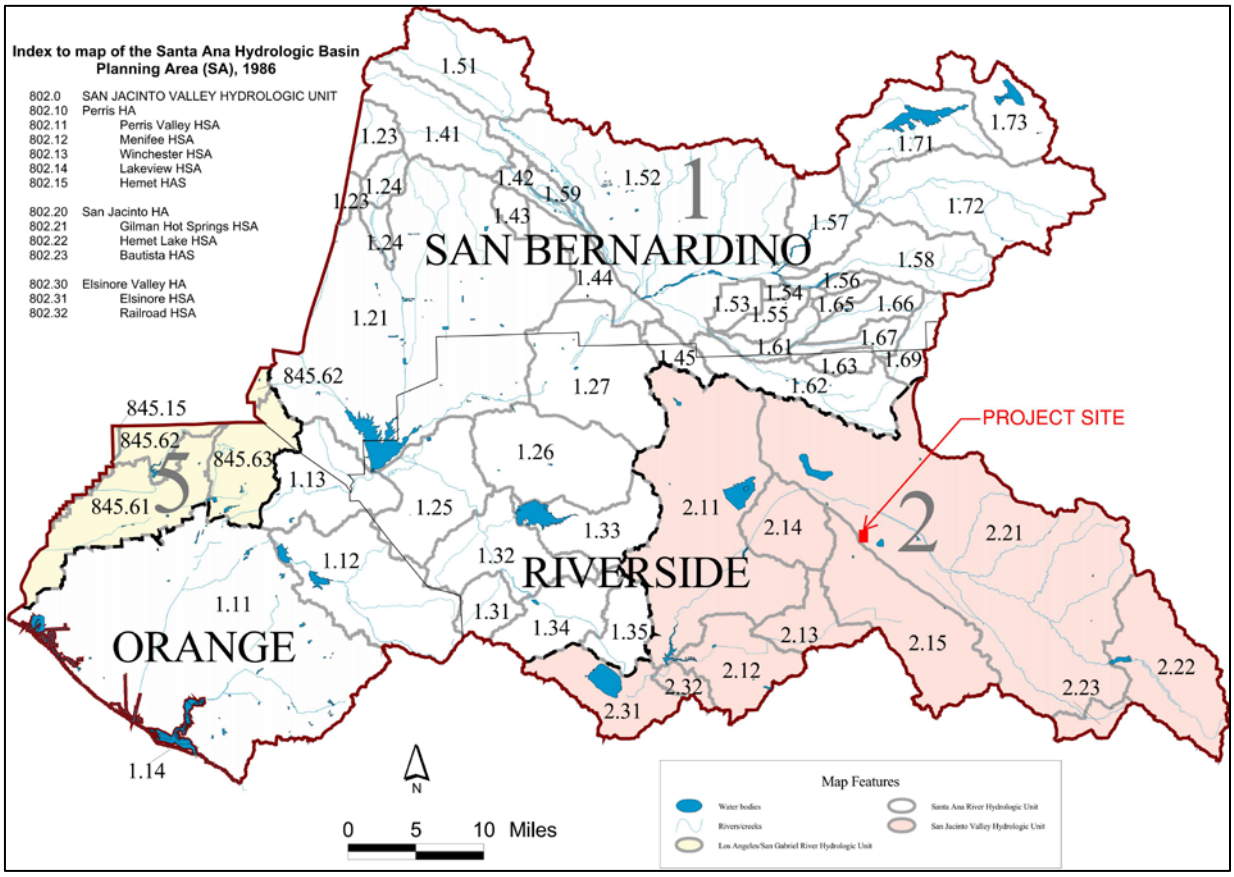

Figure 6-2 **Santa Ana Hydrologic Areas**

6.1.2 Site Geology

The proposed project site is located within the eastern portion of the Perris Block, south of the San Jacinto Mountains and situated between branch fault traces of the San Jacinto fault zone. The Perris Block is characterized as a broad area of intermixed valleys and low mountain ranges situated between the Elsinore and San Jacinto fault zones. Bedrock of the Perris Block is comprised principally of Cretaceous-age igneous rocks and older metasedimentary rocks.

The proposed project site is located within the San Jacinto Valley, which is a broad relatively flat-floored alluvial valley surrounded by granitic and metasedimentary bedrock hills. This alluvial valley is drained by the San Jacinto River which drains northwest to approximately 11 miles north of the City of San Jacinto where the river turns and flow southwest towards the City of Perris. Lithologically, the proposed project site is underlain by Quaternary-age alluvial deposits (Morton and Matti, 2001, Dibblee, 2003, Morton and Miller, 2006). The alluvial soils

consist primarily of fine-grained mixtures of clays and sandy clays with minor interbedded silty sand and clayey sand. The site geologic conditions are described in detail in the geotechnical report included in **Appendix F**.

6.1.3 Site Hydrogeology

Based on well data from the Western Municipal Water District (WMWD) Cooperative Well Measuring Program (WMWD, 2016) and the California Department of Water Resources (DWR) website, the regional groundwater is estimated to be at depths greater than 150 feet bgs below the proposed project site. It is possible that local variations in groundwater levels may occur due to seasonal changes, run-off, precipitation, irrigation and/or construction activities. The site groundwater conditions are described in detail in the geotechnical report included in **Appendix F**.

6.1.4 Site Surface Hydrology and Stormwater Runoff

Flood plain data reviewed indicates the proposed project site is located within an area designated as Zone X outside the 0.2 percent annual chance floodplain (FEMA, 2008). Appropriate project design, construction, and maintenance can reduce sheet flooding potentials.

6.1.5 Site Water Quality

The site is located in Lakeview – Hemet North groundwater management zone of the San Jacinto River Basin. The wells located in Lakeview – Hemet North groundwater basin are listed in **Table 6-1** and shown in **Figure 6-3**. The analytical data of the groundwater quality is summarized in **Table 6-2.**

Table 6-1 Wells in Lakeview – Hemet North Groundwater Management Zone

Well Number	Type of Well
10233	Agricultural/ Irrigation
10234	Agricultural/ Irrigation
10238	Agricultural/ Irrigation
10239	Not Defined/ Unknown
10308	Agricultural/ Irrigation
10309	Domestic
10311	Monitoring
10313	Agricultural/ Irrigation
12152	Not Defined/ Unknown
12905	Agricultural/ Irrigation
13059	Not Defined/ Unknown
14308	Agricultural/ Irrigation
14309	Agricultural/ Irrigation
14420	Agricultural/ Irrigation
25770	Domestic

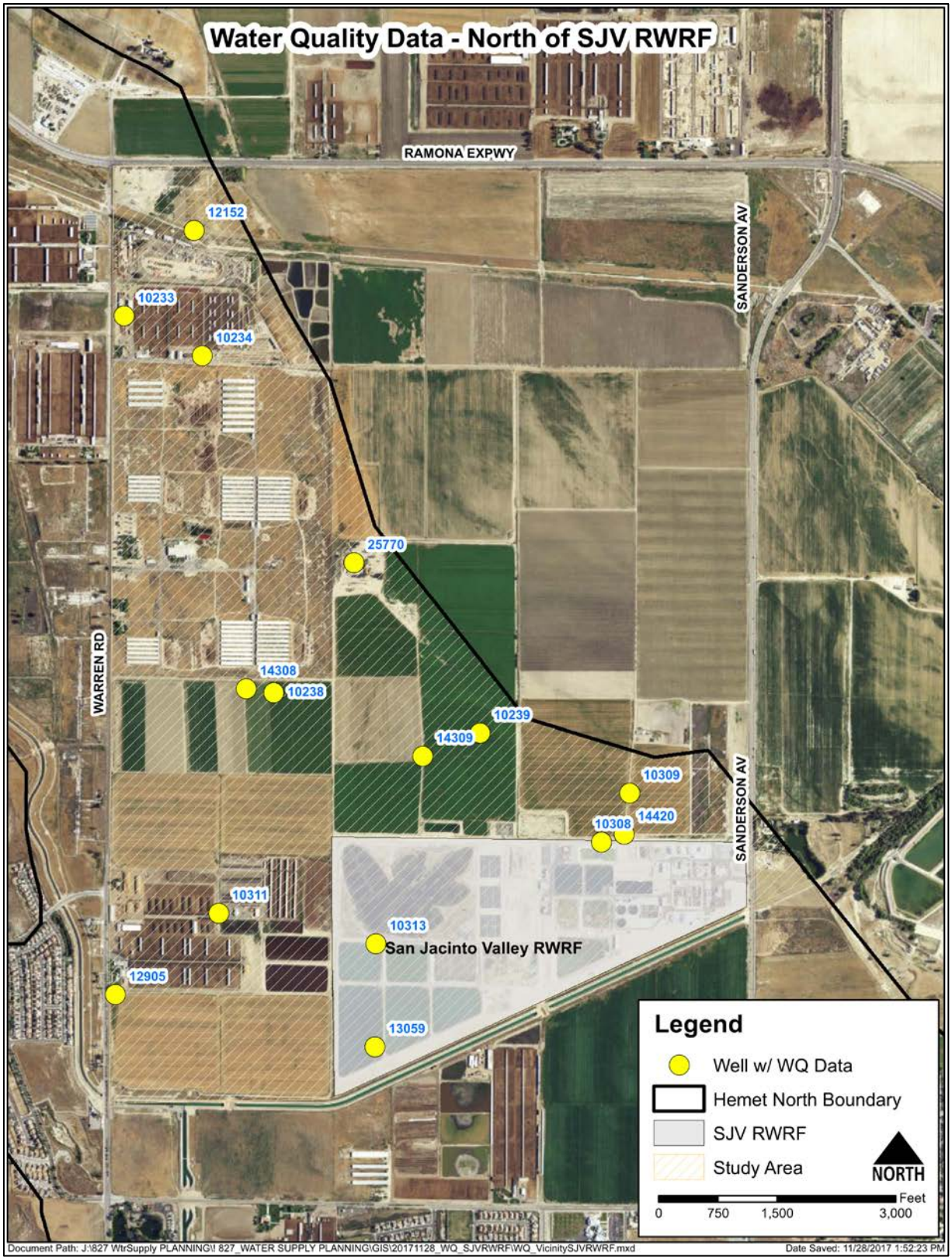

Figure 6-3 Wells in Lakeview – Hemet North Groundwater Management Zone

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Table 6-2 Water Quality Objectives for Lakeview – Hemet North Groundwater Management Zone

Parameters	Units	Wells															Lakeview-Hemet North GMZ		
		10233	10234	10238	10239	10308	10309	10311	10313	12152	12905	13059	14308	14309	14420	25770	Average	Min	Max
Ammonia as N	mg/L	<3	<3	-	-	-	0.15	<0.5	-	-	0.57	-	<0.2	0.88	0.1	<0.2	0.68	<0.2	0.25
Bicarbonate (HCO3)	mg/L	148	200	132	95	171	242	130	-	-	134	129	170	150	277	220	174	95	290
Boron	mg/L	0.20	0.44	-	-	-	0.093	0.9	-	-	0.74	-	0.24	4.79	0.53	0.12	0.60	0.09	8.81
Calcium	mg/L	50	70	20	28	28	51	57	-	-	63	51	66	48	64	76	59	20	89
Carbonate (CO3)	mg/L	<3	3	<3	<3	7	<3	<3	-	-	<3	<3	<3	<3	<3	<3	1.49	<3	7
Chloride	mg/L	90	135	26	437	39	41	125	-	-	196	60	123	285	86	150	127	12	460
Copper	µg/L	11.8	5.3	-	-	-	5.8	<10	-	-	5.6	-	<10	67.5	15.8	<10	10	<5	130
Electrical Conductance	µM/cm	786	987	-	-	-	730	1,010	-	-	1,294	-	910	1,400	907	960	981	620	1,790
Fluoride	mg/L	0.45	0.33	-	-	-	0.32	0.45	-	-	0.66	-	0.31	2.79	0.51	0.21	0.51	<0.1	5.1
Hardness	mg/L	166	231	-	-	-	187	185	-	-	212	-	213	145	195	237	202	89	300
Hydroxide (OH)	mg/L	<3	<3	-	-	-	<3	<3	-	-	<3	-	<3	<3	<3	<3	<3	<3	<3
Iron	µg/L	29	120	-	-	-	57	151	-	-	255	-	250	1,545	63	46	175	<5	2,980
Magnesium	mg/L	9.3	14	4	2	5	6.9	11	-	-	13	12	12	6.3	8.9	12	11	2	27
Manganese	µg/L	4.2	3.4	-	-	-	57	25	-	-	3.5	-	5.1	99	71	62	17	<1	170
MBAS	mg/L	-	-	-	-	-	<0.05	-	-	-	-	-	-	-	0.053	-	0.034	<0.05	0.06
Nitrate	mg/L	17	18	9	4	-	2.2	-	-	-	15	7.9	28	9.1	0	15	15	0	30
Nitrate as N	mg/L	3.5	2.9	-	-	-	0.26	3.8	-	-	4.4	2.3	6.3	2.1	0.35	3.4	3.1	0.1	6.8
Nitrite as N	mg/L	0.026	<0.1	-	-	-	<0.01	0.045	-	-	<0.1	-	<0.1	0.1	<0.1	<0.1	0.027	<0.01	0.15
NOX	mg/L	4.5	4.9	-	-	-	-	-	-	-	3.3	-	6.4	2.1	<0.1	3.4	4.1	<0.1	6.7
pH	-	7.6	7.5	-	-	-	7.7	8.0	-	-	7.6	-	7.8	7.9	7.8	7.9	7.6	6.5	8.4
Potassium	mg/L	5.9	6.9	-	-	-	6.6	6.6	-	-	5.4	-	7.0	5.4	5.0	7.3	6.2	4.3	8.6
Silica	mg/L	17	18	-	-	-	20	20	-	-	22	-	21	18	18	20	19	7.7	27
Sodium	mg/L	98	109	62	300	90	75	135	-	-	197	79	103	225	118	120	124	42	320
Sulfate	mg/L	119	109	45	60	79	65	178	-	-	217	159	97	110	108	94	126	1	270
Total Alkalinity as CaCO3	mg/L	125	162	-	-	-	213	110	-	-	112		133	124	223	180	146	86	240
Total Dissolved Solids	mg/L	463	559	206	960		370	620	339	623	805	450	510	750	538	577	550	203	1,010
Total Inorganic Nitrogen	mg/L	3.2	2.7	-	-	-	<0.5	3.9	-	-	4.2	-	6.0	2.3	0.4	3.1	2.9	<0.2	6.8
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	0.40	-	-	-	-	-	-	-	0.15	-	0.23	<0.2	0.4
Total Organic Carbon	mg/L	0.62	0.94	-	-	-	1.5	<0.7	-	-	0.53	-	0.40	1.4	1.5	0.80	0.82	<0.2	2.5
Turbidity	NTU	0.3	0.2	-	-	-	-	-	-	-	0.5	-	-	-	-	-	0.33	0.2	0.5
Zinc	µg/L	20.3	20	-	-	-	40	4.3	-	-	16	-	<6	5.0	8.3	<6	18	<4	110

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The water quality objectives for Lakeview - Hemet North groundwater management zone are summarized in **Table 6-3**.

Table 6-3 Water Quality Objectives for Lakeview – Hemet North Groundwater Management Zone

Parameter	Water Quality Objectives (mg/L)	Notes
Arsenic	≤ 0.05	
Bacteria, Coliform	≤ 2.2 organism/100 mL median over any seven-day period	
Barium	≤ 1.0	
Boron	≤ 0.75	
Chloride	≤ 500	
Color	---	Waste discharges shall not result in coloration of the receiving waters which causes a nuisance or adversely affects beneficial uses.
Cyanide	≤ 0.2	
Total Dissolved Solids	≤ 520	Lakeview – Hemet North
Fluoride	≤ 1.0	
Hardness	---	The hardness of receiving waters shall not be increased as a result of waste discharges to levels that adversely affect beneficial uses.
Metals		
Cadmium	≤ 0.01	
Chromium	≤ 0.05	
Cobalt	≤ 0.2	
Copper	≤ 1.0	
Iron	≤ 0.3	
Lead	≤ 0.05	
Manganese	≤ 0.05	
Mercury	≤ 0.002	
Selenium	≤ 0.01	
Silver	≤ 0.05	
Methylene Blue-Activated Substances (MBAS)	≤ 0.05	
Nitrate as Nitrogen	≤ 1.8	Lakeview – Hemet North
Oil and Grease		Waste discharges shall not result in deposition of oil, grease, wax or other materials in concentrations which cause a nuisance or adversely affect beneficial uses.
pH	6 ≤ pH ≤ 9	
Radioactivity		
Combined Radium-226 and Radium-228	≤ 5 pCi/L	
Gross Alpha particle Activity	≤ 15 pCi/L	
Tritium	≤ 20,000 pCi/L	
Strontium-90	≤ 8 pCi/L	

Table 6-3 Water Quality Objectives for Lakeview – Hemet North Groundwater Management Zone

Parameter	Water Quality Objectives (mg/L)	Notes
Gross Beta particle activity	≤ 50 pCi/L	
Uranium	≤ 20 pCi/L	
Sodium	180	
Sulfate	500	
Taste and Odor	3	

6.1.6 Faulting and Seismicity

The proposed project site is located in the highly seismic southern California region within the influence of several fault systems that are considered to be active or potentially active. The northeast corner of the proposed project site is situated within the EFZ for the Casa Loma fault of the San Jacinto fault zone (California Geological Survey, 1987, 1988).

The potential of surface fault rupture within the proposed project site is considered moderate to high due to the near proximity to active fault traces. A major seismic event on the San Jacinto fault (Claremont or Casa Loma branches) have the potential to cause strong ground shaking at the site. The proposed project site may also be subjected to ground motion from a seismic event occurring on any of the other numerous active faults in the region. The Casa Loma fault of the San Jacinto fault zone, located approximately 400 feet northeast of the proposed project site, is capable of generating a maximum credible earthquake (MCE) of magnitude 7.7. The faulting and seismicity are described in detail in the geotechnical report included in **Appendix F**.

The Facility, including the Class II Surface Impoundments, will be been designed using Class C design criteria, based on the 2010 California Building Code.

6.1.7 Site Topography

The proposed project site slopes toward north-northwest. The existing site elevation is 1,495 feet above mean sea level (MSL) at the southwest corner of the 100-acre parcel, and 1,485 feet above MSL at the northwest corner. In addition, there is a significant elevation drop across the fault line that runs through the northeast corner of the parcel. The existing site elevation at the northeast corner of the parcel, to the north of the fault line, is 1,478 feet above MSL.

6.1.8 Climatology

The proposed project site, located in San Jacinto, California, experiences hot summers, mild winters, infrequent rainfall, and moderate afternoon winds. On average, the warmest month is August (average high is 98 °F and lows of 62 °F), while the coolest month is December (average highs of 66 °F and lows of 36 °F).

The temperature, wind speed and direction, relative humidity, precipitation, and evapotranspiration data are from California Irrigation Management Information System (CIMIS), Station 179 Winchester. Station 179, located 11 miles southwest of SJVRWRF and 1.5 miles west of Diamond Valley Lake, is the closest CIMIS station with substantial historical data to the project

site and most representative of project site weather conditions. For more accurate climate data, especially with regard to wind speed and direction, a weather station is recommended to be installed at SJVRWRF during final design. The more accurate weather data can be input into the evaporation model, described in Section 6.3, to better estimate the effects of natural evaporation and mechanical spray evaporators.

The bulk of the precipitation occurs between December and March, with February averaging as the wettest month as summarized in **Table 6-4**. Annual rainfall ranges from 3.68 inches in 2013 to 13.63 inches in 2010. Summer thunderstorms are also common in late summer and early fall. Average annual rainfall is approximately 7.6 inches.

Table 6-4 Precipitation Data

Month	Monthly Precipitation[1] (Inch)
January	1.3
February	1.7
March	0.7
April	0.4
May	0.2
June	0.1
July	0.3
August	0.1
September	0.2
October	0.5
November	0.5
December	1.5
Annual Total	7.6

1. Source: California Irrigation Management Information System (CIMIS), Station 179 Winchester, data from July 2002 through March 2017.

The pan evaporation rates for San Jacinto Reservoir, located one mile to the east of the project site, is from Department of Water Resources Bulletin 73-79, Evaporation from Water Surfaces in California. Pan evaporation rates are the greatest in June, July, and August. Pan evaporation rates are typically greater than the monthly precipitation rates. The average annual pan evaporation rate of 55.4 inches per year. To convert the pan evaporation rate to the expected evaporation of a free water surface, a lake factor of 0.7 was used.

The evapotranspiration rates are from CIMIS Station 179. Because evapotranspiration is a loss of water to the atmosphere by the combined processes of evaporation from soil and plant surfaces and transpiration from plants, the reference evapotranspiration data are from standardized grass or alfalfa surfaces over which the weather stations are sitting. The annual evapotranspiration rate of 54.9 inches per year was similar to the average annual pan evaporation rate. However, without a reliable correlation between the evapotranspiration rate to the evaporation of a free water surface, the evapotranspiration rate cannot be used for the evaporation modeling described in Section 6.3. **Table 6-5** shows a comparison of the monthly pan evaporation rate versus the evapotranspiration rate.

Table 6-5 Comparison of Evaporation Rates

Month	Monthly Pan Evaporation Rate[1] (Inch)	Monthly Evapotranspiration Rate[2] (Inch)
January	1.5	2.0
February	1.7	2.5
March	2.7	4.1
April	3.7	4.8
May	6.2	6.3
June	7.4	6.7
July	9.4	7.7
August	8.3	7.4
September	6.5	5.9
October	4.1	3.7
November	2.4	2.5
December	1.5	1.5
Annual Total	55.4	54.9

1. Source: Department of Water Resources Bulletin 73-79, Evaporation from Water Surfaces in California. Station No. Y02 781100 San Jacinto Reservoir.
2. Source: California Irrigation Management Information System (CIMIS), Station 179 Winchester, data from July 2002 through March 2017.

The wind direction and wind speed data are from CIMIS Station 179 are shown graphically in **Figure 6-4** and **Figure 6-5** respectively. The predominant wind direction in the proposed project site is from the south-southwest (SSW). The average wind speed in the SSW direction is 7.4 mph.

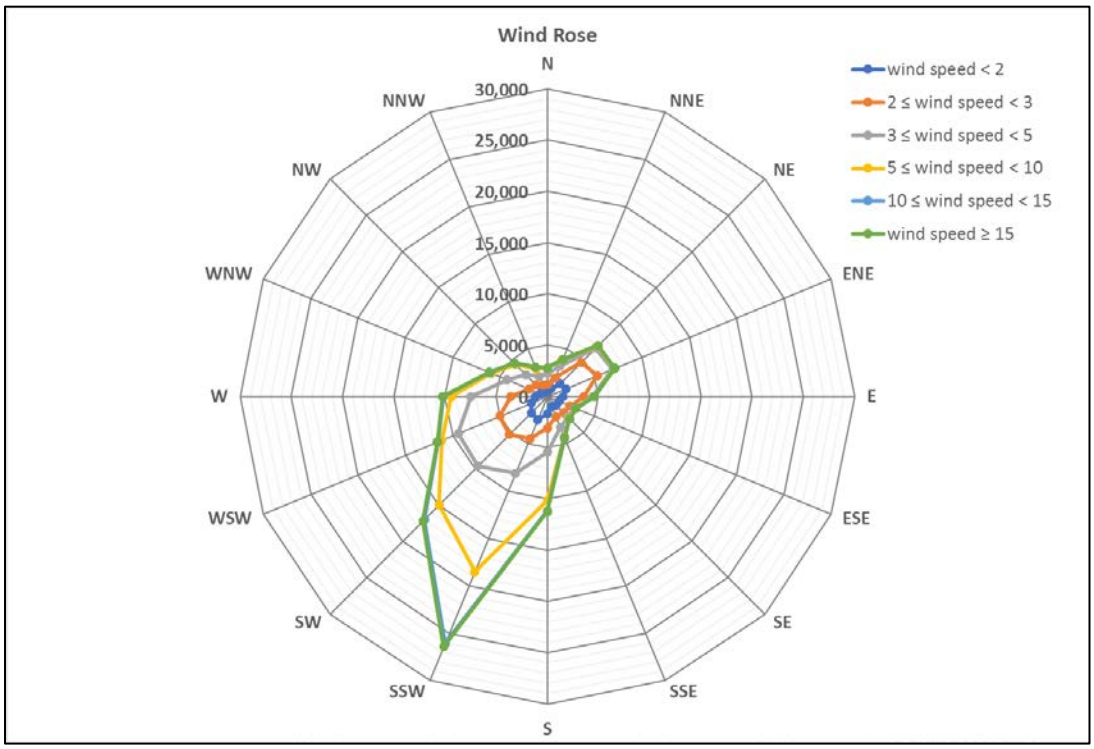

Figure 6-4 CIMIS Station 179 Wind Rose

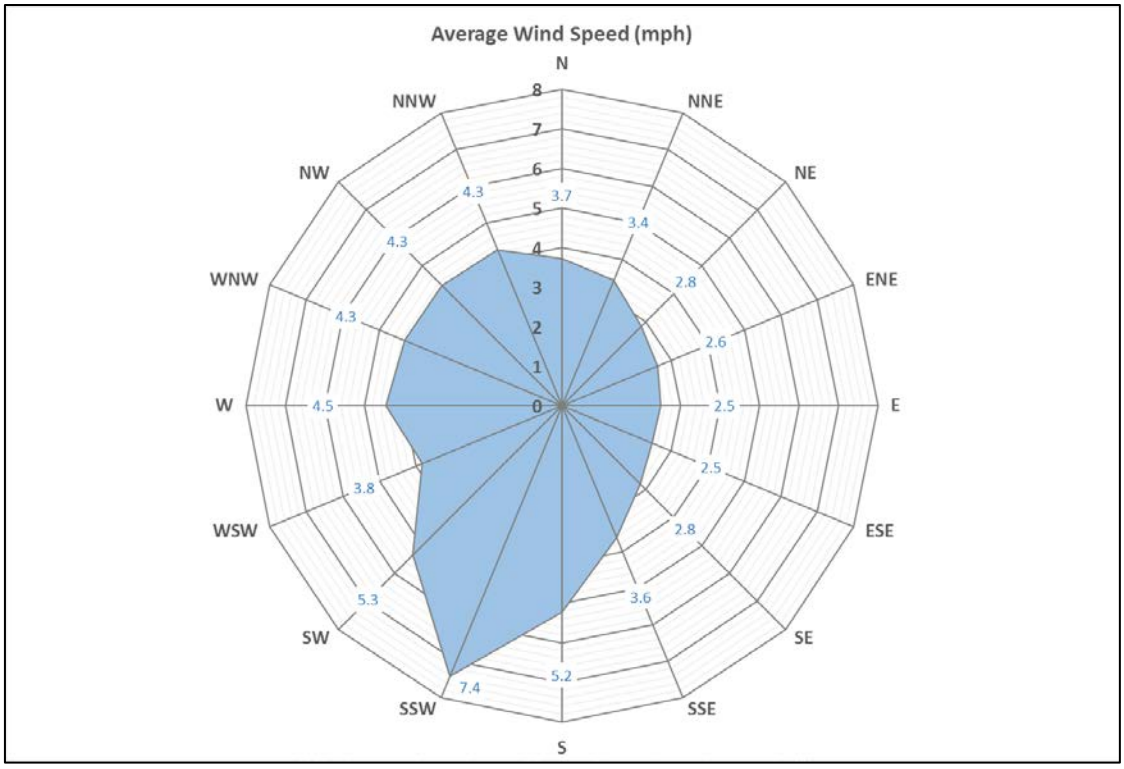

Figure 6-5 CIMIS Station 179 Average Wind Speed

6.1.9 Land Uses

The proposed project site currently consists of undeveloped farmland that EMWD leases for agricultural purposes. As of September 2017, the site was being used as an alfalfa field, which involved regular watering.

The parcel for the proposed project site is located in the City of San Jacinto and has a Medium Density Residential (MDR) land use zone in the City's General Plan. A Conditional Use Permit (CUP) will be required for the construction of the AWPF and the brine evaporation ponds.

To the south of the proposed project site is the SJVRWRF, which is in the Public Institutional land use zone. Although the properties surrounding the proposed project site to the north, east, and west are currently undeveloped farmlands, they are also zoned for High Density Residential (HDR) and Open Space Recreation (OS-R) land uses to the north, and MDR land use to the east and west.

6.2 Description of the Waste Stream and Waste Classification

6.2.1 Pond Influent Flows

Only the concentrate stream from the RO treatment process will be discharged to the brine evaporation pond. The RO system will be designed with three stages, capable of achieving 92.8 percent recovery. The anticipated daily RO concentrate flow rate will be 155,000 gallons per day (gpd), or 108 gallons per minute (gpm). With anticipated 90 percent online factor, the annual RO concentrate flow rate will be 50.9 million gallons per year (MG/year).

While the brine evaporation ponds will be sized for high recovery (three stages) RO, the third stage RO system may be bypassed for short durations. When only the first two stages are operated, then the RO system will achieve only 85 percent recovery, resulting in 323,000 gpd, or 224 gpm, of RO concentrate flow. **Table 6-6** shows the influent flows into the brine evaporation ponds.

Table 6-6 Pond Influent Flow

Stream	Unit	RO Concentrate at 85% Recovery[1]	RO Concentrate at 92.8% Recovery[2]
Daily RO Concentrate Flow	gpd	323,000	155,000
Annual RO Concentrate Flow	MG/year	N/A	50.9

1. Primary RO system (two stages) only. RO system may be operated in this mode only for short durations.
2. High recovery RO (three stages total). Brine evaporation ponds are sized for this mode of operation.

In addition to the RO concentrate, the pond will be designed to store and evaporate rainwater that falls within the pond surface areas. The average monthly precipitation is presented in Table 6-4 in Section 6.1.8.

6.2.2 Waste Characterization

The main chemicals of concern in the RO concentrate include the anions and cations of chloride, nitrate, sulfate, potassium, and sodium that when discharged to the ponds have a TDS concentration of approximately 8,840 mg/L.

The RO concentrate is classified as a designated waste under title 27 of the CCR. This liquid designated waste must be contained in a Class II surface impoundment constructed with a double liner and a leachate collection and removal system (LCRS) per CCR, title 27. As part of the CCR, title 27 requirements, the Discharger is also required to monitor the surface impoundments, including the vadose zone and groundwater beneath the site. A monitoring and reporting program is specified to confirm compliance.

Based on mass balance equations and predictive modeling, the RO concentrate is expected to have characteristics listed in **Table 6-7**. These concentrations assume influent water quality with 85 percent recovery (with Primary RO only) and with 92.8 percent recovery (with both Primary and Secondary RO treatment processes). The 92.8 percent recovery will result in lower volume (flow) but higher concentrate being discharged to the surface impoundments. Additional acid is added prior the secondary RO to mitigate fouling at the high recovery rate.

Table 6-7 Brine Water Quality Characteristics

Parameter	Unit	RO Concentrate at 85% Recovery	RO Concentrate at 92.8% Recovery
pH		7.65	7.48
ANIONS			
Bicarbonate	mg/L	679	1,298
Carbonate	mg/L	3.6	6.1
Chloride	mg/L	946	1,947
Fluoride	mg/L	1.7	3.5
Nitrate	mg/L	352	676
SiO_2	mg/L	145	297
Sulfate	mg/L	849	1,837
CATIONS			
Calcium	mg/L	408	845
Magnesium	mg/L	68	140
Potassium	mg/L	119	240
Sodium	mg/L	758	15,401
Ammonium	mg/L	3.1	6.3
Barium	mg/L	0.2	0.4
OTHER			
TDS (sum of ions)	mg/L	4,331	8,839
Conductivity	µS/cm	6,462	12,523
Total Hardness	mg/L as $CaCO_3$	1,298	2,688
Langelier Saturation Index (LSI)		1.44	1.84

6.3 Evaporation Model

An evaporation model using the local weather data (see Section 6.1.8) was developed to estimate the daily evaporation rate and the inventory of water that would accumulate in the pond when the influent flow exceeds the evaporation rate. In 2004, the United States Department of Energy published a report on the capabilities of a mechanical spray evaporator to enhance natural evaporation. In this report, sets of equations were developed to estimate evaporation rates with a mechanical spray evaporator. These equations were used to develop the evaporation model used for this analysis.

The evaporation model accounts for the pond surface area, the flow rate to the mechanical spray evaporators, the number of sprayer evaporators, the temperature, the wind speed and direction, the relative humidity, precipitation, and the TDS concentration in the evaporation pond as variables. The governing equation used in the model is shown below:

Spray Nozzle Evaporation Governing Equation

$$E = \frac{1}{\frac{1}{a * EP * V} + \frac{b}{Q}}$$

Where, E = evaporation yield (% of nozzle discharge)
V = wind speed (miles per hour (mph))
EP = adiabatic saturation cooling degrees
a = empirical constant
b = empirical constant
Q = flow rate to nozzles

6.3.1 Natural Evaporation

Evaporation of a free water surface can be calculated from the pan evaporation rate, modified by the lake factor. The average net natural evaporation rate is calculated from the following Natural Evaporation Rate Governing Equations:

$$Evaporation = (PanEvaporationRate - Precipitation) * LakeFactor * SalinityFactor$$
$$SalinityFactor = 1 - 0.0086 * \%TDS$$

The estimated net annual evaporation rates for the proposed project site is approximately 33 inches per year, assuming 0.7 lake factor and 0.99 salinity factor.

$$Evaporation = (55.4 - 7.6) * 0.7 * 0.99 = 33\ inches/year$$

The total surface area of the pond will vary during the evaporation pond operation, but will typically range from 18 to 23 acres within the operational pond elevations of 2.5 and 8 feet (ft). An average pond area is estimated to be 20 acres within the operational pond elevations. With an average pond area of 20 acres and an annual average evaporation rate of 33 inches per year, it is estimated that approximately 17.9 MG/year (or 49,000 gpd) of the discharged RO brine can be removed by natural evaporation.

Since the brine evaporation pond surface area is too small to evaporate all of the RO concentrate influent flow of 50.9 MG/year by natural evaporation, the volume of brine waste between the RO brine flow into the brine evaporation pond and the natural evaporation will have to be evaporated by the addition of mechanical spray evaporators.

6.3.2 Estimate of TDS in Pond Water

The evaporation model estimates the TDS concentration in the evaporation pond. The data can be used to estimate the natural evaporation rate as discussed in Section 6.3.1 and is also used to determine the timing of salt removal from the evaporation pond. It should be noted that salt build-up within the bottom of the pond will be gradual, requiring removal less than once a decade without significantly impacting the storage capacity in the pond.

Once salt saturation level (approximately 36 percent or 360,000 mg/L) is reached, salt crystals will form at the bottom of the pond. Additional pond influent will then dissolve these salts, maintaining equilibrium concentrations near saturated levels much of the time. Therefore,

salinity in the pond is not expected to drop below saturated levels unless the solids at the bottom of the pond have been removed. Salt could periodically be removed from the bottom on the pond to increase the natural evaporation efficiency, if needed.

6.3.3 Drift

The evaporation pond must be sized to contain all of the water droplets and capture the any remaining droplets that do not evaporate. The regulations do not allow mist or water droplets to be carried outside of the containment area. Therefore, the evaporation modeling and the design of the evaporation pond must take into account the wind speed and direction to make sure that the drift of the potential water droplets does not carry them past the edge of the containment area.

The limits of where the water droplets will carry within the containment area are included in Section 6.4.1. The drift of the water droplets can be estimated from the droplet diameter, the vertical falling distance and the lateral distance the droplet travels while falling into the pond containment area. The following information shown in **Figure 6-6**, provided by the equipment vendor, is used to estimate the maximum allowable wind speed to keep the water droplets from traveling outside of the pond containment area.

The size of the water droplets from the spray evaporators proposed for this project (i.e., SMI Model 420F Evaporator) would be in the range of 100 µm to 150 µm or larger. The typical particle size is 180 µm for the SMI 420F evaporators. A water droplet diameter of 150 µm is used in this analysis.

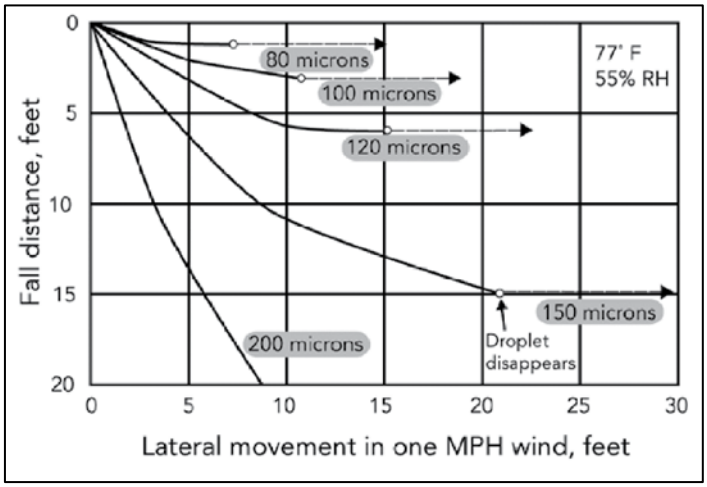

Figure 6-6 Water Droplet Drift Estimate

Table 6-8 shows lateral droplet travel distance at 3 mph for water droplets falling 10 ft vertical distance, and at 15 mph for water droplets falling 15 ft vertical distance, for various water droplet sizes.

Table 6-8 Water Droplet Size and Projected Drift

Droplet Diameter (micron)	Type of Droplets	Time to Fall 10 ft in Still Air	Lateral Travel Distance in Falling 10 ft in a 3 mph Wind	Time to Fall 15 ft in Still Air	Lateral Travel Distance in Falling 10 ft in a 15 mph Wind
10	Fog	17 Minutes	4,500 feet	N/A	N/A
100	Mist	11 Seconds	48 feet	N/A	N/A
150	Evaporator Standard	9 Seconds	40 feet	14 Seconds	315 feet
200	Fine Spray	4 Seconds	18 feet	5 Seconds	100 feet

Based on the 150 µm droplet size, the estimated space requirements for droplet containment, 15 mph is selected as a conservative cut off wind speed for the spray evaporation modeling. Using this information, it is proposed that the mechanical spray evaporators would not be located within 315 feet of exterior edge of the outside ponds, keeping all spray within the area of the evaporation ponds.

6.3.4 Modeling Results

The evaporation model was run using instantaneous weather data measured every hour, from March 2003 to March 2017. **Table 6-9** and **Table 6-10** summarize the minimum number of evaporators required, percent offline, average water depth and maximum water depth for various operating conditions. Table 6-9 assumes being able to operate the evaporators all day, weather conditions permitting. Table 6-10 assumes being able to operate the evaporators 12 hours per day only (e.g., 6 a.m. to 6 p.m.). All operating conditions assume average pond surface area of 20 acres.

Table 6-9 Evaporation Model Results for Operating Evaporators All Day

Operating Conditions	Minimum No. of Evaporators Required	% Offline	Average Water Depth (ft)	Maximum Water Depth (ft)
Wind Speed (<9 mph); Wind Direction (101.25° to 326.25°)	21	48	4.5	7.1
Wind Speed (<15 mph); Wind Direction (101.25° to 326.25°)	16	39	3.8	7.1
Wind Speed (<25 mph); Wind Direction (101.25° to 326.25°)	15	37	4.4	8.0
Wind Speed (<9 mph); Wind Direction (All Directions)	17	31	4.2	6.5
Wind Speed (<15 mph); Wind Direction (All Directions)	13	21	4.0	7.1
Wind Speed (<25 mph); Wind Direction (All Directions)	13	21	3.9	7.0

Table 6-10 Evaporation Model Results for Operating Evaporators 12 Hours per Day

Operating Conditions	Minimum No. of Evaporators Required	% Offline	Average Water Depth (ft)	Maximum Water Depth (ft)
Wind Speed (<9 mph); Wind Direction (101.25° to 326.25°)	29	71	4.4	7.3
Wind Speed (<15 mph); Wind Direction (101.25° to 326.25°)	19	61	4.6	7.6
Wind Speed (<25 mph); Wind Direction (101.25° to 326.25°)	19	61	4.4	7.5
Wind Speed (<9 mph); Wind Direction (All Directions)	24	65	5.6	8.0
Wind Speed (<15 mph); Wind Direction (All Directions)	17	55	4.6	7.6
Wind Speed (<25 mph); Wind Direction (All Directions)	17	54	4.3	7.4

Based on the estimated water droplet size and drift and assuming that the evaporators could be operated all day since the properties adjacent to the project site are vacant lots, 18 duty evaporators and 3 standby evaporators would be recommended. This assessment also assumes that the mechanical spray evaporators only operate at wind speeds less than 15 mph but can operate in all wind directions (360 degrees).

In the future, if the properties adjacent to the project site are developed as residential areas, consistent with the City of San Jacinto's planning documents, then a minimum of three additional evaporators may be needed to allow the evaporators to shut down at night time.

6.4 Description of Surface Impoundments

6.4.1 Pond Configuration

Five brine evaporation ponds will be provided for a total of 20 acres of evaporation area. **Table 6-11** shows the pond areas, along with surface area, maximum operating depths, total depths, maximum operating volume and total volume. The proposed pond configuration is shown in **Figure 6-7**, and the limits of probable drift is shown in **Figure 6-8**. The ponds will have 2:1 side slope.

Table 6-11 Pond Areas

Pond	Surface Area[1]		Maximum Operating Depth[2] (ft)	Total Depth[3] (ft)	Maximum Operating Volume (MG)	Total Volume (MG)
	(Acres)	(ft^2)				
Pond 'A'	2.94	128,100	8.3	11	7.95	10.54
Pond 'B'	4.80	208,900	8.3	11	12.97	17.19
Pond 'C'	2.28	99,300	8.3	11	6.17	8.17
Pond 'D'	4.42	192,700	8.3	11	11.97	15.86
Pond 'E'	5.61	244,100	8.3	11	15.16	20.09
TOTAL	20.1	873,000	8.3	11	54.2	71.8

1. Area at mid height of the pond.
2. Does not account for sloping of the pond floor.
3. Includes maximum operating depth, 1,000-year, 24-hour storm of 8.3 inches, and 2-feet freeboard.

As shown in Figure 6-7 and Figure 6-8, the ponds will be designed with access roads between and around the ponds for vehicular access. The drift from the spray evaporators will be contained within the ponds and the access roadways between the ponds. The access roads on the perimeter of the ponds will be elevated higher than the inner roadways, designed to capture the drift and prevent rainwater that fall on the pond berms from flowing away from the brine evaporation pond facility. The same perimeter access roads will also prevent inundation of the ponds with stormwater runoff from offsite.

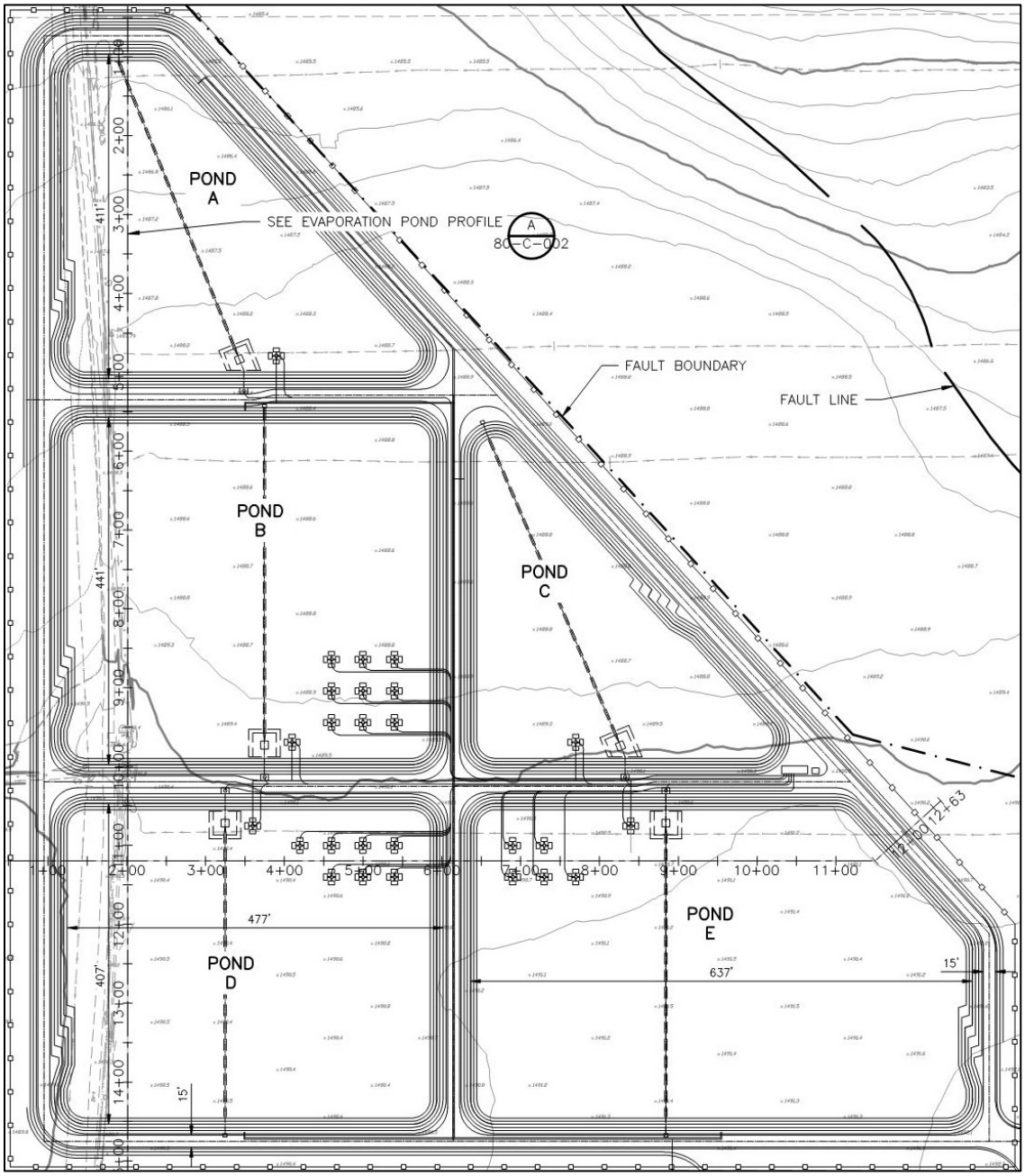

Figure 6-7 Proposed Brine Evaporation Ponds Layout

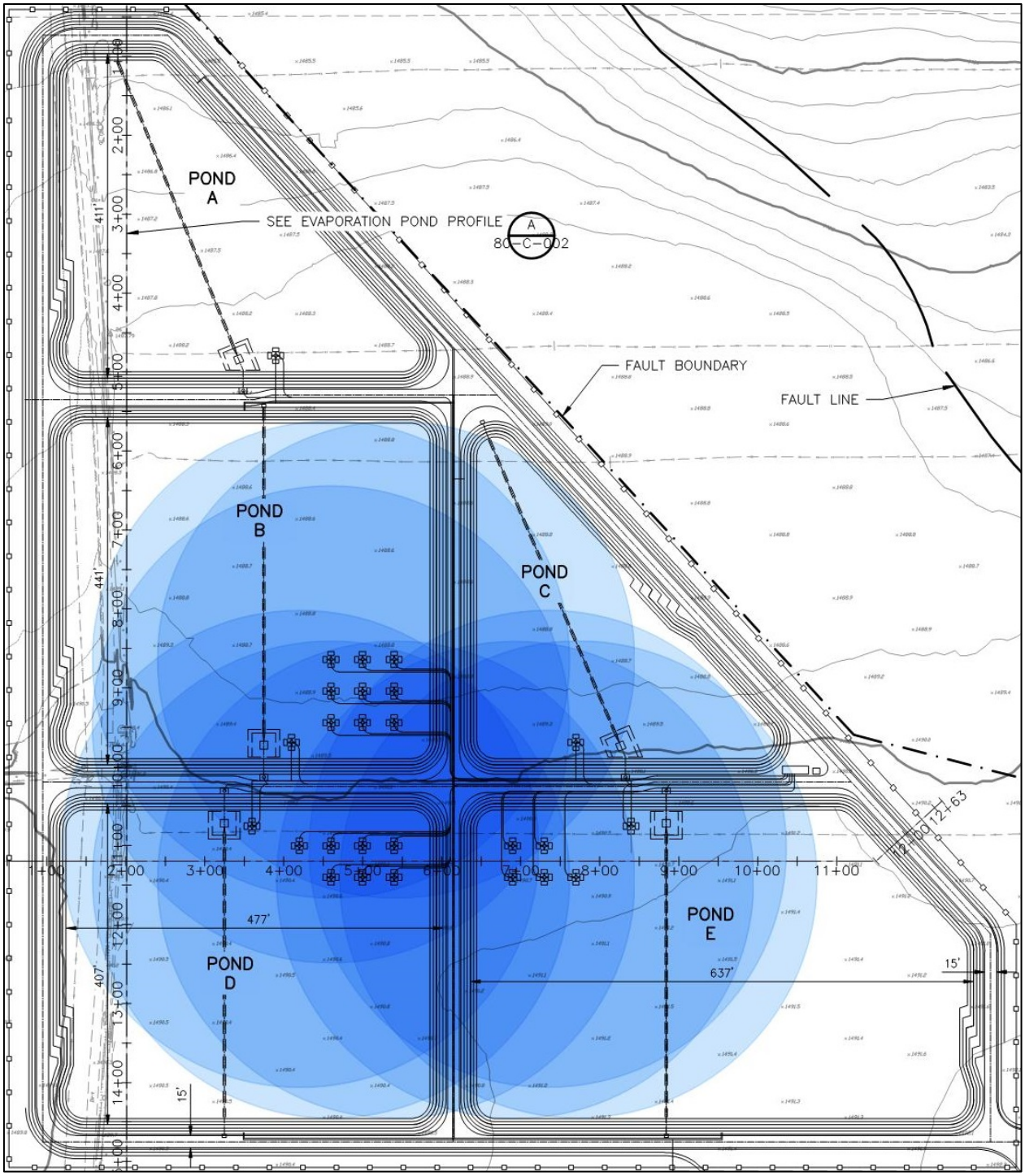

Figure 6-8 Probable Limits of Drift

6.4.2 Pond Liner

The design of the Class II Surface Impoundments (evaporation ponds) includes several layers of protection and monitoring capabilities. The uppermost layer consists of a 60-mil textured HDPE primary liner, which is designed to prevent leachate from migrating below the ponds. A second 60-mil HDPE drain liner makes up the bottom of the LCRS. The liner system is shown in **Figure 6-9.**

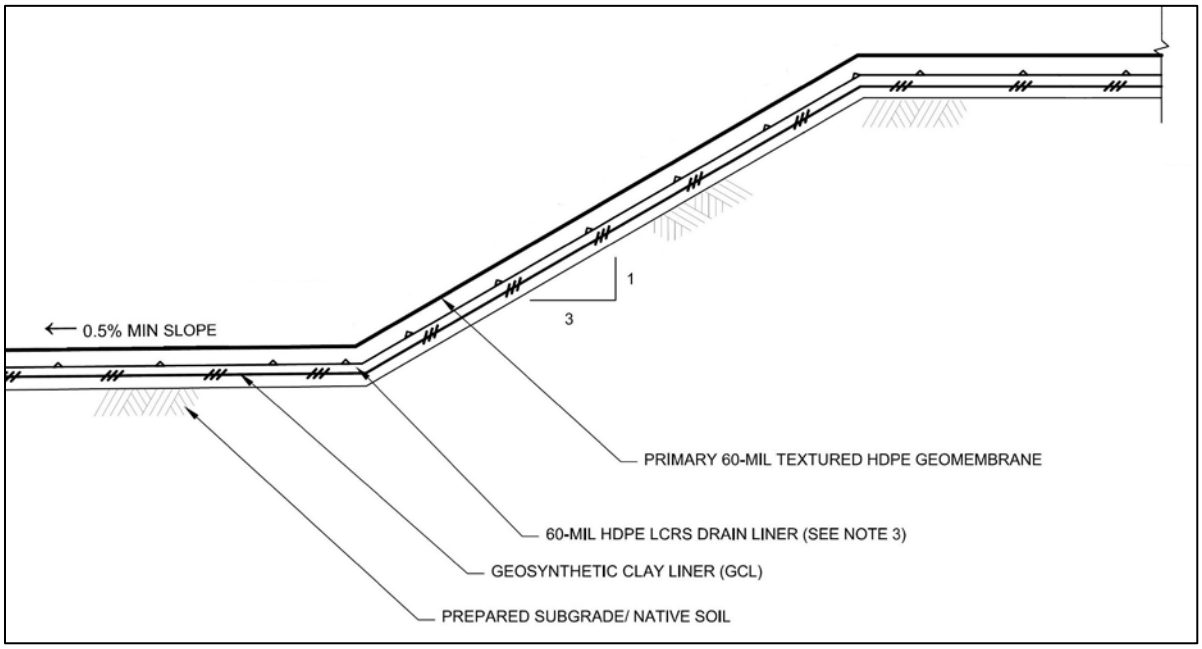

Figure 6-9 Proposed Brine Evaporation Ponds Section

A sump should be constructed in each pond that directs moisture within the LCRS to the sump. A 20-ounce geosynthetic clay liner (GCL) is installed below the LCRS system to protect the liner from the compacted subgrade/native soil. Below the LCRS sump and along the centerline of each pond is another liner designed to monitor any potential leaks through the surface impoundments (soil-cement armament and LCRS) to the environment. This bottom liner is defined as the free-draining vadose zone monitoring system (VZMS). Liquid collected by the VZMS will be directed to a sump that is part of the VZMS. Each VZMS sump will also contain an access pipe that will allow monitoring of moisture in the engineered vadose zone monitoring system.

The Class II Surface Impoundments shall have sufficient free board to accommodate seasonal precipitation and the design storm specified in Table 4.1 of title 27, California Code of Regulations. The design storm is a 1,000-year, 24-hour storm, which is 8.3 inches. But in no case will the vertical distance between the liquid surface elevation and the lowest part of a pond dike or the invert of an overflow structure be less than two feet.

6.4.3 Mechanical Spray Evaporator Equipment

Floating-type mechanical spray evaporators have been selected for this project as a practical and cost-efficient solution to enhance the natural evaporation. These spray evaporators were identified as part of the brine management evaluation performed for the Phase I Feasibility Study.

EMWD staff traveled to Reno, Nevada to see a brine evaporation pond in operation using similar mechanical spray evaporators. One of the mechanical spray evaporators used at the Reno site is shown in **Figure 6-10**.



Figure 6-10 Typical Mechanical Spray Evaporator (Reno, NV)

The basic concept of mechanical evaporation is to pump water from the evaporation pond through a series of nozzles into an air flow stream that generates a fine mist plume from the water stream that is discharged into the air. The fine composition of the mist increases the surface area of the water stream, which substantially enhances the evaporation rate of the water droplets. As the mist is propelled into the air, a portion of the mist plume evaporates while the remainder falls back into the pond. The mechanical evaporators will be used in conjunction with the evaporation pond to allow for the storage of flow when the evaporators are turned off or environmental conditions are not conducive to evaporation.

Table 6-12 shows the design criteria for the selected mechanical evaporators.

Table 6-12 Mechanical Spray Evaporators Design Criteria

Parameter	Criteria
Mechanical evaporator make, model	SMI, 420F Evaporator
Number of units	21 (18 Duty, 3 Standby)
Brine flow pumping rate	25 gpm/unit
Evaporator operation time	365 days/year, 24 hours/day weather permitting
Power	27 hp/unit total 2 hp for a submersible pump and 25 hp for a fan

6.4.4 Pond Level Monitoring and Fill

The water level in each pond will be monitored with level transmitters. A 4-inch RO concentrate pipe from the AWPF will be routed to the ponds. The automatic valves on the inlet pipes will allow the operators to select the pond(s) to be filled. The selection of the ponds to be filled will be based on the water levels in the ponds.

6.4.5 Pond Water Transfer

Each pond may be equipped with an optional submersible transfer pump floating on pontoons. These pumps would allow the operators to transfer water from one pond to another via 8-inch transfer pipes (optional). The design criteria for the Inter-Pond Transfer Pumps are summarized in **Table 6-13**.

Table 6-13 Inter-Pond Transfer Pumps (Optional)

Parameter	Criteria
Type	Submersible
Number of units	5 (one per pond)
Transfer pumping rate	1,000 gpm
Power	30 hp

In lieu of permanent transfer pumps and piping, portable pumps and temporary piping may be used to transfer pond water between the ponds. The permanent pond water transfer system would require higher construction cost than the portable system. However, the portable system would require more planning and coordination by the operators for the pond water transfer, resulting in potentially greater labor cost than the permanent system. The pond water transfer system may be removed from the final design after further consideration.

6.4.6 Pond Operations and Controls

The three semi-enhanced evaporation ponds, Ponds B, D and E, will be the primary ponds receiving RO concentrate from the AWTP. By monitoring the level in each pond, the operators may select any one of the three ponds to fill. The filling will be achieved by opening the automatic valve on the inlet pipe of the selected pond. The position of the inlet valves will be interlocked with the operation of the RO, such that the RO cannot be started if all inlet valves to the ponds are closed.

Utilizing the mechanical spray evaporators, the three semi-enhanced evaporation ponds will evaporate pond water faster than Ponds A and C that do not have mechanical spray evaporators. Consequently, Ponds B, D and E will accumulate salts more rapidly than Ponds A and C. When the salt concentration in the pond water of Ponds B, D or E reach a desired level, the inter-pond transfer pumps may be used to transfer the highly concentrated pond water from Ponds B, D or E to Ponds A or C, where the highly concentrated pond water will continue evaporating to achieve slurry-like brine solution.

6.5 Detection Monitoring System

A detection monitoring program, as required in Section 20385(a)(2) or (3) of title 27, will include a LCRS, a VZMS, and a groundwater detection monitoring program. Elevated concentrations of sodium and chloride, and elevated electrical conductivity measurements will be used as a field method to determine if concentrated brine is present in the LCRS and or the VZMS. Each pond will have its own LCRS and VZMS.

6.5.1 Leachate Collection and Removal System (LCRS)

The LCRS will consist of an upper 60-mil textured HDPE primary liner overlying a 60-mil HDPE drain liner. The system will be designed to detect any leaks and collect any moisture that may develop in the LCRS. The bottom liner will be designed to capture any liquid that leaks through the upper primary liner with the liquid being collected in the sump area for collection and removal. The sump will be continuously monitored using a level switch that is installed in the monitoring tube of each LCRS sump.

If leachate is present in the leachate collection sump, the level of leachate in the leachate collection sump will be no higher than needed to ensure efficient sump dewatering pump operation.

The LCRSs will be operated to function without clogging throughout the life of the project including closure and post closure maintenance periods. The LCRS will be capable of removing twice the maximum anticipated daily volume of leachate from the waste management unit. Any leachate collected in an LCRS will be pumped into an adjacent Class II Surface Impoundment that is not leaking above the ALR or to another approved holding alternative.

6.5.1.1 Action Leakage Rates (ALRs)

An action leakage rate (ALR) will be applied for the upper liner of the double lined surface impoundments. The ALR will be the point at which the Water Board will be notified of a potential leak requiring a sample to be collected to determine the source of the liquid. If liquids are detected in the LCRS sumps at a rate equal to or greater than the ALR, then a plan for investigating the potential release will be prepared and submitted with the next self-monitoring report. Should the liquid be identified as originating from the ponds (high TDS), a plan will be prepared describing how the exceedance will be addressed. The liquid collected in the LCRS sumps will be removed and pumped to a surface impoundment that is not leaking above the ALR, or an approved alternative. The ALR (**Table 6-14** below) will be determined during the permitting process.

Table 6-14 Action Leakage Rates

Impoundment	Surface Area (Acres)	Action Leakage Rate (gallons per day per pond)
Pond 'A'	2.94	TBD
Pond 'B'	4.80	TBD
Pond 'C'	2.28	TBD
Pond 'D'	4.42	TBD
Pond 'E'	5.61	TBD

Note: The Action Leakage Rate will be determined during the permitting process.

6.5.1.2 Rapid and Large Leakage Rate (RLLR)

The Rapid and Large Leakage Rate (RLLR) is defined as the maximum design flow rate that the leak detection system (LDS) can remove without the fluid head on the bottom liner exceeding 1 foot of head. If the RLLR is met or exceeded, the Water Board will be notified immediately of such exceedances, the pond will be removed from service and the leak will be repaired. Discharges of waste to the affected impoundment will not recommence until the appropriate repairs are made and approval for discharge is granted. The RLLR (**Table 6-15** below) will be determined during the permitting process.

Table 6-15 Rapid and Large Leakage Rates

Impoundment	Surface Area (Acres)	Rapid and Large Leakage Rate (gallons per day per pond)
Pond 'A'	2.94	TBD
Pond 'B'	4.80	TBD
Pond 'C'	2.28	TBD
Pond 'D'	4.42	TBD
Pond 'E'	5.61	TBD

Note: The Rapid and Large Leakage Rate will be determined during the permitting process.

6.5.2 Vadose Zone Monitoring System (VZMS)

The VZMS will consist of a free draining lysimeter or more simply, a partial fourth liner that will be installed directly below the LCRS sump and along the centerline of each pond where leaks are most likely to occur. The VZMS will consist of a gravel layer and a lined sump (40-mil geotextile) designed to allow for moisture detection monitoring, collection and removal. Should a leak develop in the LCRS system, the VZMS will be designed to detect the leak and to enable sampling of the moisture present in the sump to determine the source of the moisture (from the ponds or from some other source). The VZMS will extend the entire length of the centerline of each pond and will be a minimum of 3 feet wide. This VZMS liner will be centered along the V-shaped bottom of each surface impoundment.

6.5.3 Groundwater Detection Monitoring System

A groundwater investigation was conducted by the geotechnical engineer to determine the presence of groundwater directly below the site. During the initial investigation, groundwater was estimated to be at depths greater than 150 feet bgs, as described in Section 6.1.3. While the groundwater samples were not analyzed specifically for this project, existing water quality data from wells located within Lakeview-Hemet North GMZ were analyzed, as summarized in Section 6.1.5.

6.5.3.1 Detection Monitoring Trigger Points

Field measurements will be used to monitor the quality of liquid present in the various monitoring locations. If liquid is present in the LCRS at flows less than the Rapid Action Leakage Rate, the liquid in the LCRS sump will be maintained at a level indicated in the permit. If the specified level cannot be maintained, the pond will be removed from service and the leak repaired. Should liquid be discovered in the VZMS indicative of concentrated brine

(see **Table 6-16** below), the data will indicate that a release to the environment has occurred and corrective actions will be taken.

Table 6-16 Detection Monitoring Trigger Points

Monitoring Program	Sodium (mg/L)	Chloride (mg/L)	Specific Conductance
LCRS	>10,000	>10,000	>12,500
VZMS	5,000	5,000	12,500
Groundwater	Water Quality Protection Standard	Water Quality Protection Standard	Water Quality Protection Standard

6.6 Monitoring Programs

6.6.1 Detection Monitoring Program

A Detection Monitoring Program will be maintained as required in Section 20385(a)(1) and Section 20420 of CCR, title 27.

6.6.2 Evaluation Monitoring Program

An Evaluation Monitoring Program will be established whenever there is statistically significant evidence of a release from the Facility as required in Section 20385(a)(2) or (3) and Section 20425 of CCR, title 27.

6.6.3 Corrective Action Monitoring Program

A Corrective Action Program will be instituted when required pursuant to Section 20385(a)(4) and Section 20430 of CCR, title 27.

6.7 Closure Post-Closure Maintenance

Clean closure per Section 21400 of CCR, title 27, is the likely closure process to be implemented when the Facility is decommissioned. The expected life of the brine evaporation pond is 30 years. The preliminary closure and post-closure maintenance plan will be updated if there is a substantial change in operations or cost for closure, and a report will be submitted annually indicating conformance with existing operations. A final plan will be submitted at least 180 days prior to beginning any partial or final closure activities or at least 120 days prior to discontinuing the use of the site for waste management, storage or disposal, whichever is greater. The final plan will be prepared by or under the supervision of either a California Registered Civil Engineer or a California Certified Engineering Geologist.

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Section 7
Conveyance Pipelines Design Criteria

The main conveyance pipelines for the PWR project convey the following flow between following locations:

- Tertiary effluent from SJVRWRF to AWPF.
- AWPF product water from AWPF to existing 18-inch steel pipe to slip-line at the SJVRWRF.
- AWPF product water from the SJVRWRF to the Alessandro Blending Station.
- AWPF product water and T22 blend from the Alessandro Blending Station to the Mountain Avenue Ponds.
- Brine from the AWPF to the brine evaporation ponds.
- Process waste from the AWPF to the SJVRWRF.

This section provides the preliminary design criteria for major conveyance pipelines indicated in **bold**. The other conveyance pipelines listed above will be summarized in the Section 5.3 Civil Design Criteria.

7.1 Alignments

Pipelines will be required to convey RO permeate from the SJVRWRF to the Alessandro Blending Station as well as blended water (RO permeate and Title 22 recycled water) from the Alessandro Blending Station to the Mountain Avenue Percolation Ponds. These two pipeline alignments conveying RO permeate/blend water to the respective spreading grounds are described as follows:

- **SJVRWRF to Alessandro Blending Station**: Based on the RO Permeate Conveyance Study Technical Memorandum (CDM Smith, March 2017), two conveyance options were evaluated to move water from the AWPF to the Alessandro Blending Station, they include:
  - a new 24-inch high-density polyethylene (HDPE) pipeline; and
  - a 16-inch slipline within an existing 18-inch steel pipe.

  Option 1 (24-inch pipe in an open cut trench) would be able to adequately convey both Phase I and II flows to the Alessandro Blending Station but would incur much higher construction cost compared to Option 2. Option 2 (16-inch slipline) is more cost effective but will not provide enough capacity for Phase II of the PWR project assuming that Phase II requires 50/50 blend. The District would have to install an additional new pipe in the future to adequately convey Phase II flows.

Based on recommendations of the Study Option 2 is carried forward as the basis of design. The RO Permeate Conveyance Study TM is included in **Appendix B**. The alignment for the sliplined pipe is shown in **Figure 7-1**.

- **Alessandro Blending Station to Mountain Avenue Ponds**: Based on the Conveyance Facilities Study Technical Memorandum (CDM Smith, April 2017), two alignment options (see Figure 4-3) were evaluated for the 36-inch conveyance pipeline from Alessandro Blending Station to Mountain Avenue East and West Ponds:
  - primarily along the shoulder of Ramona Expressway; and
  - along the trough located adjacent to raised roadway that runs along the San Jacinto River.

  Option 1 was recommended over Option 2 based on being more cost effective, requiring less easements, and requiring less complex construction. Based on discussions with the District a modified version of Option 2 is carried forward.

  The proposed pipeline will begin at Alessandro Blending Station and head south/southeast through the ponds for approximately 3,500 linear feet (LF) before it intersects Ramona Expressway. The proposed pipeline will continue along the east shoulder of Ramona Expressway until it reaches the northeast corner of the Mountain Avenue West Pond, located approximately 900 feet south of the intersection of Old Mountain Avenue and Ramona Expressway. The proposed route terminates at the Mountain Avenue East and West ponds. The east shoulder of Ramona Expressway was recommended over the west shoulder to reduce roadway crossings. Final design will include the coordination with the Mountain Ave West Pond design to determine exact connection location. See **Figure 7-2** and **Figure 7-3** for proposed blending station and 36" conveyance pipeline alignment.

  The Conveyance Facilities Study TM is included in **Appendix C**.

Table 7-1 summarizes the two alignments.

Table 7-1 Conveyance Piping Alignments

Alignment	Nominal Pipe Diameter (in)	Length (ft)[1]	Service Type
SJWRF to Alessandro Blending Station	16	21,700	RO Permeate
Alessandro Blending Station s to Mountain Avenue Ponds	36	14,200	Blend Water (RO Permeate + T22)

1. Pipe length does not include piping required for the Blending Station.

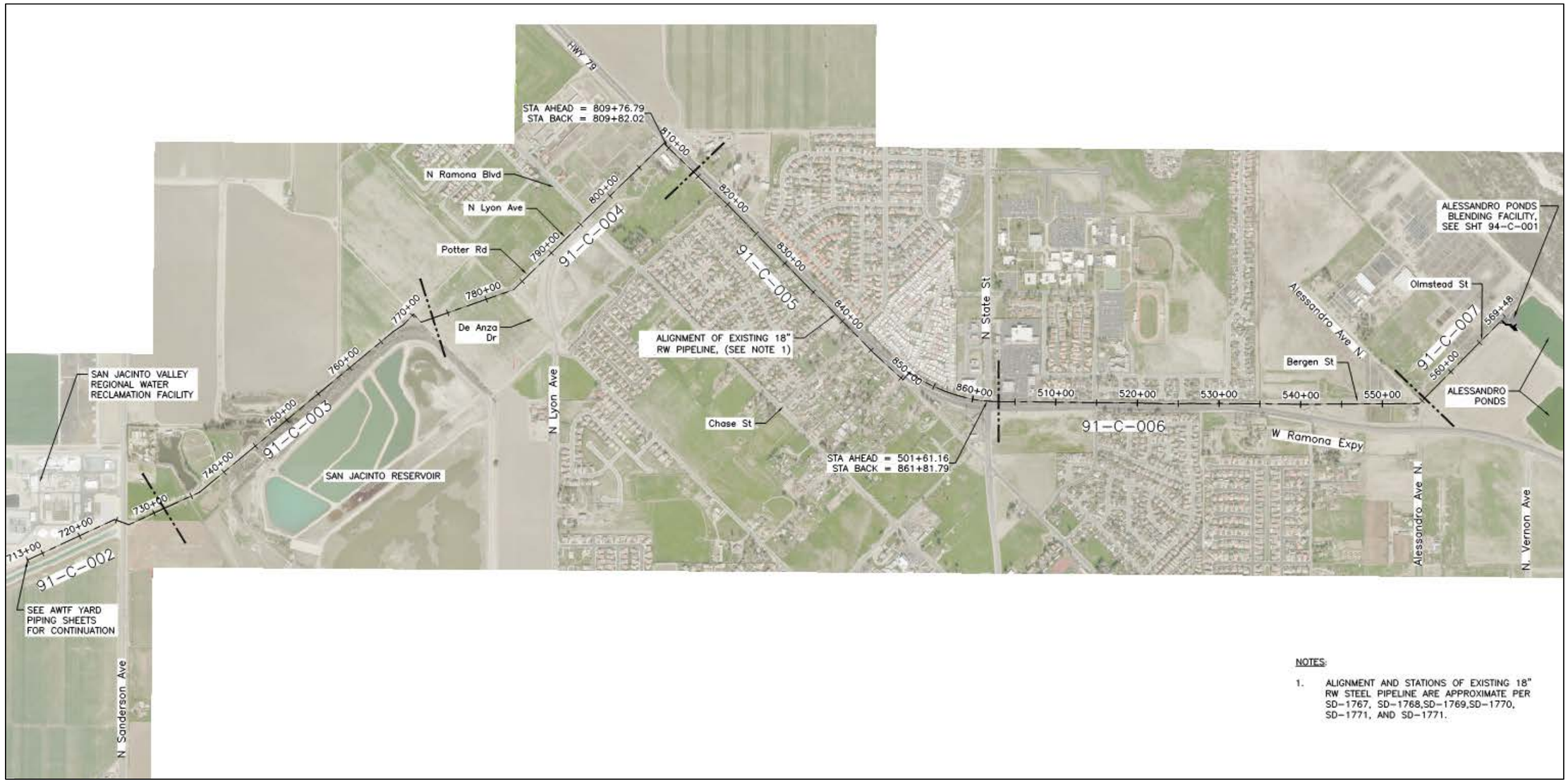

Figure 7-1 ROP Conveyance Pipeline

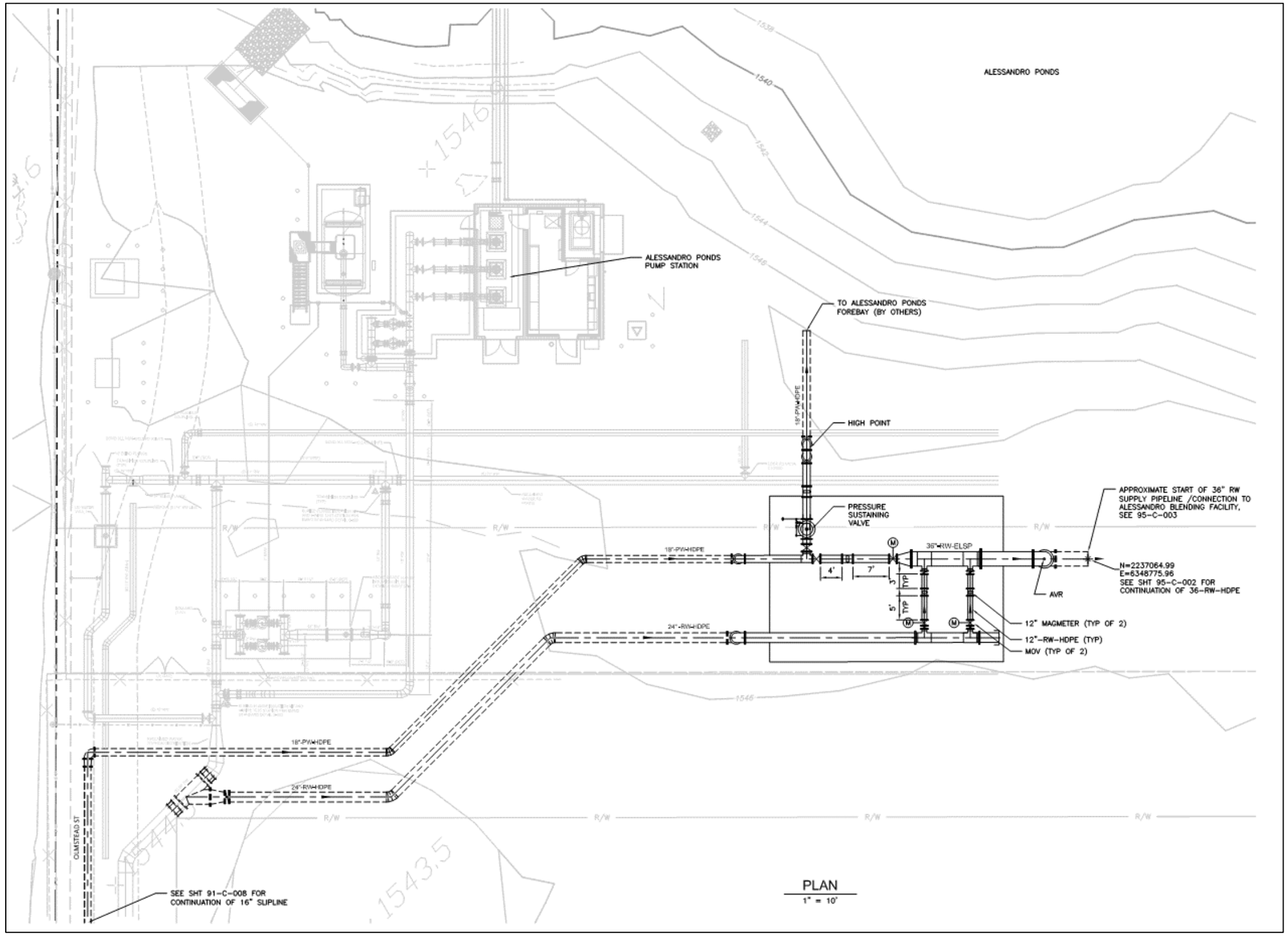

Figure 7-2 Alessandro Blending Station

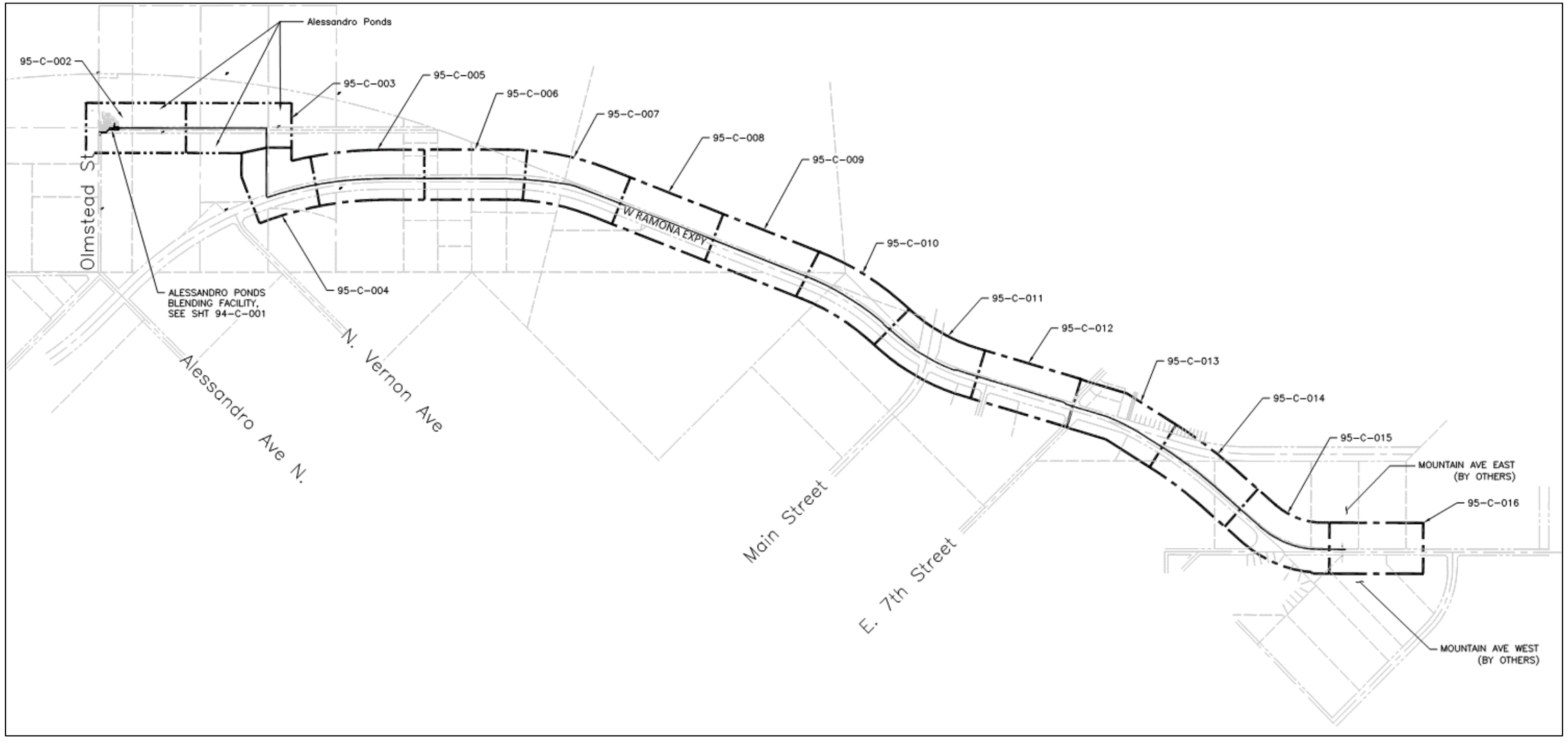

Figure 7-3 **36” Conveyance Pipeline Alignment**

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7.2 Design Flows and Pressure Rating

Table 7-2 provides a summary of the design flow rates anticipated in each pipeline as well as the maximum operating pressure of the system. For the basis of design, the pipeline pressure class is selected based on a preliminary maximum operating pressure of 160 psi.

Table 7-2 Design Flow and Pressure Ratings

Alignment	Nominal Pipe Diameter (in)	Phase I Flow Rate (mgd)	Phase II Flow Rate (mgd)	Max Pressure Rating (psi)
SJVWRF to Alessandro Blending Station	16	1.98	7.44	160
Alessandro Blending Station to Mountain Avenue Ponds	36	3.77	14.14	160

1. District would need to install an additional pipeline to adequately convey all Phase II flows assuming a 50/50 blend is required for phase II.
2. Assumes maximum Phase II flow of 3.85 mgd in the 16-inch pipeline (additional flow will need to be carried by a separate, future pipeline)

7.3 Sliplining

Sliplining is the insertion of a new pipe liner into an existing host pipe, where the outside diameter of the new pipe is smaller than the inside diameter of the existing host pipe. This method allows the liner to fit inside the existing pipe without excavating or removing the entire length of existing pipeline. The inside diameter of the new pipe is dependent on the thickness of the lining, protrusions or other defects in the host pipe, the desired annular space and the standard pipe sizes available for the liner pipe. The inner diameter of the existing cement-mortar-lined steel pipeline is estimated to be approximately 18 inches. The outer diameter of the liner pipe will be approximately 10 percent smaller than the 18 inches in order to be pulled smoothly through the host pipe. Following the insertion of the new liner, the annular space between the host pipe and the liner is typically grouted.

See **Appendix G** for sliplined pipeline alignment drawings.

7.3.1 Material of Construction

There are three typical pipe liner materials that could be potentially used to slipline the existing pipe: HDPE, steel, and fiberglass polymer mortar (i.e. Hobas or FlowTite). All materials have different properties, advantages, and disadvantages. **Table 7-3** lists some of the key aspects of each that must be considered prior to selecting a pipe material for sliplining.

Table 7-3 Liner Material Options

Liner Material	Advantages	Disadvantages
HDPE	▪ Lightweight pipe material ▪ Seamless material after butt-weld fusion is performed ▪ Pipe joints are fully restrained ▪ Can be pulled into place in long continuous sections ▪ Pipe can bend and navigate most deflections without compromising liner integrity ▪ Superior corrosion resistance	▪ Thick liner wall results in a liner inside diameter of approximately 13.488" and represents a flow area reduction of 44% (16" HDPE with a 1.185" wall thickness (DR 13.5) ▪ Pipe must be fused above ground and long staging areas will be required behind insertion pits ▪ Pipe must be full of water during grouting for temperature and floating control
Steel	▪ Can be pushed long distances into a host pipe piece by piece within a small access pit ▪ High pressures greater than 200 psi can be specified ▪ Thin walls (3/8" to 1/2") will maximize the sliplining inside diameter and flow capacity ▪ Can handle up to 3 degrees of deflection per joint ▪ Joints can be continuously welded and fully restrained	▪ Requires an internal liner for corrosion protection like Protecto 401; this protective liner can be "held back" from the pipe ends until after the pipe section are welded together, but post-installation application will be difficult for the pipe size in consideration ▪ Pipe must be weighted down during grouting so it does not float ▪ Relatively thin-walled steel is susceptible to collapse if grouting pressures are not carefully controlled
Fiberglass Polymer Mortar	▪ Inert substance that is corrosion resistant ▪ Can be pushed long distances into a host pipe piece by piece within a small access pit ▪ Joints manufactured that can handle greater than 200 psi pressure test	▪ Heavy pipe with shorter pipe segments which require more labor for a given length of pipe ▪ More challenging to connect to standard ductile fittings for valves, tees, bends and air valves ▪ Thick liner wall results in a flow area reduction similar to HDPE ▪ Can handle only 1 degree of pipe deflection per joint

For the basis of design, HDPE will be detailed as the liner material with the option for contractor to propose alternatives based on installation experience and economic factors. HDPE (PE4710) Iron Pipe Sizing (IPS) has an outside diameter of 16 inches (DR 13.5 pressure class [160 psi]). The maximum feasible pulling length for this material type/size is approximately 4,000 LF. Restrictions such as major grade, pipe, or alignment deflection points will significantly shorten the pulling length. Note that the thickness of the new liner pipe will be sized so that it is capable of withstanding the pulling forces as well as all external live and dead loads without the benefit of the host pipe. The Final Design could specify alternative materials to maintain cost competition.

Grout for the annual space between the liner and host pipe will be a low strength fluid concrete, bentonite, or ash that does not contribute to the final structural resistance of the pipe. Also, the liner will be filled with water to help prevent buoyancy and to resist excessive temperature increase due to the heat of hydration during curing of cementitious grout. Grouting procedures would likely require grouting ports to provide better control of the grouting operations and reduce the likelihood of pipe floating during grouting.

Unrestrained HDPE pipe expands and contracts considerably in response to thermal fluctuations when compared to metal pipes. However, the tensile or compressive stresses associated with temperature change are comparatively low and can be mitigated. With buried installations, soil friction frequently provides considerable restraint against thermal expansion and contraction movement. For sliplining installations, by grouting the annular space between the HDPE liner and the host pipe, the liner will be unlikely to move due to thermal stresses. If there are segments of annular space that turn out to be too small to grout, additional grouting at the entrance and exit points of the liner can act as additional anchors to prevent liner movement.

7.3.2 Access Pits

Access pits will be required for inserting and receiving the pipe, at in-line valve locations, at maximum feasible pulling length restrictions, at major deflections in grade, alignment, or at pipe joints, and for connection points to branch mains. Geotechnical investigation should be performed at pit locations to inform pit design and dewatering techniques.

In addition, direction drilling can be considered in more challenging locations. One example of these locations is at the State Street crossing where the existing 18-inch pipeline drops to avoid a storm drain crossing.

The size of insertion pits will be determined primarily by the depth of the existing host pipe and the diameter of the HDPE liner. Additionally, there should be sufficient width in the area to safely excavate and shore the trench depth that is needed. Sufficient stage area behind the insertion pit needs to be provided to lay and fuse segments of the HDPE liner to be inserted. Other features of the location such as roadway intersection, traffic, and topography will also affect the pit locations. Once the existing pipe is accessed and the top of the pipe is removed, the new pipe will be inserted by pulling it through the existing pipe from the receiving pit.

Depending on locations of the insertion pits, the excavated trench can be anywhere between 25 to 50 feet in length. The receiving pits will have smaller footprints, sufficient to allow a winch or equivalent assembly to pull the inserted liner through the host pipe. After the liner is installed, the exposed section of host pipe in the insertion pit will be encased in concrete to provide additional protection for the new liner and anchor it to the host pipe.

7.4 Conventional Open Cut Buried Pipeline

In general, open-cut trenches with laid back walls will be used for buried blended conveyance pipeline. There will be areas that are confined due to existing utilities, roadway intersections, easements, or right-of-way where there is insufficient lateral space to allow laid back trench walls. In these confined areas, trench-box excavation will be used to keep the trench width as narrow as possible. Where trench excavation is not feasible trenchless methods (i.e., jack and bore) will be utilized.

See **Appendix G** for alignment drawings for the 30-inch diameter blended water conveyance pipeline.

7.4.1 Material of Construction

At this time, the basis of design for the conveyance piping is based on HDPE; however, the District may want to evaluate subcontractor bids for multiple materials in order to select the more cost-effective option. Pipe is designed to AWWA standard C906 for HDPE pipe and fittings. HDPE pipe will be detailed as the initial pipe material with other materials offered as an alternate, as material availability, contractor familiarity and experience, and economic factors may make the alternative more feasible.

7.4.2 Wall Thickness and Pressure Rating

For external loading, the net thickness will consider the final burial depth of the pipe and assume AASHTO HS-20 wheel loads with an impact factor of 1.5. For internal loading, the net thickness design will be based on maximum operating pressure of the pipe with consideration of transient surge pressures. HDPE pipe will have a DR of 13.5, corresponding to the pressure class of 160 psi for PE4710 (see **Table 7-4**). At a nominal diameter of 36-inch, C900 PVC pipe of the equivalent pressure class (DR25/165 psi) has a larger outer diameter compared to HDPE and has a smaller wall thickness resulting in greater hydraulic capacity at the same nominal diameter. Alternatively, a C900 PVC with nominal diameter of 30-inch could be considered as well for cost savings if the small loss in hydraulic capacity is acceptable.

Table 7-4 HDPE and PVC Pipe Material Comparison

Pipe Material	Nominal Diameter (in)	DR	Pressure Class (psi)	Outer Diameter (in)	Inner Diameter (in)
C906-15 HDPE (PE4710) IPS	36	13.5	160	36.00	30.346
C900-16 PVC	36	18	235	38.30	34.04
C900-16 PVC	30	18	235	32.00	28.44

7.4.3 Pipe Structural Section

7.4.3.1 Joint Types

HDPE pipe will use heat fused joints with integrated testing of the welding procedure complying with AWWA C906 and ASTM F2620. PVC pipe will use push-on bell and spigot type joints with an integral rubber gasket.

7.4.3.2 Thrust Restraint

HDPE pipe will be restrained either through the heat fused joint or HDPE flange adapters. PVC pipe restrained joints will be “locked type” joints consisting of megalug mechanical joint types as manufactured by EBBA Iron, equivalent. The restraint will be independent of the joint gasket.

7.4.3.3 Elbows, Tees, Wyes, Bends

HDPE pipe will use HDPE pipe and fittings in butt, socket, or electro-fusion, or flange adapters. HDPE also has a curvature allowance that may be used to align the pipe through small alignment bends as shown in the plans. Ductile iron elbows, tees, wyes, and other bends will be used, as needed, to construct the PVC pipelines.

7.4.3.3.1 Transition Couplings

Transition couplings will be called out where the new pipe will be joined to an existing or installed pipe of differing material or dimensions, or a new pipe of differing material and dimensions. The transition coupling will be rated for the higher of the two joined pipe pressure classes and be installed following the manufacturer's instructions.

7.4.4 Pipe Trench Design

Depth of cover for pipe was assumed to be 4 feet for pressurized pipelines. This is in accordance with District design guidelines for water and sewer pipelines.

Trench width will vary according to the soil types found during construction and existing utilities and structures. Where site conditions require a narrower trench width, slip-shoring or trench boxes will need to be incorporated to allow vertical trench walls and thereby limit the trench width. Additional reduction in trench width could be achieved by reducing the trench bottom width dimension to less than 8 inches either side of the pipe. This method would require utilizing self-consolidating fill, such as pea gravel vibrated in place or Controlled Low Strength Material (CLSM), since sufficient space for compaction equipment is not available.

Pipe bedding material will be compacted to a minimum of 95 percent of maximum density per ASTM D698. Pipe bedding material will be detailed as imported commercially produced sand and gravel mixture or excavated onsite material meeting certain gradation requirements. The bedding thickness below the pipe will be at least 6 inches. Geotechnical testing will be required, as well as monitoring and retesting during construction, to ensure material being placed as bedding meets project requirements. Final material selection should be determined during the final design.

Trench backfill material above 12" above the top of pipe will be native material free of any rock larger than 6 inches in any direction and free of organic material. Compaction will be a minimum of 95 percent of maximum density adjacent to or beneath paved roads, per ASTM 1557. Surface restoration will consist of returning the disturbed surface to pre-construction conditions.

7.5 Pipeline Corrosion Control

Where soils are mildly corrosive, bonded joints with polyethylene wrapping around the ductile iron fittings are recommended. This is the lowest cost alternative for low to mildly corrosive soils and is the simplest for operations. Where soils are more corrosive epoxy coating and test stations will be evaluated for ductile iron fittings. In areas with higher moisture, additional measures will be considered, including installation of sacrificial anodes. Corrosion assessments and calculations should be performed when additional information is available after geotechnical investigation.

7.6 Waterline Appurtenances

7.6.1 Isolation Valves

Isolation valves will be spaced every 2,500 LF of pipeline and at tees to laterals and looped connections. Isolation valves will be butterfly valves. A 2-inch square operating nut and a non-rising stem will be specified and the valve body will be specified as ductile iron and lined and coated with 10 mils of fusion bonded epoxy. The valves will be rated to meet or exceed the adjoining pipe pressure class.

7.6.2 Air Valves

Air valves will be called out to be placed at all high points along the pipeline profile. Air valve models will comply with District standards.

7.6.3 Blow-offs

Blow-offs will be installed at identified locations and in compliance with District standards.

7.7 Next Steps

The District should consider the following items during the detailed design of both conveyance pipeline alignments:

- Perform a CCTV inspection and laser profile of the existing out-of-service 18-inch steel pipeline to confirm the dimensional assumptions made in this evaluation and establish the plan, profile and interior conditions of the existing pipeline. Some segments of the existing pipeline may have deflected or deteriorate to a point where a new liner might not be able to be pulled though the host pipe.
- Geotechnical investigation to provide trench design recommendations and test soil corrosivity to inform corrosion control methods.
- Hydraulic surge/transient analysis to verify the pressure class of selected pipe material and appropriately locate air release/vacuum valves.

7.8 Alessandro Blending Station

RO permeate from the new 16" sliplined pipeline and T22 water from the existing 36-inch pipeline between the SJVRWRF and Alessandro Blending Station will be blended in-pipe at the Alessandro Blending Station before combined flow is conveyed to Mountain Avenue Ponds through the new 36-inch pipeline. The blending facility will be located on an equipment pad southeast of the existing pressure regulating station downstream of the Alessandro Pump Station. The blending facility will utilize motor-operated valves (MOVs) where valve actuation will be adjusted to match flow adjustments in the upstream RO permeate and T22 deliveries. A connection with a pressure regulating valve will be provided at the blending facility for the option to discharge RO permeate into the Alessandro Ponds forebay.

Figure 7-2 shows the blending facility at the Alessandro Blending Station. Also see **Appendix G** for preliminary pipeline and blending facility drawings.

7.9 Recharge Pond

The Mountain Avenue West recharge ponds design and details will be provided by others. The scope of work under this project assumes that the blended water conveyance pipeline terminates at the property line near the northeast corner of the Mountain Avenue West property and as indicated on the preliminary pipeline drawings included in **Appendix G**.

Section 8
Implementation Schedule

During a meeting with EMWD on December 5, 2017, the following construction packages were proposed for this project:

- **Contract 1 – AWPF**: The AWPF construction package will include the final grading of the AWPF site, AWPF construction, influent pipeline from the SJVRWRF to the AWPF, the product water pipeline from AWPF to the 18" slip-lining connection, and conveyance from the AWPF to the brine evaporation pond connections.
- **Contract 2 – Brine Evaporation Ponds**: The brine evaporation ponds construction package will include the preliminary grading of the AWPF site as well as the brine evaporation pond site, brine evaporation ponds construction, and the brine line connection point for the AWPF.
- **Contract 3 – Conveyance Pipelines**: The Conveyance Pipelines construction package will include slip-lining existing 18" from SJVRWRF to Alessandro Blending Station and the installation of the new 36" pipeline from the Alessandro Blending Station to the Mountain Avenue West Pond.

A single design contract is assumed for all three total contracts. A schedule for each contract indicates the preliminary sequencing of tasks for all major project activities. Each of the construction packages are assumed to use a conventional design/bid/build implementation methodology.

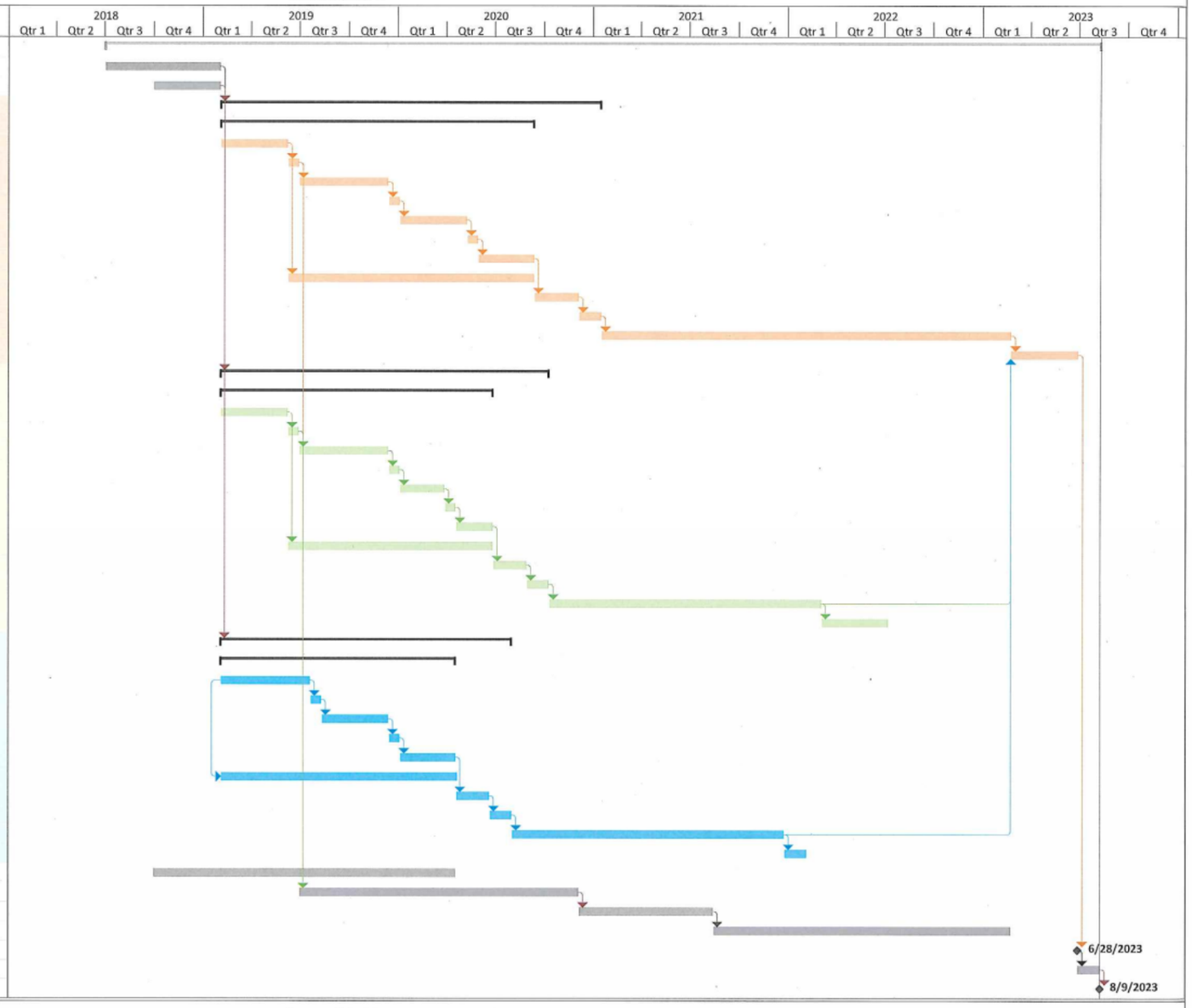
This schedule can be found in **Figure 8-1**. Highlights from the schedule include:

- The schedule shows detailed durations for design, bidding and construction for each construction package.
- Final designs will begin in 2018 and be completed by approximately winter 2020. The start date for the final design is still to be determined, with the schedule adjusted to the actual start date of the design.
- The first Construction activities will start in October 2019 on the conveyance pipelines. AWPF construction start in May 2020.
- The AWPF construction period is estimated to be approximately 25 months.
- The Brine evaporation pond construction period is estimated to be approximately 17 months.

- The Conveyance Pipelines construction period is estimated to be approximately 17 months.
- The schedule for the brine evaporation ponds and for the Conveyance pipelines are shorter than the construction period for the AWPF so the start of construction for those projects could be delayed if desired.
- AWPF start-up and testing is scheduled for July-October 2022.
- The Phase I PWR project must be completed, tested, and operational by December 2022.
- The draft Engineering Report will be prepared during the Final Design and submitted to DDW for review and comment. The Final Engineering Report will be completed during construction and incorporate the DDW comments. Approval from DDW should be obtained prior to start-up of the AWPF.

Eastern Municipal Water District
Indirect Potable Reuse Project
Preliminary Design

ID	Task Name	Duration	Start	Finish
0	**EMWD IPR Implementation Schedule**	**1333 days**	**Mon 7/2/18**	**Wed 8/9/23**
1	Groundwater Modeling	155 days	Mon 7/2/18	Fri 2/1/19
2	Scope of Work Development	90 days	Mon 10/1/18	Fri 2/1/19
3	**Final Design - AWPF**	**510 days**	**Mon 2/4/19**	**Fri 1/15/21**
4	**Final Design**	**420 days**	**Mon 2/4/19**	**Fri 9/11/20**
5	30% Design	90 days	Mon 2/4/19	Fri 6/7/19
6	Review	15 days	Mon 6/10/19	Fri 6/28/19
7	60% Design	120 days	Mon 7/1/19	Fri 12/13/19
8	Review	15 days	Mon 12/16/19	Fri 1/3/20
9	90% Design	90 days	Mon 1/6/20	Fri 5/8/20
10	Review	15 days	Mon 5/11/20	Fri 5/29/20
11	Final Design	75 days	Mon 6/1/20	Fri 9/11/20
12	Permitting	330 days	Mon 6/10/19	Fri 9/11/20
13	Bid Phase	60 days	Mon 9/14/20	Fri 12/4/20
14	Award of Construction Contract	30 days	Mon 12/7/20	Fri 1/15/21
15	**Construction - AWPF**	**548 days**	**Mon 1/18/21**	**Wed 2/22/23**
16	**Startup and Testing - Entire Project**	**90 days**	**Thu 2/23/23**	**Wed 6/28/23**
17	**Final Design - Brine Evaporation Ponds**	**440 days**	**Mon 2/4/19**	**Fri 10/9/20**
18	**Final Design**	**365 days**	**Mon 2/4/19**	**Fri 6/26/20**
19	30% Design	90 days	Mon 2/4/19	Fri 6/7/19
20	Review	15 days	Mon 6/10/19	Fri 6/28/19
21	60% Design	120 days	Mon 7/1/19	Fri 12/13/19
22	Review	15 days	Mon 12/16/19	Fri 1/3/20
23	90% Design	60 days	Mon 1/6/20	Fri 3/27/20
24	Review	15 days	Mon 3/30/20	Fri 4/17/20
25	Final Design	50 days	Mon 4/20/20	Fri 6/26/20
26	Permitting	275 days	Mon 6/10/19	Fri 6/26/20
27	Bid Phase	45 days	Mon 6/29/20	Fri 8/28/20
28	Award of Construction Contract	30 days	Mon 8/31/20	Fri 10/9/20
29	**Construction - Brine Ponds**	**365 days**	**Mon 10/12/20**	**Fri 3/4/22**
30	**Startup and Testing - Brine Ponds**	**90 days**	**Mon 3/7/22**	**Fri 7/8/22**
31	**Final Design - Conveyance Pipelines**	**390 days**	**Mon 2/4/19**	**Fri 7/31/20**
32	**Final Design**	**315 days**	**Mon 2/4/19**	**Fri 4/17/20**
33	60% Design	120 days	Mon 2/4/19	Fri 7/19/19
34	Review	15 days	Mon 7/22/19	Fri 8/9/19
35	90% Design	90 days	Mon 8/12/19	Fri 12/13/19
36	Review	15 days	Mon 12/16/19	Fri 1/3/20
37	Final Design	75 days	Mon 1/6/20	Fri 4/17/20
38	Permitting	316 days	Mon 2/4/19	Mon 4/20/20
39	Bid Phase	45 days	Mon 4/20/20	Fri 6/19/20
40	Award of Construction Contract	30 days	Mon 6/22/20	Fri 7/31/20
41	**Construction - Conveyance Pipelines**	**365 days**	**Mon 8/3/20**	**Fri 12/24/21**
42	**Startup and Testing - Conveyance**	**30 days**	**Mon 12/27/21**	**Fri 2/4/22**
43	CEQA	405 days	Mon 10/1/18	Fri 4/17/20
44	Draft Engineer's Report	375 days	Mon 7/1/19	Fri 12/4/20
45	DDW Review	180 days	Mon 12/7/20	Fri 8/13/21
46	Final Engineer's Report	398 days	Mon 8/16/21	Wed 2/22/23
47	**Substantial Completion - Entire Project**	**0 days**	**Wed 6/28/23**	**Wed 6/28/23**
48	**Closeout - Entire Project**	**30 days**	**Thu 6/29/23**	**Wed 8/9/23**
49	**Project Completion**	**0 days**	**Wed 8/9/23**	**Wed 8/9/23**



Summary Schedule
Page 1 of 1

Figure 8-1 Implementation Schedule

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Section 9

Preliminary Cost Estimates

This section describes the capital cost estimate for the PWR project.

9.1 Construction Contract Packages

Capital cost estimates are prepared for the construction of the AWPF and ancillary facilities. As described in Section 8, three different contracts were identified to complete the construction of the PWR project. A fourth construction contract package for the Mountain Avenue West percolation ponds is not a part of this contract and will be prepared by others. The construction packages include the following.

- AWPF.
- Brine Evaporation Ponds.
- Conveyance Pipelines.
- Mountain Avenue West Percolation Pond (by others).

A summary of what work is included in each of these contracts is discussed in the following subsections. An "Opinion of probable cost of construction" is presented for the first three contracts.

9.1.1 Contract No. 1 - AWPF

The AWPF construction package includes the construction of the AWPF and appurtenances. The AWPF opinion of probable cost of construction is the largest single contract. The cost estimate includes the following main areas of construction:

- Influent pipeline from the SJVRWRF to the AWPF, including connections to the TEPS and the chlorine contact tank.
- Site work included foundations, fine grading, storm drainage, utilities, yard piping, access road pavement, and landscaping.
- Influent pump station and appurtenances.
- MF and related facilities (includes automatic backwashing strainers, MF/UF units, air system, backwash pumps, MF CIP/EFM system, and waste neutralization system).
- MF break tank and RO transfer pump station.
- RO and related facilities (includes cartridge filters, RO feed pumps, RO skids, RO CIP system, and RO flush tank).
- Effluent pump station.

- Chemical Storage (includes chemical storage structure, bulk storage tanks, metering pumps and appurtenances for adding sodium hypochlorite, ammonium sulfate, sulfuric acid, threshold inhibitor, citric acid, sodium bisulfite, sodium hydroxide).
- Process and Control Building, including interior improvements, utilities, HVAC, and plumbing.
- Electrical facilities including electrical and instrumentation, switchgear and building, lighting, emergency generator.

9.1.2 Contract No. 2 – Brine Evaporation Ponds

The brine evaporation ponds opinion of probable cost of construction includes the following main areas of construction:

- Earthwork to construct the ponds and berms, including access roads and pavement; and rough grading for the AWPF site.
- Pond liner system, including primary HDPE textured primary liner, HDPE LCRS, GCL below the LCRS, compacted subgrade.
- Mechanical spray evaporator equipment and appurtenances.
- Detection monitoring system.
- Pipelines and appurtenances.
- Electrical facilities, including pre-fabricated electrical building.

In addition, this cost estimate highlighted some addition optional features for the brine evaporation ponds. They include:

1. Transfer pumps and associated controls to transfer flow between the ponds.
2. Installing soil cement lining inside Pond A
3. Installing soil cement lining inside Pond B
4. Installing soil cement lining inside Pond C
5. Installing soil cement lining inside Pond D
6. Installing soil cement lining inside Pond E
7. Providing lining on the interior roadways which are important when the evaporators are in use.
8. Providing lining on the exterior roadways

Of the optional items described above, only Option 7 (lining the interior roadways) has been included in the opinion of probable cost of construction for this contract. The costs for all optional features is found in Appendix I.

9.1.3 Contract No. 3 – Conveyance Pipelines

The Conveyance Pipeline opinion of probable cost of construction includes the following main areas of construction:

- Sliplined pipeline and appurtenances.
- Conventional blended water conveyance pipeline and appurtenances.
- Alessandro Blending Station and appurtenances.

9.2 Development of Opinion of Probable Construction Cost

CDM Smith construction cost estimators prepared the Opinion of Probable construction cost using computerized the Timberline™ estimating system. This system consists of a custom database (over 130,000 items) including items for labor, material, equipment and/or subcontract components. The database is updated continuously with information comes from many sources such as: past project histories, schedules of value, bid breakdown analyses, commercial pricing services such as R.S. Means, and vendor quotations. This allows the estimates to have very specific cost information on process and specialty equipment and engineered materials.

As part of the estimating process, the schedule is utilized to: determine the length of the project; to determine the time requirements for indirect costs; to aid in establishing delivery dates; to assist in developing manpower and equipment requirements; and to properly analyze needs for shift work or overtime.

Table 9-1 shows the indirect costs used to prepare the estimates. Cost opinions were developed for Phase I of this project only.

Table 9-1 Indirect Cost Summary*

Description	Mark-up	
Sales Tax	7.75	percent of materials, equipment & other (MEO) (included in the direct costs)
Contractor's OH&P, GC General Conditions, Sales Tax, Building Permits, Bldr's Risk Ins, General Liab Ins, GC Bonds	20	percent of total cost
Construction Contingency	15	percent of subtotal cost with OH&P
Escalation	0	Costs are for 2017 and are not escalated

*Implementation costs were not included in the cost summary table.

9.3 Opinion of Probable Construction Cost

Construction contracts 1, 2, and 3 are part of this Preliminary Design Estimate of Probable Construction Cost while the contract for the Mountain Avenue West percolation pond will be completed by others. An overall summary table with the opinion of probable cost of construction (not including implementation costs) for these three contracts is presented in **Table 9-2**. See **Appendix I** for complete construction cost estimates.

Table 9-2 Opinion of Probable Construction Cost Summary – Phase I

Line Item	Cost
Contract No. 1 - AWPF	
MF System	$2,249,000
Influent Pump Station	$407,000
MF Break Tank	$277,000
Primary RO System (include RO Transfer Pumps, Flush System and CFs)	$1,844,000
High Recovery RO System	$819,000
Chemical Systems	$1,185,000
Control/Electrical/Process Buildings (w/ process piping)	$7,312,000
Product Water Pump Station	$403,000
Site Electrical/I&C Allowance	
Electrical	$4,462,000
I&C	$1,456,000
Site/Civil Allowance	$2,394,000
24" Pipe (from AWPF to slip-lining location)	$877,000
TOTAL	**$23,700,000**
Contract No. 2 – Brine Evaporation Ponds	
Evaporation Ponds	
Semi-Enhanced Evaporation Pond	$8,717,000
AWPF Rough Grading	$351,000
Brine Pond Features (Optional)	--
1. Pump Optional Item - Transfer Pumps	--
2. Pond A Optional Item - Drive into ponds for maint.	--
3. Pond B Optional Item - Drive into ponds for maint.	--
4. Pond C Optional Item - Drive into ponds for maint.	--
5. Pond D Optional Item - Drive into ponds for maint.	--
6. Pond E Optional Item - Drive into ponds for maint.	--
7. Inside Access Roads Optional Item - soil cement	$162,000
8. Outside Access Road Optional Item - soil cement	--
TOTAL	**$9,200,000**
Contract No. 3 – Conveyance Pipelines	
Slip-line Existing 18-inch	$3,221,000
36" Pipe	$5,561,000
Flow Control Facility	$341,000
TOTAL	**$9,200,000**
Construction Subtotal	**$42,000,000**
Contractor's OH&P, GC General Conditions, Sales Tax, Building Permits, Bldr's Risk Ins, General Liab Ins, GC Bonds	$8,400,000
Construction Total with Contractor's OH&P, Tax, General Conditions, Insurance, Bonds	**$50,400,000**
Contingency	$7,560,000
Construction Total with Contractor's OH&P, Tax, General Conditions, Insurance, Bonds and Contingency	**$58,000,000**

9.4 Operation & Maintenance Costs

O&M costs considers annual power, chemical, maintenance, major equipment replacement, compliance/monitoring and labor for each of the construction contracts.

The following assumptions were made for each O&M cost item:

- Power was anticipated at $0.15/kWh assuming AWPF is operated with a 90% online factor and including a 10% contingency. See **Appendix I** for breakdown of power costs for each piece of equipment.
- Chemical unit costs were provided by Brenntag Pacific including a 10% contingency.
- Major equipment replacement was assumed based on similar projects and reaching out to anticipated equipment manufacturers.
- Compliance and monitoring costs were provided by reaching out to laboratories using a list of sample requirements assumed from similar projects.
- Maintenance cost is estimated at 0.25 to 1% of the total construction cost for opinion of probable construction costs for each contract included in Section 9.3.
- Labor assumes 4 full time staff members at the AWPF and ½ staff member at the brine ponds. See **Appendix I** for breakdown on anticipated personnel and their associated time.

Table 9-3 provides a summary of the estimated annual O&M costs for each construction contract. See **Appendix I** for complete O&M cost estimates.

Table 9-3 Annual O&M Cost Summary

O&M Cost Item	AWPF	Brine Evaporation Ponds	Conveyance Pipelines
Equipment and Building Operations Power	$492,000	$216,000	--
Chemicals	$377,000	--	--
Major Equipment Replacement	$150,000	$78,000	$15,000
Compliance/Monitoring	$200,000	$25,000	--
Maintenance	$280,000	$29,000	$27,000
Labor	$319,000	$37,000	--
Phase I Total Annual O&M Cost	**$1,820,000**	**$385,000**	**$42,000**

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Section 10

Design Specifications List

The following design specification list is anticipated for the PWR project. These specifications are based on the 16 Division format. The specification list will need to be updated if the new 46 Division format is required.

10.1 AWPF Technical Specifications

Division 1 – General Requirements

01010 Summary of Work
01011 Site Conditions
01015 Index of Drawings
01016 Safety Requirements and Protections of Property
01025 Measurement and Payment
01031 Grades, Lines and Levels
01080 Identification and Tagging
01090 Reference Standards
01092 Abbreviations and Symbols
01100 Special Project Procedures
01120 Sequence of Construction
01140 Security
01171 Electric Motors to 250HP
01174 Pulse Width Variable Frequency Drive (Low Voltage)
01175 Form-Wound Induction Motors 250HP and Above
01300 Submittals
01310 Project Schedules, Meetings and Reports
01380 Construction Photographs
01381 Audio Video Taping
01410 Testing and Testing Laboratory Services
01500 Temporary Facilities
01524 Construction Waste Management
01562 Dust Control
01580 Field Offices and Sheds
01581 Project Signs
01612 Seismic Restraint Requirements for Nonstructural Components
01600 Material and Equipment Shipment, Handling, Storage and Protection
01630 Substitutions and Product Options

01565 Stormwater Pollution Prevention Plan
01670 Commissioning and Acceptance Testing
01700 Contract Closeout
01710 Cleaning
01720 Project Record Documents
01730 Operating and Maintenance Manuals
01731 Equipment Operation and Maintenance Training
01740 Permits

Division 2 – Site Work

02000 Site Work General
02080 Fire Hydrants
02100 Site Preparation
02140 Dewatering and Drainage
02151 Jacking
02160 Excavation Support Systems
02200 Earthwork
02205 Soil Materials
02210 Site Grading
02221 Trenching, Backfilling and Compacting
02222 Protecting Existing Underground Utilities
02230 Granular Materials
02270 Erosion and Sedimentation Control
02273 Geotextile
02500 Pavement
02505 Cleaning and Testing of Main
02512 Disinfection of Water Main
02515 Concrete Walkways
02535 Gravity Sewer Systems
02543 Precast Concrete Catch Basin, Inlet and Cover
02544 Precast Concrete Chemical Trenches
02575 Roadways, Markings, Guardrails and Appurtenances
02576 Pavement Repair and Resurfacing
02600 Yard Piping
02610 Leakage and Infiltration – Testing of Non-Pressure Pipelines
02616 Ductile Iron Yard Pipe and Fittings
02617 Buried Steel Pipe and Fittings
02620 Manhole Frame Sealing System

02622 Polyvinyl Chloride (PVC) Pressure Piping
02623 High Density Polyethylene (HDPE) Yard Pipe and Fittings
02630 Storm Drainage
02640 Valves, Hydrants and Appurtenances
02646 Polyvinyl Chloride (PVC) And Chlorinated Polyvinyl Chloride (CPVC) Gravity Pipe and Fittings
02650 Welded Steel Pipe
02653 Fabricated Steel and Stainless-Steel Pipe Specials
02655 Installation of Pipe
02660 Stainless Steel Pipe
02667 Utility Relocation
02670 Monitoring Wells
02673 Observation Wells
02676 Pressure Testing of Piping
02741 Prime and Tack Coats
02745 Asphaltic Concrete Paving
02765 Pavement Markings and Traffic Signs
02769 Slip-lining
02770 Curbs and Gutters
02775 Sidewalks
02810 Irrigation Systems
02821 Chain-Link Fences and Gates
02840 Parking Appurtenances
02900 Landscaping
02935 Grassing, Solid Sod and Seed
02950 Landscape Maintenance

Division 3 – Concrete

03100 Concrete Formwork
03200 Concrete Reinforcement
03290 Joints in Concrete
03300 Cast-In-Place Concrete
03315 Grout
03350 Concrete Finishes
03370 Concrete Curing
03400 Precast Concrete Manholes, Vaults and Boxes

Division 4 – Masonry

04220 Concrete Block Masonry

Division 5 – Metals

05120 Structural Steel
05311 Steel Roof Deck
05500 Miscellaneous Metals

Division 6 – Wood and Plastics

06100 Rough Carpentry
06105 Miscellaneous Carpentry
06402 Interior Architectural Woodwork
06410 Cabinetwork and Millwork

Division 7 – Thermal and Moisture Protection

07100 Waterproofing and Dampproofing
07190 Water Repellents
07210 Building Insulation
07241 Exterior Finish Systems
07260 Vapor Barrier
07412 Metal Wall Panels
07552 EPDM Membrane Roofing
07620 Sheet Metal Flashing and Trim
07716 Roof Expansion Assemblies
07720 Roof Accessories
07920 Sealants and Caulking

Division 8 – Doors and Windows

08110 Steel Doors and Frames
08111 Interior Aluminum Doors and Frames
08211 Flush Wood Doors
08311 Access Doors and Frames
08331 Overhead Coiling Doors
08361 Sectional Overhead Doors
08411 Aluminum-Framed Entrances
08710 Finish Hardware
08800 Glazing
08830 Mirrors
08911 Glazed Aluminum Curtain Walls

Division 9 – Finishes

09260 Gypsum Board Assemblies
09310 Ceramic Tile
09511 Acoustical Panel Ceilings
09651 Resilient Flooring and Base
09680 Carpet
09841 Acoustical Panels
09870 Plant Applied Cement Mortar Lining
09871 Cement Mortar Coating
09900 Coating Systems
09910 Epoxy Lining and Coating for Pipelines
09960 Architectural High - Performance Coatings

Division 10 – Specialists

10155 Toilet Compartments
10200 Louvers and Vents
10290 Bird Control Devices
10350 Flagpoles
10400 Signage
10431 Interior Signs
10510 Safety Devices and Equipment
10520 Fire Protection Specialties
10652 Folding Panel Partitions
10801 Toilet and Bath Accessories

Division 11 – Equipment

11000 General Equipment Requirements
11132 Projection Screens
11148 Skid-Mounted Self Priming Pumps
11192 Submersible Plant Process Waste Pumps
11205 Submersible Pumps
11208 Stainless Steel Submersible Sump Pumps
11209 Vertical Wet-Pit Submersible Pumps
11211 Horizontal End Suction Pumps
11212 Vertical Turbine Can Pumps
11213 Vertical Turbine Reverse Osmosis
11214 Magnetic Drive End Suction Pumps
11215 Hydraulic Diaphragm Chemical Metering Pumps
11216 Peristaltic Pumps

11217 Vertical Chemical Resistant Sump Pumps
11218 Product Water Sample Pumps
11224 Inline Static Mixer
11242 Chemical Metering Pumps
11243 Fiberglass Storage Tanks
11244 Reverse Osmosis Clean-In-Place System (RO CIP)
11245 Steel Storage Tanks
11282 Fabricated Stainless-Steel Gates
11305 Microfiltration System Installation
11346 Crosslinked Polyethylene Tanks
11396 Diesel Engine Standby Generators
11400 Reverse Osmosis (RO) Treatment System
11403 Cartridge Filters
11436 Tank Mounted Compressor
11717 Vertical Mixers

Division 12 – Furnishing

12362 Wood Break Room Casework and Equipment
12484 Entrance Mats
12494 Roller Shades
12600 Furniture

Division 13 – Special Construction

13125 Metal Building Systems
13201 Welded Stainless-Steel Water Storage Tanks
13300 Instrumentation and Controls (I&C) – General Provisions
13302 I&C - Testing
13303 I&C - Training
13305 I&C - Control Descriptions
13306 I&C - Applications Engineering Services
13311 I&C - PLC Hardware and Software
13320 I&C - Control and Data Network Equipment
13321 I&C - Fiber Optic Cabling and Equipment
13330 I&C - Control Panels Enclosures and Panel Equipment
13335 I&C - Control Panel UPS (Single-Phase)
13340 I&C - Instruments
13340 A I&C - Instrumentation Schedule
13341 I&C - Flow Devices
13342 I&C - Level Devices

13343 I&C - Pressure Devices
13344 I&C - Temperature Devices
13345 I&C - Analytical Devices

Division 15 – Mechanical

15000 Piping - General Requirements
15040 Seal Water System
15052 Pipe Testing - General Requirements
15060 Ductile Iron Piping and Fittings
15061 Steel Pipe and Fittings
15062 Stainless Steel Pipe and Fittings
15064 Plastic Pipe and Fittings
15065 Fiberglass Reinforced Plastic Pipe and Fittings
15066 Double Wall Chemical Pipe System
15067 Alloy 20 Pipe and Fittings
15068 Large Diameter Stainless Steel Pipe and Fittings
15069 Flexible Hose (RBH) And Fittings
15075 Chemical Tubing and Appurtenances
15077 Polyvinylidene Fluoride (PVDF) Pipe and Fittings
15080 Piping Schedule
15101 Butterfly Valves
15102 Ball Valves
15104 Check Valves
15105 Specialty Valves
15106 Valve Actuators
15115 Valving Schedule
15121 Piping Specialties
15124 Reduced Pressure Principle Backflow Preventers
15140 Pipe Supports
15151 Buried Pipeline Identification
15162 Flexible Pipe Couplings and Expansion Joints
15250 Thermal Insulation
15330 Fire Sprinkler Systems
15400 Plumbing - General Provisions
15410 Plumbing - Piping Systems
15431 Emergency Eyewash and Shower Units
15440 Plumbing - Fixtures and Trim
15450 Plumbing - Equipment

15473 Electric Water Heaters
15500 Common Work Results For HVAC
15558 Common Motor Requirements for HVAC Equipment
15562 Hangers and Supports for HVAC Piping and Equipment
15574 Vibration Controls for HVAC Piping and Equipment
15577 Identification for HVAC Piping and Equipment
15583 HVAC Insulation
15634 Refrigerant Piping
15635 Refrigerant Detection and Alarm
15671 Condensing Units
15725 Air Handling Units
15762 Unit Heaters
15815 Metal Ducts
15816 Non-Metal Ducts
15820 Duct Accessories
15837 Centrifugal Fans
15838 Power Ventilators
15855 Diffusers, Registers, And Grilles
15856 Intake and Relief Ventilators
15861 Particulate Air Filtration
15900 HVAC Instrumentation and Controls
15940 Sequence of Operations
15950 Testing, Adjusting, And Balancing

Division 16 – Electrical

16000 Electrical – General Provisions
16015 Electrical Systems Analysis
16110 Raceways, Boxes, Fittings and Supports
16120 Wires and Cables (600V maximum)
16121 Medium Voltage Cable
16141 Wiring Devices
16191 Miscellaneous Equipment
16263 Static UPS
16325 Pad-Mounted Transformers
16350 Medium-Voltage Switchgear
16420 Low-Voltage Switchboard
16470 Panelboards
16480 Low Voltage MCC

16500 Lighting System
16502 Lightning Protection
16600 Underground Systems
16660 Grounding System
16720 Fire Alarm System
16724 Card Access Control
16727 Gate Security System
16741 Telephone System
16781 Closed Circuit TV System
16950 Electrical System Testing and Settings

10.2 Brine Evaporation Pond Technical Specifications

Division 1 – General Requirements

01010 Summary of Work
01011 Site Conditions
01015 Index of Drawings
01016 Safety Requirements and Protections of Property
01025 Measurement and Payment
01031 Grades, Lines and Levels
01080 Identification and Tagging
01090 Reference Standards
01092 Abbreviations and Symbols
01100 Special Project Procedures
01120 Sequence of Construction
01140 Security
01171 Electric Motors to 250HP
01174 Pulse Width Variable Frequency Drive (Low Voltage)
01300 Submittals
01310 Project Schedules, Meetings and Reports
01380 Construction Photographs
01381 Audio Video Taping
01410 Testing and Testing Laboratory Services
01500 Temporary Facilities
01524 Construction Waste Management
01562 Dust Control
01580 Field Offices and Sheds
01581 Project Signs
01612 Seismic Restraint Requirements for Nonstructural Components

01600 Material and Equipment Shipment, Handling, Storage and Protection
01630 Substitutions and Product Options
01565 Stormwater Pollution Prevention Plan
01670 Commissioning and Acceptance Testing
01700 Contract Closeout
01710 Cleaning
01720 Project Record Documents
01730 Operating and Maintenance Manuals
01731 Equipment Operation and Maintenance Training
01740 Permits

Division 2 – Site Work

02000 Site Work General
02100 Site Preparation
02140 Dewatering and Drainage
02160 Excavation Support Systems
02200 Earthwork
02205 Soil Materials
02210 Site Grading
02221 Trenching, Backfilling and Compacting
02222 Protecting Existing Underground Utilities
02230 Granular Materials
02270 Erosion and Sedimentation Control
02500 Pavement
02505 Cleaning and Testing of Main
02543 Precast Concrete Catch Basin, Inlet and Cover
02575 Roadways, Markings, Guardrails and Appurtenances
02600 Yard Piping
02610 Leakage and Infiltration – Testing of Non-Pressure Pipelines
02616 Ductile Iron Yard Pipe and Fittings
02617 Buried Steel Pipe and Fittings
02622 Polyvinyl Chloride (PVC) Pressure Piping
02623 High Density Polyethylene (HDPE) Yard Pipe and Fittings
02630 Storm Drainage
02640 Valves, Hydrants and Appurtenances
02646 Polyvinyl Chloride (PVC) And Chlorinated Polyvinyl Chloride (CPVC) Gravity Pipe and Fittings
02650 Welded Steel Pipe

02655 Installation of Pipe
02667 Utility Relocation
02670 Monitoring Wells
02673 Observation Wells
02676 Pressure Testing of Piping
02712 Subdrains
02774 Geotextiles
02775 Leakage Collection Trench
02776 Waste Containment Geo-membrane
02777 Geosynthetic Clay Liner (GCL)
02741 Prime and Tack Coats
02745 Asphaltic Concrete Paving
02765 Pavement Markings and Traffic Signs
02821 Chain-Link Fences and Gates

Division 3 – Concrete

03100 Concrete Formwork
03200 Concrete Reinforcement
03290 Joints in Concrete
03300 Cast-In-Place Concrete
03315 Grout
03350 Concrete Finishes
03370 Concrete Curing
03400 Precast Concrete Manholes, Vaults and Boxes
03714 Soil-Cement Lining for Evaporation Ponds
03723 Roller-Compacted Concrete for Evaporation Ponds

Division 5 – Metals

05500 Miscellaneous Metals

Division 7 – Thermal and Moisture Protection

07100 Waterproofing and Dampproofing
07160 Bituminous Dampproofing
07190 Water Repellents
07210 Building Insulation
07241 Exterior Finish Systems
07260 Vapor Barrier
07412 Metal Wall Panels
07552 EPDM Membrane Roofing

07620 Sheet Metal Flashing and Trim
07720 Roof Accessories
07920 Sealants and Caulking

Division 8 – Doors and Windows

08110 Steel Doors and Frames
08710 Finish Hardware

Division 9 – Finishes

09900 Coating Systems
09960 Architectural High - Performance Coatings

Division 10 – Specialists

10200 Louvers and Vents
10290 Bird Control Devices
10400 Signage

Division 11 – Equipment

11000 General Equipment Requirements
11205 Floating Submersible Pond Transfer Pumps
11218 Brine Water Sample Pumps
11350 Mechanical Spray Evaporators

Division 15 – Mechanical

15000 Piping - General Requirements
15052 Pipe Testing - General Requirements
15061 Steel Pipe and Fittings
15064 Plastic Pipe and Fittings
15080 Piping Schedule
15101 Butterfly Valves
15102 Ball Valves
15104 Check Valves
15105 Specialty Valves
15106 Valve Actuators
15115 Valving Schedule
15121 Piping Specialties
15140 Pipe Supports
15151 Buried Pipeline Identification
15162 Flexible Pipe Couplings and Expansion Joints
15400 Plumbing - General Provisions

15410 Plumbing - Piping Systems
15500 Common Work Results For HVAC
15558 Common Motor Requirements for HVAC Equipment
15562 Hangers and Supports for HVAC Piping and Equipment
15574 Vibration Controls for HVAC Piping and Equipment
15577 Identification for HVAC Piping and Equipment
15583 HVAC Insulation
15634 Refrigerant Piping
15635 Refrigerant Detection and Alarm
15671 Condensing Units
15725 Air Handling Units
15762 Unit Heaters
15815 Metal Ducts
15816 Non-Metal Ducts
15820 Duct Accessories
15837 Centrifugal Fans
15838 Power Ventilators
15855 Diffusers, Registers, And Grilles
15856 Intake and Relief Ventilators
15861 Particulate Air Filtration
15900 HVAC Instrumentation and Controls
15940 Sequence of Operations
15950 Testing, Adjusting, And Balancing

Division 16 – Electrical

16000 Electrical – General Provisions
16015 Electrical Systems Analysis
16110 Raceways, Boxes, Fittings and Supports
16120 Wires and Cables (600V maximum)
16121 Medium Voltage Cable
16141 Wiring Devices
16191 Miscellaneous Equipment
16263 Static UPS
16325 Pad-Mounted Transformers
16350 Medium-Voltage Switchgear
16420 Low-Voltage Switchboard
16470 Panelboards
16480 Low Voltage MCC

16500 Lighting System
16502 Lightning Protection
16600 Underground Systems
16660 Grounding System
16720 Fire Alarm System
16724 Card Access Control
16727 Gate Security System
16741 Telephone System
16781 Closed Circuit TV System
16950 Electrical System Testing and Settings

10.3 Conveyance Pipelines Technical Specifications

Division 1 – General Requirements

01010 Summary of Work
01011 Site Conditions
01015 Index of Drawings
01016 Safety Requirements and Protections of Property
01025 Measurement and Payment
01031 Grades, Lines and Levels
01080 Identification and Tagging
01090 Reference Standards
01092 Abbreviations and Symbols
01100 Special Project Procedures
01120 Sequence of Construction
01140 Security
01300 Submittals
01310 Project Schedules, Meetings and Reports
01380 Construction Photographs
01381 Audio Video Taping
01410 Testing and Testing Laboratory Services
01500 Temporary Facilities
01524 Construction Waste Management
01562 Dust Control
01565 Stormwater Pollution Prevention Plan
01580 Field Offices and Sheds
01581 Project Signs
01612 Seismic Restraint Requirements for Nonstructural Components
01600 Material and Equipment Shipment, Handling, Storage and Protection

01630 Substitutions and Product Options
01670 Commissioning and Acceptance Testing
01700 Contract Closeout
01710 Cleaning
01720 Project Record Documents
01730 Operating and Maintenance Manuals
01731 Equipment Operation and Maintenance Training
01740 Permits

Division 2 – Site Work

02100 Site Preparation
02140 Dewatering and Drainage
02151 Jacking and Boring
02160 Excavation Support Systems
02200 Earthwork
02205 Soil Materials
02221 Trenching, Backfilling and Compacting
02222 Protecting Existing Underground Utilities
02230 Granular Materials
02270 Erosion and Sedimentation Control
02273 Geotextile
02500 Pavement
02505 Cleaning and Testing of Main
02512 Disinfection of Water Main
02575 Roadways, Markings, Guardrails and Appurtenances
02576 Pavement Repair and Resurfacing
02616 Ductile Iron Pipe and Fittings
02617 Buried Steel Pipe and Fittings
02620 Manhole Frame Sealing System
02622 Polyvinyl Chloride (PVC) Pressure Piping
02623 High Density Polyethylene (HDPE) Yard Pipe and Fittings
02640 Valves, Hydrants and Appurtenances
02650 Welded Steel Pipe
02655 Installation of Pipe
02667 Utility Relocation
02676 Pressure Testing of Piping

02741 Prime and Tack Coats
02745 Asphaltic Concrete Paving
02769 Slip-lining

Division 3 – Concrete

03100 Concrete Formwork
03200 Concrete Reinforcement
03290 Joints in Concrete
03300 Cast-In-Place Concrete
03315 Grout
03350 Concrete Finishes
03370 Concrete Curing
03400 Precast Concrete Manholes, Vaults and Boxes

Appendix A

Water Quality Data Review Technical Memo

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Memorandum

To: *David Ahles, P.E., Senior Civil Engineer, Eastern Municipal Water District;*
John Wuerth, Recycled Water Program Analyst, Eastern Municipal Water District

From: *Robert Chalmers, P.E., Vice President, CDM Smith*
Jessica Koop, Project Engineer, CDM Smith

Date: *March 7, 2017, Revised September 13, 2017*

Subject: *Alternative Water Quality Data Review Technical Memorandum*

As part of the Indirect Potable Reuse (IPR) preliminary design project, this Alternative Water Quality Data Review Technical Memorandum has been prepared for Eastern Municipal Water District (EMWD or District). This memorandum is provided to summarize the current water quality data, review of historical data, discuss potential design impacts to the Advanced Water Treatment Facility (AWTF) and update the anticipated water quality following soil aquifer treatment (SAT).

Background

EMWD has initiated the development of an IPR program. IPR is the process of using recycled water to replenish groundwater aquifers to supplement the local water supply. Implementation of IPR is consistent with EMWD's objectives to fully utilize recycled water within its service area (no discharge of recycled water), maximize the potable water offset, create new local potable water supplies, minimize cost, and manage the salt balance in the groundwater basin.

The program began with the preparation of the San Jacinto Upper Pressure Management Zone (SJUPMZ) Indirect Potable Reuse Phase I Study (CDM Smith, January 2014). The Phase I Study included an evaluation of five (5) IPR project alternatives for recharge into the SJUPMZ, including recycle water treatment, recharge method and locations, conveyance and brine management recommendations for each alternative. The recommended alternatives were: Alternative No. 2, blend of recycled water and reverse osmosis (RO) permeate; and Alternatives No. 5, phased approach with Phase I including only recharge of recycled water and Phase II including a blend of recycled water and RO permeate.

Following the Phase I Study, an IPR Program Definition Study was prepared and included a comparison of projects for both the SJUPMZ and for the Perris South Management Zone (PSMZ) (CDM Smith, May 2016). This study evaluated five (5) alternatives with varying recharge into PSMZ and/or SJUPMZ. The study recommended recharge into SJUPMZ with a blend of recycled water and RO permeate.

EMWD established goals that anticipate a two-phase implementation program with a Phase I capacity of 4,000 acre-feet per year (AFY) and a Phase II expansion of 11,000 AFY for a 15,000 AFY total IPR project. The preliminary design includes the design for the 4,000 AFY IPR project with 2,000 AFY for RO permeate and 2,000 AFY for tertiary recycled water (tertiary RW). It should be noted that these capacities vary from what was included in the previous studies and represent the current flow capacities established by EMWD.

IPR Capacity

In a preliminary design meeting with EMWD on January 12, 2016, CDM Smith was advised to adjust the flow capacities from a 30% RO permeate/70% tertiary RW blend to a 50% RO permeate/50% tertiary RW blend. This equates to approximately 2,000 AFY for tertiary RW and 2,000 AFY for RO permeate for Phase I, and 7,500 AFY for tertiary RW and 7,500 AFY for RO permeate for Phase II.

AWTF

The project will include the design of an AWTF including microfiltration (MF) and RO treatment processes. The AWTF will be sized to produce 2,000 AFY for Phase I and 7,500 AFY for Phase II. Assuming a 90% online factor, the AWTF will be sized for approximately 2.0 MGD for Phase I and approximately 7.5 MGD for Phase II. The influent for the AWTF will be chlorinated tertiary effluent from the San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF). For Phase I of this project, SJVRWRF effluent is sufficient to meet AWPF demands. For Phase II and when the SJVRWRF's effluent flow does not meet the AWTF demands, additional flow from the existing recycled water distribution system will be provided to supplement the flows from the SJVRWRF. This study only evaluated SJVRWRF effluent and it is recommended that the AWTF feed water quality be reevaluated prior to Phase II design.

Between 2010 to 2015, SJVRWRF was expanded from 11 MGD to 14 MGD and upgraded to meet more stringent state recycled water requirements. Current water quality data, representative of the only the SJVRWRF expansion effluent (October 2015 to December 2016), along with historical data were analyzed in this memorandum.

Purpose of Study

This memorandum summarizes:

1. Water quality data review of SJVRWRF effluent following the expansion project;
2. Historical data comparison to details the differences in water quality found as compared to previous water quality reviews;
3. Impacts of AWTF design to highlight the potential impacts on the design assumptions for the AWTF.;
4. And a discussion of water quality through SAT.

Water Quality Data Review

Table 1 summarizes the SJVRWRF effluent water quality from October 2015 to December 2016.

Table 1 - SJVRWRF Effluent Data - 2015 through 2016

Parameter (units)	Min.	Avg.	Max.
Alkalinity as $CaCO_3$ (mg/L)[5]	84	100	110
Ammonia (mg/L)[2]	0.10	0.33	9.80
Bicarbonate (mg/L)[5]	100	122	140
Boron (µg/L)[5]	270	439	710
Calcium (mg/L)[5]	52	61	69
Carbonate (mg/L)[5]	2.0	2.0	2.0
Chloride (mg/L)[5]	120	143	170
Chlorine (mg/L)[1]	5.4	12	20
EC - Specific Conductance (µmhos/cm)[5]	890	980	1100
Fluoride (mg/L)[5]	0.12	0.26	0.35
Hardness (mg/L)[5]	170	200	230
Hydroxide (mg/L)[5]	2	2	2
Iron (µg/L)[6]	54	54	54
Magnesium (mg/L)[5]	8.1	10	13
Mercury (µg/L)[5]	0.075	0.075	0.075
Nitrate (NO_3) (mg/L)[2]	25	54	92
Nitrate as N (mg/L)[2]	5.7	12	21
Nitrite as N (mg/L)[2]	0.050	0.052	0.12
pH (S.U.)[1]	6.1	7.4 [3]	8.8
Potassium (mg/L)[5]	16	18	20
Silica (mg/L)[5]	21	22	23
Sodium (mg/L)[5]	100	120	140
Sodium Adsorption Ratio[5]	5.4	6.2	7.2
Sulfate (mg/L)[5]	90	120	150
TDS (mg/L)[2]	510	590	690
Temperature (deg F)[4]	64	77	86
TKN (mg/L)[2]	1.0	2.4	7.6
TKN-Estimated (mg/L)[2]	0.25	1.3	21
TOC (mg/L)[2]	4.8	6.9	12
Total Inorganic Nitrogen (mg/L)[2]	5.8	12	22
Total Nitrogen - Estimated (mg/L)[2]	6.2	13	24
Total Organic Nitrogen (mg/L)[5]	0.33	1.4	4.3
Total Phosphorus (mg/L)[5]	1.3	3.3	4.1
Turbidity (NTU)[1]	0.26	0.74	2.3

[1]Source: SJVRWRF Effluent Data from October 2015 to October 2016. Data collected approximately once a month.
[2]Source: SJVRWRF Effluent Data from October 2015 to December 2016. Data collected every few days.
[3]pH average values were unavailable. Values is table is the average of the min and max pH values.
[4]Source: SJVRWRF Effluent Data from October 2015 to December 2016. Data collected every day.
[5]Source: SJVRWRF Effluent Data from October 2015 to December 2016. Data collected approximately once a month.
[6]Source: SJVRWRF Effluent Data from October 2015 to December 2016. Data collected approximately once a year.

To calculate the maximum, average and minimum values, parameters with non-detect values were set equal to one half of the corresponding analytical detection limits.

Additional summarized data for organics, metals and emerging containments can be found in Attachments No. 1 to No. 3.

Historical Data Comparison

A historical comparison of available data is performed to determine what values should be used in the AWTF design. Table 2 provides a comparison between current and previously reviewed historical data. The current 2015-2016 data is representative of the SJVRWRF expansion completed in October 2015[1].

Table 2 - SJVRWRF – Comparison of Historical and Current Average Effluent Data

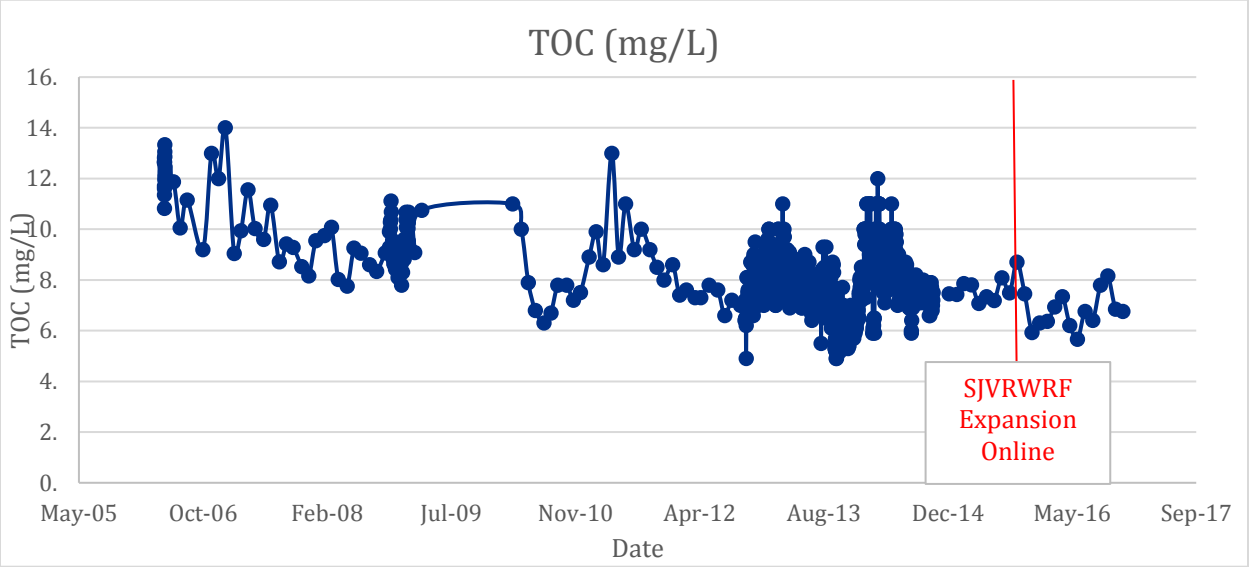
Parameter	Unit	2007-2012 Data	2008-2014 Data[2]	2013-2014 Data[2]	*Current* 2015-2016 Data
TOC	mg/L	8.8 [1]	7.9		6.9 [4]
TDS	mg/L	555 [3]	547		589 [4]
Nitrate as N	mg/L	13.1 [3]		5.7	12.1 [4]
Nitrite as N	mg/L			0.08	0.05 [4]
TKN	mg/L			8.8	2.4 [4]
TN	mg/L	13.1 [3]		14.5	13.1 [5]
TIN	mg/L			5.8	12.4 [4]

[1]Data received from Indirect Potable Reuse Phase I Study for Eastern Municipal Water District by CDM Smith dated January 2014 (pg. 7-4 and 7-19)
[2]Data received from Table 2-7 in Perris South IPR Feasibility Study and IPR Program Alternative Analysis for Eastern Municipal Water District by CDM Smith dated May 2016 (pg. 2-25)
[3]Data received from Table 6-1 in Perris South IPR Feasibility Study and IPR Program Alternative Analysis for Eastern Municipal Water District by CDM Smith dated May 2016 (pg. 6-2)
[4]Source: SJVRWRF Effluent Data from October 2015 to December 2016. Data collected every few days.
[5]Source: SJVRWRF Effluent Data from October 2015 to December 2016. Data collected every few days. This value was estimated by EMWD.

TOC and TDS data for the last ten (10) years was analyzed. Figures 1 and 2 provide a graphical summary of TOC and TDS data for the last ten (10) years.

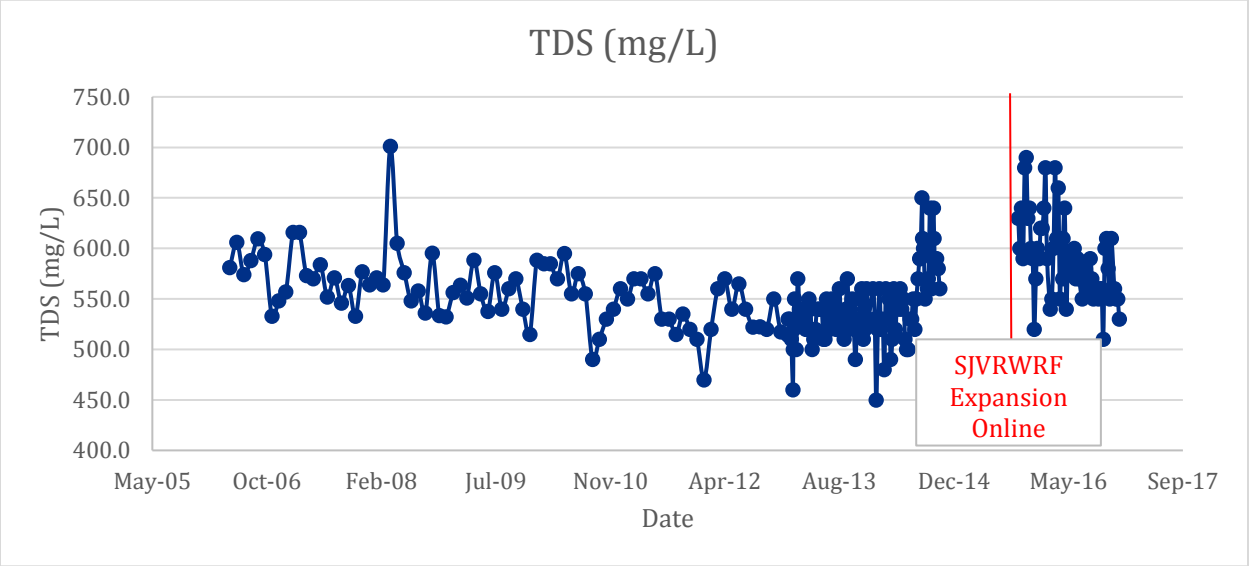
[1]Schultz Craig, The Press Enterprise. 2015 October 14 http://www.pe.com/articles/water-783451-facility-district.html

Figure 1 – SJVRWRF TOC Historical Data



As indicated in Figure 1, TOC values have decreased since over the past ten (10) years. TOC values may have decreased due to the expansion of the SJVRWRF or due to the source of imported water used in the District.

Figure 2 – SJVRWRF TDS Historical Data



As indicated in Figure 2, TDS concentrations have varied over time and the current average TDS concentration is higher than the average for the last five years. TDS concentrations were likely not impacted due to the expansion of the SJVRWRF since treatment mechanisms to remove TDS are not part of the wastewater treatment plant process, but the source of imported water may have an impact.

The District is aware of correlations between source water quality TDS and TOC and SJVRWRF effluent quality. To account for variations in source water quality, the most conservative (highest) of the historical TOC and TDS values will be incorporated in the design of the AWTF.

Impacts on AWTF Design

The following sub-sections provide a summary of considerations for critical parameters in the IPR project and potential impacts on AWTF design:

Total Nitrogen

Total Nitrogen (TN) values have remained fairly consistent over the last ten (10) years with a current average concentration of 13.1 mg/L. Design of the AWTF will consider the most conservative concentrations for TN or 14.5 mg/L.

TDS

For the design of the AWTF, the most current, highest concentration of TDS will be used. Figure 2 shows that the TDS values have increased in the past 5 years and the current TDS concentration of approximately 600 mg/L appears conservative and appropriate for the AWTF design. Higher TDS concentrations in the raw water of the AWTF will result in slightly higher energy requirements for the RO system.

TOC

TOC values found in Figure 1 appear to have decreased over time. To account for variations in source water quality, the most conservative historical measurements of TOC or 8.8 mg/L will be utilized for the IPR project. While TOC does not directly impact the process design for the AWTF, it will impact the diluent water contribution requirements. As indicated in previous studies, Recycled Municipal Wastewater Contribution (RWC_{max}) is a requirement for the credited diluent water. The RWC_{max} is determined by the concentration of TOC in the recycled water following SAT. Higher TOC concentrations in the recycled water will increase the amount of diluent water required.

The TOC has varied over time at the SJVRWRF, therefore, so have the quantity requirements for RWC_{max} and the credited diluent water. Table 4 shows the various TOC values and the associated diluent water flow requirements. As the TOC in the raw water increases, the volume of required diluent water also increases. The chosen TOC concentration of 8.8 mg/L results in a minimum diluent water contribution for Phase I of approximately 5,000 AFY. It should be noted that the minimum diluent water contributions indicated in the Table 4 will require preapproval by the Division of Drinking Water (DDW).

Table 4 – Minimum Diluent Water Contributions for Various TOC Concentrations

SJVRWRF Effluent TOC (mg/L)	Post-SAT TOC Water Quality (mg/L)[1]	RWC_{max} (%)[4]	Min. Diluent Water Contribution (AFY) - Phase I[2]	Min. Diluent Water Contribution (AFY) - Phase II[3]
5.0	0.6	79%	1,075	4,031
6.0	0.8	66%	2,090	7,838

SJVRWRF Effluent TOC (mg/L)	Post-SAT TOC Water Quality (mg/L)[1]	RWC_{max} (%)[4]	Min. Diluent Water Contribution (AFY) - Phase I[2]	Min. Diluent Water Contribution (AFY) - Phase II[3]
7.0	0.9	56%	3,105	11,644
8.8[5]	1.1	45%	4,932	18,495
10.0	1.3	39%	6,150	23,063
11.0	1.4	36%	7,165	26,869
12.0	1.5	33%	8,180	30,675
13.0	1.6	30%	9,195	34,481

[1]Based on AWTF removal of 98.5% TOC and 50%/50% contribution of T22 water and RO permeate.

[2]Based on recycled water contribution of 4,000 AFY. $RWC_{max} = Q_{recycled\ water} / (Q_{recycled\ water} + Q_{diluent\ water})$

[3]Based on recycled water contribution of 15,000 AFY. $RWC_{max} = Q_{recycled\ water} / (Q_{recycled\ water} + Q_{diluent\ water})$

[4]RWC_{max} = 0.5 mg/l/ TOC per CDPH title 22, Division 4, Chapter 3, Article 5.1, §60320.116.

[5]Most Conservative Historical SJVRWRF Water Quality Data Results

NDMA

NDMA data was provided approximately once a quarter for October 2015 to October 2016 for the SJVRWRF effluent using EPA Method 521. The average NDMA concentration in the SJVRWRF effluent using Method 521 is 7.4 ng/L, which can be found in Attachment No. 1. NDMA can be critical if recycled water is used for groundwater injection but is not currently a concern for surface spreading.

Chlorine

At the SJVRWRF, chlorine is dosed upstream of the chlorine contact tanks where after disinfection, water flows to either onsite storage ponds or to the Tertiary Effluent Pump Station (TEPS). As indicated in Table 2, the average chlorine concentration in the SJVRWRF effluent is 12 mg/L. Higher levels of chlorine are likely at the influent pipeline connection for the AWTF which is located just downstream of the chlorine contact tanks. The influent of the AWTF (effluent from SJVRWRF) will likely require additional dosing of ammonia to convert the free chlorine to chloramines (3-5 mg/L).

Water Quality Through SAT

The design concept for recharging a blend of tertiary RW and RO permeate is updated based on the chosen water quality data summarized above. The original design concept was described in Appendix B of the Perris South IPR Feasibility Study and IPR Program Alternative Analysis (Phase 2 Study) prepared by CDM Smith, dated May 2016. Table 3 provides estimated recycled water quality following SAT and assuming the new flow capacities discussed in the Background section of this memorandum.

Table 3 – Water Quality through SAT

Parameter	Reclaimed Water Quality		RO Permeate Quality		Blend Water Quality (Pre-SAT)		Soil Treatment Factor (STF)		Blend Water Quality (Post-SAT)	
	Ph 2	*PDR*[2]	*Ph 2*	*PDR*[3]	*Ph 2*	*PDR*[1]	*Ph 2*	*PDR*	*Ph 2*	*PDR*
TOC (mg/L)	8.8	8.8	0.13	0.13	5.8	4.47	75%	75%	1.4	**1.1**
TDS (mg/L)	555	589	67	17	384	303	0%	0%	384	**303**
TN (mg/L)	13.1	14.5	3	1.97	9.6	8.23	60%	60%	3.8	**3.3**
Nitrate a N (mg/L)	13.1	13.1	3	1.94	9.6	7.52	60%	60%	3.8	**3.0**

[1]Asumming a 50% Tertiary RW and 50% RO Permeate flow contributions.
[2]Average values from Table 1 of this memorandum.
[3]RO Permeate water quality based on RO model run using current water quality data.
Bold values indicate new calculated post-SAT water quality conditions.
Ph 2 references values provide in Appendix B of the Phase 2 Study. PDR indicates updated conservative values that reviewed historical and current 2015-2016 data.

The blended water quality results have improved for TOC, TDS, TN, and Nitrate since the Phase 2 Study due to the higher percentage of RO permeate in the blended water.

Attachments:

Attachment No. 1 – Summarized Effluent Data for Organics
Attachment No. 2 – Summarized Effluent Data for Metals
Attachment No. 3 – Summarized Effluent Data for Emerging Containments

San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) Organics Effluent Data - 2015 through 2016

Parameter	Test Method	Units	Min.	Avg.	Max.
1,1-Dichloroethane	EPA 524.2	ug/L	0.25	0.25	0.25
1,1-Dichloroethane	EPA 624	ug/L	0.25	0.25	0.25
1,1-Dichloroethene	EPA 524.2	ug/L	0.25	0.25	0.25
1,1-Dichloroethene	EPA 624	ug/L	0.25	0.25	0.25
1,1,1-Trichloroethane	EPA 524.2	ug/L	0.25	0.25	0.25
1,1,1-Trichloroethane	EPA 624	ug/L	0.25	0.25	0.25
1,1,2-Trichloroethane	EPA 524.2	ug/L	0.25	0.25	0.25
1,1,2-Trichloroethane	EPA 624	ug/L	0.25	0.25	0.25
1,1,2,2-Tetrachloroethane	EPA 524.2	ug/L	0.25	0.25	0.25
1,1,2,2-Tetrachloroethane	EPA 624	ug/L	0.25	0.25	0.25
1,2-Dibromo-3-Chloropropane	EPA 504.1	ug/L	0.021	0.021	0.021
1,2-Dichlorobenzene	EPA 524.2	ug/L	0.25	0.25	0.25
1,2-Dichlorobenzene	EPA 625	ug/L	1	1	1
1,2-Dichloroethane	EPA 524.2	ug/L	0.25	0.25	0.25
1,2-Dichloroethane	EPA 624	ug/L	0.25	0.25	0.25
1,2-Dichloropropane	EPA 524.2	ug/L	0.25	0.25	0.25
1,2-Dichloropropane	EPA 624	ug/L	0.25	0.25	0.25
1,2-Diphenylhydrazine	EPA 625	ug/L	0.5	0.5	0.5
1,2,3-Trichloropropane (TCP)	EPA 524M-TCP	ug/L	0.019	0.019	0.019
1,2,4-Trichlorobenzene	EPA 524.2	ug/L	0.25	0.25	0.25
1,2,4-Trichlorobenzene	EPA 625	ug/L	0.5	0.5	0.5
1,2,4-Trimethylbenzene	EPA 524.2	ug/L	0.25	0.25	0.25
1,3-Dichlorobenzene	EPA 625	ug/L	0.5	0.5	0.5
1,3-Dichloropropene (Total)	EPA 524.2	ug/L	0.25	0.25	0.25
1,3-Dichloropropene (Total)	EPA 624	ug/L	0.25	0.25	0.25
1,3,5-Trimethylbenzene	EPA 524.2	ug/L	0.25	0.25	0.25
1,4-Dichlorobenzene	EPA 524.2	ug/L	0.25	0.25	0.25
1,4-Dichlorobenzene	EPA 625	ug/L	0.5	0.5	0.5
1,4-Dioxane	4-Dioxane, EPA 8270M	ug/L	0.84	0.84	0.84
2-Chloroethyl vinyl ether	EPA 624	ug/L	2.5	2.5	2.5
2-Chloronaphthalene	EPA 625	ug/L	5	5	5
2-Chlorophenol	EPA 625	ug/L	1	1	1
2-Chlorotoluene	EPA 524.2	ug/L	0.25	0.25	0.25
2-Nitrophenol	EPA 625	ug/L	5	5	5
2,3,7,8-TCDD (Dioxin)	EPA 1613B	pg/L	2.4	2.4	2.4
2,4-D	EPA 515.3	ug/L	5	5	5
2,4-Dichlorophenol	EPA 625	ug/L	0.5	0.5	0.5
2,4-Dimethylphenol	EPA 625	ug/L	0.5	0.5	0.5
2,4-Dinitrophenol	EPA 625	ug/L	2.5	2.5	2.5
2,4-Dinitrotoluene	EPA 625	ug/L	2.5	2.5	2.5
2,4,5-TP	EPA 515.3	ug/L	0.5	0.5	0.5
2,4,6-Trichlorophenol	EPA 625	ug/L	5	5	5
2,4,6-Trinitrotoluene (TNT)	EPA 8330	ug/L	0.5	0.5	0.5
2,6-Dinitrotoluene	EPA 625	ug/L	2.5	2.5	2.5
3,3-Dichlorobenzidine	EPA 625	ug/L	2.5	2.5	2.5
4-Bromophenyl phenyl ether	EPA 625	ug/L	2.5	2.5	2.5
4-Chloro-3-methylphenol	EPA 625	ug/L	0.5	0.5	0.5
4-Chlorophenyl phenyl ether	EPA 625	ug/L	2.5	2.5	2.5
4-Chlorotoluene	EPA 524.2	ug/L	0.25	0.25	0.25
4-Methyl-2-pentanone	EPA 524.2	ug/L	2.5	2.5	2.5
4-Nitrophenol	EPA 625	ug/L	2.5	2.5	2.5
4,4-DDD	EPA 608	ug/L	0.025	0.025	0.025
4,4-DDE	EPA 608	ug/L	0.025	0.025	0.025
4,4-DDT	EPA 608	ug/L	0.005	0.005	0.005
4,6-Dinitro-2-methylphenol	EPA 625	ug/L	2.5	2.5	2.5
Acenaphthene	EPA 625	ug/L	0.025	0.025	0.025
Acenaphthylene	EPA 625	ug/L	0.025	0.025	0.025
Acrolein	EPA 624	ug/L	1	1	1
Acrylonitrile	EPA 624	ug/L	1	1	1
Alachlor	EPA 525.2	ug/L	0.5	0.5	0.5
Aldrin	EPA 608	ug/L	0.0025	0.0025	0.0025
alpha-BHC	EPA 608	ug/L	0.005	0.005	0.005
Anthracene	EPA 625	ug/L	0.025	0.025	0.025

San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) Organics Effluent Data - 2015 through 2016

Parameter	Test Method	Units	Min.	Avg.	Max.
Asbestos	EPA 100.2	mf/L	0.095	0.095	0.095
Atrazine	EPA 525.2	ug/L	0.25	0.25	0.25
Bentazon	EPA 515.3	ug/L	1	1	1
Benzene	EPA 524.2	ug/L	0.25	0.25	0.25
Benzene	EPA 624	ug/L	0.25	0.25	0.25
Benzidine	EPA 625	ug/L	2.5	2.5	2.5
Benzo (a) anthracene	EPA 625	ug/L	0.025	0.025	0.025
Benzo (a) pyrene	EPA 525.2	ug/L	0.05	0.05	0.05
Benzo (a) pyrene	EPA 625	ug/L	0.025	0.025	0.025
Benzo (b) fluoranthene	EPA 625	ug/L	0.025	0.025	0.025
Benzo (g,h,i) perylene	EPA 625	ug/L	0.025	0.025	0.025
Benzo (k) fluoranthene	EPA 625	ug/L	0.025	0.025	0.025
beta-BHC	EPA 608	ug/L	0.0025	0.03	0.058
Bis(2-chloroethoxy)methane	EPA 625	ug/L	2.5	2.5	2.5
Bis(2-chloroethyl)ether	EPA 625	ug/L	0.5	0.5	0.5
Bis(2-chloroisopropyl)ether	EPA 625	ug/L	1	1	1
Bis(2-ethylhexyl)adipate	EPA 525.2	ug/L	2.5	2.5	2.5
Bis(2-ethylhexyl)phthalate	EPA 525.2	ug/L	1.5	1.5	1.5
Bis(2-ethylhexyl)phthalate	EPA 625	ug/L	1.8	2	2
Bromate	EPA 300.1	ug/L	2.5	2.5	2.5
Bromodichloromethane (THM)	EPA 524.2	ug/L	19	19	19
Bromodichloromethane (THM)	EPA 624	ug/L	18	22	28
Bromoform (THM)	EPA 524.2	ug/L	0.25	0.25	0.25
Bromoform (THM)	EPA 624	ug/L	0.25	0.25	0.25
Bromomethane	EPA 624	ug/L	0.25	0.25	0.25
Butyl benzyl phthalate	EPA 625	ug/L	5	5	5
Carbofuran	EPA 531.1	ug/L	2.5	2.5	2.5
Carbon Disulfide	EPA 524.2	ug/L	0.25	0.25	0.25
Carbon Tetrachloride	EPA 524.2	ug/L	0.25	0.25	0.25
Carbon Tetrachloride	EPA 624	ug/L	0.25	0.25	0.25
Chlorate	EPA 300.1	ug/L	10	10	10
Chlordane	EPA 508	ug/L	0.5	0.5	0.5
Chlordane	EPA 608	ug/L	0.05	0.05	0.05
Chlorite	EPA 300.1	ug/L	10	10	10
Chlorobenzene	EPA 524.2	ug/L	0.25	0.25	0.25
Chlorobenzene	EPA 624	ug/L	0.25	0.25	0.25
Chloroethane	EPA 624	ug/L	0.25	0.25	0.25
Chloroform (THM)	EPA 524.2	ug/L	38	38	38
Chloroform (THM)	EPA 624	ug/L	31	42	51
Chloromethane	EPA 624	ug/L	0.25	0.25	0.25
Chromium Hexavalent	EPA 218.6	ug/L	0.5	0.5	0.5
Chrysene	EPA 625	ug/L	0.025	0.025	0.025
cis-1,2-Dichloroethene	EPA 524.2	ug/L	0.25	0.25	0.25
Cyanide	EPA 335.3	ug/L	2.5	7.1	16
Cyanide-Free	Free Cyanide	ug/L	2.5	7.3	16
Dalapon	EPA 515.3	ug/L	5	5	5
delta-BHC	EPA 608	ug/L	0.0025	0.0025	0.0025
Di-n-butyl phthalate	EPA 625	ug/L	5	5	5
Di-n-octyl phthalate	EPA 625	ug/L	5	5	5
Dibenzo (a,h) antracene	EPA 625	ug/L	0.025	0.025	0.025
Dibromoacetic Acid (DBAA)	SM6251B	ug/L	1.8	1.8	1.8
Dibromochloromethane (THM)	EPA 524.2	ug/L	4.4	4.4	4.4
Dibromochloromethane (THM)	EPA 624	ug/L	3.8	5.3	7.7
Dichloroacetic Acid (DCAA)	SM6251B	ug/L	45	45	45
Dichlorodifluoromethane	EPA 524.2	ug/L	0.25	0.25	0.25
Dieldrin	EPA 608	ug/L	0.005	0.005	0.005
Diethyl phthalate	EPA 625	ug/L	0.9	0.97	1
Dimethyl phthalate	EPA 625	ug/L	1	1	1
Dinoseb	EPA 515.3	ug/L	1	1	1
Diquat	EPA 549.2	ug/L	0.2	0.2	0.2
Endosulfan I	EPA 608	ug/L	0.01	0.01	0.01
Endosulfan II	EPA 608	ug/L	0.005	0.005	0.005
Endosulfan sulfate	EPA 608	ug/L	0.025	0.025	0.025

San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) Organics Effluent Data - 2015 through 2016

Parameter	Test Method	Units	Min.	Avg.	Max.
Endothall	EPA 548.1	ug/L	23	23	23
Endrin	EPA 508	ug/L	0.05	0.05	0.05
Endrin	EPA 608	ug/L	0.005	0.005	0.005
Endrin aldehyde	EPA 608	ug/L	0.005	0.025	0.053
Ethylbenzene	EPA 524.2	ug/L	0.25	0.25	0.25
Ethylbenzene	EPA 624	ug/L	0.25	0.25	0.25
Ethylene Dibromide (EDB)	EPA 504.1	ug/L	0.01	0.01	0.01
Ethylene Glycol	EPA 8015B	mg/L	0.5	0.5	0.5
Fluoranthene	EPA 625	ug/L	0.025	0.025	0.025
Fluorene	EPA 625	ug/L	0.025	0.025	0.025
Formaldehyde	EPA 556	ug/L	22	22	22
gamma-BHC (Lindane)	EPA 508	ug/L	0.1	0.1	0.1
gamma-BHC (Lindane)	EPA 608	ug/L	0.01	0.01	0.01
Glyphosate	EPA 547	ug/L	2.5	2.5	2.5
HAA5 - Haloacetic Acids (Five)	SM6251B	ug/L	140	180	220
Heptachlor	EPA 508	ug/L	0.005	0.005	0.005
Heptachlor	EPA 608	ug/L	0.005	0.005	0.005
Heptachlor epoxide	EPA 508	ug/L	0.005	0.005	0.005
Heptachlor epoxide	EPA 608	ug/L	0.005	0.005	0.005
Hexachlorobenzene	EPA 508	ug/L	0.25	0.25	0.25
Hexachlorobenzene	EPA 625	ug/L	0.5	0.5	0.5
Hexachlorobutadiene	EPA 625	ug/L	0.5	0.5	0.5
Hexachlorocyclopentadiene	EPA 508	ug/L	0.5	0.5	0.5
Hexachlorocyclopentadiene	EPA 625	ug/L	2.5	2.5	2.5
Hexachloroethane	EPA 625	ug/L	0.5	0.5	0.5
HMX	EPA 8330	ug/L	0.5	0.5	0.5
Indeno (1,2,3-cd) pyrene	EPA 625	ug/L	0.025	0.025	0.025
Isophorone	EPA 625	ug/L	0.5	0.5	0.5
Isopropylbenzene (Cumene)	EPA 524.2	ug/L	0.25	0.25	0.25
Methoxychlor	EPA 508	ug/L	5	5	5
Methyl-Tert-Butyl-Ether (MTBE)	EPA 524.2	ug/L	1.5	1.5	1.5
Methylene Chloride	EPA 524.2	ug/L	0.25	0.25	0.25
Methylene Chloride	EPA 624	ug/L	0.25	0.25	0.25
Molinate	EPA 525.2	ug/L	1	1	1
Monobromoacetic Acid (MBAA)	SM6251B	ug/L	57	57	57
Monochloroacetic Acid (MCAA)	SM6251B	ug/L	12	12	12
N-Butylbenzene	EPA 524.2	ug/L	0.25	0.25	0.25
N-Nitrosodi-n-propylamine	EPA 521	ng/L	3.5	3.5	3.5
N-Nitrosodi-n-propylamine	EPA 625	ug/L	2.5	2.5	2.5
N-Nitrosodiethylamine (NDEA)	EPA 521	ng/L	2.5	2.5	2.5
N-Nitrosodimethylamine (NDMA)	EPA 521	ng/L	4.8	7.4	11
N-Nitrosodimethylamine (NDMA)	EPA 625	ug/L	2.5	2.5	2.5
N-Nitrosodiphenylamine	EPA 625	ug/L	0.5	0.5	0.5
N-Propylbenzene	EPA 524.2	ug/L	0.25	0.25	0.25
Naphthalene	EPA 524.2	ug/L	0.25	0.25	0.25
Naphthalene	EPA 625	ug/L	0.025	0.025	0.025
Nitrobenzene	EPA 625	ug/L	0.5	0.5	0.5
Oxamyl	EPA 531.1	ug/L	10	10	10
PCB-1016	EPA 608	ug/L	0.25	0.25	0.25
PCB-1221	EPA 608	ug/L	0.25	0.25	0.25
PCB-1232	EPA 608	ug/L	0.25	0.25	0.25
PCB-1242	EPA 608	ug/L	0.25	0.25	0.25
PCB-1248	EPA 608	ug/L	0.25	0.25	0.25
PCB-1254	EPA 608	ug/L	0.25	0.25	0.25
PCB-1260	EPA 608	ug/L	0.25	0.25	0.25
PCBs-Total	EPA 508	ug/L	0.05	0.05	0.05
Pentachlorophenol	EPA 515.3	ug/L	0.1	0.1	0.1
Pentachlorophenol	EPA 625	ug/L	0.5	0.5	0.5
Perchlorate	EPA 314.1	ug/L	2	2	2
Perfluoro-1-butanesulfonate	EPA 537	ug/L	0.045	0.045	0.045
Perfluoro-1-hexanesulfonate	EPA 537	ug/L	0.015	0.015	0.015
Perfluoro-1-octanesulfonate	EPA 537	ug/L	0.02	0.02	0.02
Perfluoro-n-heptanoic Acid	EPA 537	ug/L	0.005	0.005	0.005

San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) Organics Effluent Data - 2015 through 2016

Parameter	Test Method	Units	Min.	Avg.	Max.
Perfluoro-n-nonanoic Acid PFNA	EPA 537	ug/L	0.01	0.01	0.01
Perfluoro-n-octanoic Acid PFOA	EPA 537	ug/L	0.01	0.01	0.01
Phenanthrene	EPA 625	ug/L	0.025	0.025	0.025
Phenol	EPA 625	ug/L	0.45	0.49	0.5
Picloram	EPA 515.3	ug/L	0.5	0.5	0.5
Propachlor	EPA 508	ug/L	0.25	0.25	0.25
Pyrene	EPA 625	ug/L	0.025	0.025	0.025
RDX	EPA 8330	ug/L	0.5	0.5	0.5
Sec-Butylbenzene	EPA 524.2	ug/L	0.25	0.25	0.25
Simazine	EPA 525.2	ug/L	0.5	0.5	0.5
Styrene	EPA 524.2	ug/L	0.25	0.25	0.25
Tert-Butyl Alcohol	EPA 524.2	ug/L	2.5	2.5	2.5
Tert-Butylbenzene	EPA 524.2	ug/L	0.25	0.25	0.25
Tetrachloroethene	EPA 524.2	ug/L	0.25	0.25	0.25
Tetrachloroethene	EPA 624	ug/L	0.25	0.25	0.25
Thiobencarb	EPA 525.2	ug/L	0.5	0.5	0.5
Toluene	EPA 524.2	ug/L	0.25	0.25	0.25
Toluene	EPA 624	ug/L	0.25	0.25	0.25
Total Trihalomethanes (TTHM)	EPA 524.2	ug/L	62	62	62
Toxaphene	EPA 508	ug/L	0.25	0.25	0.25
Toxaphene	EPA 608	ug/L	0.25	0.25	0.25
trans-1,2-Dichloroethene	EPA 524.2	ug/L	0.25	0.25	0.25
trans-1,2-Dichloroethene	EPA 624	ug/L	0.25	0.25	0.25
Trichloroacetic Acid	SM6251B	ug/L	100	100	100
Trichloroethene	EPA 524.2	ug/L	0.25	0.25	0.25
Trichloroethene	EPA 624	ug/L	0.25	0.25	0.25
Trichlorofluoromethane	EPA 524.2	ug/L	5	5	5
Trichlorotrifluoroethane	EPA 524.2	ug/L	2.5	2.5	2.5
Vinyl Chloride	EPA 524.2	ug/L	0.25	0.25	0.25
Vinyl Chloride	EPA 624	ug/L	0.25	0.25	0.25
Xylenes (Total)	EPA 524.2	ug/L	0.25	0.25	0.25

For test results indicating that a parameter is below the detection limit, 1/2 of the detection limit was used to calculate the minimum, average and maximum values included in this table.

Source: SJVRWRF Facility Effluent Data from October 2015 to October 2016

San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) Metals Effluent Data - 2015 through 2016

Parameter	Units	Min.	Avg.	Max.
Aluminum	ug/L	5.5	9.8	20
Aluminum Dissolved	ug/L	0.75	6	16
Antimony	ug/L	0.088	0.31	0.4
Antimony Dissolved	ug/L	0.31	0.36	0.38
Arsenic	ug/L	0.98	1.1	1.2
Arsenic Dissolved	ug/L	1	1.1	1.2
Barium	ug/L	30	36	43
Beryllium	ug/L	0.03	0.03	0.03
Beryllium Dissolved	ug/L	0.03	0.065	0.16
Cadmium	ug/L	0.013	0.022	0.059
Cadmium Dissolved	ug/L	0.013	0.013	0.013
Chromium (Total)	ug/L	0.44	0.83	1.6
Chromium-Total Dissolved	ug/L	0.6	1.8	4.6
Cobalt	ug/L	0.2	0.25	0.34
Copper	ug/L	1.2	1.4	1.8
Copper Dissolved	ug/L	1.1	1.4	1.7
Lead	ug/L	0.038	0.064	0.088
Lead Dissolved	ug/L	0.025	0.049	0.082
Manganese	ug/L	17	17	17
Molydbenum	ug/L	7.3	7.3	7.3
Nickel	ug/L	1.7	2.2	3
Nickel Dissolved	ug/L	1.7	3.8	9.7
Selenium	ug/L	0.3	1.3	1.9
Selenium Dissolved	ug/L	0.3	1.2	2.2
Silver	ug/L	0.004	0.017	0.037
Silver Dissolved	ug/L	0.004	0.0096	0.017
Thallium Dissolved	ug/L	0.008	0.011	0.02
Vanadium	ug/L	3.4	3.4	3.4
Zinc	ug/L	28	32	36
Zinc Dissolved	ug/L	30	33	38

For test results indicating that a parameter is below the detection limit, 1/2 of the detection limit was used to calculate the minimum, average and maximum values included in this table.

Source: SJVRWRF Facility Effluent Data from October 2015 to October 2016

San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) Emerging Contaminants Effluent Data - 2010 through 2013

Parameter	Use	Unit	2010	2011	2012	2013[1]	Avg	Min	Max
Acetaminophen	Analgesic	ng/L	20	ND	ND	--	ND	ND	20
Bisphenol A (BPA)	Plastic Coating	ng/L	ND	18	ND	--	ND	ND	18
Caffeine	Food Additive	ng/L	620	ND	170	18	200	ND	620
Carbamazepine	Anti-Convulsant	ng/L	210	320	190	--	240	190	320
DEET	Insecticide	ng/L	280	ND	640	190	280	ND	640
Diuron	Herbicide	ng/L	46	170	65	--	94	47	170
Ethinyl Estradiol	Hormone	ng/L	ND	ND	ND	--	ND	ND	ND
Gemfibrozil	Anti-Cholesterol	ng/L	1,100	5,800	930	2,000	2,500	930	5,800
Ibuprofen	Analgesic	ng/L	130	92	ND	--	74	ND	130
Iopromide[1]	Diagnostic Aid	ng/L	*NA*	*NA*	ND	13	ND	ND	13
Naproxen[1]	Analgesic	ng/L	*NA*	*NA*	ND	--	ND	ND	ND
Sucralose[2]	Food Additive	ng/L	*NA*	*NA*	*NA*	55,000	55,000	55,000	55,000
Sulamethoxazole	Antibiotic	ng/L	790	1,800	460	--	1,000	460	1,800
TCEP	Flame Retardant	ng/L	180	230	520	--	310	180	520
17beta-estradiol[3]	Hormone	ng/L	*NA*	ND	ND	ND[2]	ND	ND	ND
Triclosan[3]	Antibacterial	ng/L	*NA*	ND	66	ND	22	ND	66

[1] Sampled according to SAWPA EC list (State Recycled Water Policy) and to be sampled every 3 years; NDMA already monitored.

[2] MRL = 1 ng/L

ND = non-detect. Detection limits not provided unless otherwise indicated.

-- = sample result not provided

Appendix B

RO Permeate Conveyance Study Technical Memo

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Memorandum

To: *David Ahles, P.E., Senior Civil Engineer, Eastern Municipal Water District;*
John Wuerth, Recycled Water Program Analyst, Eastern Municipal Water District

From: *Robert Chalmers, P.E., Vice President, CDM Smith*
Jessica Koop, Project Engineer, CDM Smith

Date: *March 3, 2017, Rev. April 6, 2017, Rev. May 26, 2017*

Subject: *RO Permeate Conveyance Study Technical Memorandum*

As part of the Indirect Potable Reuse (IPR) preliminary design, this Reverse Osmosis (RO) Permeate Conveyance Study Technical Memorandum has been prepared for Eastern Municipal Water District (EMWD or District). This study is provided to evaluate to conveyance of RO permeate via a new pipeline or by slip-lining an existing pipeline.

Background

EMWD has initiated the development of an IPR program. IPR is the process of using recycled water to replenish groundwater aquifers to supplement the local water supply. Implementation of IPR is consistent with EMWD's objectives to fully utilize recycled water within its service area (no discharge of recycled water), maximize the potable water offset, create new local potable water supplies, minimize cost, and manage the salt balance in the groundwater basin.

The program began with the preparation of the San Jacinto Upper Pressure Management Zone (SJUPMZ) Indirect Potable Reuse Phase I Study (CDM Smith, January 2014). The Phase I Study included an evaluation of five (5) IPR project alternatives for recharge into the SJUPMZ, including recycle water treatment, recharge method and locations, conveyance and brine management recommendations for each alternative. The recommended alternatives were: Alternative No. 2, blend of recycled water and reverse osmosis (RO) permeate; and Alternatives No. 5, phased approach with Phase I including only recharge of recycled water and Phase II including a blend of recycled water and RO permeate.

Following the Phase I Study, an IPR Program Definition Study was prepared and included a comparison of projects for both the SJUPMZ and for the Perris South Management Zone (PSMZ) (CDM Smith, May 2016). This study evaluated five (5) alternatives with varying recharge into PSMZ and/or SJUPMZ. The study recommended recharge into SJUPMZ with a blend of recycled water and RO permeate.

EMWD established goals that anticipate a two-phase implementation program with a Phase I capacity of 4,000 acre-feet per year (AFY) and a Phase II expansion of 11,000 AFY for a 15,000 AFY total IPR project. The preliminary design includes the design for the 4,000 AFY IPR project with 2,000 AFY for RO permeate and 2,000 AFY for tertiary recycled water (tertiary RW). It should be noted that these capacities vary from what was included in the previous studies and represent the current flow capacities established by EMWD.

IPR Capacity

In a preliminary design meeting with EMWD on January 12, 2016, CDM Smith was advised to adjust the flow capacities from a 30% RO permeate/70% tertiary RW blend to a 50% RO permeate/50% tertiary RW blend. This equates to approximately 2,000 AFY for tertiary RW and 2,000 AFY for RO permeate for Phase I, and 7,500 AFY for tertiary RW and 7,500 AFY for RO permeate for Phase II.

AWTF

The project will include the design of an Advanced Water Treatment Facility (AWTF) including microfiltration (MF) and RO treatment processes. The AWTF will be sized to produce 2,000 AFY for Phase I and 7,500 AFY for Phase II. Assuming a 90% online factor, the AWTF will be sized for approximately 2.0 MGD for Phase I and approximately 7.5 MGD for Phase II. RO permeate from this facility will be conveyed to the Alessandro Ponds where it will be blended with Title 22 treated water prior to recharge into the Mountain Avenue East and West Ponds.

Purpose of Study

This memorandum will briefly summarize alternatives for conveying RO permeate from the San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) to the Alessandro Ponds. The two alternatives considered for conveying the RO permeate from the SJVRWRF to the Alessandro Ponds are to slip-line an existing 18-inch steel pipeline that is out-of-service with HDPE pipe or to install a new 24-inch pipeline along and in parallel to the existing 36" tertiary water pipeline. The following Figure 1 shows the alignment of the existing pipelines.

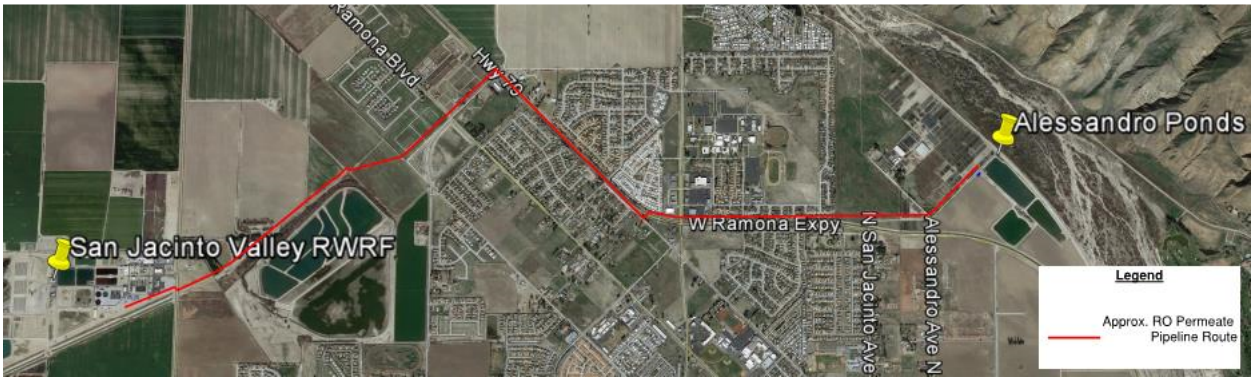


Figure 1 – Proposed Route of RO Permeate Pipeline

The existing 18-inch pipeline is a cement mortar lined and coated (CML&C) steel pipe with a total length of approximately 3.5 miles. The pipeline was designed as a low head recycled water force

main with flow from the SJVRWRF to Alessandro Ponds. The pipeline includes manholes located along the length for access to existing valves. The pipe condition is unknown and the pipe is currently out-of-service. Existing drawings of the pipeline indicate that the pipeline is flat most the length with only a few dips. Please see Attachment No. 1 for a set of existing drawings for the 18-inch pipeline.

Figure 2 shows the increasing ground elevation along the pipeline from SJVRWRF to the Mountain Ave Ponds via Alessandro Ponds. The alignment shown in Figure 2 is the proposed alignment for recharge from the AWTF to the Mountain Avenue Ponds.

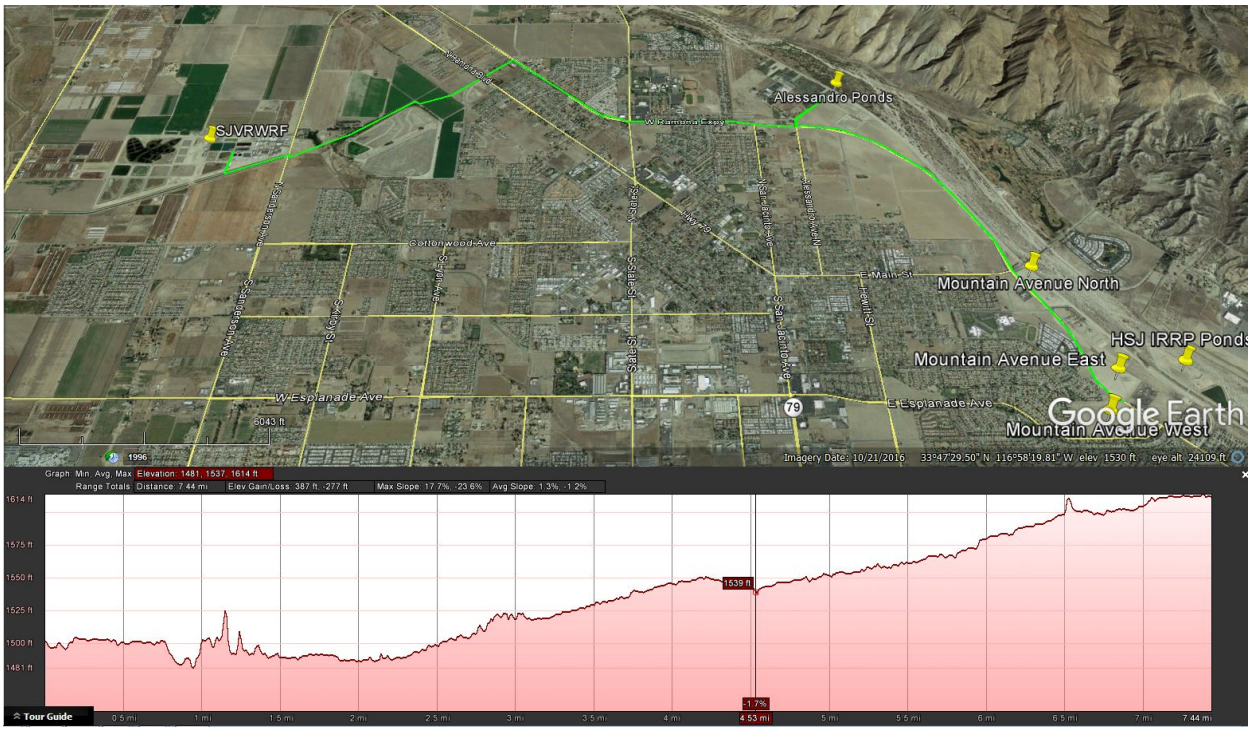


Figure 2 – Elevation Profile for IPR Recharge Piping

Trenchless Technologies

A summary of the applicable trenchless technologies for rehabilitation for existing pipelines is provided below including cured-in-place pipe (CIPP) and slip-lining alternatives.

Slip-lining

Slip-lining is used to rehabilitate an existing pipeline by inserting a smaller diameter pipe within the host pipe. The most common material for the slip-liner pipe is HDPE; however, PVC, FPVC, steel, fiberglass reinforced pipe or polymer concrete pipe can be used depending on the situation. The pipeline should be designed to assume a 2-3% deflection of the slip-liner pipe during installation. In addition, slip-lining typically includes an annular space between host pipe and slip-liner pipe of 0.1-0.2-inches. Grout is typically installed in the annual space between the host pipe and slip-liner pipe.

Slip-lining installation can either be continuous or segmented. Slip-lining smaller pipelines is typically continuously installed using a winch and crane arrangement. Larger diameter pipelines are often pushed piece by piece using a trench excavator bucket or jacked into place using a winch. Figure 3 shows a photograph of slip-lining an existing pipeline.



Figure 3 – Photograph showing slip-lining (photograph courtesy of Luis Leon, CDM Smith)

Cured-in-place pipe (CIPP)

CIPP is used to rehabilitate an existing pipeline by inserting an inverted liner made of polyster, fiberglass (or a variety of other materials) within to the host pipe. The liner is typically installed through existing manholes and is inverted to fit the circumference of the host pipe using either air or water pressure. The liner is cured using steam or a UV light train. CIPP liners for pressure pipes are only 5 to 15 mm in thickness, which can result in increased capacity of the pipeline as compared to other trenchless technologies. CIPP also requires fewer excavation pits as it can be inverted through existing manways. Locations where manways are not available or there are changes in direction of the pipeline will require open excavation.

The success of CIPP is largely dependent upon the condition of the existing pipeline. On a conference call with the District, it was noted that prior experience with CIPP resulted in problems with the liner folding during installation and required excavation of the problem areas. In addition, CIPP is often more expensive than slip-lining. Informal cost estimates from CIPP installers were on the order of $250-$300 per linear foot of CIPP installation. Due to these disadvantages, this trenchless technology was not further evaluated in this memorandum.

Conveyance Alternatives Technical Review

This section provides a brief technical review of previous evaluations for slip-lining an existing pipeline versus installing a new pipeline. The following projects where reviewed:

1. City of Oxnard, CA (2011) – Slip-lining 15,000 linear feet (LF) of 21-inch and 24-inch vitrified clay pipe (VCP) sewer pipe with 18-inch and 22-inch HDPE pipeline for conveyance of recycled water.

2. Orange County Sanitation District (OCSD) and Orange County Water District (OCWD) (2016) – Slip-lining 18,000 LF of 66-inch gravity pipeline with a 58-inch HDPE pipeline for conveyance of wastewater treatment effluent.

A summary of each project's findings is provided below.

City of Oxnard

This project evaluated using pipe bursting and slip-lining of existing pipelines instead of open-cut methods to install a new pipe to convey recycled water. In 2010 and 2011, 15,000 LF of existing abandoned sewer line was slip-lined. The existing sewer was 21-inch and 24-inch vitrified clay pipe (VCP) and was continuously slip-lined with 18-inch and 22-inch HDPE, accordingly.

The slip-lining was completed ahead of schedule with an average production of 1,200 LF per day. The overall project was completed ahead of schedule. The success was largely due to significant planning, identifying permit requirements ahead of time, developing an outreach program and optimizing the location of access. It was found that slip-lining was cost effective as compared with open-cut methods.

OCSD/OCWD

This conceptual evaluation reviewed the option to install a new pipeline, install a glass fiber-reinforced cured-in-place pipe (GFR-CIPP) lining within an unused 66-inch pipeline, or slip line the unused pipeline with an HDPE pipe. Due to the large size of the pipeline, the GFR-CIPP was ruled out because of limitations with the technology for installing in pipelines larger than 48-inches. Slip-lining was selected instead of constructing a new pipe because of the lower cost and fewer impacts to the community.

Slip-lining the existing 18,000 LF pipeline with 58-inch HDPE piping was recommended at a projected cost of approximately $800/LF or approximately $15/in-diameter per linear foot.

Flow Capacity

The flow capacity was evaluated based on the AWTF sizing of approximately 2.0 MGD in Phase I and 7.5 MGD in Phase II. The purpose of this evaluation is to determine the limitations for each alternative during each phase of the project.

Assuming a maximum fluid velocity in the pipe of 6.0 feet per second (fps), Table 1 summarizes the maximum allowable flow for each alternative.

Table 1 - Flow Capacity Evaluation for Each Alternative

Alternative	Steel Pipe OD (in)[1]	Steel Pipe ID (in)[3]	Allowable HDPE Pipe OD Assuming Losses (in)	Chosen HDPE Pipe OD (in)[2]	Chosen HDPE Pipe ID (in)[2]	Max Flow at HDPE Pipe ID (MGD)*
New 24-in HDPE Pressure Pipe	N/A	N/A	N/A	24	20.231	8.66
Slip-lining Existing Pipe with HDPE	19.781 (existing)	18.000 (existing)	16.755	16	13.488	3.85

*Assume max velocity in pipe in 6 fps

[1]Assume Cement Mortar Lined and Coated (CML&C) steel pipe. Pipe size data obtained from West Coast Pipe, Cement Lined Steel Pipe. http://www.westcoastpipe.com/pdf/wcp_brochure.pdf

[2]Pipe size data obtained from JM Eagle HDPE Water Pressure Piping Size Chart assuming 160 psi. http://www.jmeagle.com/sites/default/files/HDPE_WaterSewer_one-page-slick_v1.pdf

[3]Calculated allowable HDPE slip-lined pipe OD assuming losses associated with existing and new piping. Losses are summarized following this table.

The chosen HPDE pipe size for slip-lining in Table 1 assumed the following loss conditions:

- 3% out-of-roundness deflection for existing steel pipe.
- 3% out-of-roundness deflection for installed HDPE pipe.
- 0.2-inches of annular space between host pipe and slip-lined pipe.
- 2% dimensional tolerance for installed HDPE pipe thickness.

Table 2 provides a summary of the various pipe classes for each of the chosen HDPE pipes and the associated velocities.

Table 2 – HDPE Pipe Pressure Classes and Associated Pipe Velocities

Alternative	HDPE Pressure Class (psi)[1]	Pipe OD (in)[1]	Min. pipe thickness (in)[1]	Pipe ID (in)[1]	Phase I Pipe Velocity (fps)	Phase II Pipe Velocity (fps)
New 24-in HDPE Pressure Pipe	63	24	0.738	22.435	1.12	4.19
	100	24	1.143	21.577	1.21	4.53
	160	24	1.778	20.231	1.38	5.16
	200	24	2.182	19.374	1.50	5.62
Slip-lining Existing Pipe with HDPE	63	16	0.492	14.957	2.52	9.44
	100	16	0.762	14.385	2.72	10.20
	160	16	1.185	13.488	3.09	11.60
	200	16	1.455	12.915	3.37	12.66

[1]Pipe size data obtained from JM Eagle HDPE Water Pressure Piping Size Chart assuming 160 psi. http://www.jmeagle.com/pdfs/2008%20Submittal%20Data%20Sheets/PE%20Water%20and%20Sewer.pdf

Based on preliminary pipe sizing information, the slip-lining alternative is adequate for the Phase I flows but will not provide enough capacity for Phase II of the IPR project. To meet the Phase II capacity requirements, the velocity in the slip-lined pipe would be approximately 11.6 fps.

Cost Estimate

A rough, preliminary cost estimate is provided in Table 3 for each alternative for conveyance of the RO permeate.

Table 3 – Preliminary Cost Estimate for Each Alternative

Alternative	Steel Pipe Diameter (in)	Approx. Total Length of Pipeline (ft)	Unit Cost	Total Cost
New 24-in HDPE Pressure Pipe	24	24,310	384 $/ft [1]	$ 9,340,000
Slip-lining Existing Pipe with HDPE	18	22,650	130 $/ft [2]	$ 2,950,000

[1]Cost Assumption from Appendix D of **Perris South IPR Feasibility Study and IPR Program Alternatives Analysis** dated May 2016 or $16/in. dia-LF. Pumping cost was not included.

[2]Cost Assumption from the CDM Smith cost estimating group for the installation of 150 psi rated 16-inch HDPE pipe within the existing 18-inch steel pipeline with minimal bends and elevation changes. Assume no lateral connections. Pumping cost was not included.

The preliminary cost estimate concludes that slip-lining the existing steel pipeline will provide a cost savings for Phase I of approximately $3 million as compared to installing a new 24-in pipeline. Phase II will involve the installation of the new pipeline to meet the required flow capacity at a current additional cost of approximately $7 million.

Evaluation Results, Conclusions and Recommendations

Summary of Evaluation Results

A brief evaluation of each alternative for RO permeate conveyance with pros/cons for each alternative is discussed in this section along with a final recommendation.

Slip-line Existing 18-inch Pipeline

This alternative includes slip-lining the existing 18-inch, out-of-service pipeline that runs between SJVRWRF and Alessandro Ponds. Table 4 discusses the pros/cons for this alternative.

Table 4 – Pros and Cons for Slip-Lining Existing Pipeline

Slip-line Existing 18-inch Pipeline	
Pros	**Cons**
Less disruption to community, less traffic.	Reduced pipe capacity, unable to provide for current Phase II design flowrates. A future pipeline would be required to meet Phase II flowrates.
Minimize damage to roadway.	Damage in existing pipeline could prevent slip-lining.
Reduced excavation material to be transported.	Potential stranded asset.
Improved construction schedule.	Specialty construction required.
Lower cost.	
Allow for new, future uses for the existing pipeline.	
No right-of-way required.	
Reuse existing pipe currently abandoned.	
Existing pipe design is efficient for slip-lining, due to few bends and grade changes.	

Install New 24-inch Pipeline

This alternative includes installing a new 24-inch pipeline from SJVRWRF to Alessandro Ponds. The following are the pros/cons for this alternative:

Table 5 – Pros and Cons for Installing a New Pipeline

Install New 24-inch Pipeline	
Pros	**Cons**
Able to meet Phase I and Phase II design capacity with a 24-in pipeline. No need for a future pipeline.	Increased traffic in areas where new pipeline will be installed.
Not having to work within a potentially damaged existing pipeline.	Often this can increase the length of the construction schedule.
Conventional construction.	More materials and disposal required due to increase excavation.
	Higher cost.
	Abandoned pipeline will not be able to be reused.

Install New 24-inch Pipeline	
Pros	**Cons**
	New easements or encroachment permits may be required.

Conclusions

Based on this study findings and assumptions stated throughout, CDM Smith concludes:

- Slip-lining the existing 18-inch pipeline will only provide enough capacity for Phase I of the IPR project.
- Installing a new 24-inch pipeline will be required to provide enough capacity for Phase II design.

In addition, the IPR supply for Phase II may be subject to changes in the future and slip-lining for Phase I will allow for variations in phasing for future expansions of the IPR project. If the blend ratio changes in the future to a 30/70 blend of RO permeate to tertiary RW, the 18-inch slip-lined pipeline could be utilized for Phase II with a fluid pipe velocity of 7 fps. To maintain a fluid velocity in the slip-lined pipe of 6 fps from Table 1 above, the Phase II blend ratio would have to decrease to approximately 26/74 RO permeate/tertiary RW.

Finally, there are additional alternatives for RO permeate conveyance for Phase II that can be considered to avoid construction of a new conveyance pipeline, they include but are not limited to:

- Operational "switching" of the existing 36-inch tertiary RW pipeline and the slip-lined 18-inch pipeline. For example, the 36-inch pipeline could convey the full IPR supply (blend of tertiary RW and RO permeate) and the slip-lined pipeline could deliver tertiary RW to non-potable reuse (NPR) customers.
- In conjunction with Phase II of the Santa Ana River Conservation & Conjunctive Use Program (SARCCUP), an additional RO Permeate pipeline could connect the AWTF at the SJVRWRF to the raw water pipeline at Sanderson Ave and Esplanade Ave. RO permeate would be blended with raw imported water during conveyance and prior to surface recharge.

Recommendations

The District should determine if it is better to invest more funds now for a new pipeline that will serve both Phase I and Phase II or reduce the current cost knowing that additional cost will be incurred in the future. If the District selects slip-lining the existing 18-inch pipeline to convey RO permeate from SJVRWRF to the Alessandro Ponds, the District should consider the following prior to undertaking the design of slip-lining the existing pipeline:

- Obtain and review shop drawings of existing steel pipeline to confirm inner pipe diameter and the ultimate capacity of slip-lined pipe.

- Perform a laser profile of the existing out-of-service pipeline to confirm the dimensional assumptions made in this evaluation and establish the plan, profile and interior conditions of the existing pipeline to ensure that the new liner will be able to be easily pulled though the existing line.
- Identify potential access pit locations, feasibility and potential impacts.
- Identify if any laterals to the RO permeate pipeline are required along the length of the pipeline.
- CCTV the existing pipeline to ensure there is no major damage or debris which could preclude slip-lining.
- Evaluate the various materials for slip-lining (HDPE, PVC, etc.)
- Consideration of impact to the pipeline of temperature changes.
- Identify the pressure class of HDPE pipe to be installed based on velocity restrictions indicated in Table 2 and the potential future uses of pipe.

Attachments:

Attachment No. 1 – Existing Drawings of 18-inch Pipeline

Attachment No. 1 - Existing Drawings of 18-inch Pipelines

RESTRAIN ALL JOINTS 178.09' L.F.

11+24.51 CL=1494.64 TEMP. BLOW OFF

FUTURE 18" RCP SD

PROP. CONC. ENCASED ABL 18" RCP SD

PROP. FINISH SURFACE

PROPOSED 36" RCP SD

183+15.98 RAMONA =9+46.03 POTTER, CB CL=1487.47 90° HORIZ. BEND

1486.76 B.O.P.

1487.81 B.O.P.

CDF

1486.67 B.O.P.

S=1.0000

S=-0.0010

S=-0.0001

2.8 L.F.

IDENTICAL

10+81.03 END 24" STEEL CASING TEST STATION B-660

135.63 LF OF 24" STEEL CASING PER B-575 BORE & JACK METHOD

9+56.88 BEGIN 24" STEEL CASING TEST STATION B-660

9+52.81 G.B. CL=1484.66 45° BEND

9+50.00 G.B. CL=1487.46 45° BEND

EXIST. 162" MWD WATER LINE

CG 12" RECYCLED WTR. PVC C900 CL150 DR18

RESTRAIN ALL JOINTS 20 L.F.

183+15.98 RAMONA =9+46.03 POTTER, CB CL=1487.47 90° HORIZ. BEND

182+95.98 RAMONA =9+46.01 POTTER CL=1487.65 90° HORIZ. BEND

S=-0.0088

CG 12" RECYCLED WTR. PVC C900 CL150 DR18

RESTRAIN ALL JOINTS 5' L.F.

9+46.01 POTTER, CB= 182+95.98 RAMONA CL=1487.65 90° HORIZ. BEND

S=-0.0088

9+41.01 POTTER, CB= 182+95.98 RAMONA CL=1487.65 90° HORIZ. BEND

HOT TAP EXIST. 18" RWTR. WITH 16"x12" SDDR CONNECTION PER B-271 WITH 12" FxF RSGV

INSTALL 12" FxF ADAPTOR WITH 1" CORP. STOP (CG=1487.85)

CG 12" RECYCLED WTR. PVC C900 CL150 DR18

CONTRACTOR TO EXPOSE EXIST PIPE

1/4" MIN. THICKNESS FULL WELD DOUBLE PASS ALL JOINTS

50' – CONTRACTOR TO EXPOSE EXIST. PIPE

183+00.98 RAMONA =9+46.01 POTTER END EXPOSE EXIST. RWTR PIPELINE FULL WELD DOUBLE PASS ALL JOINTS

182+47.00 CG=(1487.84) BEGIN EXPOSE EXIST. RWTR PIPELINE FULL WELD DOUBLE PASS ALL JOINTS

WATERLINE & JOIN W/ BUTT STRAP PER B-304 & INSULATED JOINT. TEST STATION PER B-660

182+43.00 45° HORIZ. BEND CG=1487.84

182+92.00 45° HORIZ. BEND CG=1487.85

181+92.00 45° HORIZ. BEND CG=1487.84

181+81.00 45° HORIZ. BEND CG=1487.85

181+77.00 CG=(1487.85) CUT EXIST. REC WATERLINE & JOIN W/ BUTT STRAP PER B-304 & INSULATED JOINT. TEST STATION PER B-660

181+27.00 BEGIN EXPOSE EXIST. RWTR PIPELINE FULL WELD DOUBLE PASS ALL JOINTS

* CONTRACTOR TO VERIFY EXISTING ELEVATIONS PRIOR TO ANY CONSTRUCTION, AND TO NOTIFY THE ENGINEER OF RECORD OF ANY DISCREPENCIES

PROP. FINISH SURFACE

PROPOSED SD

S=-0.0005

24" RCP 1487.38 B.O.P.

S=-0.0001

(S=-0.0001)

S=-1.00

(1485.85) 162" WATER

183+00.98 CG=(1487.67) REMOVE EXIST. 90° BEND & INSTALL NEW 18" MJ ANGLE TEE (S=-0.0033)

S=1.00

S=-0.0005

182+25.10 G.B. CG=1487.65 45° BEND

182+22.44 G.B. CG=1485.15 45° BEND

182+02.29 G.B. CG=1485.14 45° BEND 6" OUTLET PER B-271 FOR 6" B.O. PER PA-1

181+99.63 G.B. CG=1487.84 45° BEND

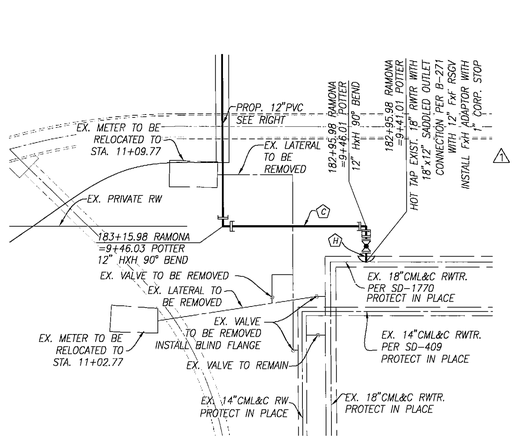
CG 18" RECYCLED WTR. CML&C STEEL 1/4" THICK

PROFILE SCALES

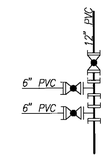
HORIZ.: 1"= 40

VERT.: 1"= 4

STATIONING OF ALL RECYCLED WATER LINES AND APPURTENANCES ARE BASED ON STREET CENTERLINE STATIONS.

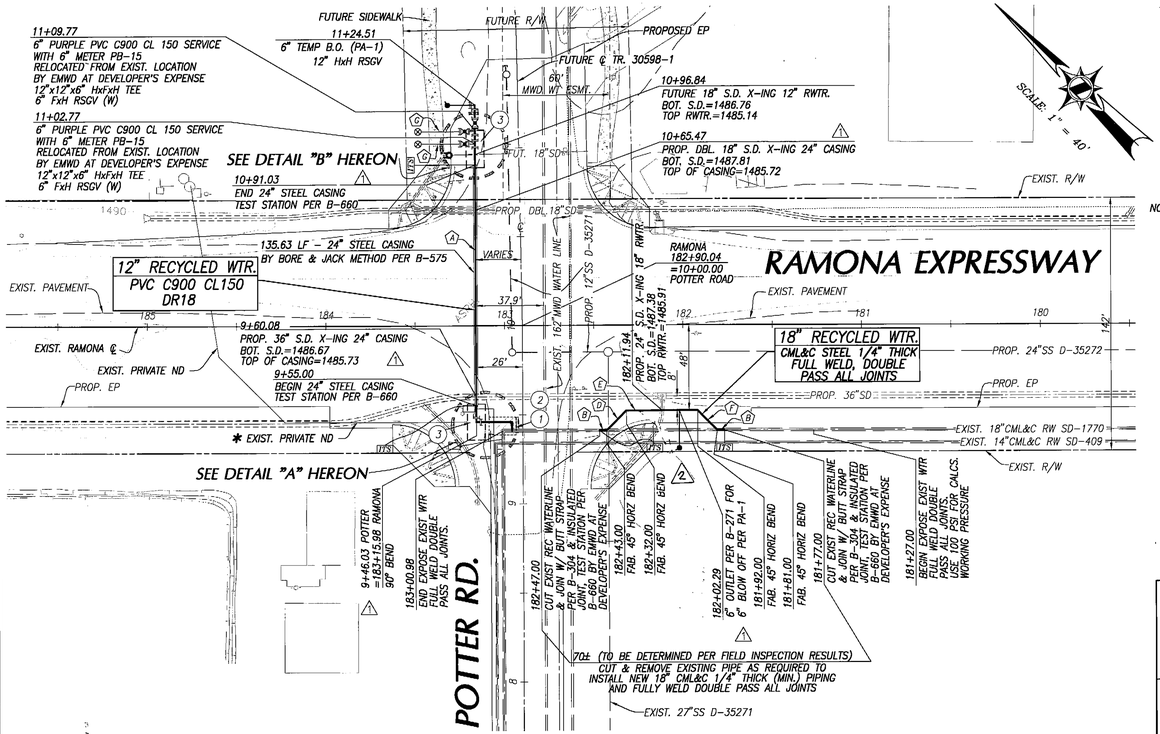


DETAIL "A"
SCALE: 1"=10'



FOR CONSTRUCTION NOTES SEE RIGHT

DETAIL "B"
NTS



NOTE: THE PROPOSED 12" PVC PIPE SHOWN HEREON IS ONLY FOR THE BENEFIT OF THE CURRENT METER OWNERS. THIS LINE DOES NOT ACCOUNT/ALLOW FOR ANY FUTURE USE BY ANY EXISTING OR FUTURE DEVELOPMENTS NORTH OF RAMONA EXPRESSWAY.

BORE PIT LOCATION

REMOVE & REPAIR EXISTING PAVEMENT & TRENCH BACKFILL

SAWCUT EXISTING PAVEMENT

(1) REMOVE & REPAIR EXISTING PAVEMENT & TRENCH BACKFILL PER COUNTY OF RIVERSIDE STD. PLAN NO. 818

(2) SAWCUT EXISTING PAVEMENT

(3) 20'x10' BORE PIT

LINE DATA

	BEARING/DELTA	RADIUS	LENGTH	TANGENT
(A)	N 44°58'01" E	–	178.09'	–
(B)	N 44°58'04" W	–	4.00'	–
(C)	N 44°58'04" W	–	20.00'	–
(D)	N 89°58'04" W	–	15.56'	–
(E)	N 44°58'04" W	–	40.00'	–
(F)	N 00°01'56" E	–	15.56'	–
(G)	N 45°01'59" W	–	30.09'	–
(H)	N 45°01'56" E	–	5.00'	–

GRAPHIC SCALE
0 20 40 80 160
1 inch = 40 feet

Underground Service Alert
Call: TOLL FREE 1-800 227-2600
TWO WORKING DAYS BEFORE YOU DIG

"CAUTION": Remember that the USA Center notifies only those utilities belonging to the center. There could be other utilities present at the work site. The center will inform you of whom they will notify.

RECYCLED WATER APPROVED BY:
EASTERN MUNICIPAL WATER DISTRICT
Joseph C. McKee 6/24/08
CIVIL ENGINEER OF SUBDIVISIONS DATE

APPROVALS	INITIAL	DATE
PROJECT ENG.	L.A.M.	6/24/08

NOTE:
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR A GRADING PERMIT HAS BEEN ISSUED.

The private engineer signing these plans is responsible for assuring the accuracy and acceptability of the design hereon. In the event of discrepancies arising after county approval or during construction, the private engineer shall be responsible for determining an acceptable solution or revising the plans for approval by the city.

MARK	BY	DATE	REVISIONS	APPR.	DATE
3	EM	10/3/08	AS CONST CO G7901 FCR 9/30/08	FM	10/6/08
2	L.A.M.	8/21/08	DELETED 2"AV/AR ON STA. 182+25.10	jm	8/21/08
1			SUPERSEDS APPROVED PLANS DATED 5/22/08	jm	6/24/08
ENGINEER				EMWD	

SEAL

CITY OF SAN JACINTO
APPROVED BY: _____ CITY ENGINEER
6-27-08 DATE

SEAL-ENGINEER
REGISTERED PROFESSIONAL ENGINEER DOUGLAS SNYDER NO. 24068 Exp. 12/31/09 CIVIL STATE OF CALIFORNIA

HUNSAKER & ASSOCIATES IRVINE, INC.
PLANNING ▪ ENGINEERING ▪ SURVEYING
Three Hughes ▪ Irvine, CA 92618 ▪ PH: (949) 583-1010 ▪ FX: (949) 583-0759

PREPARED BY: _____ DOUGLAS SNYDER
R.C.E. NO. 24068
6/23/08 DATE

BENCHMARK:
BENCHMARK CONVERSION FROM NAVD 88 TO NGVD 29:
NAVD 88 = NGVD 29 + 2.31
NATIONAL GEODETIC SURVEY BENCH MARK NO. V 1143
ELEV. 1507.32 DATUM: NAVD 88
BENCH MARK DISK IN MANHOLE STRUCTURE STAMPED V1143 1961;
2.5 MILES NORTHWEST SAN JACINTO, 243 FEET WEST ALONG RECORD RD FROM THE INTERSECTION WITH STATE ST (HWY 79), 17 FEET SOUTH OF RECORD RD, ON A SQUARE MANHOLE 4 FEET ABOVE GROUND. A STANDARD USCGS BRASS MONUMENT SET FLUSH ON NORTHWEST CORNER OF MANHOLE AT STATION 27+26.60.

SCALE: H: AS SHOWN V: AS SHOWN

CITY OF SAN JACINTO
RAMONA EXPRESSWAY & POTTER ROAD
RECYCLED WATER RELOCATION
IMPROVEMENT PLAN
PLAN & PROFILE

FOR: - W.O.: - CITY FILE NO.: SJ- 209

D-38127

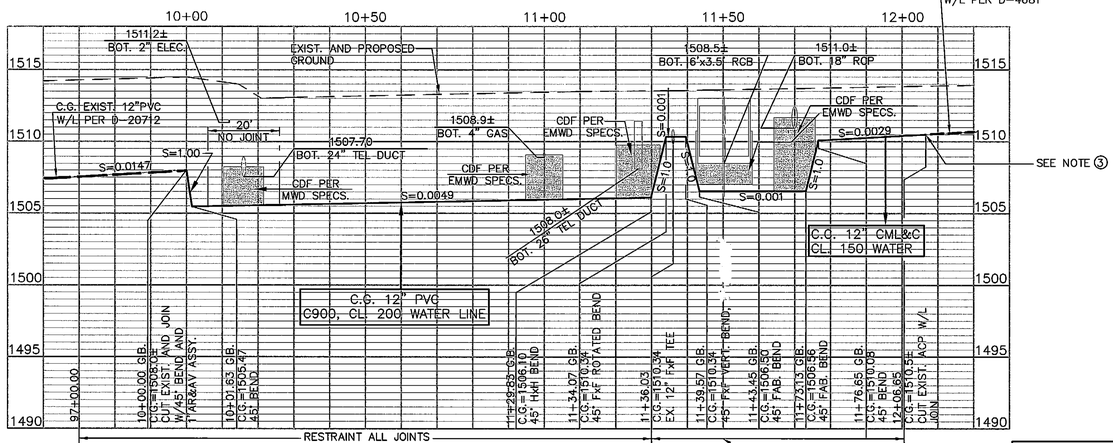
I.D.	98
S.A.	–
W.O.	12-357
C.O.	G7901 –
COORD.	46-D-39
SHT.	2 OF 2

W.O. 1375-81 RECYCLED WATER RELOCATION ON RAMONA EXPRESSWAY DOC # 66624

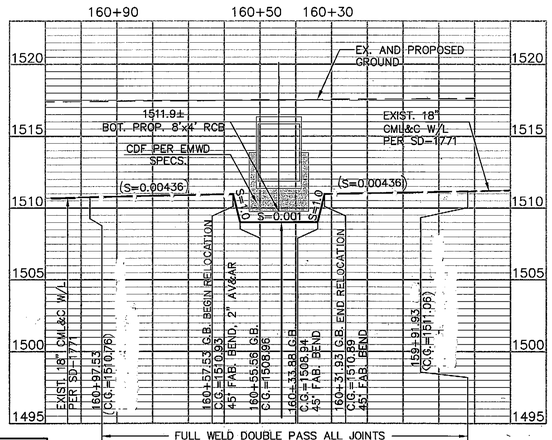
PLOTTED BY: Afshin Shahidi DATE: Jun. 23, 2008 04:00:28 .\M FILE: F:\0050\Engineering\SY_Backbone\Imp_Ramona RW Relocation\SHT02.dwg

3

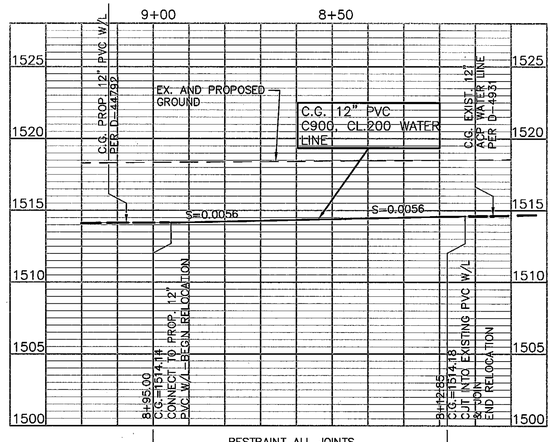
WATERLINE STATIONING
PROFILE #1



RAMONA EXP. STATIONING
PROFILE #2

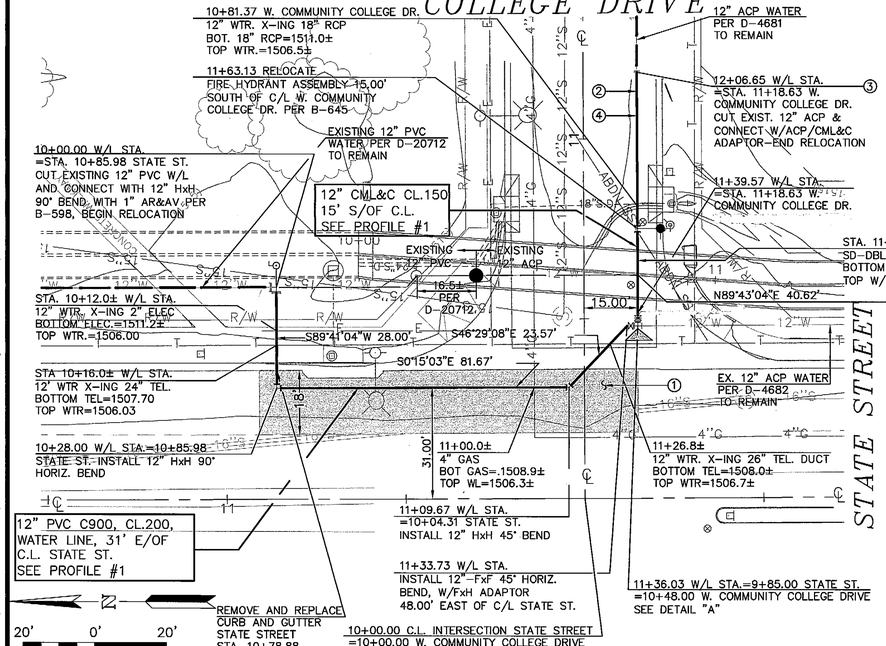


STATE ST. STATIONING
PROFILE #3



③ REMOVE AND REPLACE EXISTING 12" ACP W/12" CML&C FROM STA. 11+76.65 TO STA.12+06.65.

W. COMMUNITY COLLEGE DRIVE



PROFILE SCALE
VERT: 1 in = 5 ft.
HORZ: 1 in = 20 ft.

C.G. 18" CML&C RECYCLED WATER, CL.150,

NOTES

① RECONSTRUCT TRENCH 4" ASPHALT CONCRETE OVER 12" CLASS II BASE PLUS 0.15' GRIND AND OVERLAY FROM LANE LINE TO THE EDGE OF GUTTER

② REMOVE AND DISPOSE OF EXISTING 12" ACP FROM STA. 11+36.03 TO 12+06.65 ALONG WATERLINE STATIONING PER STATE HEALTH DEPT. STANDARD

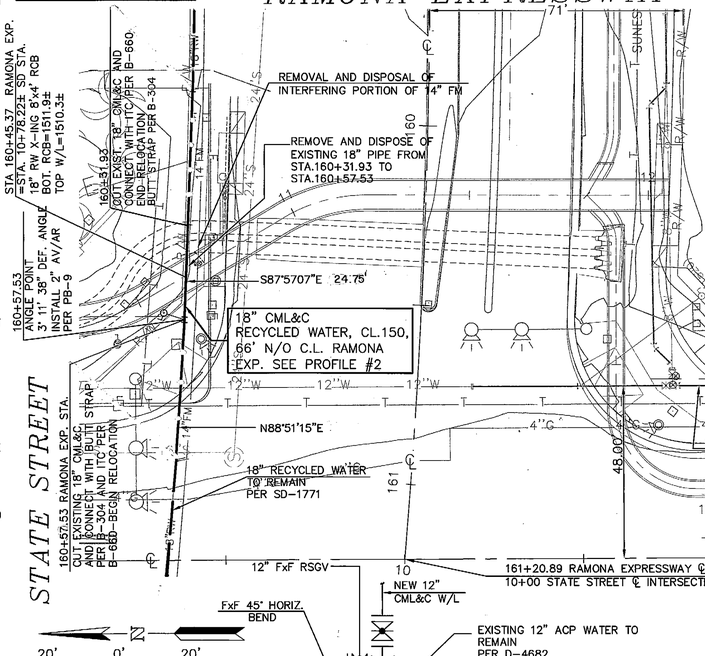
ABBREVIATIONS, SYMBOLS & LEGEND

RW/L	RECYCLED WATER LINE
C&G	CURB AND GUTTER
CMP	CORRUGATED METAL PIPE
EP	EDGE OF PAVEMENT
(TYP.)	TYPICAL
℄ ℄	EXISTING RIGHT-OF-WAY
℄ ℄	EXISTING CENTERLINE OF STREET
	EXISTING/PROPOSED EASEMENT
2"G 2"G	EXISTING 2" GAS (TYP.)
E E	EXISTING ELECTRICAL
X X	EXISTING FENCE
T T	EXISTING TELEPHONE
8"W 8"W	EXISTING OR PROPOSED BY OTHERS WATER LINE (SIZE & TYPE NOTED)
	PROPOSED RECYCLED WATERLINE (SIZE & TYPE NOTED)
	RESILIENT SEAT GATE VALVE
	2" COMB AR & AV (PB-9)
	6" BLOW-OFF ASSEMBLY (PA-1) PERMANENT
	THRUST BLOCK PER A-530
	FIRE HYDRANT
	FxH ADAPTER

NOTE

④ REMOVAL OF ACP PIPE AND APPURTENANCES SHALL BE DONE BY CONTRACTOR LICENSED TO HANDLE HAZARDOUS MATERIAL. DISPOSAL SHALL BE IN ACCORDANCE WITH STATE AND FEDERAL LAW.

RAMONA EXPRESSWAY



CAUTION:
EXISTING WATERLINE IS ASBESTOS CEMENT PIPE. ASBESTOS CEMENT PIPE CONTAINS ASBESTOS FIBERS. BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM. REFER TO "RECOMMENDED WORK PRACTICES FOR A/C PIPE", BY: A/C PIPE PRODUCERS ASSOCIATION.

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK:
B.M. H-14-4
CENTERLINE INTERSECTION OF RAMONA BLVD. AND LYON AVE.. FOUND 1" BRASS BENCH MARK MONUMENT WITH NIPPLE IN A 0.5' DIAMETER HAND WELL DOWN 1.3' LOCATED 1.2 MILES SOUTHEAST ALONG RAMONA BLVD. FROM THE INTERSECTION OF RAMONA BLVD. AND SANDERSON. LYON AVE. WAS PREVIOUSLY KNOWN AS POTTER ROAD. ELEVATION: 1487.542' (NGVD 29)

BASIS OF BEARING:
THE BASIS OF BEARINGS IS THE BASELINE BETWEEN COORS STATIONS "P584" AND "BILL" SAID LINE BEARS N 17°07'38" E 119,437.72'(GRID) 119,447.28'(GROUND) PER HILLWIG-GOODROW, INC. TOPOGRAPHIC SURVEY OF RAMONA EXPRESSWAY, OCTOBER 2010

ENGINEERING RESOURCES OF SOUTHERN CALIFORNIA, INC.
3550 E. Florida Avenue, Suite B
Hemet, California 92544
(951) 765-6622 Fax (951) 765-6621
PREPARED UNDER THE SUPERVISION OF:
MAHMOUD AHMADI ZADEH
REGISTERED CIVIL ENGINEER NO. 58784
DATE: 12-13-2012

SEAL — REGISTERED PROFESSIONAL ENGINEER MAHMOUD AHMADI ZADEH No.C 58784 CIVIL STATE OF CALIFORNIA

CITY OF SAN JACINTO
PUBLIC WORKS DEPARTMENT
APPROVED BY
CITY ENGINEER
DATE

REF.	REVISIONS	APPR.	DATE
1	REVISED SHEET#2 TO MATCH EMWD FILES	AGA	4/12/13

WATER AND RECYCLED WATER APPROVEDITER BY:
EASTERN MUNICIPAL WATER DISTRICT
PROJECT MANAGER — 12/13/12 DATE

DESIGNED	RT	
DRAWN	RT	
TRACED		
CHECKED	MA	
SUBMITTED		

APPROVALS	INITIAL	DATE
PROJECT ENGINEER	AGA	12/13/12
INSPECTION		
WATER OPERATIONS		
MAINTENANCE		

SCALE: AS SHOWN

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

CITY OF SAN JACINTO
MDP LINE H
WATERLINE RELOCATIONS
RAMONA EXPRESSWAY AND STATE STREET

I.D.	U-20
S.A.	42
W.O.	13-130
C.O.	68590
COORD.	16-0
SHT.	2 OF 3
	D-44791

Drawing name: T:\Projects\58072100- City of San Jacinto- Final Design Line H\04-2012\Final Plans-October 18-2012\SHEET 2-2--EMWD-Revised-12-10-2012.dwg Dec 13, 2012 - 2:33pm

APPROXIMATE QUANTITIES

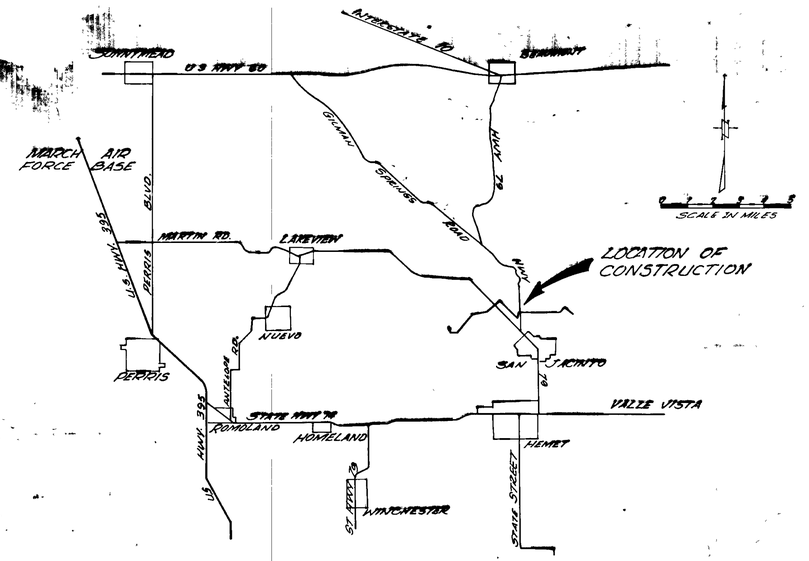
ITEM	DESCRIPTION	QUANTITY
Schedule I	SEWER EFFLUENT FORCE MAIN	
1.	21" C.M.L.&C. Steel Pipe	1,640 L.F.
2	18" C.M.L.&C. Steel Pipe	22,678 L.F.
3	12" C.M.L.&C. Steel Pipe	1,075 L.F.
4.	8" C.M.L.&C. Steel Pipe	445 L.F.
5.	Line Valve Installation	4 Ea.
6.	18" Gate Valve	2 Ea.
7.	14" Gate Valve	1 Ea.
8.	12" Gate Valve	1 Ea.
9.	8" Gate Valve	8 Ea.
10	8" Meter Installation	5 Ea.
11	30" Casing Pipe	142 L.F.
12	Insulated Test Connection Stations	9 Ea.
Schedule II	SEWER INFLUENT FORCE MAIN	
1	21" Asbestos Cement Pipe	4,390 L.F.
2	Direct Burial Cable	4,390 L.F.
3	21" C.M.L.&C. Steel Pipe	15 L.F.
4	2" Sewer Air Valve	1 Ea.
Schedule III	CONSTRUCT PONDS AT PLANT & RECLAMATION SITES	
1	Excavation at Reclamation Site	13,261 C.Y.
2	Excavation at Plant Site	19,000 C.Y.
3.	PVC Pond Lining at Plant Site	76,000 S.F.
4.	Splash Pads	8 Ea.
5.	Remove & Reinstall 6' Fence at Reclamation Site	525 L.F.
6.	Furnish & Install 6' Fence at Reclamation Site	2,740 L.F.
7.	Remove & Reinstall 6' Fence at Plant Site	1,625 L.F.
8.	Furnish & Install 6' Fence at Plant Site	2,610 L.F.
9	Construct Overflow Pipe	4 Ea.
10	Construct A.C. Downdrain	1 Ea.
11.	Remove & Dispose of Existing Fence	3,130 L.F.

EASTERN MUNICIPAL WATER DISTRICT

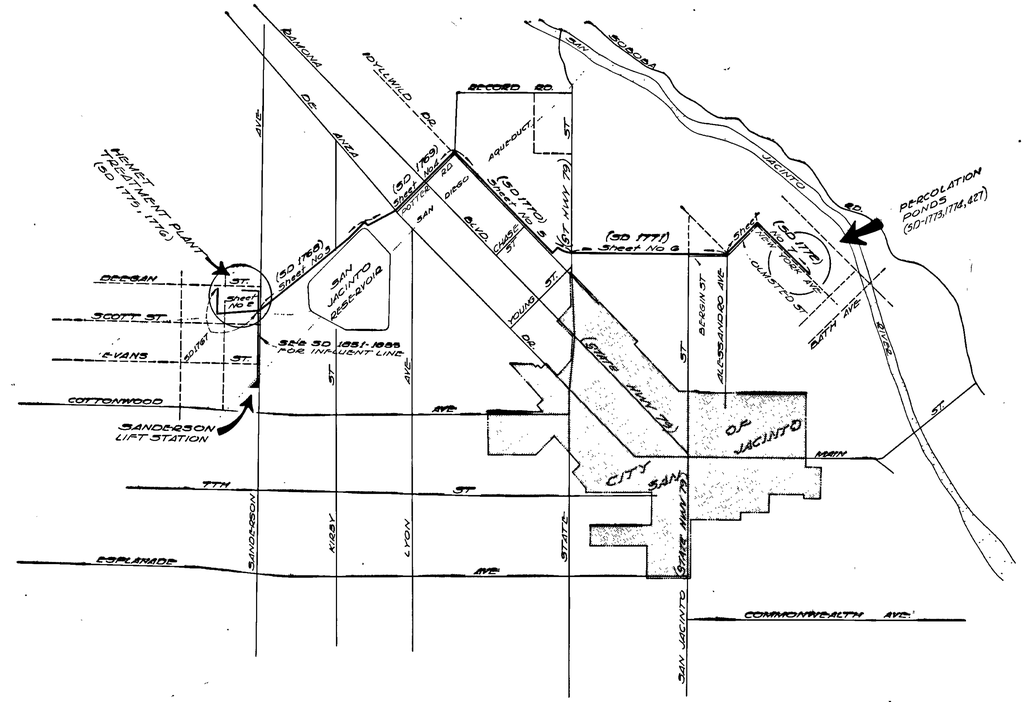
RIVERSIDE COUNTY, CALIFORNIA

IMPROVEMENT DISTRICT NO. 17

(PHASE II EFFLUENT PIPE LINE, INFLUENT PIPE LINE AND PONDS)



VICINITY MAP



INDEX MAP
No Scale

DESIGNED & SUBMITTED: JOHN B BRUDIN, R.C.E No. 12116 2-17-71

APPROVED: GENERAL MANAGER & CHIEF ENGINEER, DOYLE F. BOEN R.C.E. No. 6012 2-18-71

Prepared By
NESTE, BRUDIN & STONE, Incorporated
Civil Engineers
535 E. Florida Ave. Hemet, California

COORD. 13,16 - N.O.P C.O. 1670

SD-1766

REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APP'VD
1	6-8-71	ARB	Added 100' Stationing to Plan	
2	6-8-71	ARB	Changed E.T.S. to I.T.S.	
3	2-4-72	RNS	AS CONSTRUCTED	

JOB NO. 65-257.044	DATE	2 / 17 SHEET OF SHEETS	P-4-6086
DESIGNED RMM	1-71		
DRAWN JMP	1-71		
CHECKED MGS	FEB '71	CALIF. REG. ENGR. NO. 12116 2-17-71	

NESTE, BRUDIN & STONE
INCORPORATED
CIVIL ENGINEERS
535 E. FLORIDA AVENUE HEMET, CALIFORNIA 658-7116

REFERENCES

APPROVALS

DESIGN	CONSTRUCTION	OPERATIONS

SCALE 1"=100' HORIZONTAL 1"=10' VERTICAL — DATE
DESIGNED
DRAWN
TRACED
CHECKED
SUBMITTED
RECOMMENDED

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

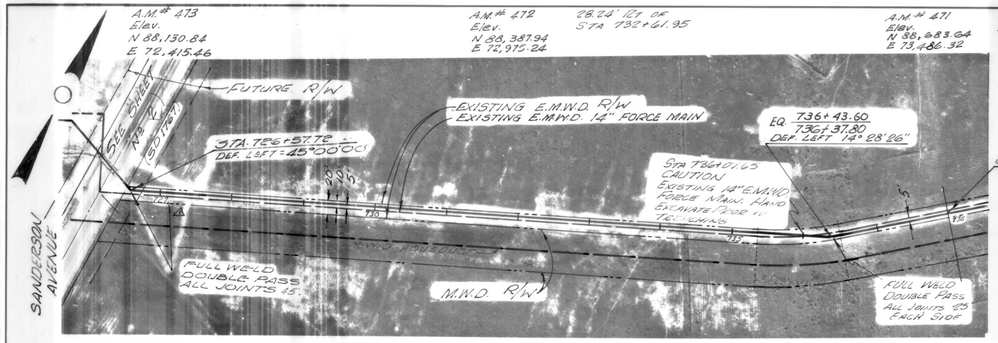
I.D. 17 PHASE II EFFLUENT PIPE LINE
PUMP STATION TO STA 726+57.72

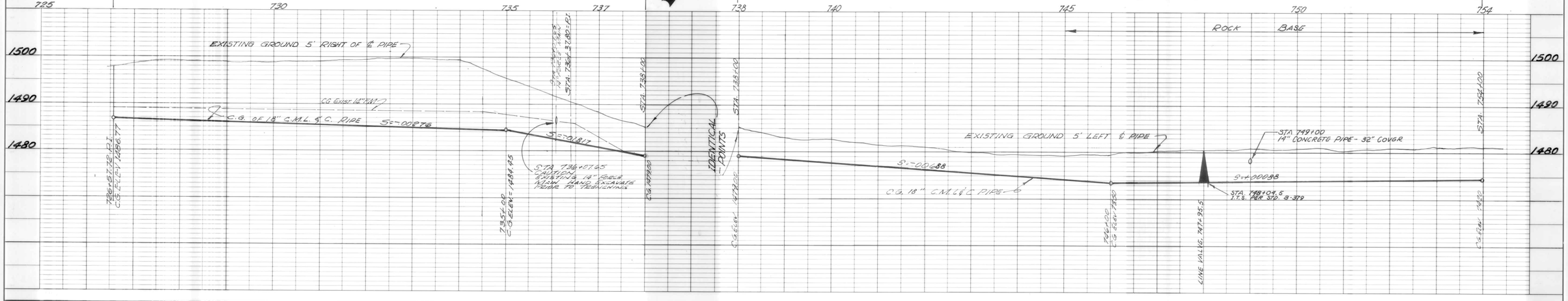
2-18-71 APPROVED GENERAL MANAGER & CHIEF ENGINEER — SD 1767

3

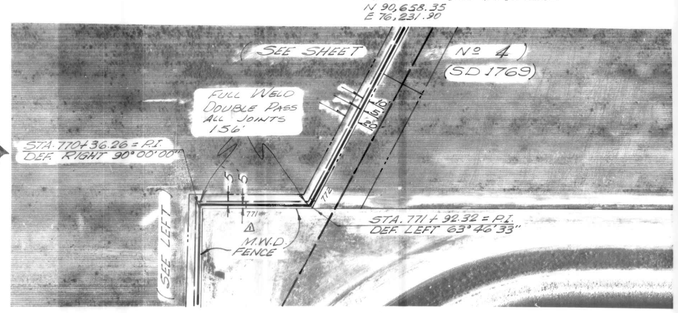
AS CONSTRUCTED

COORD. 16-N









JOB NO. 65-257.044	DATE	3/17	P-4-6086
DESIGNED R.W.M.	1-71	SHEET OF SHEETS	
DRAWN J.M.P.	1-71		
CHECKED W.G.S.	Feb '71	CALIF. REG. ENGR. NO. 12116 2-17-71	

NESTE, BRUDIN & STONE
INCORPORATED
CIVIL ENGINEERS
535 E. FLORIDA AVENUE HEMET, CALIFORNIA 658-7116

REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APP'VD
1	6-8-71	ARB	Added 100' Stationing to Plan	
2	6-8-71	ARB	Changed E.T.S. to T.T.S.	
3	8-18-71	ARB	Added Weld Note	
4	2-4-72	RNS	As Constructed	
5	8-21-90	GR	UPDATED PER STICK FILE	

REFERENCES

APPROVALS

DESIGN	CONSTRUCTION	OPERATIONS

SCALE 1"=100' HORIZONTAL 1"=10' VERTICAL	DATE
DESIGNED	
DRAWN	
TRACED	
CHECKED	
SUBMITTED	
RECOMMENDED	

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

I.D. 17 PHASE II EFFLUENT PIPE LINE

SURVEY LINE
STA. 726+07.72 TO STA. 771+92.32

APPROVED 2-18-71 GENERAL MANAGER & CHIEF ENGINEER

S.D. 1768

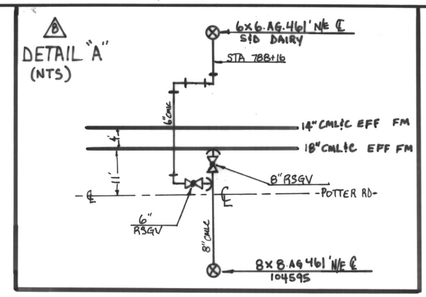
COORD. 15-N

AS CONSTRUCTED

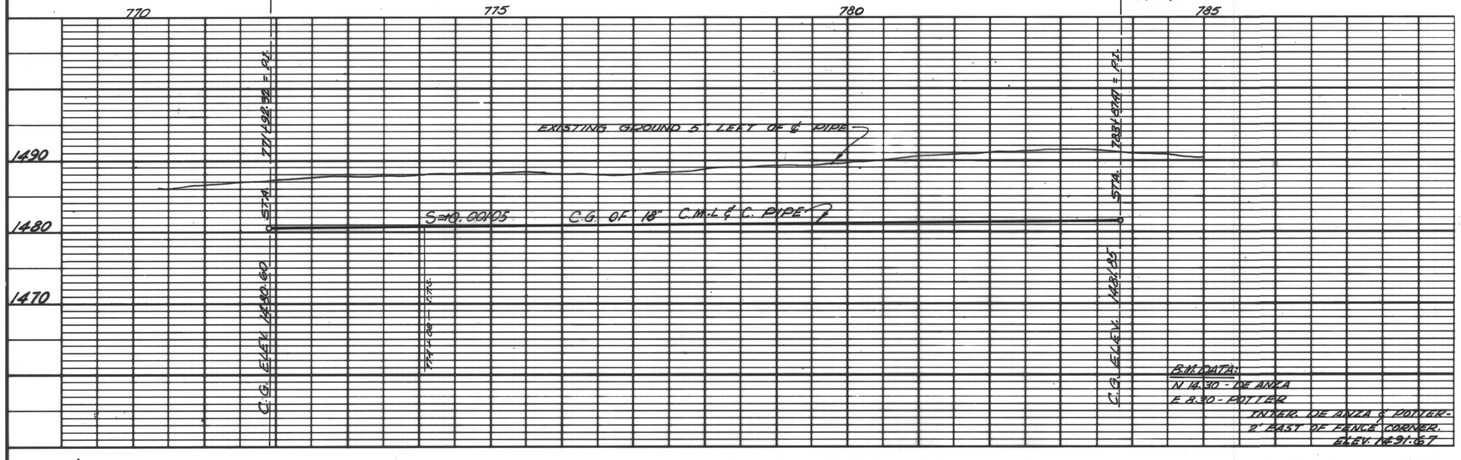
AM# 461 — 773+94.20
Elev. 3.92' RT.
N. 90, 668.35
E. 76, 231.90

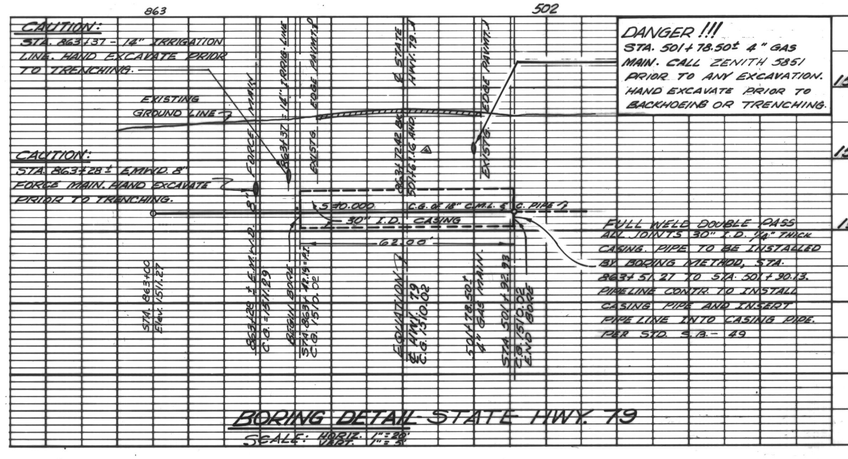
AM# 466 — 783+50.23
Elev. 27.56' RT.
N. 90, 964.90
E. 77, 137.72





SEE PLAN SHEET Nº 5
(SD-1710)





BORING DETAIL STATE HWY. 79
SCALE: HORIZ. 1"=20' VERT. 1"=5'

AM# 466 — 783+50.23
Elev. 27.56' RT.
N 90,964.90
E 77,137.72

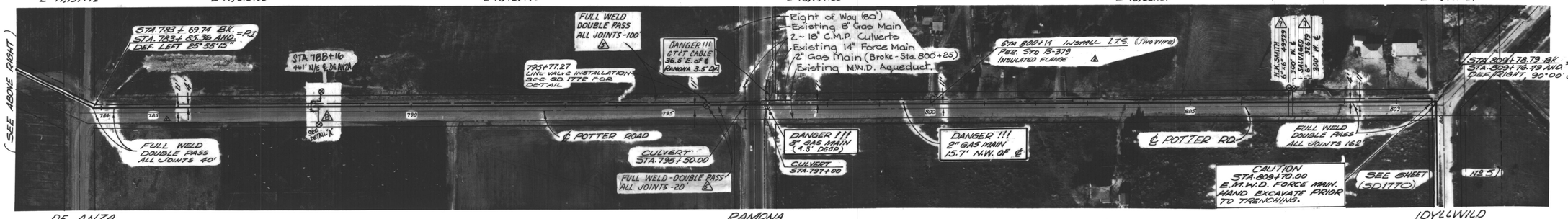
AM# 430 — 785+87.32
Elev. 11.00' RT.
N 91,128.83
E 77,313.93

AM# 465 — 791+81.93
Elev. 10.73' RT.
N 91,652.84
E 77,731.40

AM# 464 — 797+74.49
Elev. 11.08' RT.
N 91,973.75
E 78,147.88

AM# 463 — 803+91.89
Elev. 11.23' RT.
N 92,413.09
E 78,581.67

AM# 462 — 809+79.43
Elev. 13.11' LT.
N 92,850.44
E 79,001.24



DE ANZA DRIVE — POTTER ROAD — RAMONA BLVD. — IDYLLWILD DRIVE

JOB NO. 65-257.044	DATE	4/17	P-4-6086
DESIGNED R.W.M.	1-71	SHEET OF SHEETS	
DRAWN J.W.P.	1-71		
CHECKED M.G.S.	FEB '71		

CALIF. REG. ENGR. NO. 12116 2-17-71

NESTE, BRUDIN & STONE
INCORPORATED
CIVIL ENGINEERS
535 E. FLORIDA AVENUE HEMET, CALIFORNIA 658-7116

NO.	DATE	INITIAL	DESCRIPTION	APP'VD
1	6-8-71	ARB	Added 100' Stationing to Plan	
2	6-8-71	ARB	Changed E.T.S. to I.T.S.	
3	6-11-71	ARB	Added GT&T Cable Warning - Sta 797+10±	
4	6-25-71	E.E.D.	Revised stationing Boring Detail	
5	8-18-71	ARB	Added Weld Note	
6	2-7-72	RNS	As Constructed	
7	8-21-90	GR	UPDATED PER STICK FILE	
8	9-11-02	JTES	ADDED DETAIL 'A'. ± STA 788+16	W.O. 6770-0350-A3 CA. 11-2-01 COAST.

REFERENCES

APPROVALS

DESIGN	CONSTRUCTION	OPERATIONS	RECOMMENDED

SCALE 1"=100' HORIZONTAL 1"=10' VERTICAL
DESIGNED
DRAWN
TRACED
CHECKED
SUBMITTED
DATE

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

I.D. 17 PHASE II EFFLUENT PIPE LINE
POTTER ROAD
STA. 783+87.47 TO STA. 809+78.79

2-18-71 APPROVED _____ GENERAL MANAGER & CHIEF ENGINEER

SD 1769

AS CONSTRUCTED

COORD. 15-0

AM # 462 Elev. N 92,850.46 E 79,001.24 — STA 809+78.43 19.11' LEFT

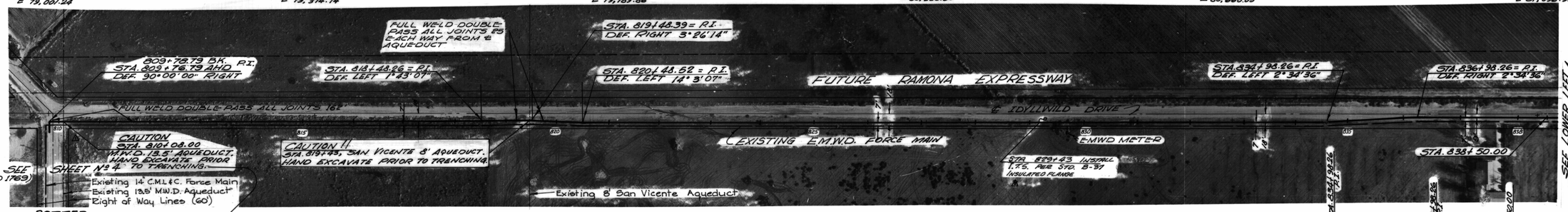
AM # 460 Elev. N 92,476.88 E 79,378.14 — STA 815+07.26 15.71' LEFT

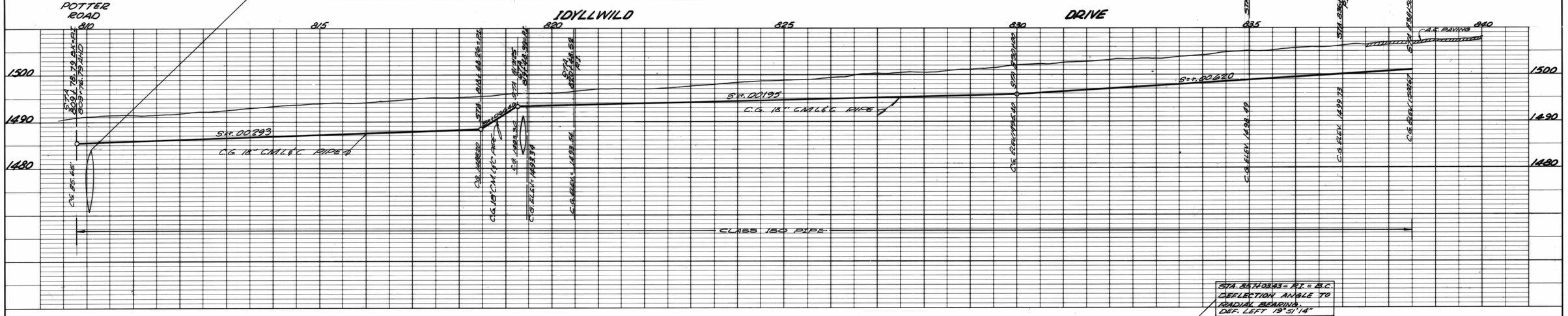
AM # 459 Elev. N 92,039.18 E 79,789.86 — STA 821+10.72 9.17' RIGHT

AM # 458 Elev. N 91,618.28 E 80,228.95 — STA 827+17.03 4.50' LEFT

AM # 457 Elev. N 91,194.48 E 80,660.05 — STA 833+05.41 8.15' LEFT

AM # 456 Elev. N 90,776.37 E 81,096.98 — STA 838+28.28 9.12' LEFT

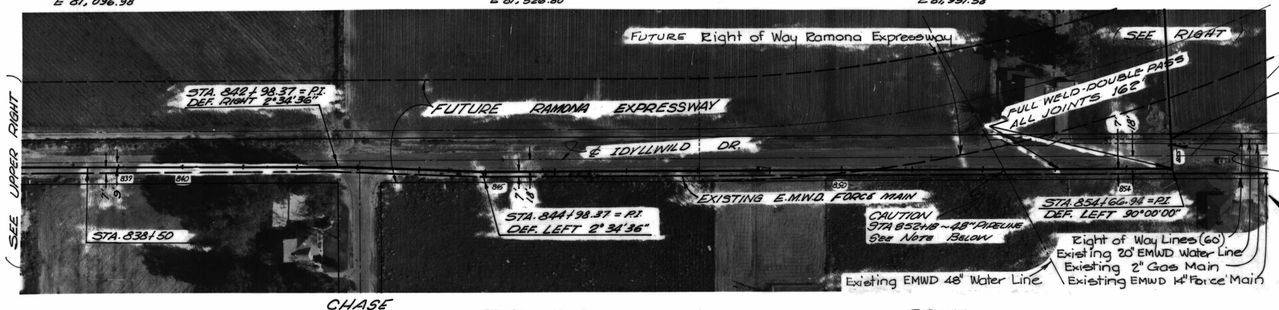




AM # 456 Elev. N 90,776.37 E 81,096.98 — STA 838+28.28 9.12' LEFT

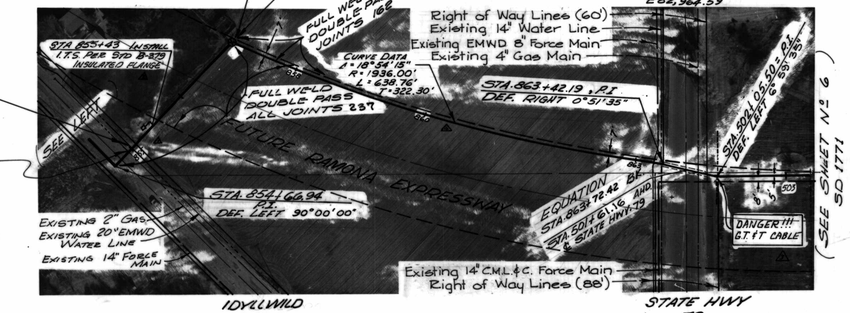
AM # 455 Elev. N 90,856.14 E 81,526.80 — STA 845+30.99 20.14' RIGHT

AM # 418 Elev. N 89,931.02 E 82,951.58 — STA 851+30.54 18.00' LEFT

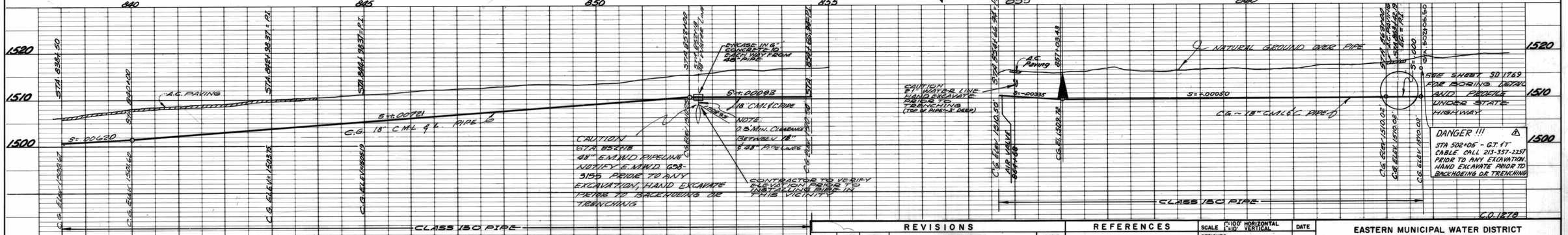


CAUTION !!!
8" WATER LINE
HAND EXCAVATE PRIOR TO TRENCHING
(44' N. of ℄ IDYLLWILD)

CAUTION !!!
2" GAS MAIN 1-3' Deep
HAND EXCAVATE PRIOR TO TRENCHING
(40' N. of ℄ IDYLLWILD)



AM # 414 Elev. N 89,648.03 E 82,964.53



JOB NO. 65-257.044	DATE
DESIGNED RMM	1-71
DRAWN JMP	1-71
CHECKED MGS	Feb '71

5 / 17 SHEET OF SHEETS — P-4-6086

CALIF. REG. ENGR. NO. 12116 2-17-71

NESTE, BRUDIN & STONE
INCORPORATED
CIVIL ENGINEERS
535 E. FLORIDA AVENUE HEMET, CALIFORNIA 658-7116

NO.	DATE	INITIAL	DESCRIPTION	APP'VD
1	6-8-71	ARB	Added 100' Stationing to Plan	
2	6-8-71	ARB	Changed E.T.S to I.T.S.	
3	6-10-71	ARB	Added G.T.I.T. Warning - Sta 502+05	
4	6-25-71	E.E.B.	Revised pipe alignment 857+03.93-502+05.50	
5	2-7-72	RNS	As Constructed	

REFERENCES

APPROVALS

DESIGN	CONSTRUCTION	OPERATIONS

SCALE 1"=100' HORIZONTAL 1"=10' VERTICAL	DATE
DESIGNED	
DRAWN	
TRACED	
CHECKED	
SUBMITTED	
RECOMMENDED	

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

I.D. 17 PHASE II EFFLUENT PIPE LINE

IDYLLWILD DR. & SURVEY LINE STA. 809+76.79 to STA. 863+51.27

2-18-71 APPROVED — GENERAL MANAGER & CHIEF ENGINEER

SD 1770

AS CONSTRUCTED

COORD. 15-0

AM# 414
Elev.
N 89,648.03
E 82,964.59

AM# 452 – 505+80.41
Elev. 42.43' RT.
N 89,652.24
E 83,403.96

AM# 451 – 511+96.12
Elev. 28.15' RT.
N 89,665.82
E 84,019.58

AM# 450 – 517+88.26
Elev. 43.83' RT.
N 89,652.29
E 84,611.77

AM# 449 – 524+08.97
Elev. 29.48' RT.
N 89,668.90
E 85,232.42

AM# 448 – 530+07.57
Elev. 16.68' RT.
N 89,684.57
E 85,831.03

(SEE SHEET NO 5 OF 1770)

STA. 502+05.50 = P.I.
DEF. LEFT 6°59'35"

DANGER!!! GT&T CABLE

STA. 507+38.46 = P.I.
DEF. LEFT 2°51'45"

STA. 508+38.58 = P.I.
DEF. RIGHT 2°51'45"

STA. 504+38.34 = P.I.
DEF. RIGHT 2°51'45"

STA. 505+38.46 = P.I.
DEF. LEFT 2°51'45"

STATE HWY 79

SECTION LINE

STA 515+32 ± 12" IRRIGATION LINE CROSSING ~ HAND EXCAVATE PRIOR TO TRENCHING (3' DEEP)

STA 519+28.5 INSTALL I.T.S. PIPE STD B-379 INSULATED FLANGE

STA. 521+01.58 = P.I.
DEF. RIGHT 0°22'35"

EXISTING E.M.W.D. FORCE MAIN

STA. 521+51.58
DEF. LEFT 0°22'35"

FUTURE RAMONA EXPRESSWAY

STA. 523+30± 12" IRRIGATION LINE CROSSING HAND EXCAVATE PRIOR TO TRENCHING

STA. 528+05.36 = P.I.
DEF. RIGHT 0°05'26"

22 23 27 26

85' SCE LINE
45' SCE LINE

STA. 530+05.36
DEF. LEFT 0°17'11"

STA 528+16 ± 14" WATER LINE CROSSING ~ HAND EXCAVATE PRIOR TO TRENCHING

STA 528+16
6" Outlet (North)

(SEE BELOW RIGHT)

501 505 510 515 520 525 530

1540 1530 1520 1510 1500

STA 502+05.50
STA. 502+00
STA 504+38.34 = P.I.
STA 505+38.46 = P.I.
STA 507+38.46 = P.I.
STA 508+38.58 = P.I.
STA 515+32 ± 12" IRRIGATION LINE CROSSING ~ HAND EXCAVATE PRIOR TO TRENCHING
STA 517+17.75 2" GAS LINE CROSSING ~ HAND EXCAVATE PRIOR TO TRENCHING (2' DEEP)
STA 519+28.5
STA 521+01.58
STA 523+30± 12" IRRIGATION LINE CROSSING HAND EXCAVATE PRIOR TO TRENCHING
STA 528+05.36 = P.I.
STA 530+05.36
STA 528+16 ± 14" WATER LINE CROSSING ~ HAND EXCAVATE PRIOR TO TRENCHING
Sta 528+16 6" Outlet (North)

EXISTING GROUND 8' RIGHT OF ℄ PIPE

Top of Conduit ~ 1512.16

S=+.00677
S=+.00436
S=+.00800
S=+.00596
S=+.0055

C.G. 18" CM'L & C PIPE

DANGER!!!
STA 502+05 - GT&T CABLE - CALL 213 - 357-2251 PRIOR TO ANY EXCAVATION. HAND EXCAVATE PRIOR TO BACKHOEING OR TRENCHING.

C.G. Elev. 1501.82
C.G. Elev. 1501.02
C.G. Elev. 1504.80
C.G. Elev. 1505.80
C.G. Elev. 1508.80
C.G. Elev. 1509.80
C.G. Elev. 1512.80
C.G. Elev. 1513.72
C.G. Elev. 1517.86
C.G. Elev. 1522.86
C.G. Elev. 1525.40
C.G. Elev. 1527.86
C.G. Elev. 1530.86
C.G. Elev. 1532.86

CLASS 150 PIPE

AM# 448 – 530+07.57
Elev. 16.68' RT.
N 89,684.57
E 85,831.03

AM# 447 – 536+14.76'
Elev. 27.23' RT.
N 89,664.17
E 86,437.93

AM# 446 – 542+23.87
Elev. 23.25' RT.
N 89,673.07
E 87,041.10

AM# 445 – 548+28.81
Elev. 27.89' RT.
N 89,673.07
E 87,651.94

AM# 405 – 554+31.48
Elev. 32.41' RT.
N 89,672.80
E 88,258.37

(SEE LEFT ABOVE)

STA. 532+46.36 = P.I.
DEF. RIGHT 0°48'31"

STA. 530+05.36
DEF. LEFT 0°17'11"

STA. 533+88.03 BK. P.I.
= STA. 533+88.44 AHD.
DEF. LEFT 0°48'31"

SECTION LINE

STA 540+99.92 = P.I.
DEF. LEFT 0°17'12"

FULL WELD - DOUBLE PASS ALL JOINTS -100'

EXISTING E.M.W.D. FORCE MAIN

FULL WELD - DOUBLE PASS ALL JOINTS -20'

FUTURE RAMONA EXPRESSWAY

STA. 542+99.91 = P.I.
DEF. RIGHT 0°17'12"

STA 544+89 INSTALL I.T.S. PIPE STD B-379 INSULATED FLANGE

STA. 540+81.5
LINE VALVE INSTALLATION
SEE STD 1772 FOR DETAIL

EXISTING E.M.W.D. FORCE MAIN

STA. 554+62.12 = P.I.
DEF. LEFT 44°54'30"

SAN JACINTO AVENUE

BERGIN STREET

OLMSTEAD STREET

No 1 1/2

FULL WELD DOUBLE PASS ALL JOINTS 50' EACH WAY

MONTROSE AVENUE

530 535 540 545 550 555

1550 1540 1530 1520

STA. 530+05.36
STA. 531+46.36
STA. 533+88.03 BK. P.I.
STA. 533+88.44 AHD.
STA. 535+61.00
STA. 540+81.50
LINE VALVE
STA. 540+99.92 = P.I.
STA. 542+99.91 ± P.I.
STA. 544+89
STA. 547+62.12 = P.I.
STA. 554+62.12 = P.I.

EXISTING GROUND 7' RIGHT OF ℄ PIPE

EXISTING GROUND 5' RIGHT OF ℄ PIPE

S=+0.00550
S=+0.00838
B=+.0019

C.G. 18" CM'L & C PIPE

C.G. Elev. 1527.85
C.G. Elev. 1529.15
C.G. Elev. 1532.15
C.G. Elev. 1533.52
C.G. Elev. 1535.52
C.G. Elev. 1537.52
C.G. Elev. 1539.52
C.G. Elev. 1541.52
C.G. Elev. 1543.52

CLASS 150 PIPE

B.M. DATA:
N 14.00
E 10.25
N.W. CORNER BERGIN & SAN JACINTO E. W/OF
P.B.# 17293. ELEV 1541.33

C.O. 1870

JOB NO. 65-257.044	DATE	6/17	P-4-6086
DESIGNED RMM	1-71	SHEET OF SHEETS	
DRAWN JMP	1-71		
CHECKED MGS	Feb '71		

CALIF. REG. ENGR. NO. 12116 2-17-71

NESTE, BRUDIN & STONE
INCORPORATED
CIVIL ENGINEERS
535 E. FLORIDA AVENUE HEMET, CALIFORNIA 658-7116

REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APP'VD
1	6-8-71	ARB	Added 100' Stationing to Plan	
2	6-8-71	ARB	Changed ETS to ITS	
3	6-10-71	ARB	Added GT&T Warning - Sta 502+05	
4	6-25-71	MGS	Revised Access St. Hwy 79	
5	8-18-71	ARB	Added Weld Note	
6	2-7-72	RNS	As Constructed	

REFERENCES		

APPROVALS		
DESIGN	CONSTRUCTION	OPERATIONS

SCALE 1"=100' HORIZONTAL 1"=10' VERTICAL	DATE
DESIGNED	
DRAWN	
TRACED	
CHECKED	
SUBMITTED	
RECOMMENDED	

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

I.D. 17 PHASE II EFFLUENT PIPE LINE
SURVEY LINE ℄ BERGIN STREET.
STA. 501+90.13 TO STA. 554+62.12.

2-18-71 APPROVED Charles W. Stone GENERAL MANAGER & CHIEF ENGINEER

SD 1771

COORD. 15,16-O,P

AS CONSTRUCTED

A.M.# 405 – 554+31.42 Elev. 32.41' RT.
N 89,672.80
E 88,254.57

A.M.# 404 – 556+59.36 Elev. 11.37' RT.
N 89,837.73
E 88,433.04

A.M.# 423 – 562+67.94 Elev. 14.05' RT.
N 90,266.92
E 88,864.58

A.M.# 402 – 568+74.71 Elev. 11.30' RT.
N 90,698.60
E 89,291.00

BERGIN ST.

SEE SHEET NO 6

STA. 554+62.12 = P.I.
DEF. LEFT 44° 54' 30"

FULL WELD-DOUBLE PASS ALL JOINTS 50

EXISTING E.M.W.D. FORCE MAIN

FULL WELD-DOUBLE-PASS ALL JOINTS 162'

STA. 567+99 INSTALL 175 PIPE S-70 B-378 INSULATED FLANGE

STA. 569+17.90 = P.I.
DEF. RIGHT 30° 00' 00"

STA. 569+15.43
18" GATE VALVE (215.1 R)

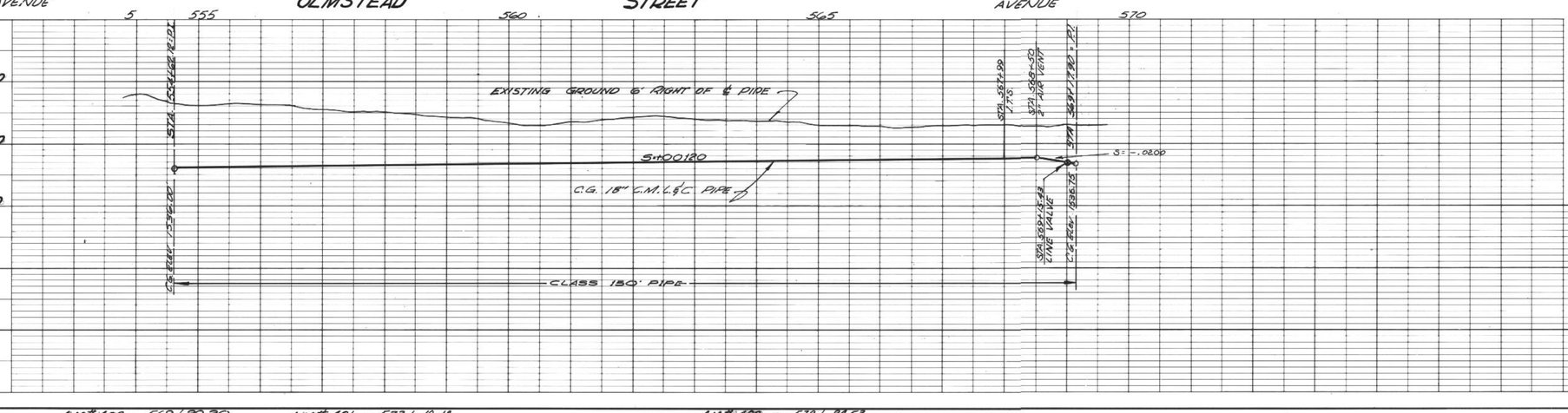
SEE LEFT BELOW

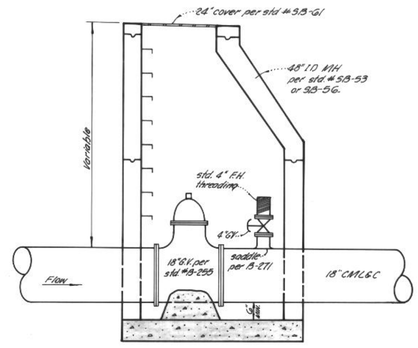
CONNECT LINE TO EXISTING 14" FORCE MAIN. SEE DETAIL ON SHE-ET S.D. 1773

MONTROSE AVENUE

OLMSTEAD STREET

NEW YORK AVENUE





LINE VALVE DETAIL
No Scale

A.M.# 402 – 569+89.20 Elev. 43.19 RT.
N 90,698.60
E 89,291.00

A.M.# 401 – 573+19.18 Elev. 40.93' RT.
N 90,424.88
E 89,568.79

A.M.# 400 – 579+84.53 Elev. 37.43' RT.
N 90,000.00
E 90,000.00

PROPOSED PONDS

STA. 569+17.90 = P.I.
DEF. RIGHT 30° 00' 00"

2" AIR VENT

LINE VALVE & RISER

FULL WELD DOUBLE PASS ALL JOINTS 162'

(SEE DETAIL ON SHEET S.D. 427) & S.D. 1773-1774

SEE RIGHT ABOVE

E.M.W.D. PERCOLATION PONDS

STA. 582+00

STA. 585+05

SEE DETAIL S.D. 1774

CONNECT TO EXISTING LINE (SEE DETAIL ON S.D. 427)

E.M.W.D. PERCOLATION PONDS

OLMSTEAD STREET

NOTE: PONDS 11 THRU 15 CONNECTIONS ABOVE 14" F.M. (ABND.) USED FOR BACKFLOW.

NEW YORK AVENUE

B.M. DATA:
N.1820 - BERGIN
E-10.70 - MONTROSE

RECLAMATION AREA:
2' S.W. OF P.P.# 77489, 860'± N.E. OF MONTROSE & BERGIN ALONG EASTERLY SIDE OF OLMSTEAD. ELEV. 1545.78

C.O. 1278

REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APP'VD
1	6-8-71	ARB	Added 100' Stationing to Plan	
2	6-8-71	ARB	Change E.T.S. to 175.	
3	2-8-72	RNS	As Constructed	
4	3-1883	SRD	LOCATIONS VERIFIED PER J. SYLVA	

REFERENCES

APPROVALS

DESIGN	CONSTRUCTION	OPERATIONS	RECOMMENDED

SCALE 1"=100' HORIZONTAL, 1"=10' VERTICAL

DESIGNED | DRAWN | TRACED | CHECKED | SUBMITTED | DATE

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

I.D. 17 PHASE II EFFLUENT PIPE LINE
OLMSTEAD STREET & NEW YORK AVE.
STA. 554+62.12 TO STA. 569+33.90

2-18-71 APPROVED — GENERAL MANAGER & CHIEF ENGINEER

S.D. 1772

AS CONSTRUCTED

COORD. 15-P

JOB NO.	65-257.044
DESIGNED	R.M.M.
DRAWN	J.M.P.
CHECKED	M.G.S.
DATE	1-71 / 1-71 / Feb '71
SHEET OF SHEETS	7 / 17
	P-4-6086

CALIF. REG. ENGR. NO. 12116 2-17-71

NESTE, BRUDIN & STONE
INCORPORATED
CIVIL ENGINEERS
535 E. FLORIDA AVENUE HEMET, CALIFORNIA 658-7116

ANY FILL DIRT NEED FOR NEW BASINS TO BE TAKEN FROM BASIN NO 14

S 44°49'45" W.

190.00' - S 45°10'15" E

12" VIC METER

12" RSGV

12"45° ELBOW

14"x14"x14" TEE

14"x12" REDUCER

PVT. VALVE

20" STAND PIPE

14"x14"x14" TEE

14" RSGV

14" RSGV

18"x18"x18" TEE

18"x12" INCREASER

18"x18"x18" TEE

8" GV

14" GV

3" CHK V

1" AV

VAULT

18"

6'

14"

DETAIL "A"
NTS

BASIN # 15
ELEV 1540.0

BASIN # 14
ELEV 1541.0

BASIN # 13
ELEV 1542.6

BASIN # 12
ELEV 1543.7

BASIN # 11
ELEV 1545.1

EXISTING BASIN # 10
ELEV. 1546.8

EXIST. BASIN #9

442'±

478'±

470'±

460'±

447'±

12" C.M.L.&C. OVERFLOW LINE SEE DETAIL SHT SD-1774

REMOVE & SALVAGE EXIST. FENCE FOR NEW FENCING ALIGNMENT.

8" UNDERDRAIN SEE DETAIL BELOW TYPICAL FOR EACH BASIN

TOP OF DIKE

34'-0"

VALVE CAN

8" PVC PIPE

8" BV

BOTTOM OF BASIN

TYPICAL UNDERDRAIN
NTS

50'R

200' TYP.

100' TYP.

5'

40'

Concrete Box Culvert Screened Opening

60' TYP.

OLMSTED STREET

EXISTING 14" PIPE (ABAND.)

8" CML&C

8" B.V.

EXISTING 14" PIPE (ABANDON)

21" C.M.L.&C.

B.M. 1547.49

12" WELL CASING (EXISTING) OF FORCE MAIN

REMOVE EXISTING 70' GATE AND USE @ OLMSTED ST.

NEW YORK AVENUE

40'

30'

30'

65'

5'

STA. 570+50

STA. 572+50

STA. 574+50

STA. 576+50

STA. 578+50

STA. 581+90
21"x12" CROSS

582'±

SEE SD-427

76'-0"±

55.5'±

51.5'±

4'-0"

18.5'±

5'-0"

TOP OF DIKE - POND 15 ELEV. = 1544.0

DEBRIS SCREEN

RIP RAP

C.G. ELEV 1546.50

2"45° ELBOW

VAULT

FLOW

PIPELINE

12"

EXIST 18" C.M.L.C. STA 569+23.00 I.G. ELEV 1537.75 PER SD-422

12" R.S.G.V.

12" MONUMETER ACRE FEET

TOE OF DIKE - POND 15 ELEV. = 1540.0

SECTION B-B
NTS

GRADING QUANTITIES
EXCAVATION 13,261 CY
EMBANKMENT 7,867 CY

EXIST. BASIN # 10

BASIN # 11

BASIN # 12

BASIN # 13

BASIN # 14

BASIN # 15

DIKE ELEV. 44.0

FLOOR ELEV. 40.0

DIKE ELEV. 44.8

FLOOR ELEV. 41.5

DIKE ELEV. 46.0

FLOOR ELEV. 43.1

DIKE ELEV. 47.0

FLOOR ELEV. 44.3

DIKE ELEV. 48.0

FLOOR ELEV. 45.0

EXIST. DIKE ELEV. 1550.0

"A-A" CROSS SECTION
SCALE: 1"=6'-0"

EMWD INSPECTOR MIKE ALLEN

REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APP'VD
1	1-21-71	KNS	As Constructed	
2	6-26-71	CMS	Added 14" Pipe and Inlet To Basin #14	CM
3	5-27-96	JG	ADDED CK V PER FIELD NOTE	
4	7-16-96	REF	AS CONST'D C.O. 45940 (11-94 C.O.)	MS 4/1/96
			PER EMWD INSPECTOR'S AS BUILTS	

REFERENCES

APPROVALS

DESIGN	CONSTRUCTION	OPERATIONS

SCALE 1"=50' DESIGNED DRAWN JEW TRACED CHECKED SUBMITTED RECOMMENDED

DATE

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY CALIFORNIA

ID-17 PHASE II EFFLUENT LINE

RECLAMATION PONDS & DETAILS

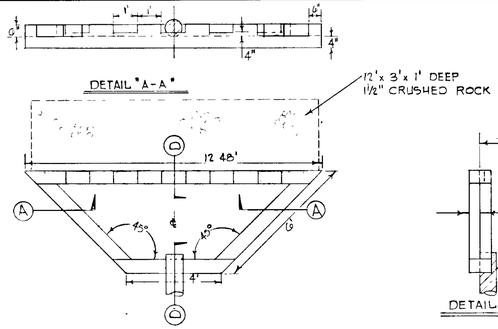
APPROVED 2-18-71 GENERAL MANAGER & CHIEF ENGINEER

SD-1775

SHEET 8 OF 17 SHEETS

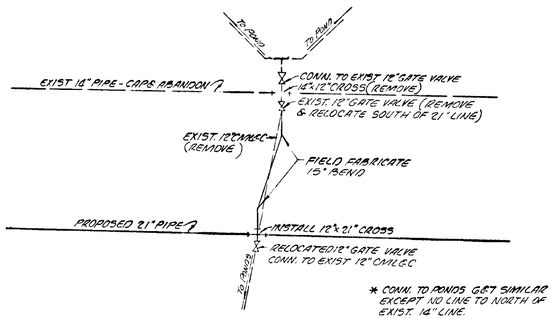
10-167

AS CONSTRUCTED



SPLASH PAD DETAIL

SCALE : 1"= 3'-0"

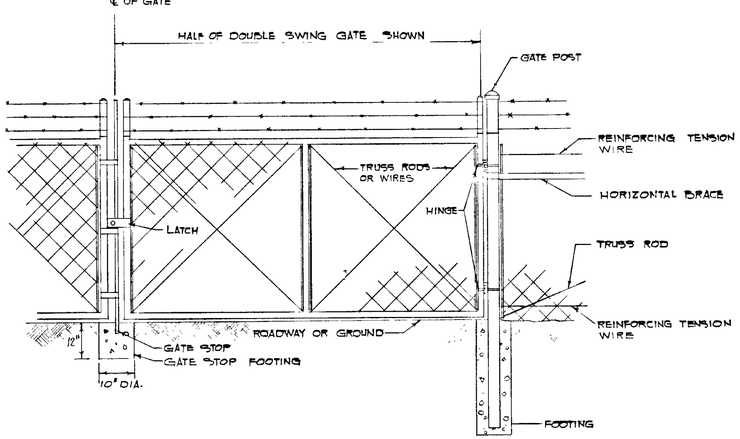


CONNECTION DETAILS

@ BASIN 5,8,9 & 10 *

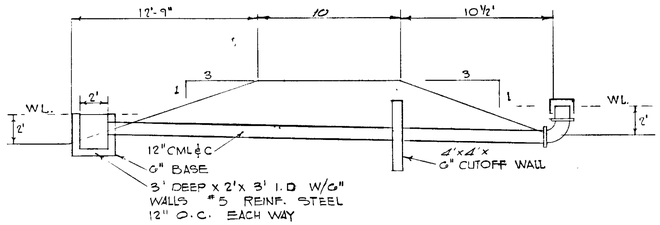
Sta 582+00 ±

Sta 585+05 ±



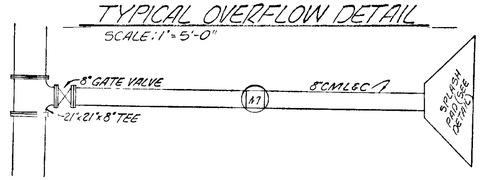
EXISTING GATE DETAIL

SCALE: ½" = 1'-0"

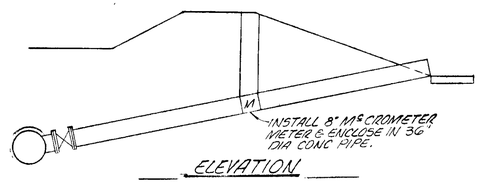


TYPICAL OVERFLOW DETAIL

SCALE: 1"= 5'-0"



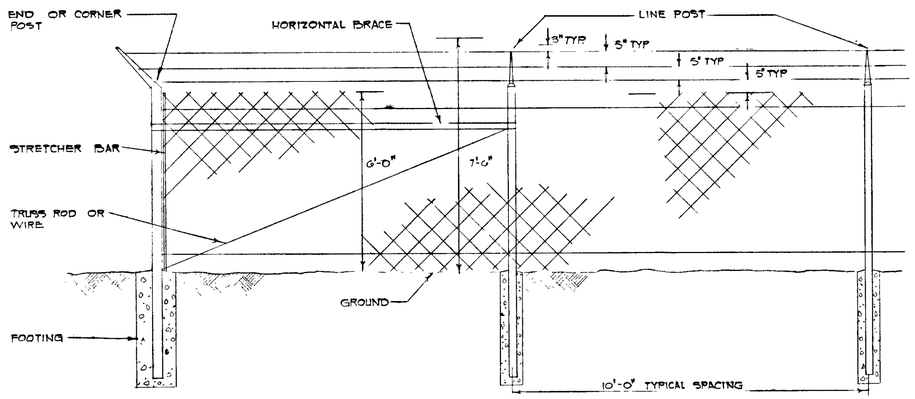
PLAN



ELEVATION

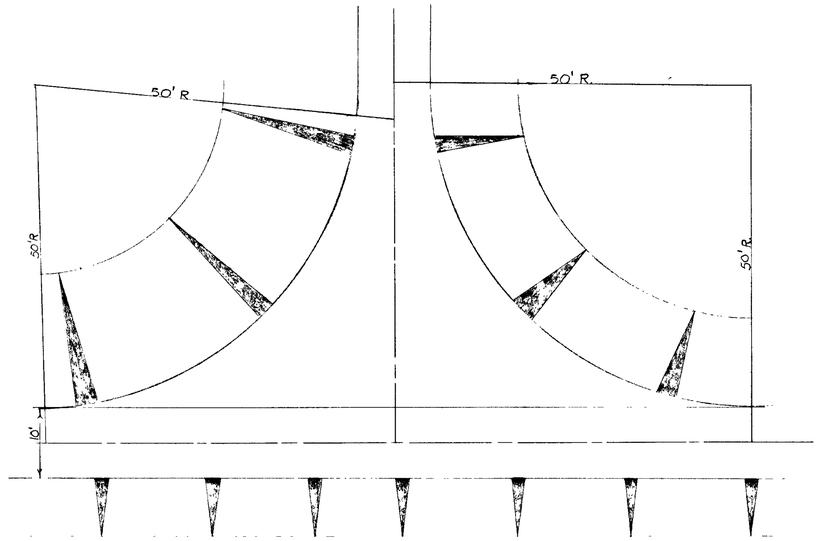
OUTLET PIPE

NO SCALE



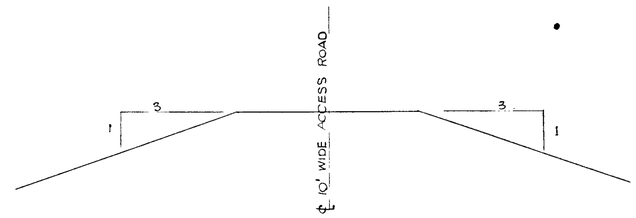
EXISTING TYPICAL ELEVATION OF FENCE

SCALE: ½"= 1'-0"



BASIN ACCESS ROAD

SCALE : 1"= 10'



ACCESS ROAD CROSS SECTION

SCALE : 1"= 4'

REVISIONS					REFERENCES	SCALE	DATE
NO.	DATE	INITIAL	DESCRIPTION	APP'VD		DESIGNED	
11578		KHC	AS CONSTRUCTED			DRAWN	
						TRACED	
						CHECKED	
					APPROVALS	SUBMITTED	
					DESIGN / CONSTRUCTION / OPERATIONS	RECOMMENDED	

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY CALIFORNIA

ID-17 PHASE II EFFLUENT PIPE LINE

DETAIL SHEET

2-18-71 APPROVED — GENERAL MANAGER & CHIEF ENGINEER

SD-1774

AS CONSTRUCTED

SHEET 9 OF 17 SHEETS

REMOVE & SALVAGE CHAIN LINK FENCE

TOE OF SLOPE

INV = 1496.50
CONST 4'x4'x6' CONC. SPLASH PAD

INV = 1497.30
CONST 4'x4'x6' CONC. SPLASH PAD

Finished Elev At Pond Bottom = 1496.7

Finished Elev At Pond Bottom = 1497.7

Finished Elev At Pond Bottom = 1498.7

SEE SHEET 9 (SD. 1776)

INSTALL SALVAGED 6' CHAIN LINK FENCE

FURNISH & INSTALL NEW 6' CHAIN LINK FENCE

INSTALL NEW 6' CHAIN LINK FENCE INSIDE EXISTING FENCE

GROUND LINE

COMPACTED SUBGRADE

1:1 SLOPE

2'-4"

6"

8.0'

30.0'

SECTION B-B

2" AC X 3' WIDE DOWN DRAIN FLARED TO 5' AT TOP WITH ROCK RIP-RAP AT TOE.

2.0' MIN.

1.0' MIN.

Water Surface

3:1 SLOPES

NATURAL GROUND

SECTION A-A

NO SCALE

TREATMENT PLANT PONDS

JOB NO 65-257.044	DATE 10/17	SHEET OF SHEETS P-4-6072
DESIGNED RK		
DRAWN JMP		
CHECKED MGS		

CALIF REG ENGR NO 12116 2-15-71

NESTE, BRUDIN & STONE
INCORPORATED
CIVIL ENGINEERS
535 E FLORIDA AVENUE HEMET, CALIFORNIA 658-7116

REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APP'VD
1	2.28.72	RNS	AS CONSTRUCTED	

REFERENCES

APPROVALS

DESIGN	CONSTRUCTION	OPERATIONS	RECOMMENDED

SCALE: 1" = 50'

DESIGNED

DRAWN

TRACED

CHECKED

SUBMITTED

DATE

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

I.D. 17 PHASE II EFFLUENT PIPE LINE

DISPOSAL PONDS

2-18-71 APPROVED GENERAL MANAGER & CHIEF ENGINEER

SD 1775

AS CONSTRUCTED

COOKE. 10-N

REMOVE EXISTING FENCE
FURNISH & INSTALL NEW 6' CHAIN LINK FENCE

TOE OF SLOPE

BOTTOM ELEV. = 1492.00
SALT POND

"A" "A"

Place Filter Material Per Sec A-1

A.C. PAVED RAMP & 4"x4'0" SPLASH PAD

CO#1 8"CI 45°ELL STA 10+50
INV. EL. 1492.80 (2)

8" P.V.C. IRRIG. (2)

2" PVC SCHEDULE 80 BY OTHERS

11+00 (2)
INV. EL. 1492.51 LOW POINT FOR FTR. PUMP

3" PVC. SUP.

12+32 SEE SD-1696 FOR CONT.

8" P.V.C. SUP.

8" P.V.C. IRRIG. T.P. 1491.86

8" C.I. TEE 10+00
INV. EL. 1495.24 (2)

END 8" P.V.C. 9+76± (2)

B.H.-1

B.H.-2

B.H.-3

B.H.-4

B.H.-5

B.H.-6

Finished Elev. At Pond Bottom

6" GATE VALVES

395' 6" P.V.C.

C.O. 1863

STAINLESS M.H.

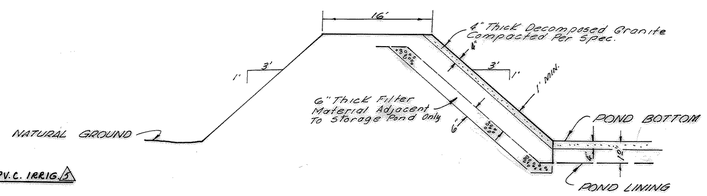
8" IRRIGATION (2)

REMOVE EXISTING FENCE & INSTALL STAGGED FENCE

REMOVE & REINSTALL 6' FENCE ON WEST SIDE OF PONDS (INCLUDING GATE)

SEE SHEET 8 (SD.1775)

SECTION "A"-"A"
NO SCALE

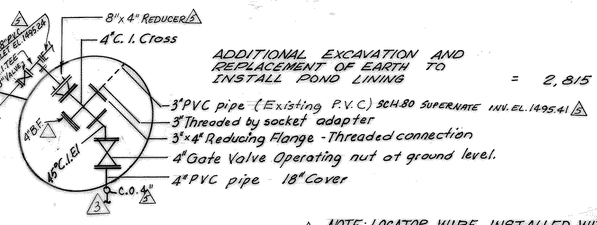


△NOTE: SEE P.C.O. #5

EARTH WORK

TOTAL EMBANKMENT	= 14,524 C.Y.
TOTAL EXCAVATION	19,365 C.Y.

ADDITIONAL EXCAVATION AND REPLACEMENT OF EARTH TO INSTALL POND LINING = 2,815 C.Y.



△NOTE: LOCATOR WIRE INSTALLED WITH 8" SUPERNATE LINE. END LOCATED AT 4" CROSS, CLEAN OUT #3, CLEAN OUT #5 AND CLEANOUT #6.

INSIDE TOE OF EXISTING POND

12" C.M.L. & C.

12" GV

18"x18"x12" TEE

12" RSGV

14" RSGV

See S.D. 1767

JOB NO. 65-257.044	DATE	11/17	SHEET OF SHEETS	P-4-6072
DESIGNED R.K.				
DRAWN J.N.P.				
CHECKED M.G.S	Feb '71			

CALIF. REG. ENGR. NO. 12116 2-17-71

NESTE, BRUDIN & STONE
INCORPORATED
CIVIL ENGINEERS
535 E. FLORIDA AVENUE HEMET, CALIFORNIA 658-7116

REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APP'VD
1	2-8-72	RNS	As Constructed	
2	3-8-74	CMS	added Test Wells	
3	9-16-74	M.C.A	As Constructed C.O. 1726	
4	6-11-76	CMS	As Constructed C.O. 1863	
5	5-3-86	SD	AS CONSTRUCTED C.O. 4840 SPEC 255.3	
6	11-28-07	PDDM	AS CONST ACCT 06400 (CR 10-9-07)	

REFERENCES		

APPROVALS			
DESIGN	CONSTRUCTION	OPERATIONS	RECOMMENDED

SCALE: 1" = 50'	DATE
DESIGNED	
DRAWN	
TRACED	
CHECKED	
SUBMITTED	

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

I.D. 17 PHASE II EFFLUENT PIPE LINE

DISPOSAL PONDS

TREATMENT PLANT PONDS

2-18-71 APPROVED — GENERAL MANAGER & CHIEF ENGINEER — S.D. 1776

AS CONSTRUCTED

COORD. 16-N

Appendix C

Conveyance Facilities Study Technical Memo

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Memorandum

To: *David Ahles, P.E., Senior Civil Engineer, Eastern Municipal Water District*

From: *Robert Chalmers, P.E., Vice President, CDM Smith*

Date: *June 9, 2017, Revised September 13, 2017*

Subject: *Conveyance Facilities Study Technical Memorandum*

As part of the Indirect Potable Reuse (IPR) preliminary design project, this Conveyance Facilities Study Technical Memorandum has been prepared for Eastern Municipal Water District (EMWD or District). This memorandum has been prepared to evaluate two (2) alternative conveyance alignments for recycled water from the Alessandro Ponds to the Mountain Avenue East and West ponds.

Section 1 - Background

EMWD has initiated the development of an IPR program. IPR is the process of using recycled water to replenish groundwater aquifers to supplement the local water supply. Implementation of IPR is consistent with EMWD's objectives to fully utilize recycled water within its service area (no discharge of recycled water), maximize the potable water offset, create new local potable water supplies, minimize cost, and manage the salt balance in the groundwater basin.

The program began with the preparation of the San Jacinto Upper Pressure Management Zone (SJUPMZ) Indirect Potable Reuse Phase I Study (CDM Smith, January 2014). The Phase I Study included an evaluation of five (5) IPR project alternatives for recharge into the SJUPMZ, including recycle water treatment, recharge method and locations, conveyance and brine management recommendations for each alternative. The recommended alternatives were: Alternative No. 2, blend of recycled water and reverse osmosis (RO) permeate; and Alternatives No. 5, phased approach with Phase I including only recharge of recycled water and Phase II including a blend of recycled water and RO permeate.

Following the Phase I Study, an IPR Program Definition Study was prepared and included a comparison of projects for both the SJUPMZ and for the Perris South Management Zone (PSMZ) (CDM Smith, May 2016). This study evaluated five (5) alternatives with varying recharge into PSMZ and/or SJUPMZ. The study recommended recharge into SJUPMZ with a blend of recycled water and RO permeate.

EMWD established goals that anticipate a two-phase implementation program with a Phase I capacity of 4,000 acre-feet per year (AFY) and a Phase II expansion of 11,000 AFY for a 15,000 AFY

total IPR project. The preliminary design includes the design for the 4,000 AFY IPR project with 2,000 AFY for RO permeate and 2,000 AFY for tertiary recycled water (tertiary RW). It should be noted that these capacities vary from what was included in the previous studies and represent the current flow capacities established by EMWD.

Section 1.1 IPR Capacity

In a preliminary design meeting with EMWD on January 12, 2016, CDM Smith was advised to adjust the flow capacities from a 30% RO permeate/70% tertiary RW blend to a 50 percent RO permeate/50 percent tertiary RW blend. This equates to approximately 2,000 AFY for tertiary RW and 2,000 AFY for RO permeate for Phase I, and 7,500 AFY for tertiary RW and 7,500 AFY for RO permeate for Phase II.

Section 1.2 AWTF and Alessandro Ponds

The project will include the design of an AWTF including microfiltration (MF) and RO treatment processes. The AWTF will be sized to produce 2,000 AFY for Phase I and 7,500 AFY for Phase II. Assuming a 90 percent online factor, the AWTF will be sized for approximately 2.0 MGD for Phase I and approximately 7.5 MGD for Phase II. The current proposed design includes a finished water pumping station to convey RO permeate from the AWTF to the Mountain Avenue West and East Ponds via Alessandro Ponds.

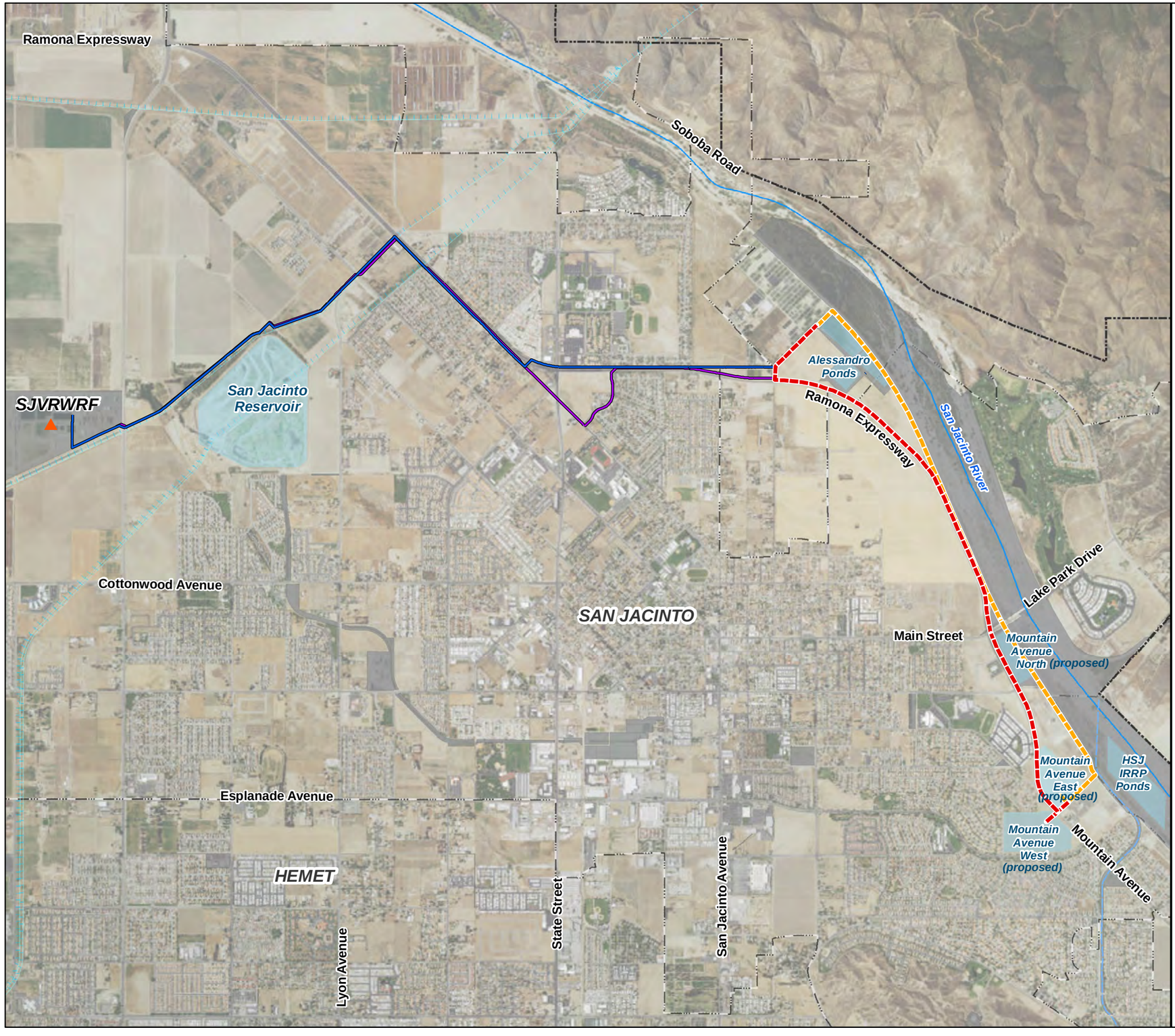
A draft memorandum prepared by CDM Smith entitled "RO Permeate Conveyance Study Technical Memorandum" dated March 3, 2017 provides an evaluation of conveyance of RO permeate from the AWTF to Alessandro Ponds. The final recommendation of the draft memorandum included slip-lining an existing 18-in steel pipeline for Phase I flow. A new 24-inch HPDE pipeline is recommended for Phase II flows; however, EMWD may be able to utilize existing pipelines depending on variations of the future expansion. The existing 18-inch pipeline is shown in **Figure 1-1.**

Tertiary RW will be blended with RO permeate at Alessandro Ponds and then conveyed to the Mountain Avenue East and West Ponds for recharge. **Figure 1-2** includes a flow schematic depicting conveyance from the AWTF to the Mountain Avenue East and West Ponds and includes blending at Alessandro Ponds.

Purpose of Study

This memorandum summarizes conveyance from Alessandro Ponds to the Mountain Avenue East and West Ponds and includes:

1. Alternative Alignment Selection,
2. Alternatives analysis of the two (2) alignments, and
3. Final evaluation and recommendation for alignment.



Legend

- Incorporated City Boundary
- Eastern Municipal Water District Boundary
- Easements
- Existing 18" Abandoned Reclaimed Water Line
- Existing 36" Tertiary Water Pipeline
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 1
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 2
- Canals
- San Jacinto River
- Other Streams
- Treatment Plant

Note:
Proposed alternative pipelines are approximate
and shall be adjusted based upon conditions in the field.

NORTH

0 1,500 3,000 6,000
Feet

Eastern Municipal Water District
Indirect Potable Reuse
Preliminary Design

Figure 1-1
Existing Conveyance

Overall Plan for Conveyance of
Indirect Potable Reuse Project

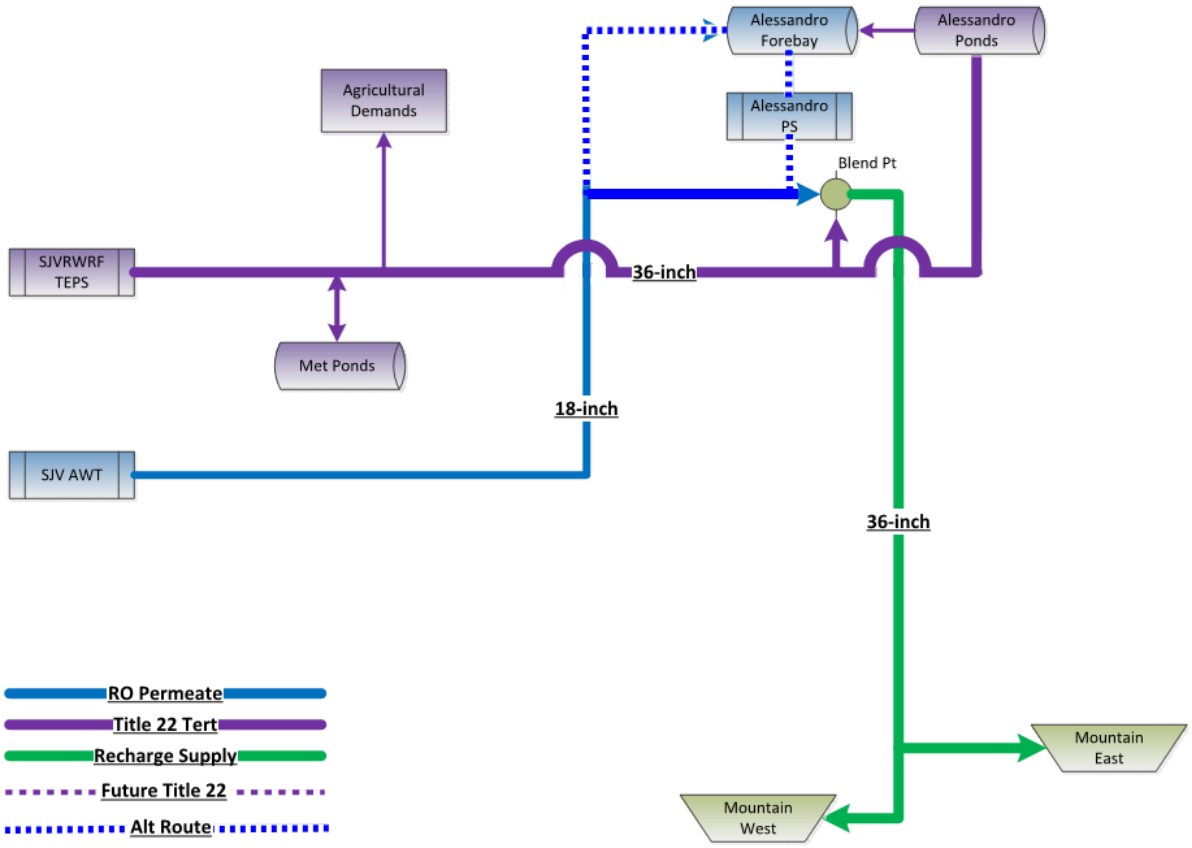


Figure 1-2
Indirect Potable Reuse (IPR) Preliminary Design Flow Schematic

Section 2 - Alternative Alignment Selection

The following alternative alignments were recommended for evaluation from Alessandro Ponds to the Mountain Ave East and West Ponds and depicted on Figure 1-1.

Section 2.1 - Alternative No. 1 – Conveyance Along the Roadway

This alternative conveys blended tertiary treated water from the Alessandro Points to the Mountain Avenue Ponds primarily along the Ramona Expressway. The proposed 36-inch blended tertiary treated water pipeline will have a total approximate length of 15,370 feet. This proposed alternative will begin at the Alessandro Pond pump station and convey flow along Olmstead Street to the intersection of Ramona Expressway. The proposed pipeline will continue along the east shoulder of Ramona Expressway until it reaches the northeast corner of the Mountain Avenue West Pond, located approximately 900 feet south of the intersection of Old Mountain Avenue and Ramona Expressway. The proposed route will terminate at the Mountain Avenue East and West ponds. The east shoulder of Ramona Expressway was recommended over the west shoulder to reduce roadway crossings.

Section 2.2 - Alternative No. 2 – Conveyance Along the Creek

This alternative conveys blended tertiary treated water from the Alessandro Points to the Mountain Avenue Ponds along the trough located adjacent to raised roadway that runs along the San Jacinto River. The proposed 36-inch blended tertiary treated water pipeline will have a total approximate length of 15,380 feet. This proposed alternative will begin at the Alessandro Pong pump station and convey flow east to creek running east along the Alessandro Ponds. The proposed pipeline will continue along the creek bed until it reaches the northeast corner of the Mountain Avenue East Pond, located approximately 4,500 feet south of where the alignment crosses East Main Street. The proposed pipeline will then turn 90 degrees southeast and run along the south end of the Mountain Avenue East Pond to the northeast corner of the Mountain Avenue West Pond. The proposed route will terminate at the Mountain Avenue West Pond with outfall into both the Mountain Avenue West and East ponds.

Section 3 - Alternatives Analysis

A methodology was developed to evaluate the two proposed pipeline alignments (Alternative No. 1 and Alternative No. 2). The results of the analysis are provided in the following sections:

Section No.	Description
3.1	Minimization of Overall Length
3.2	Easements and Right-of-Way
3.3	Avoidance of Conflicts with Other Buried Utilities
3.4	Minimization of Traffic and Community Disruption
3.5	Avoidance of Sensitive Receptors (hospitals, schools, police, fire, other)
3.6	Consideration of Pipeline Construction Techniques
3.7	Permitting Requirements
3.8	Environmental Impacts
3.9	Construction and Capital Costs

Section 3.1 - Minimization of Overall Length

Table 3-1 provides an overview of the length of each alternative alignment.

Table 3-1 Alternative Length Comparison

Alternative	Length (feet)
Alternative No. 1 – Along Roadway	15,365
Alternative No. 2 – Along Creek	15,382

The alternatives have relatively similar proposed lengths with the alignment for Alternative No. 2 being approximately 20 feet longer than the Alternative No. 1 alignment.

Section 3.2 - Easements and Right-of-Ways

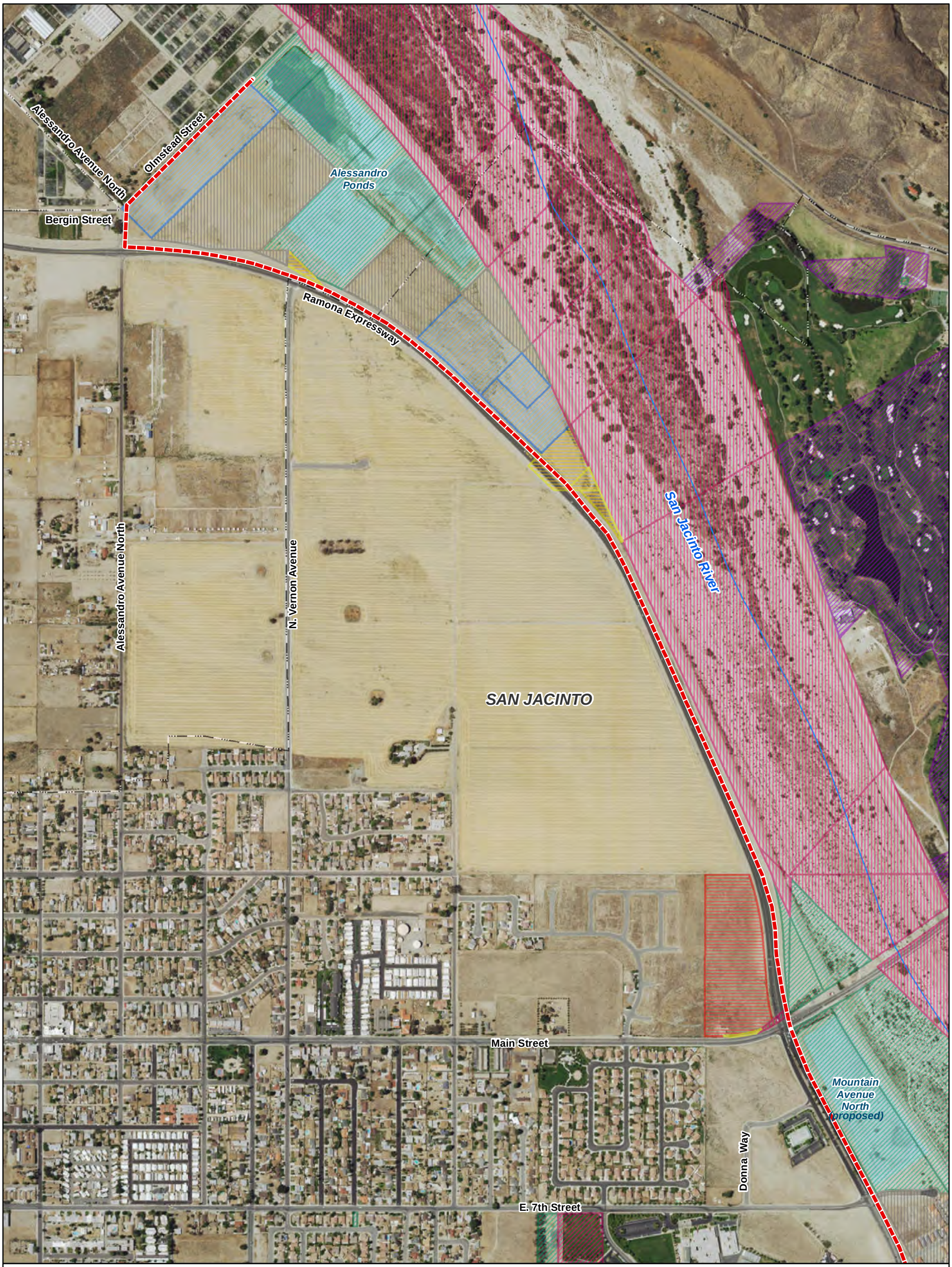
Existing GIS data was reviewed to determine locations that may require obtaining easements for each of the proposed alignments. No title report search was completed to investigate the potential for existing easements and constraints over private property portions of the proposed alignments.

Existing public and private easements were identified and evaluated for each alternative as potential constraints to working within these easements. The existing easements located along the length of each alternative can be found in **Figure 3-1a** and **Figure 3-1b** for Alternative No. 1 and **Figure 3-2a** and **Figure 3-2b** for Alternative No. 2.

Table 3-2 below presents available easement information taken from available GIS data of the properties and easements found along both alignment alternatives.

Table 3-2 Available Easement Information

Property Owner / Easement Stake Holder	Alternative No. 1 – Along Roadway	Alternative No. 2 – Along Creek
Riverside County Flood Control and Water Conservation District	It appears that the Riverside County Flood Control parcel crossing the existing roadway right-of-way at the intersection of Ramona Expressway and East Main Street. Further discussion with the is recommended to determine the extent of their property line.	Along the majority of the east side of the proposed alignment
Curci San Jacinto Investors, LLC	None	Along the west side of the proposed alignment about 1/2 to 3/4 of a mile south of Alessandro Ponds
County of Riverside	It appears that the County of Riverside parcel crossing the existing roadway right-of-way approximately one mile south of the intersection of Ramona Expressway and Alessandro Avenue North. Further discussion with the County of Riverside is recommended to determine the extent of their property line.	Along the west side of the proposed alignment about ¾ of a mile south of Alessandro Ponds
Maravilla Partners, LLC	None	Along the west side of the proposed alignment located on the northeast side of the Mountain Ave East Ponds.
Residential	None	Along west side of the proposed alignment just south of Alessandro Ponds and north of Mountain Avenue East Pond. Residential property is also located south of the Mountain Ave East Pond adjacent to the proposed alignment's crossing to the Mountain Avenue West Pond.



Legend

- Incorporated City Boundary
- Eastern Municipal Water District Boundary
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 1
- Canals
- San Jacinto River
- Other Streams

Note:
Proposed Alternative 1 pipeline is approximate and shall be adjusted based upon conditions in the field.

- County of Riverside
- CURCI San Jacinto INV
- Eastern Municipal Water District
- Latham Management & Consulting Service Inc.
- Riverside County Flood Control
- San Jacinto Unified School District
- USA BIA
- Residential / Private Owner

NORTH

0 375 750 1,500

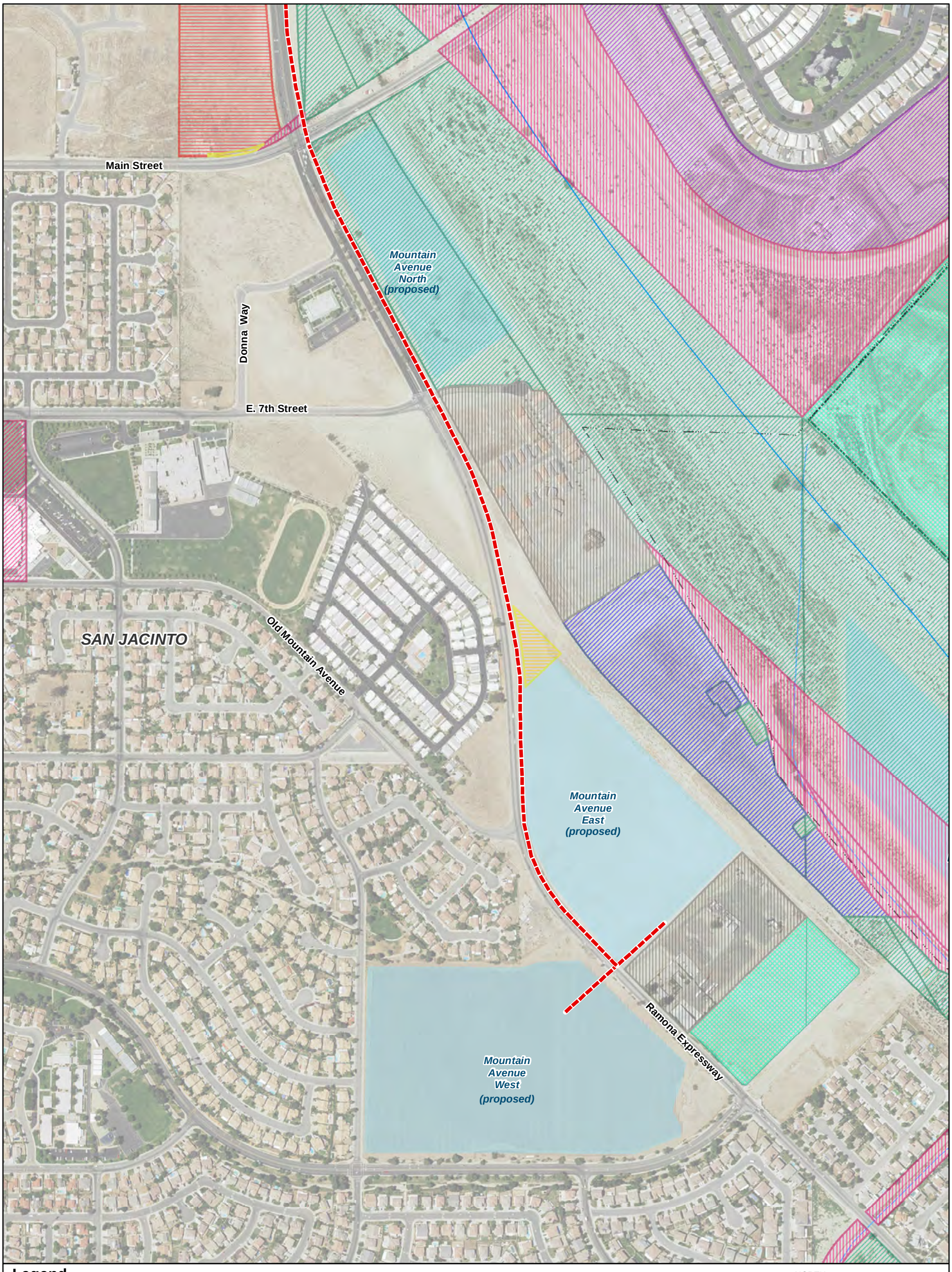
Feet

Eastern Municipal Water District
Indirect Potable Reuse
Preliminary Design

Figure 3-1a

Alternative No. 1 - Along Roadway Easements - Northern Section

Overall Plan for Conveyance of
Indirect Potable Reuse Project



Legend

- Incorporated City Boundary
- Eastern Municipal Water District Boundary
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 1
- Canals
- San Jacinto River
- Other Streams
- County of Riverside
- CURCI San Jacinto INV
- Eastern Municipal Water District
- Latham Management & Consulting Service Inc.
- Maravilla Partners II
- Riverside County Flood Control
- San Jacinto Unified School District
- SOBOBA BAND OF LUISENO INDIANS; USA SOBOBA INDIAN RES 547; USA 547
- USA BIA
- Residential / Private Owner

Note:
Proposed Alternative 1 pipeline is approximate and shall be adjusted based upon conditions in the field.

NORTH

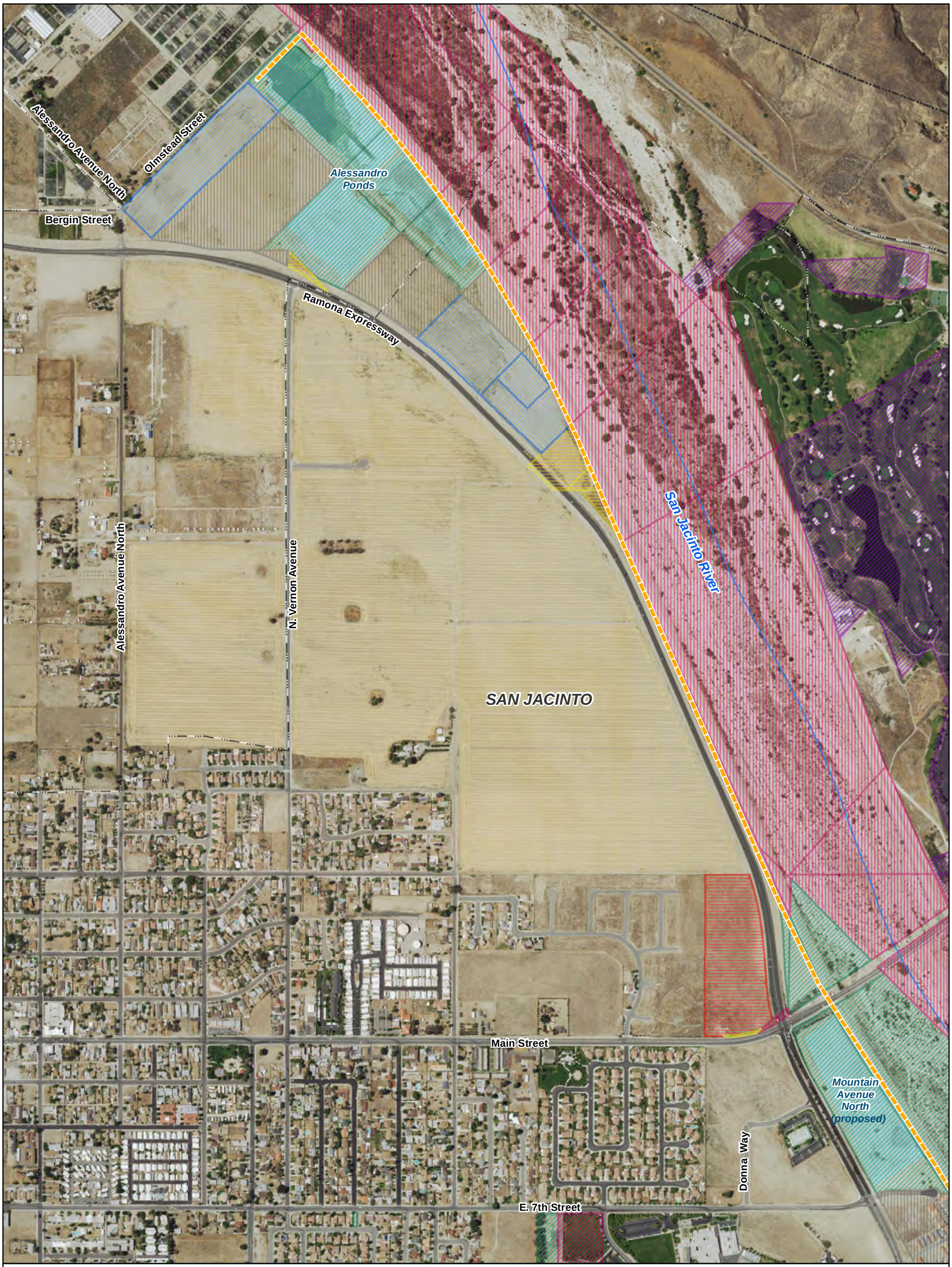
0 250 500 1,000
Feet

Eastern Municipal Water District
Indirect Potable Reuse
Preliminary Design

Figure 3-1b

Alternative No. 1 - Along Roadway Easements - Southern Section

Overall Plan for Conveyance of
Indirect Potable Reuse Project



Legend

- Incorporated City Boundary
- Eastern Municipal Water District Boundary
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 2
- Canals
- San Jacinto River
- Other Streams

Note:
Proposed Alternative 2 pipeline is approximate and shall be adjusted based upon conditions in the field.

- County of Riverside
- CURCI San Jacinto INV
- Eastern Municipal Water District
- Latham Management & Consulting Service Inc.
- Riverside County Flood Control
- San Jacinto Unified School District
- USA BIA
- Residential / Private Owner

NORTH

0 375 750 1,500

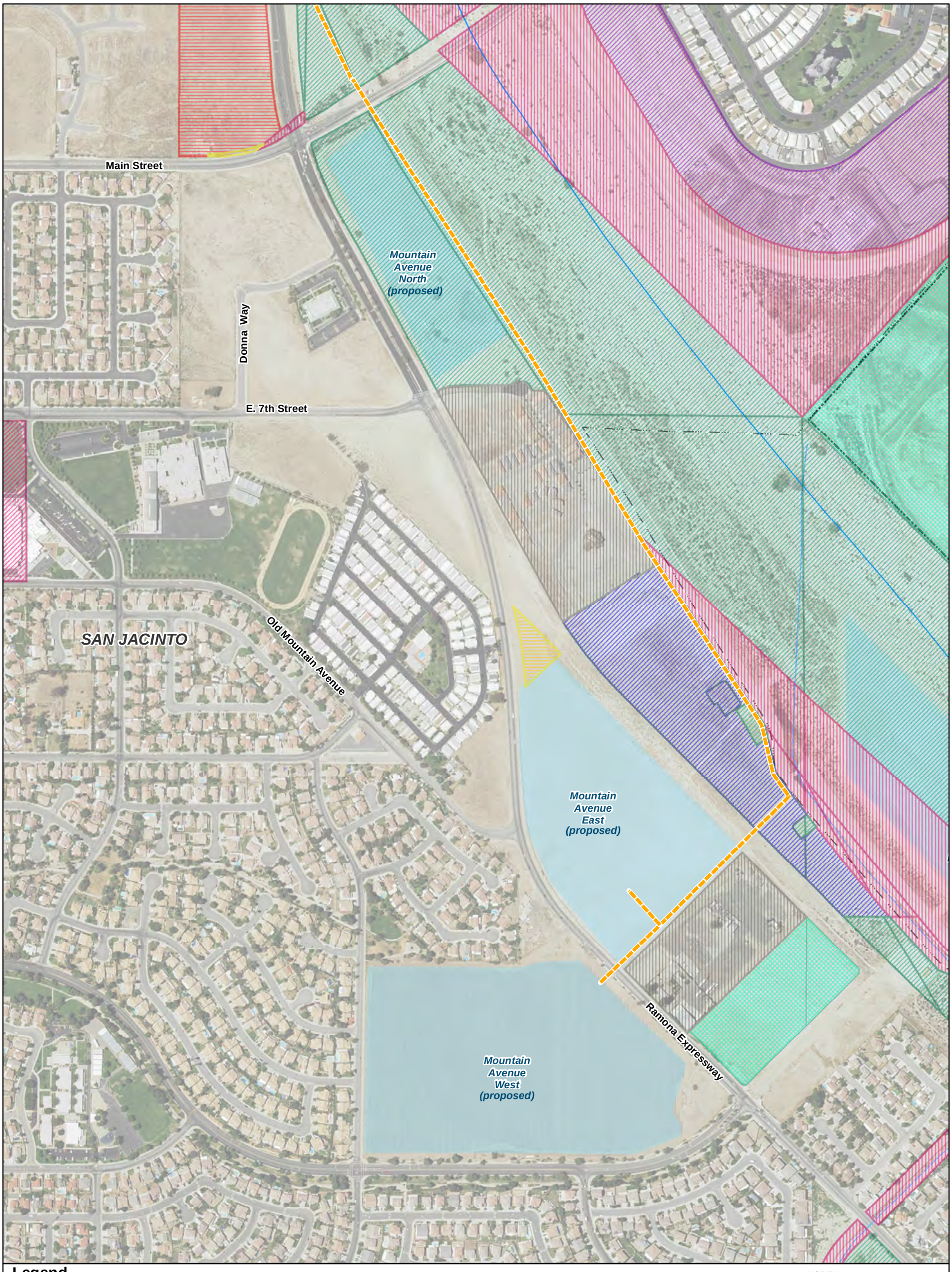
Feet

Eastern Municipal Water District
Indirect Potable Reuse
Preliminary Design

Figure 3-2a

Alternative No. 2 - Along Creek Easements - Northern Section

Overall Plan for Conveyance of Indirect Potable Reuse Project



Legend

- Incorporated City Boundary
- Eastern Municipal Water District Boundary
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 2
- Canals
- San Jacinto River
- Other Streams
- County of Riverside
- CURCI San Jacinto INV
- Eastern Municipal Water District
- Latham Management & Consulting Service Inc.
- Maravilla Partners II
- Riverside County Flood Control
- San Jacinto Unified School District
- SOBOBA BAND OF LUISENO INDIANS; USA SOBOBA INDIAN RES 547; USA 547
- USA BIA
- Residential / Private Owner

Note:
Proposed Alternative 2 pipeline is approximate and shall be adjusted based upon conditions in the field.

NORTH

0 250 500 1,000
Feet

Eastern Municipal Water District
Indirect Potable Reuse
Preliminary Design

Figure 3-2b

Alternative No. 2 - Along Creek Easements - Southern Section

Overall Plan for Conveyance of
Indirect Potable Reuse Project

The majority of Alternative No. 1 alignment is within the existing street right-of-way. The Alternative No. 2 alignment mainly runs through private properties and existing easements. Based on the information provided in Table 3-2 above, the Alternative No. 1 alignment is less likely to require easements as compared to the Alternative No. 2 alignment.

Section 3.3 - Avoidance of Conflict with Other Buried Utilities

An investigation was conducted into existing utilities for the two alignment alternatives. Utility infrastructure maps for both alignments were requested using the Digalert Utility Notification System located at www.digalert.org. A total of nine (9) utility purveyors were identified, contacted and as-built drawings requested.

The following rating system was utilized to indicate project impact on existing utilities:

- **High (H)** – More than two parallel utilities or more than two crossing utilities within 100 feet.
- **Medium (M)** – More than one parallel utilities or more than one crossing utilities within 100 feet.
- **Low (L)** – One parallel utility or one crossing utility.
- **None** – No impacts, no utilities found within project area.

Parallel utilities are defined at utility lines within 50-feet in either direction of the proposed alignment.

The existing utilities located along the length of each alternative can be found in **Figure 3-3a** to **Figure 3-3c** for Alternative No. 1 and **Figure 3-4a** to **Figure 3-4c** for Alternative No. 2.

Table 3-3 summarizes potential utility conflicts associated with each alignment at the various locations indicated in **Table 3-4** and **Table 3-5.** Each utility has been provided a rating to relate its potential impact; high, medium or low to the pipeline as follows:

Table 3-3 Potential Impacts to Existing Utilities

Utility	Alternative No. 1 – Along Roadway	Alternative No. 2 – Along Creek
Frontier – Telecom	Low	Low
Time Warner – Cable	Low	Low
Sunesys/Crown Castle – Fiber Optics	None	None
SC Edison – Power	Low	Low
SC Gas	Low	Low
City of San Jacinto	Medium	Low
City of Hemet	None	None
Lake Hemet MWD	None	None
EMWD	Medium	Medium



Legend

- Incorporated City Boundary
- Eastern Municipal Water District Boundary
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 1
- Eastern Municipal Water District 18" PVC Sewer Line
- Southern California Edison Underground Power Lines
- Frontier Buried Cable
- Frontier Conduit
- Time Warner Aerial Facilities
- Hand Hole
- Power Pole
- # Impact Location Number

Note:
Proposed Alternative 1 pipeline is approximate
and shall be adjusted based upon conditions in the field.

NORTH

0 200 400 800

Feet

Eastern Municipal Water District
Indirect Potable Reuse
Preliminary Design

Figure 3-3a

Alternative No. 1 - Along Roadway Existing Utilities - Northern Section

Overall Plan for Conveyance of
Indirect Potable Reuse Project



Legend

- Incorporated City Boundary
- Eastern Municipal Water District Boundary
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 1
- Eastern Municipal Water District Distribution Water Line
- Eastern Municipal Water District Transmission Water
- Eastern Municipal Water District Sewer Line
- Southern California Gas Company Lines
- Southern California Edison Underground Power Lines
- # Impact Location Number
- City of San Jacinto 12" A.C.P. Water Line
- City of San Jacinto 16" PVC Water Line
- City of San Jacinto 8" Sewer Line
- Frontier Conduit
- Time Warner Aerial Facilities
- Time Warner Underground Facilities
- Power Pole

Note:
Proposed Alternative 1 pipeline is approximate and shall be adjusted based upon conditions in the field.

NORTH

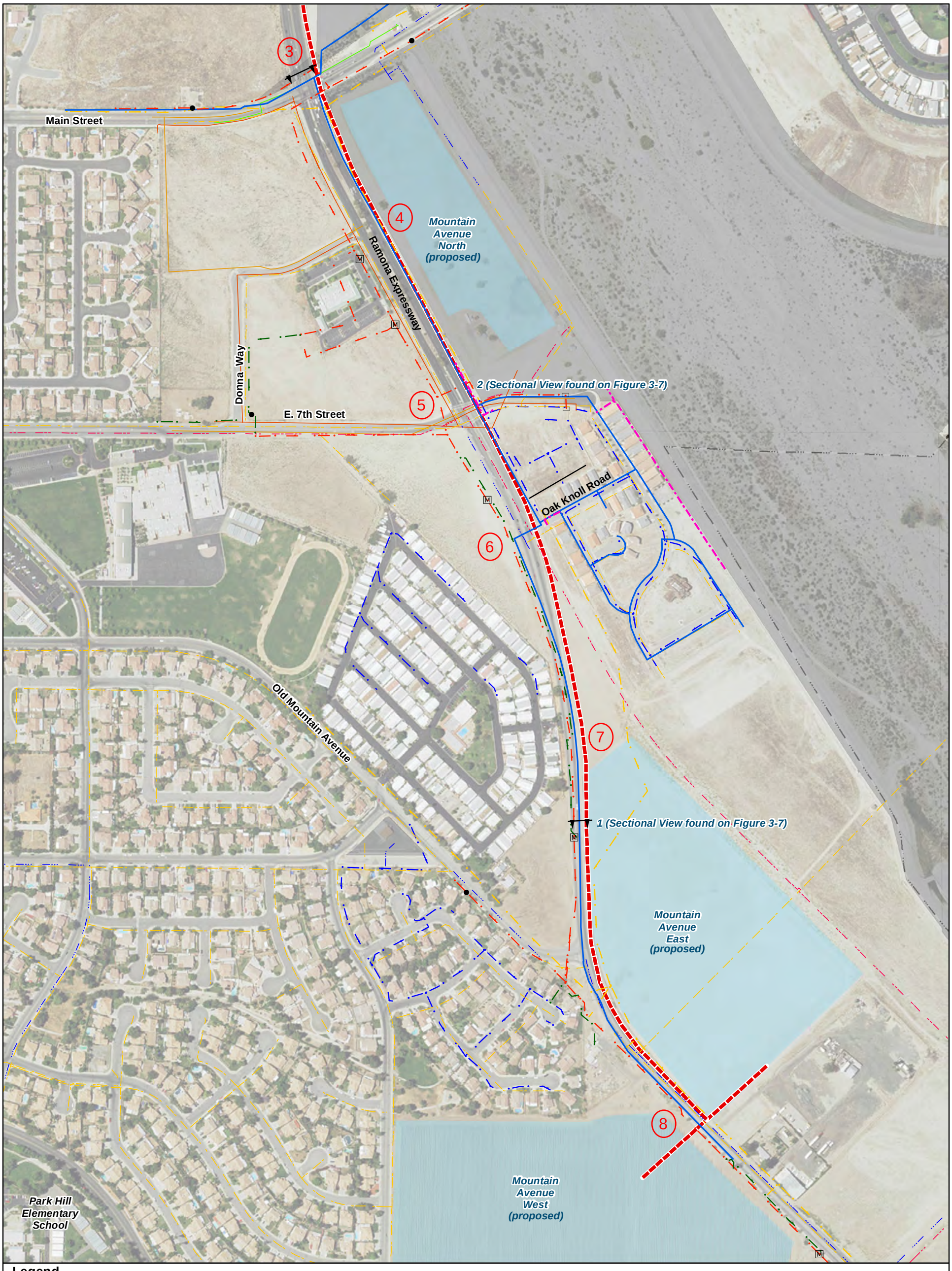
0 200 400 800
Feet

Eastern Municipal Water District
Indirect Potable Reuse
Preliminary Design

Figure 3-3b

Alternative No. 1 - Along Roadway
Existing Utilities - Central Section

Overall Plan for Conveyance of
Indirect Potable Reuse Project



Legend

- Incorporated City Boundary
- Eastern Municipal Water District Boundary
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 1
- Eastern Municipal Water District Distribution Water Line
- Eastern Municipal Water District Raw Water Line
- Eastern Municipal Water District Transmission Water
- Southern California Gas Company Lines
- City of San Jacinto 12" A.C.P. Water Line
- City of San Jacinto 16" PVC Water Line
- Southern California Edison Underground Power Lines
- City of San Jacinto 8" Sewer Line
- Frontier Buried Cable
- Frontier Conduit
- Time Warner Aerial Facilities
- Time Warner Underground Facilities
- Alignment 1 Cut-out
- Manhole
- Hand Hole
- Power Pole
- # Impact Location Number

NORTH

0 200 400 800

Feet

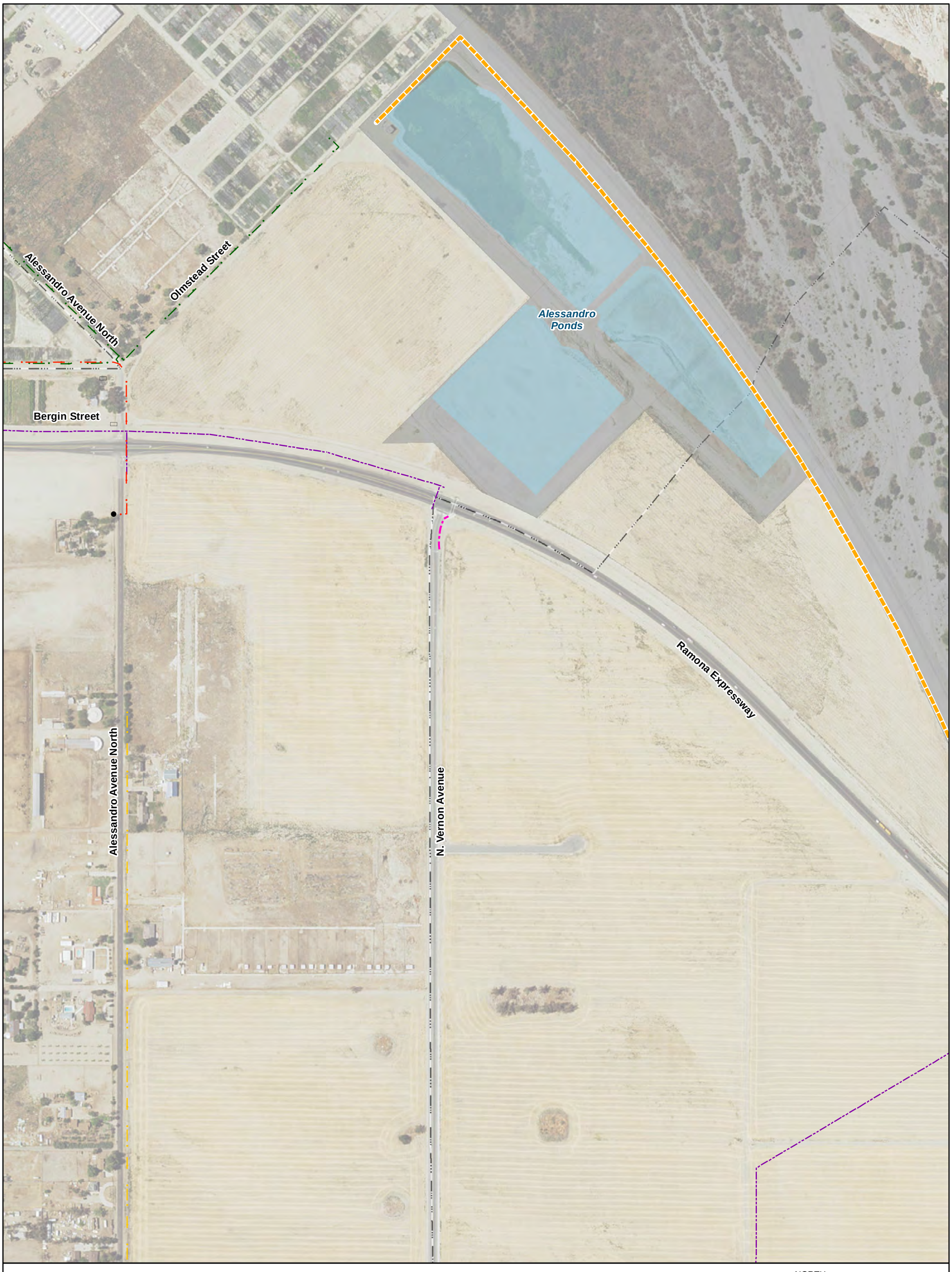
Eastern Municipal Water District
Indirect Potable Reuse
Preliminary Design

Figure 3-3c

Alternative No. 1 - Along Roadway Existing Utilities - Southern Section

Overall Plan for Conveyance of
Indirect Potable Reuse Project

Note:
Proposed Alternative 1 pipeline is approximate and shall be adjusted based upon conditions in the field.



Legend

- Incorporated City Boundary
- Eastern Municipal Water District Boundary
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 2
- Eastern Municipal Water District 18" PVC Sewer Line
- Southern California Edison Underground Power Lines
- Frontier Buried Cable
- Frontier Conduit
- Time Warner Aerial Facilities
- Hand Hole
- Power Pole
- # Impact Location Number

Note:
Proposed Alternative 2 pipeline is approximate
and shall be adjusted based upon conditions in the field.

NORTH

0 200 400 800

Feet

Eastern Municipal Water District
Indirect Potable Reuse
Preliminary Design

Figure 3-4a

Alternative No. 2 - Along Creek
Existing Utilities - Northern Section

Overall Plan for Conveyance of
Indirect Potable Reuse Project

Ramona Expressway

San Jacinto River

1

SAN JACINTO

2

Main Street

Legend

- Incorporated City Boundary
- Eastern Municipal Water District Boundary
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 2
- Eastern Municipal Water District Distribution Water Line
- Eastern Municipal Water District Transmission Water
- Eastern Municipal Water District Sewer Line
- Southern California Gas Company Lines
- Southern California Edison Underground Power Lines
- City of San Jacinto 12" A.C.P. Water Line
- City of San Jacinto 16" PVC Water Line
- City of San Jacinto 8" Sewer Line
- Frontier Conduit
- Time Warner Aerial Facilities
- Time Warner Underground Facilities
- Power Pole
- (#) Impact Location Number

Note:
Proposed Alternative 2 pipeline is approximate and shall be adjusted based upon conditions in the field.

NORTH

0 200 400 800

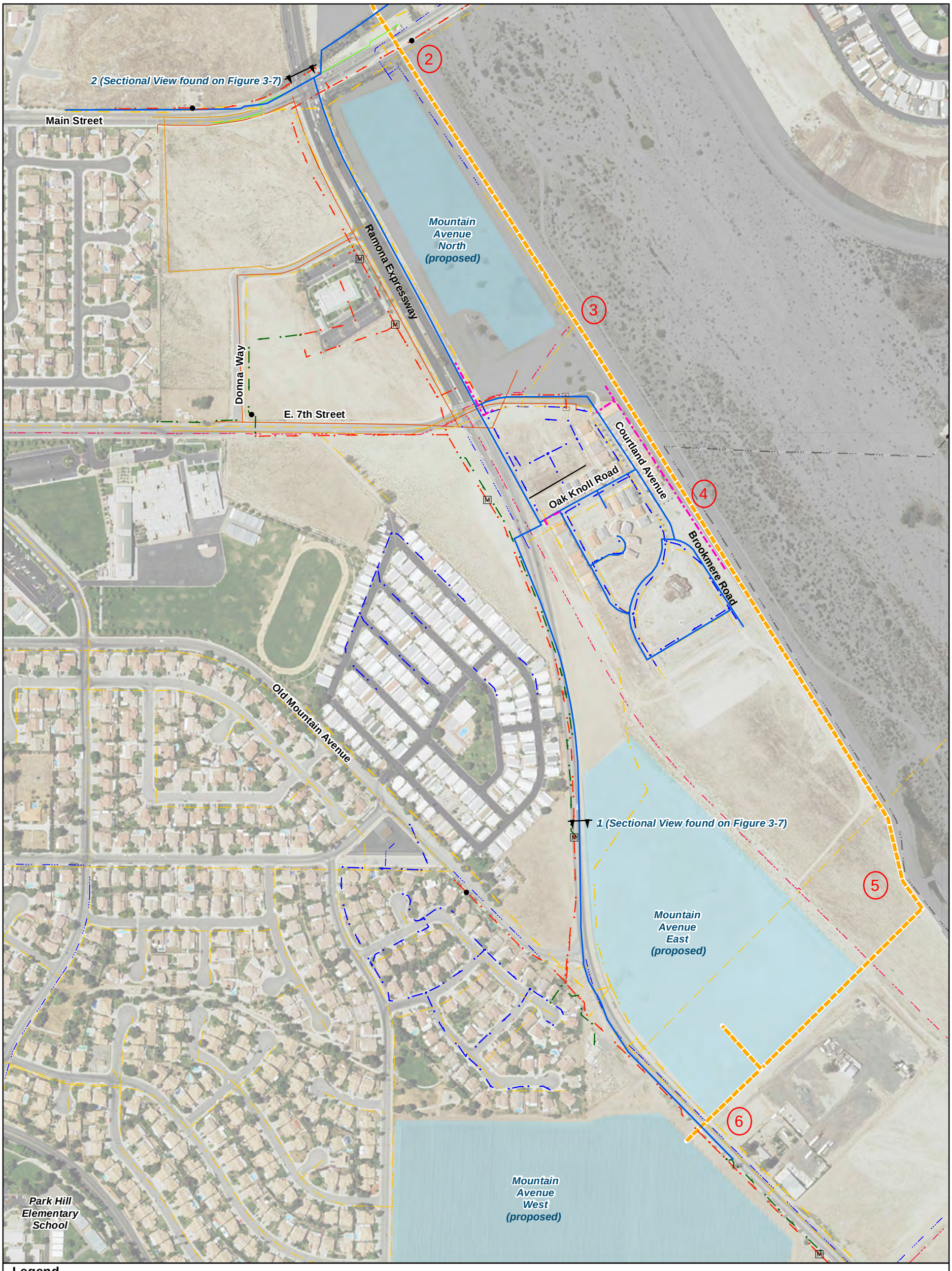
Feet

Eastern Municipal Water District
Indirect Potable Reuse
Preliminary Design

Figure 3-4b

Alternative No. 2 - Along Creek
Existing Utilities - Central Section

Overall Plan for Conveyance of
Indirect Potable Reuse Project



Legend

- Incorporated City Boundary
- Eastern Municipal Water District Boundary
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 2
- Eastern Municipal Water District Distribution Water Line
- Eastern Municipal Water District Raw Water Line
- Eastern Municipal Water District Transmission Water
- Southern California Gas Company Lines
- City of San Jacinto 12" A.C.P. Water Line
- City of San Jacinto 16" PVC Water Line
- Southern California Edison Underground Power Lines
- City of San Jacinto 8" Sewer Line
- Frontier Buried Cable
- Frontier Conduit
- Time Warner Aerial Facilities
- Time Warner Underground Facilities
- Alignment 1 Cut-out
- Manhole
- Hand Hole
- Power Pole
- # Impact Location Number

NORTH

0 200 400 800

Feet

Eastern Municipal Water District
Indirect Potable Reuse
Preliminary Design

Figure 3-4c

Alternative No. 2 - Along Creek
Existing Utilities - Southern Section

Overall Plan for Conveyance of
Indirect Potable Reuse Project

Note:
Proposed Alternative 2 pipeline is approximate
and shall be adjusted based upon conditions in the field.

Table 3-4 and Table 3-5 below further details of the utility information from the above table and summarizes the impacts for each location from high to low.

Table 3-4 Potential Impacts to Existing Utilities – Alternative No. 1 – Along Roadway

Location No.	Location	Description	Impact
1 (Figure 3-3a)	Olmstead Street	Buried telecommunication cables along Olmstead Street to Alessandro North(Frontier).	L
		Telecommunication conduit crossing Olmstead Street at Bergin Street and crossing Ramona Expressway at intersection with Olmstead Street (Frontier).	
		EMWD 18" PVC sewer line crossing proposed alignment at the intersection of Olmstead and Ramona Expressway. (EMWD).	
2 (Figure 3-3a)	North Vernon Avenue	EMWD 18" PVC sewer line runs parallel to the proposed pipeline until it crosses the proposed pipeline at North Vernon Avenue. The EMWD sewer line also crosses Ramona Expressway approximately one mile south of the intersection with Ramona Expressway and Olmstead Street at North Vernon Avenue. (EMWD).	L
3 (Figure 3-3b)	East Main Street	Aerial facilities along East Main Street and crossing Ramona Expressway and running parallel proposed alignment on Ramona Expressway (Time Warner).	H
		Telecommunication conduit crossing Ramona Expressway twice at intersection with Main Street (Frontier).	
		3-in steel gas line crossing Ramona Expressway at intersection with East Main Street and running along proposed pipeline south of East Main Street (SC Gas).	
		16" PVC water line crossing Ramona Expressway at East Main Street (City of San Jacinto).	
4 (Figure 3-3c)	Donna Way	4-in steel gas line running parallel to proposed alignment from East Main Street to East 7th Street (SC Gas).	H
		Time Warner aerial facilities running parallel to proposed alignment from East Main Street to East 7th Street (Time Warner).	
		8-in diameter sewer and manhole on Ramona Expressway within 50-feet of proposed alignment (City of San Jacinto).	
5 (Figure 3-3c)	East 7th Street	(1) 8" diameter sewer and (2) 12" diameter water line crossing Ramona Expressway (City of San Jacinto).	H
		Telecommunication conduit crossing Ramona Expressway just north of the intersection with East 7th Street (Frontier).	
		Time Warner aerial facilities running parallel to proposed alignment along Ramona Expressway (Time Warner).	
		2-in plastic gas line connecting to the 4-in steel gas line located on Ramona Expressway (SC Gas).	
		EMWD raw water line crossing Ramona Expressway and proposed alignment (EMWD).	
		Underground energy lines crossing into Ramona Expressway at East 7th Street (SC Edison).	

Table 3-4 Potential Impacts to Existing Utilities – Alternative No. 1 – Along Roadway

Location No.	Location	Description	Impact
6 (Figure 3-3c)	Oak Knoll Road	2-in plastic gas line connecting to the 4-in steel gas line located on Ramona Expressway (SC Gas).	H
		EMWD raw water and distribution water lines crossing Ramona Expressway and proposed alignment (EMWD).	
		Time Warner underground and aerial facilities running parallel to alignment along Ramona Expressway (Time Warner).	
		Underground Parallel energy line crossing Oak Knoll Road (SC Edison).	
7 (Figure 3-3c)	Ramona Expressway (Oak Knoll to Old Mountain Avenue)	4-in steel gas line running parallel to proposed alignment and Ramona Expressway (SC Gas).	H
		Time Warner aerial facilities crossing Ramona Expressway and running parallel to proposed alignment (Time Warner).	
		Raw water and transmission water line running parallel to Ramona Expressway and alignment (EMWD).	
		Telecommunication buried cable and conduit on Ramona Expressway and running parallel to alignment (Frontier).	
8 (Figure 3-3c)	Mountain Avenue West Pond Access	Telecommunication conduit on Ramona Expressway. Pipeline is proposed to cross conduit to deliver flow to the Mountain Avenue West (Frontier).	H
		4-in steel gas line crossing alignment and running parallel to Ramona Expressway (SC Gas).	
		Distribution and transmission water line crossing alignment and running parallel to Ramona Expressway (EMWD).	
		Time Warner aerial facilities crossing alignment and running parallel Ramona Expressway (Time Warner).	

As indicated in Table 3-4 and Table 3-5, the proposed Alternative No. 1 alignment conflicts with a greater number of existing utilities than the proposed Alternative No. 2 alignment.

Table 3-5 Potential Impacts to Existing Utilities – Alternative No. 2 – Along Creek

Location No.	Location	Description	Impact
1 (Figure 3-4b)	North Vernon Avenue to East Main Street	EMWD 18" PVC sewer line crosses Ramona Expressway approximately one mile south of the intersection with Ramona Expressway and Olmstead Street (EMWD).	L
2 (Figure 3-4b/c)	East Main Street	City of San Jacinto 16" PVC water line along East Main Street (City of San Jacinto).	H
		3-in steel gas line along East Main Street (SC Gas).	
		Time Warner telecommunication aerial facilities along East Main Street (Time Warner).	
		Telecommunication conduit along East Main Street (Frontier).	
		EMWD transmission water and distribution water lines along East Main Street (EMWD).	
		Power lines near alignment just north of E. Main Street (SC Edison).	
3 (Figure 3-4c)	East Main Street to East 7th Street	EMWD water distribution water lines running parallel to alignment. Water transmission line also within 50-ft of a portion of the alignment (EMWD).	M
		EMWD raw water lines within 50-ft of alignment (EMWD).	
4 (Figure 3-4c)	Courtland Ave	Parallel energy lines running behind homes located on Courtland Avenue and Brookmere Road (SC Edison).	L
5 (Figure 3-4c)	Mountain Avenue East Pond	EMWD raw water lines crossing alignment in the southeast corner of the Mountain Avenue East pond (EMWD).	L
		EMWD distribution water line crossing the alignment just east of the Mountain Avenue East pond (EMWD).	
6 (Figure 3-4c)	Mountain Avenue West Pond Access	Telecommunication conduit on Ramona Expressway. Pipeline is proposed to cross conduit to deliver flow to the Mountain Avenue West (Frontier).	H
		4-in steel gas line crossing alignment and running parallel to Ramona Expressway (SC Gas).	
		Raw water and transmission water line crossing alignment and running parallel to Ramona Expressway (EMWD).	
		Time Warner aerial facilities crossing alignment and running parallel Ramona Expressway (Time Warner).	

Section 3.4 - Minimization of Traffic and Community Disruption

The following section summarizes the traffic and community disruption impacts from the two alignment alternatives considered by using a rating system. The rating system assigned to the portions of road alignments below ranges from high to low impacts. The rating criteria definitions are as follows:

- **High Impact (H)** – Delays longer than ten minutes resulting from planned closures of existing roads affecting residents or small businesses.
- **Medium Impact (M)** – Delays of roughly five to ten minutes resulting from a required detour or lane closure.
- **Low Impact (L)** – Minor to no delay in travel time anticipated during construction.

Table 3-6 and **Table 3-7** summarize anticipated traffic impacts and include an estimate of the relative traffic impact.

Table 3-6 Traffic Disruption - Alternative No. 1 – Along Roadway

Location	Description	Impact
Olmstead Street/Alessandro Ave North	**Olmstead Street/Alessandro Avenue North from Alessandro Ponds to Ramona Expressway – Approximately 1,700 feet** – This alignment is anticipated to have little effect on traffic and should only affect homeowners living along Olmstead Street. Roadway may go down to one lane during the construction.	L
Ramona Expressway	**Ramona Expressway from Alessandro Avenue North to Mountain Avenue East and West Ponds – Approximately 14,000 feet** – This alignment is anticipated to affect existing traffic patterns to/for North Mountain Middle School and Mt San Jacinto College. A majority of this alignment is within the east shoulder of the four-lane road which may reduce traffic of the southbound lanes to a single lane. South of East 7th Street, the roadway reduces to a two-lane roadway. During construction, the roadway may be reduced to a single lane in both directions. This could result in traffic control to maintain the single lane roadway. For pipeline connection to the Mountain Avenue West Pond, the pipeline will be required to cross the entirety of the Ramona Expressway. This would result in the closure of Ramona Expressway from Old Mountain Avenue to East Esplanade Avenue for this portion of the work. A potential mitigation is to switch to night hours.	M
East Main Street	**Crossing of Ramona Expressway and East Main Street – Approximately 200 feet** – This alignment will cross East Main Street and restrict traffic from East Main Street to Lake Park Drive. Traffic will be redirected around this crossing during the construction. A potential mitigation is to switch to night hours.	M
Courtland Ave	**Crossing of Ramona Expressway and Courtland Avenue – Approximately 100 feet** – This alignment will cross Courtland Avenue and restrict access to the small neighborhood. During the construction, traffic will be redirected to Oak Knoll Road. This detour will have little impact on the community.	L
Oak Knoll Road	**Crossing of Ramona Expressway and Oak Knoll Road – Approximately 100 feet** – This alignment will cross Oak Knoll Road and restrict access to the small neighborhood. During the construction, traffic will be redirected to Courtland Avenue. This detour will have little impact on the community.	L

Table 3-7 Traffic Disruption – Alternative No. 2 – Along Creek

Location	Description	Impact
Ramona Expressway	**Crossing Ramona Expressway to Mountain Avenue West Pond – Approximately 200 feet** – For pipeline connection to the Mountain Avenue West Pond, the pipeline will be required to cross the entirety of the Ramona Expressway. This would result in the closure of Ramona Expressway from Old Mountain Avenue to East Esplanade Avenue for this portion of the work. A potential mitigation is to switch to night hours.	M
East Main Street	**Crossing of Ramona Expressway and East Main Street – Approximately 200 feet** – This alignment will cross East Main Street using trenchless pipeline construction discussed in Section 3.6 and likely have little impact to traffic on Lake Park Drive.	L

As indicated in Table 3-6 and Table 3-7, Alternative No. 1 has a greater impact to traffic disruption since it is mainly located with an existing right-of-way. Traffic control will be required per the City of San Jacinto.

Community disruption was also studied in the evaluation. The purpose of this discussion is to determine the potential impact to City provided services and planned public events.

Table 3-8 below summarizes existing City of San Jacinto services including bus routes, street cleanings and public events.

Table 3-8 Community Disruption

Description	Alternatives	
	Alternative No. 1 – Along Roadway	Alternative No. 2 – Along Creek
Street Cleaning[1]	1st and 3rd Monday - Ramona Expressway north of East 7th Street. 2nd and 4th Monday - Ramona Expressway south of East 7th Street.	1st and 3rd Monday - Ramona Expressway and East Main Street crossing. Unlikely to cause a conflict.
Bus Routes	One bus route may be affected (Route 42).	One bus route may be affected (Route 42).
Public Events	North Mountain Middle School and Mt. San Jacinto College events may be affected. (2)	Not affected.

Notes:

(1) Minor impacts associated with construction. Coordinate Contract Documents to have Contractor provide daily street sweeping during the short duration of construction.

(2) Facilities should not be directly impacted. However, if events occur during the weekday working hours, traffic to the event may be affected.

The proposed alignments for Alternative No. 1 and 2 both have one (1) bus stops that may be impacted by pipeline construction. The Alternative No.1 alignment is located near two schools that may have events that would be impacted due to the pipeline construction. Lastly, Alternative No. 1 has street cleaning along its route ever Monday which may be impacted depending upon the construction schedule.

Section 3.5 - Avoidance of Sensitive Receptors

The two alignments were reviewed for the presence of sensitive receptors, as defined in **Table 3-9** below. **Figure 3-5** and **Figure 3-6** illustrate the location of the sensitive receptors identified.

Schools that would be affected are defined as directly in front of or adjacent to the proposed project. Schools that are indirectly impacted are Schools within 1,000 feet of the alignment. The same criteria were applied to hospitals, police, fire facilities and all other sensitive receptors included below.

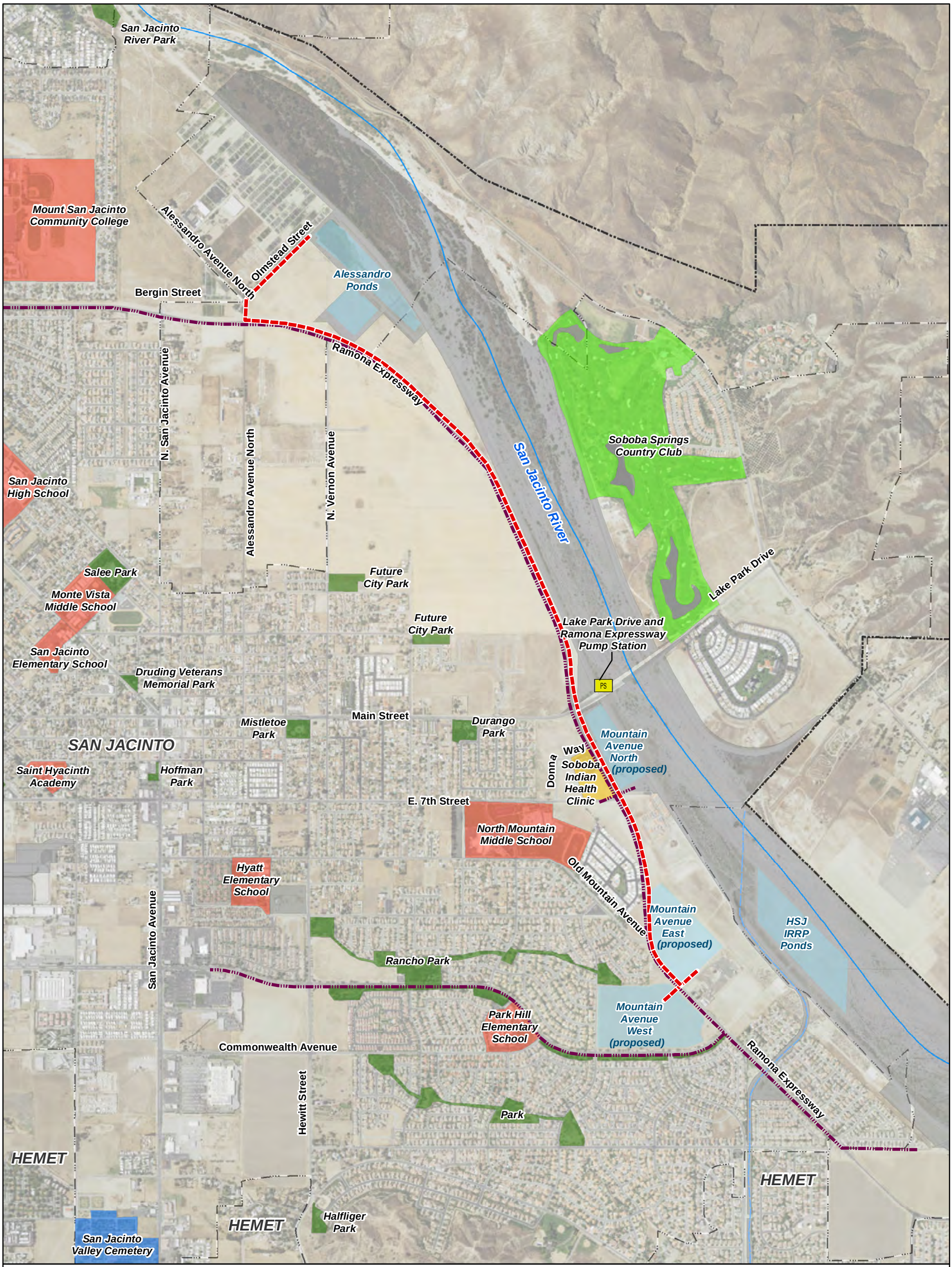
Table 3-9 summarizes the impacts to existing sensitive receptors.

Table 3-9 Sensitive Receptors

Include Description	Alternative Alignments	
	Alignment No. 1 – Along Roadway	Alignment No. 2 – Along Creek
Medical Facilities/Hospitals Indirectly Affected	None Present	None Present
Medical Facilities/Hospitals Directly Affected	Soboba Indian Health Clinic 607 Donna Way San Jacinto, California	None Present
Schools Indirectly Affected	North Mountain Middle School 1202 East 7th Street San Jacinto, California	None Present
Police	No Effects [(1)]	No Effects [(1)]
Fire	No Effects [(1)]	No Effects [(1)]
Parks/Bike Trails Directly Affected	Ramona Expressway Class I Bike Trail	None Present
Parks/Bike Trails Indirectly Affected	▪ City of San Jacinto Public Park and Playground/Rancho Park ▪ Villines Avenue and Corte Floradora ▪ San Jacinto, CA ▪ City of San Jacinto Public Park ▪ E. Esplanade Avenue ▪ San Jacinto, CA ▪ E. Esplanade Avenue Class II Bike Trail	▪ Ramona Expressway Class I Bike Trail ▪ City of San Jacinto Public Park and Playground/Rancho Park ▪ Villines Avenue and Corte Floradora ▪ San Jacinto, CA ▪ City of San Jacinto Public Park ▪ E. Esplanade Avenue ▪ San Jacinto, CA ▪ E. Esplanade Avenue Class II Bike Trail
Government Offices/Facilities Directly Affected	None Present	Lake Park Drive and Ramona Expressway Pump Station
Government Offices/Facilities Indirectly Affected	Lake Park Drive and Ramona Expressway Pump Station	None Present

Notes:

(1) During the final design phase, emergency response officials should be engaged to determine response time impacts.



Legend

- Incorporated City Boundary
- Eastern Municipal Water District Boundary
- Easements
- Medical Facility
- Education Facility
- Golf Course
- Cemetery
- Park
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 1
- Bike Trail
- Canals
- San Jacinto River
- Other Streams
- PS PumpStation

Note:
Proposed Alternative 1 pipeline is approximate and shall be adjusted based upon conditions in the field.

NORTH

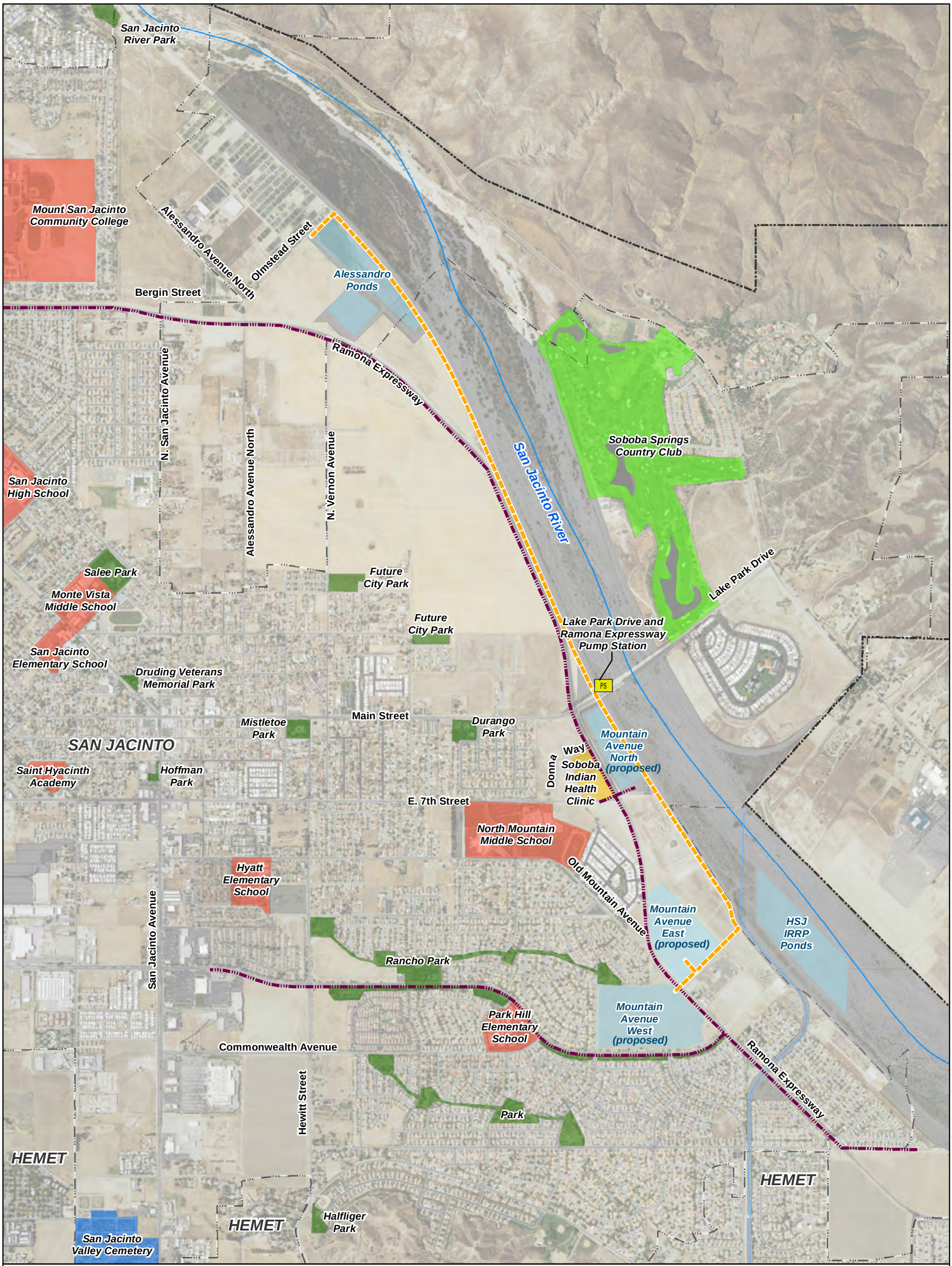
0 750 1,500 3,000
Feet

Eastern Municipal Water District
Indirect Potable Reuse
Preliminary Design

Figure 3-5

Alternative No. 1 - Along Roadway Sensitive Receptors

Overall Plan for Conveyance of Indirect Potable Reuse Project



Legend

- Incorporated City Boundary
- Eastern Municipal Water District Boundary
- Easements
- Medical Facility
- Education Facility
- Golf Course
- Cemetery
- Park
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 2
- Bike Trail
- Canals
- San Jacinto River
- Other Streams
- PS PumpStation

Note:
Proposed Alternative 2 pipeline is approximate and shall be adjusted based upon conditions in the field.

NORTH

0 750 1,500 3,000
Feet

Eastern Municipal Water District
Indirect Potable Reuse
Preliminary Design

Figure 3-6

Alternative No. 2 - Along Creek Sensitive Receptors

Overall Plan for Conveyance of Indirect Potable Reuse Project

Both alignments should not impact police headquarter buildings or existing fire stations. Alignment No. 1 has approximately seven (78) sensitive receptors that are indirectly/directly impacted. Alignment No. 2 only has five (5) sensitive receptors that are indirectly/directly impacted. Based on the above information, the Alignment No. 2 has fewer impacts to sensitive receptors.

Section 3.6 - Consideration of Pipeline Construction Techniques

The construction of each alternative pipeline alignment has been considered in this evaluation.

Subsurface Investigation

A tabletop geotechnical evaluation to provide information on the subsurface conditions will be provided with the final memorandum.

Preliminary Alignment Design

Figure 3-7 and **Figure 3-8** include preliminary section views of each alternative alignment design.

For Alternative No. 1, the proposed pipeline is recommended for installation in the existing shoulder of the roadway right-of-way. For the Ramona Expressway, the roadway transitions from a four-lane roadway to a two-lane roadway with a dirt shoulder for most the proposed pipeline installation. In the future if Ramona Expressway is expanded/widened, the proposed pipeline may be located under the roadway.

The north portion of the proposed alignment on Ramona Expressway is maintained by the County of Riverside, Transportation Department while the southern portions is maintained by the City of Jacinto. See Appendix A for County Maintained and Public Road System maps indicating road ownership. Appendix A also includes road standards for the County of Riverside and existing plans for a portion of the Ramona Expressway provided by the City of San Jacinto. It is recommended that specific pipeline installation and location requirements be coordinated between the County of Riverside and City of Jacinto.

For Alternative No. 2, the proposed pipeline is recommended for installation in the base of the raised access roadway berm running along the San Jacinto River. The base of the berm is bordered by a property fence line to the west and the berm to the east. The base appears flat for most of the proposed pipeline alignment with widths ranging from 5 to 15 feet.

Preliminary Alignment Construction

It is anticipated for each alternative that most of the proposed 36" pipeline will be constructed using open-cut construction techniques. Typical open-cut construction of pipelines includes excavation and backfill by a large tracked backhoe. The project specifications will require that all excavations be sheeted and shored for worker safety. In areas where there is insufficient width, areas anywhere adjacent to structures, and when in streets, solid sheeting and shoring will be required.

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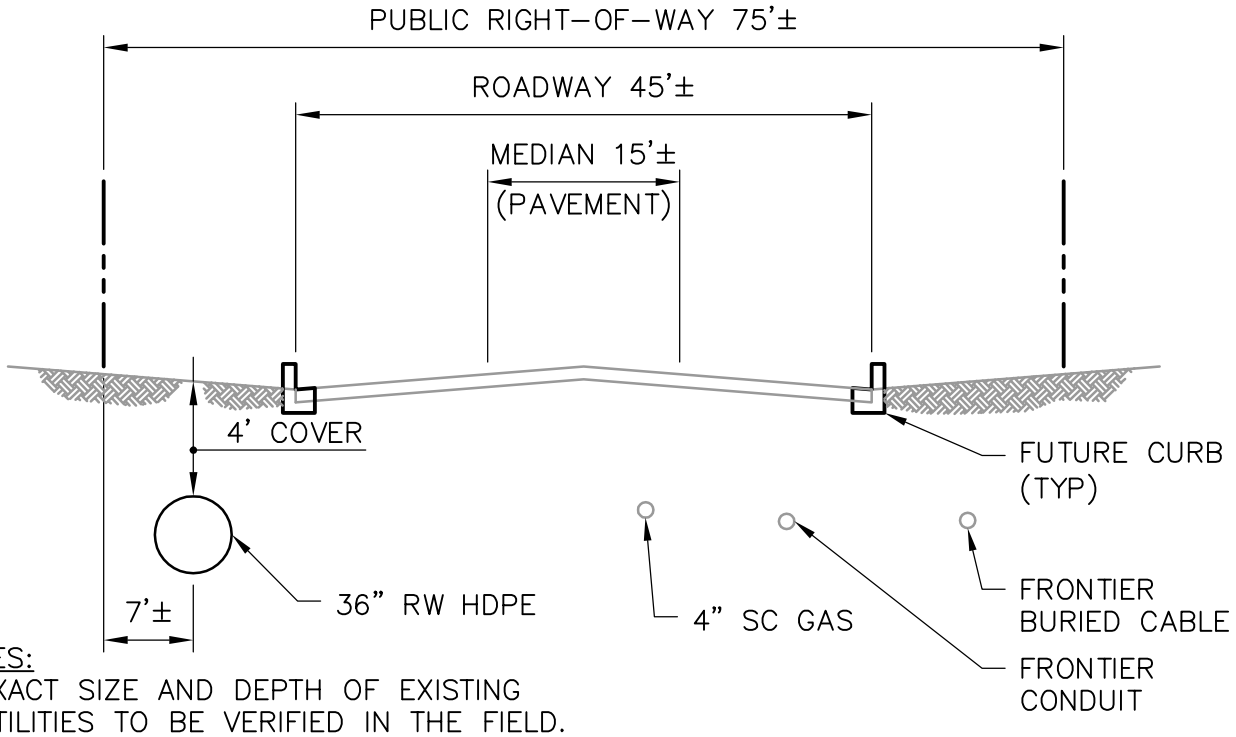
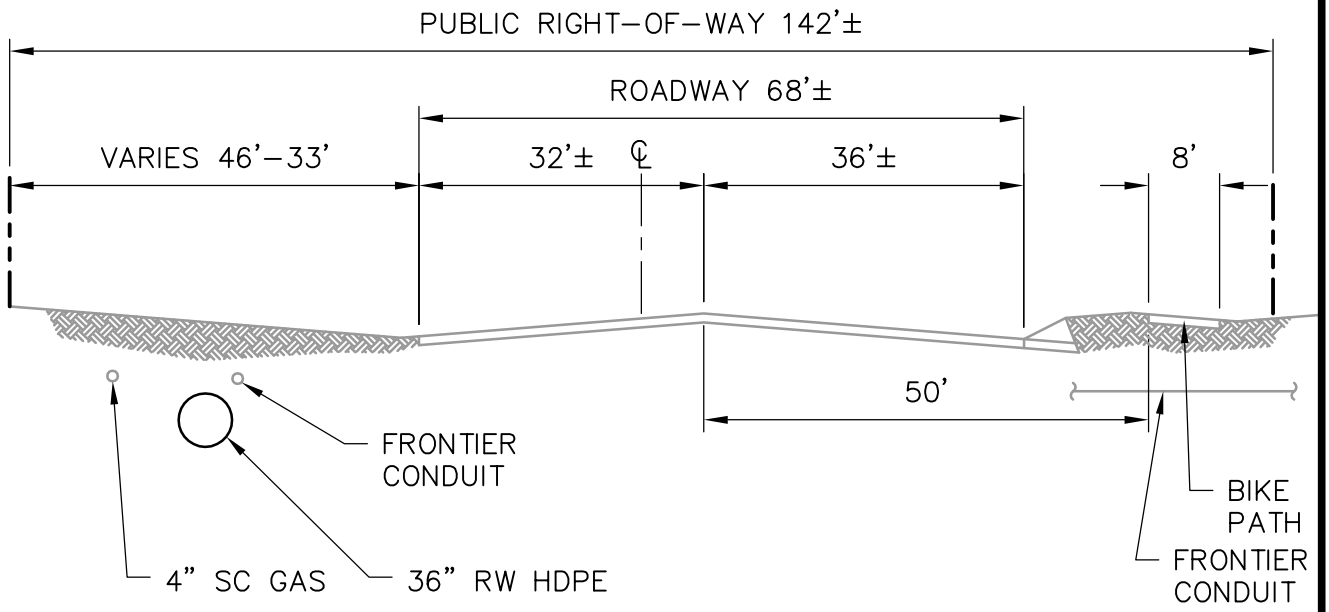


NOTES:
1 EXACT SIZE AND DEPTH OF EXISTING UTILITIES TO BE VERIFIED IN THE FIELD. LOCATION IS SHOWN AS APPROXIMATE.

SECTION 1-1 FROM FIGURE 3-3c



NOTES:
1 EXACT SIZE AND DEPTH OF EXISTING UTILITIES TO BE VERIFIED IN THE FIELD. LOCATION IS SHOWN AS APPROXIMATE.

SECTION 2-2 FROM FIGURE 3-3c

CDM Smith

Figure No. 3-7
Alignment No. 1 Proposed Construction
APRIL 2017

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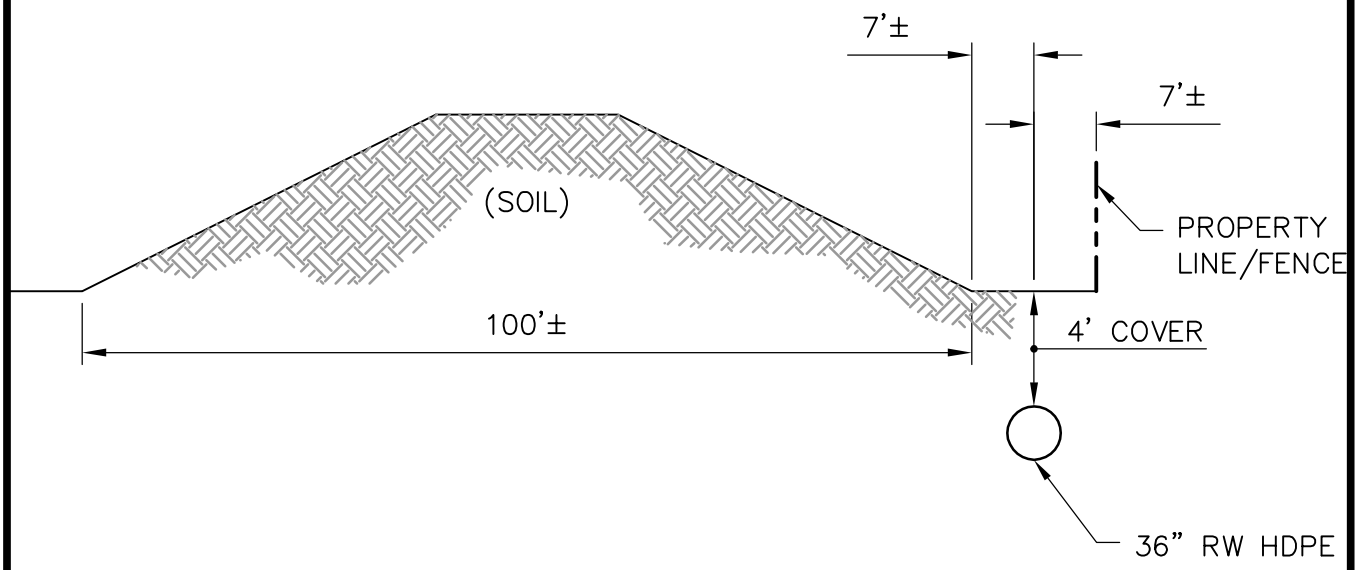


SECTION 3-3 FROM FIGURE 3-4c

CDM Smith

Figure No. 3-8
Alignment No. 2 Proposed Construction
APRIL 2017

It is typical to excavate at least 6 inches below the bottom of the pipe to allow placement of a suitable material (sand, for example) that allows bedding of the pipe. Where the surface is improved, the rules of the jurisdiction will be followed regarding sub-base and pavement thickness. Access will be needed to the trench to allow export of excess unsuitable excavated materials, import of sand for bedding, and import of the pipe itself. Where possible, there should be a travel lane adjacent to the trench.

Trenchless construction is only anticipated for Alternative No. 2 at the intersection with East Main Street/Lake Park Drive. The following photograph in **Figure 3-9** depicts the location of East Main Street relative to the bottom of the berm.



Figure 3-9 – Proposed Jack and Bore Location for Alternative No. 2 at East Main Street

Trenchless construction consists of installing a pipe within shoring (the casing) that completely envelops the pipe. The most common of these is known alternatively as jack-and-bore, or bore-and-jack installation. In this technique, a steel pipe (casing) is installed on the pipe alignment without significant surface disturbance. In jack-and-bore construction, the casing is advanced by hydraulic jacks and the spoil is removed from within the casing by auger boring. In jack-and-bore construction, the spoil is excavated by an auger in advance of the casing, which is pushed by hydraulic jacks as the spoil is removed. In that method, the jacking forces can be much lower, but there is a larger risk of collapse in advance of the casing in loose and sandy soils.

Typically, a shored pit is excavated at each end of the casing, one from which the casing is advanced and one toward which the casing is advanced. The jacking pit should be about 14 feet wide to allow room for shoring and the jacking frame, and will need to be anywhere from 32 feet to 40 feet in length. The contractor will need room to operate a backhoe from the end of the shored excavation. Additional room provided adjacent to the shored excavation is also preferred.

Pipe ramming is another trenchless method for installation of steel pipes and casings over distances usually up to 150 feet long and up to 55 inches in diameter, although the method can be used for much longer and larger installations. The method is the most useful for shallow installations under railways and roads, where other trenchless methods could cause surface settlement or heave. The majority of installations are horizontal, although the method can be applied for vertical installations as well. The spoil is usually excavated from the inside after the ramming is completed. For Alternative No. 2, it is anticipated that the methodology will be bid as a contractor-selected alternative to jack-and-bore.

Table 3-10 is a summary of the anticipated jacking and receiving pits for Alignment No. 2.

Table 3-10 Jacking and Bore Location – Alternative No. 2 – Along Creek

Item	Location	Length (feet)
1	East Main Street	300
	Total Jacking Length	**300**

As shown in the above table, Alternative No. 2 will require some trenchless construction and is recommended for installation along the base of an existing raised berm. Alternative No. 1 is recommended for installation using traditional open cut methods along an existing roadway shoulder. The cost of trenchless construction is much greater than open cut installation costs.

Section 3.7 - Permitting Requirements

Table 3-11 provides a summary of permitting requirements for the IPR project and each permit's applicability to each alignment alternative.

Table 3-11 Permit Management Plan

Agency[(1)]	Permit/Approval	Purpose	Estimated Processing Time	Applicability to Alignment No. 1	Applicability to Alignment No. 2
Federal					
USACE	Clean Water Act Section 404 Permit	Discharge of fill material into waters of the U.S. (San Jacinto River)	6-18 months	Unlikely	Likely
USFWS	Biological Opinion	Project approval and findings	6-12 months	Unlikely	Likely
State					
DDW	Title 22 Engineering Report, Summary of Public Hearing, Conditional Approval	Project approval and recommendations to RWQCB for permit	12-24 months	Likely	Likely
RWQCB	Producer/User Water Recycling Requirements	Operating permit	12 months	Likely	Likely
SWRCB/RWQCB	NPDES – Construction General Permit - Storm Water Pollution Prevention Plans (SWPPP)	Stormwater discharge during construction	3-4 months	Likely	Likely
RWQCB	401 Water Quality Certification	Required when 404 permit is issued by USACE	4-12 months	Unlikely	Likely
RWQCB	Dewatering Water Discharge Permit	Dewatering during construction	2-4 months	Likely	Likely
CDFW	Streambed Alteration Agreement (1605 Agreement) (if applicable)	Obstruct or divert river flow or affect associated riparian habitat	4-8 months	Unlikely	Likely
Caltrans	Encroachment Permit(s)	Longitudinal and/or traverse crossings	6-12 months	Likely	Unlikely
Regional					
Cal-OSHA	Construction Activities for Excavation, Trenching, Tunneling (Underground Classification)	Excavation safety for 5 ft. deep and tunneling safety (if any)	1-2 months	Likely	Likely
Local					
County and/or DDW (Environmental Health and Resources)	Cross-connection and Backflow Prevention	On-site inspection(s)	1-2 months	Likely	Likely
County (Environmental Health and Vector Control)	Vector Control and Red Fire Ants Clearance	Grading	2-3 months	Likely	Likely
County (Roads)	Encroachment Permit(s)	Access to property	1-2 months	Likely	Unlikely
RCFCWCD	Encroachment Permit	Discharges (if any)	2-3 months	Likely	Unlikely
City	Encroachment Permit(s)	Access to property	1-2 months	Likely	Likely
City (Roads)	Encroachment Permit(s)	Access to property	1-2 months	Likely	Likely

Table 3-11 Permit Management Plan

Agency[(1)]	Permit/Approval	Purpose	Estimated Processing Time	Applicability to Alignment No. 1	Applicability to Alignment No. 2
Private Property Owner(s)	Temporary Easements	Access to private property (if any)	3-4 months	Unlikely	Likely

(1) Abbreviations:
Cal-OSHA – California Occupational Safety and Health Agency
Caltrans – California Department of Transportation
CDFW – California Department of Fish and Wildlife
DDW – California Department of Public Health
City – City of Hemet and/or City of San Jacinto
County – Riverside County
RCFCWCD – Riverside County Flood Control and Water Conservation District
RWQCB – Regional Water Quality Control Board, Santa Ana Region
SWRCB – State Water Resources Control Board
USACE – U.S. Army Corps of Engineers
USFWS – U.S. Fish and Wildlife Service

Both alignments should will have permitting requirements but Alternative No. 2 will require a greater number of permits.

Section 3.8 - Environmental Impacts

To evaluate current conditions regarding hazardous materials, hazardous waste, and known releases of hazardous materials on the project site and in the surrounding area, regulatory records searches were ordered from Environmental Risk Information Services (ERIS) of Toronto, Canada. The report was centered along the alternative alignments and conformed to the requirements of the American Society for Testing and Materials (ASTM) Standard Practice E1527-05 for Phase I Environmental Site Assessments, the current standard.

Numerous regulatory database listings that apply to the project site or nearby sites were returned by the database searches. Based on the regulatory database searches prepared for the alignments, the number of listed sites for each database and each alignment was compiled. In the following tables, a distinction is made between sites that are on or immediately adjacent to the alignment, sites that are within 500 feet of the alignment, and sites that are within the 1/2-mile buffer (or search radius) along each alignment.

In the tables, the various databases are grouped based on their specific category. The categories of sites found are cleanups (past or current clean-ups), hazardous (containing hazardous material), screening (screening for potentially hazardous materials), and spills (site where spills were known). The grouping of a database based on category is shown in **Table 3-12**. Databases were only included in the below tables for databases that resulted in a known site within 1/2 mile of the either of the alignments. Several other databases were searched but did not result in any potentially hazardous sites.

The databases that returned at least one listing are shown in Table 3-12, Regulatory Databases, along with the meaning of each acronym and, where appropriate, a brief description of the purpose of each list.

Table 3-12 Regulatory Databases

Acronym	Name/Meaning [Type]
CHMIRS	California Hazardous Materials Incident Reporting System (state spills list) [Spills]
CDL	Clandestine drug labs [Cleanups]
DELISTED COUNTY	Records removed from County or CUPA databases due to inactivity or below reportable thresholds [Hazardous]
ENVIROSTOR	Contaminated sites regulated by State Department of Toxic Substances Control, and school investigation sites [Screening]
ERNS	Emergency Response Notification System (federal spills list) [Spills]
FINDS/FRS	Facilities Index Database System (Federal index list, mostly RCRA sites)
HAZNET	Hazardous waste generators (state list) [Hazardous]
RIVERSIDE HWG	Hazardous waste generator sites in Riverside County [Hazardous]
RIVERSIDE HZH	A list of facilities that handle hazardous materials in Riverside County [Hazardous]
SCH	Department of Toxic Substances Control (DTSC) School Property Evaluation and Cleanup (SPEC) Division (ensures property previously contaminated is cleaned up) [Screening]

Table 3-13 and **Table 3-14** present compilations of the number of listed sites "on", near (within 500 feet) or within the vicinity of (within the search radii-1/2 mile) of each alignment. For the sites that are "on" an alignment, it should be noted that since the actual construction will occur within street right-of-way for the most part, a (for example) gas station that is "on" the alignment most likely would be located along and adjacent to the affected street.

Table 3-13 Alignment No. 1 – Along Roadway – Regulatory Database Summary

Type	List	On Alignment (3 sites)	Near Alignment (<500 ft.) (9 sites)	Within ½ mile (43 sites)
Hazardous Waste	FINDS/FRS	2	7	20
	RIVERSIDE HZH	1	4	9
	HAZNET	2	4	27
	DELISTED COUNTY	0	1	1
	RIVERSIDE HWG	0	1	1
Cleanups	CDL	0	0	2
Spills	ERNS	0	0	1
	CHMIRS	1	3	8
Screening	ENVIROSTOR	0	0	2
	SCH	0	0	2
Unique Environmental Sites		**3**	**9**	**43**

Table 3-14 Alignment No. 2 – Along Creek – Regulatory Database Summary

Type	List	On Alignment (0 sites)	Near Alignment (<500 ft.) (5 sites)	Within ½ mile (28 sites)
Hazardous Waste	FINDS/FRS	0	3	13
	RIVERSIDE HZH	0	1	8
	HAZNET	0	1	20
	DELISTED COUNTY	0	1	1
	RIVERSIDE HWG	0	0	1
Cleanups	CDL	0	0	1
Spills	ERNS	0	0	0
	CHMIRS	0	3	4
Screening	ENVIROSTOR	0	0	1
	SCH	0	0	1
Unique Environmental Sites		**0**	**5**	**28**

Figure 3-10 and **Figure 3-11** provide a summary of the various sites located within a half miles' radius of each alignment.

Most listed sites appear on more than one database, thus the numbers of listed sites under each category does not add up to the number of listed sites shown in the headers.

Available information on the extent of contamination for each potential site of concern should be evaluated based on available records (site assessment reports, cleanup reports, etc.) once an alternative is selected. If impacted soil or groundwater is or is expected to be encountered during construction, appropriate mitigation measures will be necessary to minimize the potential impacts.

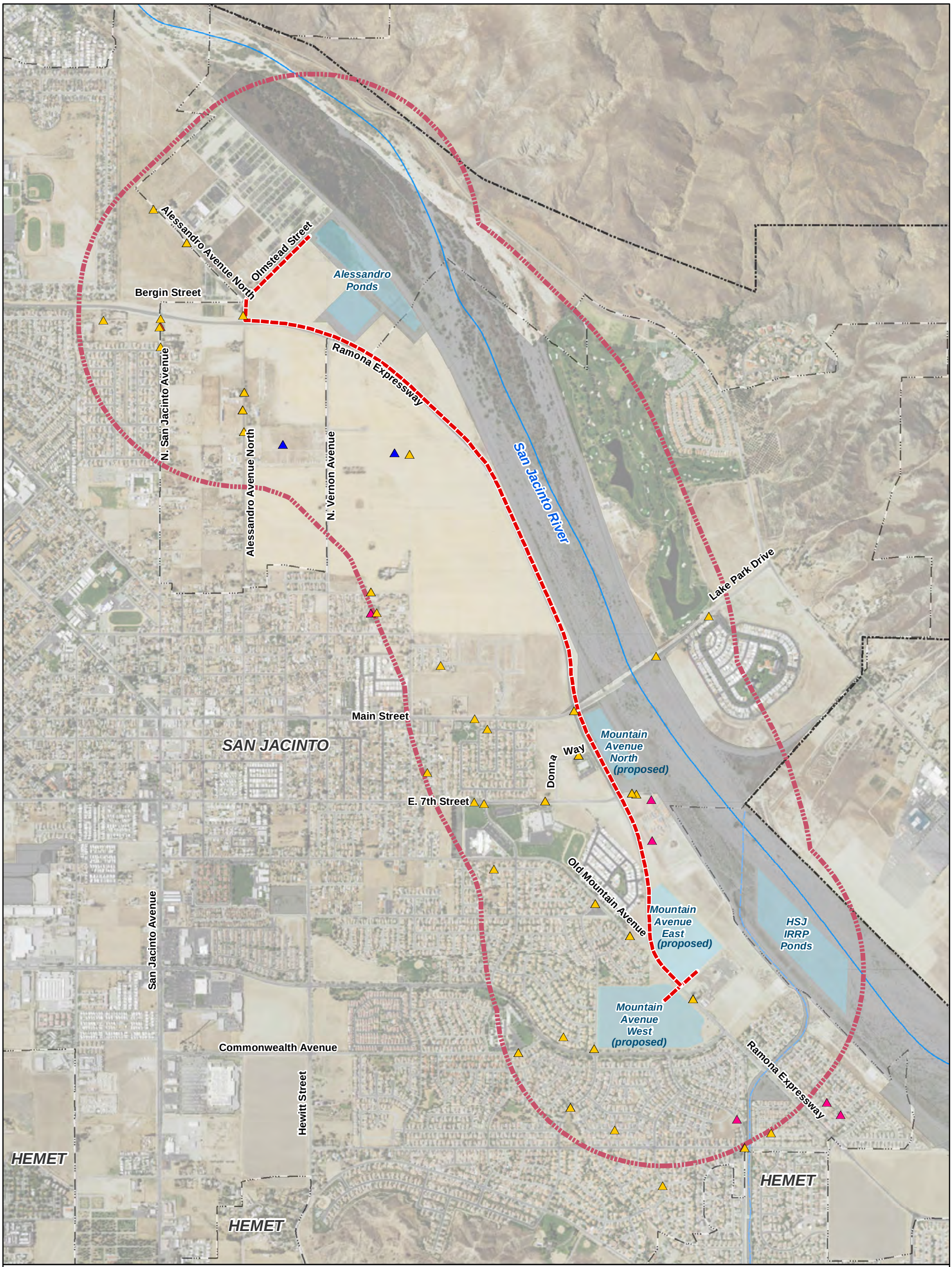
As indicated above, there are more listed sites on, near or within a half mile of the Alternative No. 1 than Alternative No. 2.

Section 3.9 - Construction and Capital Cost

A preliminary Opinion of Construction Cost was prepared based on the project understanding noted in the previous sections. The Cost Opinion was prepared for a 36" High-density polyethylene (HDPE) pipeline.

A few items were not included in the cost opinion. These items included treatment of hazardous waste, construction dewatering, discharge structures and connections at Alessandro Pond. Further investigation for soil and water sampling would be required to make an opinion of the costs to treat or remove any hazardous soil and or groundwater. Upon completion of the soil borings, groundwater levels will be made available. This will assist the Contractor in determining if and where construction dewatering will be required and to what extent.

The costs associated with discharge structures and connections at Alessandro Pond are assumed to be the same for both alternatives.



Legend

- Incorporated City Boundary
- Eastern Municipal Water District Boundary
- Easements
- 1/2-Mile Radius Within Alignment - Alternative 1
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 1
- Canals
- San Jacinto River
- Other Streams
- Hazardous Waste Site
- Cleanup Site
- Spill Site
- Screening Location

Note:
Proposed Alternative 1 pipeline is approximate and shall be adjusted based upon conditions in the field.

NORTH

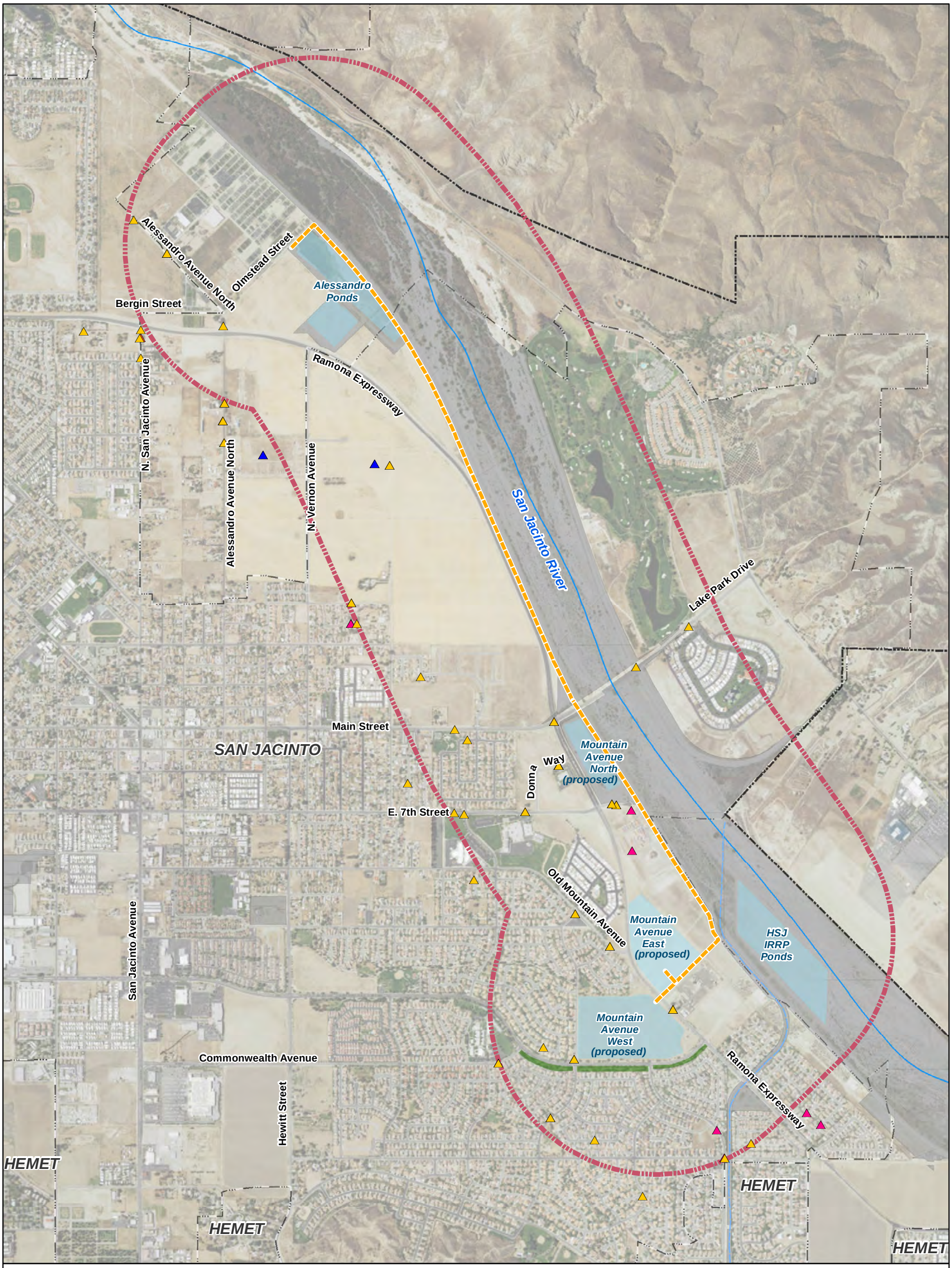
0 625 1,250 2,500
Feet

Eastern Municipal Water District
Indirect Potable Reuse
Preliminary Design

Figure 3-10

Alternative No. 1 - Along Roadway Environmental Impacts

Overall Plan for Conveyance of
Indirect Potable Reuse Project



Legend

- Incorporated City Boundary
- 1/2-Mile Radius Within Alignment - Alternative 2
- Eastern Municipal Water District Boundary
- Easements
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 2
- Canals
- San Jacinto River
- Other Streams
- Hazardous Waste Site
- Cleanup Site
- Spill Site
- Screening Location

Note:
Proposed Alternative 2 pipeline is approximate and shall be adjusted based upon conditions in the field.

NORTH

0 750 1,500 3,000
Feet

Eastern Municipal Water District
Indirect Potable Reuse
Preliminary Design

Figure 3-11
Alternative No. 2 - Along Creek Environmental Impacts

Overall Plan for Conveyance of
Indirect Potable Reuse Project

Table 3-15 below summarizes the major construction items and costs for the Alternative No. 1 – Along Roadway:

Table 3-15 Preliminary Estimate of Probable Construction Cost – Alternative No. 1

Description	Total
Pipeline - 36" Open Cut Installation in Native Material Areas	$ 9,520,000
Subtotal	**$ 9,520,000**
Contingency (30%)	$ 2,860,000
Total Construction Cost	**$ 12,380,000**
Engineering Cost (15%)	$ 1,860,000
Construction Management and Inspection (15%)	$ 1,860,000
Total Project Cost	**$ 17,000,000**

Table 3-16 below summarizes the major constructions items and costs for the Alternative No. 2 – Along Creek:

Table 3-16 Preliminary Estimate of Probable Construction Cost – Alternative No. 2

Description	Total
Pipeline - 36" Open Cut Installation in Native Material Areas	$ 11,070,000
36" Pipeline - Jack and Bore (E. Main Street) Approx. 300 Feet	$ 360,000
Subtotal	**$ 11,430,000**
Contingency (30%)	$ 3,430,000
Total Construction Cost	**$ 14,860,000**
Engineering Cost (15%)	$ 2,230,000
Construction Management and Inspection (15%)	$ 2,230,000
Total Project Cost	**$ 20,000,000**

Alternative No. 1 does not require trenchless pipeline installation (jack and bore) and is slightly less costly to construct.

Section 4 - Evaluation and Recommendation

Using the selection criteria as a basis, the alignments were evaluated using a matrix evaluation. This matrix evaluation provided a weight to each criterion and an associated ranking for each alignment.

Section 4.1 Selection Criteria Definitions

To develop measurements to score each alignment, the following definitions were used:

Minimization of Overall Length

Overall length refers to the lateral distance the pipeline covers throughout an alignment. This metric will be used with respect to construction duration since the overall length correlates with the construction duration (approximately 100 feet per day of construction). This criteria is incorporated into the capital cost criteria, listed as a separate criterion (see below).

Easements and Right-of-way

Easements and right-of-way is based on whether the proposed alternatives are located with existing right-of-way's or within existing easements/private properties. Scoring will be qualitative based on the number and types of permits, easements and rights-of-way required.

Avoidance of Conflicts with Other Buried Utilities

Avoidance of conflicts with buried utilities is associated with the potential for utility conflict within each alignment. Potential utility conflicts were obtaining using GIS data and existing as-builts from various utility companies located within the project area.

Minimization of Traffic and Community Disruption

Traffic disruption is based on the number of street closures, estimated duration of the closures, and the amount of traffic affected, single-lane road access and reduced lane width within roads.

Community disruption relates to access to public establishments (homes, parks and shopping centers) due to reduced access resulting from construction activities. This criterion was combined with avoidance of sensitive receptors, listed as a separate criterion (see below), for evaluation.

Avoidance of Sensitive Receptors

Sensitive receptors include hospitals, schools, police stations, fire stations and other important buildings. Impact to these facilities can include reduced access as well as noise and dust from the construction area. This criterion was combined with minimization of traffic and community disruption, listed as a separate criterion (see above), for evaluation.

Consideration of Pipeline Construction Techniques

This criterion refers to the physical limitations that would enable or negate a particular type of construction from occurring. Constructability issues that exist for the alignments relate to several issues including, but not limited to: type of construction and trenchless pipeline constriction.

Permitting Requirements

Permitting is associated with the environmental permits, encroachment permits, and mitigation measures that may be implemented. Approval is associated with the probability of obtaining appropriate permits at an appropriate time frame to begin/complete the construction.

Environmental Impacts

Environmental impacts include an evaluation of current conditions regarding hazardous materials, hazardous waste and known release of hazardous materials on the project site and in the surrounding area.

Construction and Capital Costs

Associated costs for planning, design and construction of pipelines is referred to as capital costs. The cost opinion for construction of the pipeline alignments were developed to include base construction cost (pipeline cost, labor and equipment cost, etc.), permits, taxes, insurance, general conditions, overhead and profit, contingency, engineering, construction management, and escalation.

Section 4.2 Matrix Evaluation

Each alignment was assigned a numerical value from one to ten for each selection criterion. A value of zero represented a poor result, a value of five was neutral and a value of ten was a good result. The values for a given selection criterion in a given alignment were summed to get a total value. This total value was then weighted according to **Table 4-1**. Weights for each selection criteria below were determined and approved by the EMWD staff.

Table 4-1 Selection Criteria Weights

Selection Criteria	Weights (%)
Easements and Right-of-way	10%
Avoidance of Conflicts with other Buried Utilities	10%
Minimization of Traffic and Community Disruption/ Avoidance of Sensitive Receptors	15%
Consideration of Pipeline Construction Techniques	10%
Permitting Requirements	20%
Environmental Impacts	15%
Construction and Capital Costs	20%

Table 4-2 provides the various scores and associated weights of each selection criteria. The numerical value score for each selection criterion was determined by CDM Smith based on professional opinion, evaluations, and document research provided in the alternatives analysis discussions for each pipeline alignment. The score associated with each criterion can range from zero to ten.

Table 4.2 Alignment Matrix Evaluation

	Criteria	Easements and Right-of-way	Avoidance of Conflicts with other Buried Utilities	Min. of Traffic & Community Disruption/Avoidance of Sensitive Receptors	Consideration of Pipeline Construction Techniques	Permitting Req.	Environ Impacts	Construction & Capital Costs	Total Score
Alignment Alternative	***Weight***	**10%**	**10%**	**15%**	**10%**	**20%**	**15%**	**20%**	**10 max**
No. 1 - Along Roadway		8	4	5	9	9	5	7	**6.8**
No. 2 - Along Creek		3	8	8	3	2	6	4	**4.7**

Section 4.3 Recommendation

Two (2) alignments were evaluated in this evaluation. Based on Table 4-2, Alternative No. 1 has the highest score. Alternative No. 2, pipeline construction along the creek, was not recommended due to challenging permitting, higher capital costs and more difficult construction.

It is recommended that the Alternative No. 1 alignment, pipeline construction along the roadway, be provided for the 36-inch recycled water pipeline construction. The basis for this recommendation is summarized in the sections above. The major reasons for this recommendation is that the alternative is cost effective, requires less easements, less permitting requirements and requires less complex construction.

Appendices

Appendix A – Road Ownership Maps; City and County Road Standards

APPENDIX A

RIVERSIDE COUNTY TRANSPORTATION DEPARTMENT

MAP OF
RIVERSIDE COUNTY, CALIFORNIA
SHOWING THE

COUNTY MAINTAINED AND PUBLIC ROAD SYSTEM

OCTOBER 1, 2016

LEGEND

- INTERSTATE
- STATE HIGHWAY
- FEDERAL ROUTE-COUNTY MAINTAINED
- PAVED SURFACE-COUNTY MAINTAINED
- GRAVELED SURFACE-COUNTY MAINTAINED
- DIRT SURFACE-COUNTY MAINTAINED
- DEDICATED & ACCEPTED PUBLIC ROAD
- CITY ROAD
- MAINTAINED CITY ROAD
- DEDICATED & ACCEPTED PUBLIC ROAD COMMUNITY SERVICE DISTRICT MAINTAINED
- RAILROAD

- SUPERVISORIAL DISTRICT BOUNDARY
- MAINTENANCE DISTRICT BOUNDARY
- INDIAN RESERVATION BOUNDARY
- COUNTY SERVICE AREA BOUNDARY
- ROAD & BRIDGE BENEFIT DISTRICT
- INCORPORATED CITIES
- AIRPORT
- MOUNTAIN RANGE
- NATIONAL PARK/MONUMENT
- NATIONAL FOREST

- BRIDGE-COUNTY MAINTAINED
- DRAINAGE EASEMENT-COUNTY MAINTAINED
- TRAFFIC SIGNAL-COUNTY MAINTAINED
- TRAFFIC SIGNAL-COST SHARED
- FLASHER-COUNTY MAINTAINED
- RADAR FLASHER-COUNTY MAINTAINED

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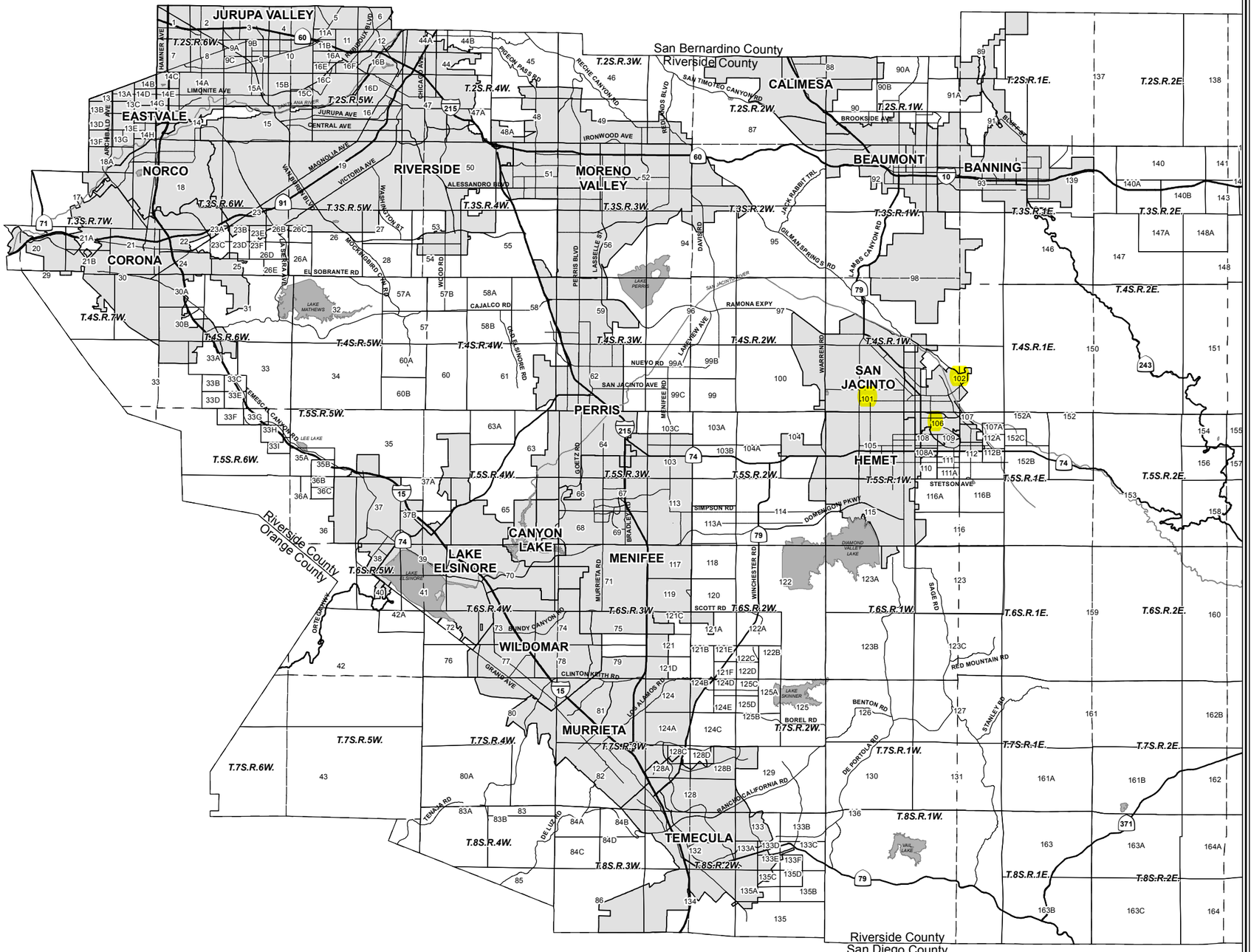
INDEX OF RIVERSIDE COUNTY MAINTAINED
and
PUBLIC ROAD SYSTEM



M- 15
S- 3

1 2 3 4 5 98 6 7 8 9 10

A B C D E F G

101 150 106 107

15 14 13 18 16 17

22 23 24 19 20 21

27 26 25 30 29 28

34 35 36 31 32 33

3 2 1 6 5 4

SAN JACINTO RIVER

SOBOBA RD M5376C

SOBOBA RD M5376B

SOBOBA RD M5376A

SOBOBA RD M5376B

GILMAN HOT SPRINGS

BANNING

1 - ALESSANDRO AVE M5264B
2 - BERGIN ST S5023
3 - CHABELA DR M5793
4 - GRANITE VIEW DR M5795
5 - LAS PALMAS CT M5796

SAN JOSE DR M5794

CLINT WAY

CHAD DR

MONTROSE AVE

COMMUNITY COLLEGE DR

GOLD ST

EAGLE RD

WESTERN VILLAGE DR

COUNTRY VILLAGE DR

RAMONA EXPY

OLMSTED ST S5515

FR W554

S5501E

RAMONA EXPY

ALESSANDRO AVE M5244A

FR V479

AUBURN AVE

NEW YORK AVE

COOKS

BATH

AVE

AVE

IDYLLWILD DR

DUSTY RD

SHOAL REEF AVE

SAN JACINTO AVE S5353

T4S/R1W

T5S/R1W

BURT AVE

CAHUILLA CIR M5264A

CAMINO LOS BANOS

ARTESIAN AVE

TIGER LN

RAMONA BLVD

WATEKA ST

TAHQUITZ ST

DE ANZA

BRENTON ST

VICTORIA

DR

DILLON

FIRST ST

AVE

MEAD ST

SECOND

ST

THIRD ST

MAIN ST

FIFTH ST

SIXTH ST

AVE

AVE

6TH ST

7TH ST

7TH ST

MISTLETOE AVE

VERNON AVE

PICO

SEVENTH ST

JONNIE WAY

TENTH ST

ELEVENTH ST

SANTA FE AVE

SAN JACINTO AVE

IRWIN ST

SHAVER ST

EVANS ST

THIRTEENTH ST

FOURTEENTH ST

ESPLANADE AVE

BNSF RR

HEWITT ST

ESPLANADE AVE

OLD MOUNTAIN RD

MOUNTAIN AVE

RAMONA EXPY

RAMONA EXPY

LAKE PARK DR

SOBOBA RD M5376A

RANCHO SAN JACINTO VIEJO

RANCHO SAN JACINTO VIEJO LINE

SAN JACINTO RIVER

CITY OF SAN JACINTO

T4S/R1W

T5S/R1W

T4S/R1W T4S/R1E
T5S/R1W T5S/R1E

T4S/R1E
T5S/R1E

T5S/R1E

Soboba Tribal Lands

N

0 1000 2000 3000 4000 feet

May 2, 2011

102

M- 15
S- 3

1 2 3 4 5 6 7 8 9 10

A B C D E F G

101 102 105 107 108 109

T4S/R1W

T5S/R1W

T4S/R1E

T5S/R1E

CITY OF HEMET

CITY OF SAN JACINTO

RANCHO SAN JACINTO VIEJO

SAN JACINTO RIVER

TENTH ST
THIRTEENTH ST
ESPLANADE AVE
OAKWOOD ST
MONTE VISTA AVE
CORI DR
FRUITVALE AVE
MIDWAY ST
MENLO AVE
TIMOTHY LN
CARSON ST
FRANKLIN ST
THOMPSON ST
OAKLAND AVE
CAMPUS WAY
SHAVER ST
EVANS ST
COMMONWEALTH AVE
REINHART ST
GARRETT WAY
WASHINGTON AVE
PARK AVE
AGAPE AVE
BERINGER DR
CHARLTON AVE
MICHELLE LN
AMHERST AVE
CORWIN PL
CAPEL ST
GENESEE DR
WHITMAN DR
VILLINES AVE
ROSAS DR
LAS
OLD MOUNTAIN RD
RAMONA EXPY
MOUNTAIN AVE
RUE PINOT BLANC
RUE CHABLIS
SANTA FE ST
SAN JACINTO AVE
HEWITT ST
ARROYO VIEJO DR
VAN FLEET DR
GIRARD ST
BRIAN ST
YALE ST
WHICHA WAY
TERRY LN
CITY OF SAN JACINTO
CITY OF HEMET

35 2 | 36 1 | 6

2 | 1 | 12 7

3 2 | 10 11 | 2 11 | 12 1 | 6

N

0 500 1000 1500 2000 feet

May 2, 2011

106

CONFIGURATION AT INTERSECTION

(SEE SHEET 2 OF 2 FOR TRANSITIONS)

GENERAL CONFIGURATION

NOT TO SCALE

ABBREVIATIONS

A.B. = AGGREGATE BASE
A.C. = ASPHALT CONCRETE
C&G = CURB AND GUTTER
ETW = EDGE OF TRAVELED WAY
FL = FLOW LINE
L/T = LEFT TURN
O.G. = ORIGINAL GROUND
R/T = RIGHT TURN
R/W = RIGHT OF WAY
TC = TOP OF CURB
FS = FINISHED SURFACE

NOTE:

1. THICKNESS OF A.B. AND A.C. TO BE DETERMINED BY SOIL TEST AT TIME OF GRADING OPERATIONS.
2. MINIMUM PAVING THICKNESS PER SPECIFICATIONS SECTION 8.07 OF THIS ORDINANCE.
3. SEE STANDARD NO. 113 FOR LANDSCAPED MEDIAN REQUIREMENTS, INCLUDING MEDIAN CURB.
4. CURB AND GUTTER TO BE TYPE "A-8" (STD. NO. 201). 6" CURB IS NOT ALLOWED.
5. DISTANCE FROM SIDEWALK TO R/W, AND TO FLOW LINE, VARIES. SEE STANDARD NO. 404 FOR DETAILS OF MEANDERING SIDEWALK .
6. MAX. WATER DEPTH FOR Q_{10} IS 0.67' TO PROVIDE MIN. 12' DRY LANE.
7. FOR UNDERGROUND UTILITY LOCATIONS SEE STD. NO. 817, SHT. 2 OF 2.

APPROVED BY:

DIRECTOR OF TRANSPORTATION
GEORGE A. JOHNSON, RCE 42328

DATE: 05/01/07

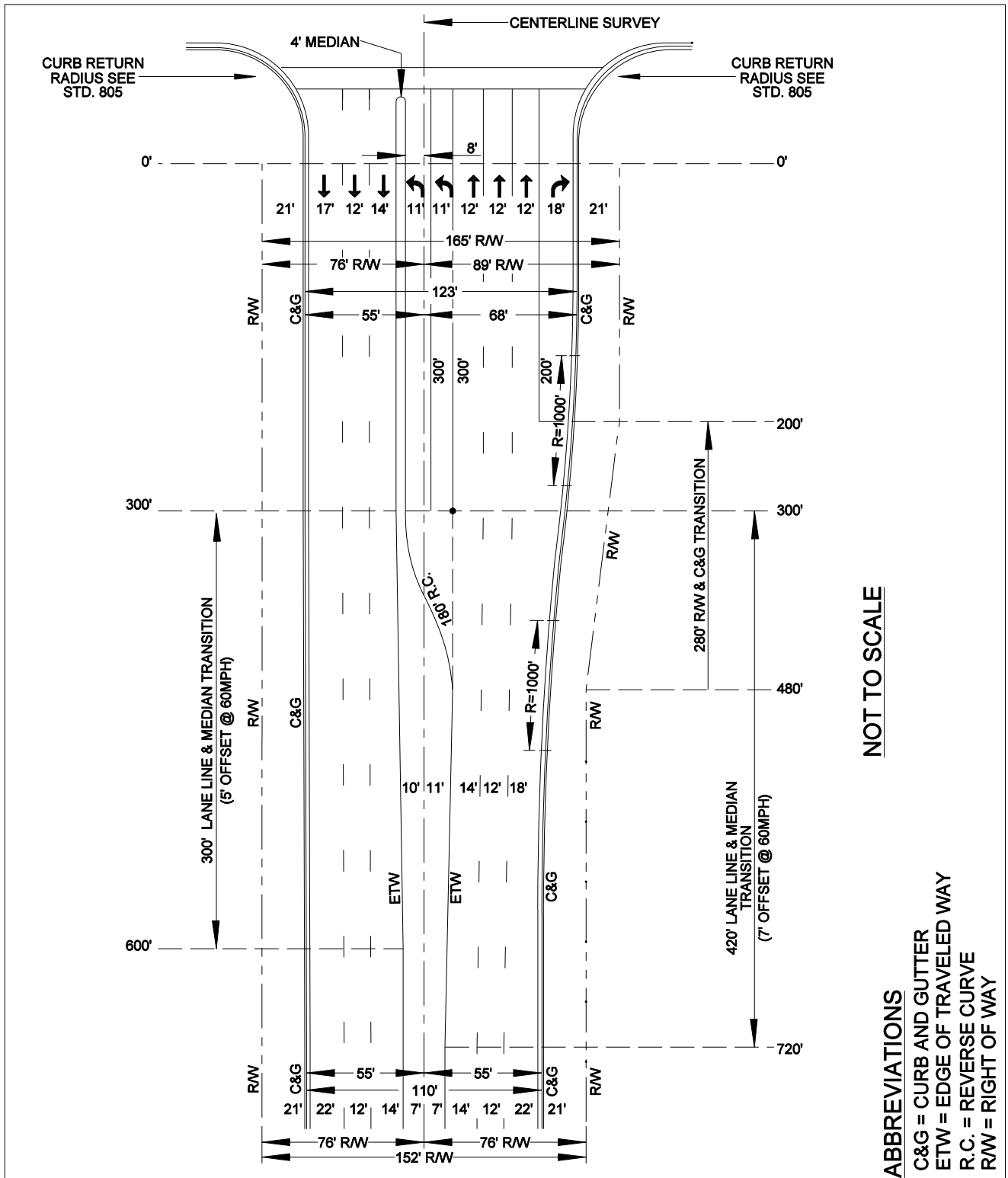
REGISTERED PROFESSIONAL ENGINEER
GEORGE A. JOHNSON
No. CE 42328
Exp. 3-31-08
STATE OF CALIFORNIA CIVIL

REVISIONS	REV.	BY:	APR'D	DATE	REV.	BY:	APR'D	DATE
	1				4			
	2				5			
	3				6			

URBAN ARTERIAL HIGHWAY (152' R/W)

COUNTY OF RIVERSIDE

STANDARD NO. 91 (1 OF 2)



NOT TO SCALE

ABBREVIATIONS

C&G = CURB AND GUTTER
ETW = EDGE OF TRAVELED WAY
R.C. = REVERSE CURVE
R/W = RIGHT OF WAY

APPROVED BY:

DATE: 05/01/07

DIRECTOR OF TRANSPORTATION
GEORGE A. JOHNSON, RCE 42328

REGISTERED PROFESSIONAL ENGINEER
GEORGE A. JOHNSON
No. CE 42328
Exp. 3-31-08
CIVIL
STATE OF CALIFORNIA

COUNTY OF RIVERSIDE

URBAN ARTERIAL HIGHWAY (152' R/W)

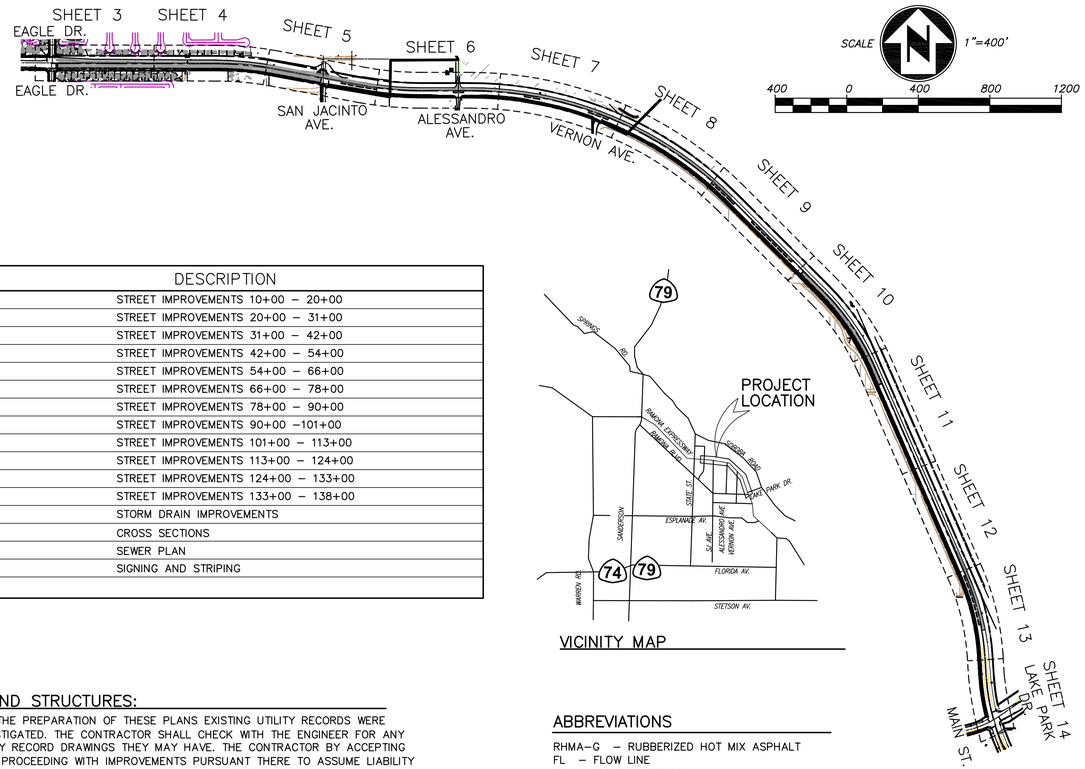
STANDARD NO. 91 (2 OF 2)

REVISIONS		REV.	BY:	APR'D	DATE	REV.	BY:	APR'D	DATE
		1				4			
		2				5			
		3				6			

CITY OF SAN JACINTO, CA.
RAMONA EXPRESSWAY WIDENING
PHASE 2
LAKE PARK DRIVE TO EAGLE DRIVE

GENERAL NOTES:

1. ALL WORK TO BE PERFORMED PER CITY OF SAN JACINTO, RIVERSIDE COUNTY TRANSPORTATION, RIVERSIDE COUNTY FLOOD CONTROL, E.M.W.D., CALTRANS AND THE 2003 MUTCD STANDARDS WITH CALIFORNIA SUPPLEMENT.
2. NOTIFY CITY ENGINEER, CITY OF SAN JACINTO, AT (951) 654–3592, AT LEAST 24 HOURS PRIOR TO START OF CONSTRUCTION.
3. CONTRACTOR IS REQUIRED TO LOCATE AND ADJUST TO GRADE ALL EXISTING MANHOLES AND VALVE COVERS FOR WATER, SEWER, TELEPHONE, ELECTRIC, CABLE TV AND OTHER FACILITIES AS REQUIRED (WEATHER CALLED–OUT OR NOT ON PLANS).
4. ALL STRIPING & LEGENDS SHALL BE REPLACED IN–KIND EXCEPT WHERE NOTED OTHERWISE. ALL STRIPING TO BE PAINT (TWO COATS) AND ALL MARKINGS (INCLUDING CROSSWALKS) TO BE THERMOPLASTIC. ALL STRIPING AND PAVEMENT MARKINGS TO BE PER 2003 MUTCD STANDARDS WITH CALIFORNIA SUPPLEMENT.
5. ALL EXISTING A.C. AND CONCRETE TO BE SAW–CUT WHERE WIDENING IS TO TAKE PLACE OR ADJACENT TO WHERE CONCRETE IS TO BE CONSTRUCTED (APPROX. 1').
6. ANY STOCKPILE OR STORAGE YARD ON PRIVATE PROPERTY MUST HAVE OWNERS APPROVAL.
7. CITY TO MARK ALL CONCRETE REMOVALS PRIOR TO CONSTRUCTION. ALL CONCRETE TO BE SAW–CUT PRIOR TO BEING REMOVED.
8. PROTECT IN PLACE EXISTING MONUMENTS OR RECORD & RESET SURVEY MONUMENTS BY A QUALIFIED REGISTERED SURVEYOR.
9. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROTECT THE NEW WORK FROM VANDALISM UNTIL THE IMPROVEMENTS HAVE BEEN ACCEPTED BY THE CITY AND A NOTICE OF COMPLETION HAS BEEN FILED.
10. ALL ASPHALT REMOVALS TO BE MARKED BY CITY PRIOR TO CONTRACTOR BEGINNING WORK ON THAT PARTICULAR STREET SEGMENT.
11. CONTRACTOR SHALL CONTACT UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA AND OTHER UTILITY COMPANIES AS NEEDED TO COORDINATE FOR PROTECTION AND/OR ADJUSTMENTS OF UTILITIES, AS REQUIRED.
12. CONTRACTOR TO VISIT THE SITE AND FAMILIARIZE HIMSELF WITH THE WORK AND AREA PRIOR TO BIDDING.
13. ALL DIMENSIONS ARE APPROXIMATE. CONTRACTOR TO VERIFY IN FIELD.
14. CONTRACTOR IS RESPONSIBLE TO PROVIDE FOR TRAFFIC CONTROL DEVICES AS NEEDED AND PROVIDE TWO WAY ACCESS AT ALL TIMES. THE CONTRACTOR SHALL MAINTAIN THESE DEVICES AT ALL TIMES INCLUDING HOLIDAYS, WEEKENDS, ETC. FLAGMAN SHALL BE UTILIZED AS REQUIRED TO PROVIDE TWO WAY TRAFFIC DURING CONSTRUCTION.
15. CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL IN COMPLIANCE WITH WATCH MANUAL, 2010 MUTCD, AND THE PLANS.
16. THE CONTRACTOR SHALL APPLY TO, AND BE ISSUED AN ENCROACHMENT PERMIT BY THE CITY OF SAN JACINTO PUBLIC WORKS DEPARTMENT (595 S. SAN JACINTO AVE., SAN JACINTO CA 92583) BEFORE BEGINNING ANY WORK WITHIN AN EXISTING CITY MAINTAINED PUBLIC STREET , AND FOR UTILITY WORK WITHIN OFFERS OF DEDICATION FOR PUBLIC USE.
17. EXISTING PUBLIC STREETS, SHALL REMAIN OPEN TO THE PUBLIC DURING CONSTRUCTION AND BE MAINTAINED BY THE CONTRACTOR, UNLESS OTHERWISE PROVIDED IN THE PLANS AND SPECIFICATIONS. PUBLIC INCONVENIENCE WILL BE MINIMIZED AT ALL TIMES AND SUCH STREETS SHALL BE LEFT FREE OF DIRT AND DEBRIS AT THE END OF EACH WORKING DAY UNLESS PERMISSION IS OTHERWISE GRANTED BY THE CITY ENGINEER.
18. FOR PAVEMENT CONSTRUCTION NINETY FIVE PERCENT (95%) RELATIVE COMPACTION OF THE BASE AND NINETY FIVE (95%) RELATIVE COMPACTION OF THE TOP 12" OF THE SUB GRADE IS REQUIRED PER TESTING PROCEDURES REQUIRED IN THE RIV. CO. ROAD DEPARTMENT SPECIFICATIONS. CONTRACTOR SHALL BE RESPONSIBLE TO BRING CLEAN FILL IF REQUIRED OR EXPORT TO CONSTRUCT THE ROAD AS SHOWN HEREIN. OVERLAY JOINTS AND NEW PAVEMENT JOINTS SHALL BE CONSTRUCTED IN A MANNER TO MATCH NEW AND EXISTING PAVEMENT AND TO PROVIDE A SMOOTH TRANSITION.
19. THE CONTRACTOR IS RESPONSIBLE FOR CLEARING AND GRUBBING THE PROPOSED WORK AREA AND SHALL RELOCATE OR CAUSE TO BE RELOCATED EXISTING CONFLICTING UTILITIES.
20. ANY DEVIATION FROM THESE PLANS IF PROPOSED BY THE CONTRACTOR MUST MEET CITY'S APPROVAL. THE CONTRACTOR IS RESPONSIBLE TO REIMBURSE THE CITY FOR ANY RELATED COST TO THE CITY ASSOCIATED WITH SUCH CHANGE. IN THIS EVENT, NO INCREASE IN CONTRACTOR'S COST WILL BE ACCEPTABLE.
21. ACCESS TO EXISTING RESIDENTS AND OTHER BUILDINGS SHALL REMAIN OPEN AT ALL TIMES.
22. APPLY WEED KILL TO ALL EXISTING WEEDS BETWEEN 1–3 WEEKS PRIOR TO CONSTRUCTION AND REMOVE WEEDS. WEEDS SHALL BE REMOVED FROM ALL EXISTING PAVEMENT, CURB AND GUTTER, SIDEWALK (BETWEEN CURB AND SIDEWALK) AND WHEREVER IMPROVEMENTS ARE PROPOSED.



SHEET#	DESCRIPTION
3	STREET IMPROVEMENTS 10+00 – 20+00
4	STREET IMPROVEMENTS 20+00 – 31+00
5	STREET IMPROVEMENTS 31+00 – 42+00
6	STREET IMPROVEMENTS 42+00 – 54+00
7	STREET IMPROVEMENTS 54+00 – 66+00
8	STREET IMPROVEMENTS 66+00 – 78+00
9	STREET IMPROVEMENTS 78+00 – 90+00
10	STREET IMPROVEMENTS 90+00 –101+00
11	STREET IMPROVEMENTS 101+00 – 113+00
12	STREET IMPROVEMENTS 113+00 – 124+00
13	STREET IMPROVEMENTS 124+00 – 133+00
14	STREET IMPROVEMENTS 133+00 – 138+00
15	STORM DRAIN IMPROVEMENTS
16–20	CROSS SECTIONS
21–24	SEWER PLAN
25–30	SIGNING AND STRIPING

VICINITY MAP

UNDERGROUND STRUCTURES:

AT THE TIME OF THE PREPARATION OF THESE PLANS EXISTING UTILITY RECORDS WERE STILL BEING INVESTIGATED. THE CONTRACTOR SHALL CHECK WITH THE ENGINEER FOR ANY ADDITIONAL UTILITY RECORD DRAWINGS THEY MAY HAVE. THE CONTRACTOR BY ACCEPTING THESE PLANS OR PROCEEDING WITH IMPROVEMENTS PURSUANT THERE TO ASSUME LIABILITY AND TO HOLD UNDERSIGNED HARMLESS FOR ANY DAMAGE RESULTING FROM THE EXISTENCE OF UNDERGROUND UTILITIES OR STRUCTURES NOT REPORTED TO THE UNDERSIGNED NOT INDICATED ON THE PUBLIC RECORDS EXAMINED. LOCATED AT VARIANCE WITH THAT REPORTED OR SHOWN ON RECORDS EXAMINED THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES OR STRUCTURES SHOWN AND ANY OTHER UTILITIES OR STRUCTURES FOUND AT THE SITE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE OWNERS OF THE UTILITIES OR STRUCTURES CONCERNED BEFORE STARTING WORK.

PRIVATE ENGINEERING NOTE:

CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONSTRUCTION CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY, THAT THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT TO BE LIMITED TO NORMAL WORKING HOURS, AND CONSTRUCTION CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY AND HOLD DESIGN PROFESSIONAL HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF DESIGN PROFESSIONAL.

CONSTRUCTION NOTES

1. PROTECT IN PLACE.
2. HEADER GRIND 0.12' A.C., AND OVERLAY VARIABLE THICKNESS RHMA–G.
3. CONSTRUCT 0.12' RHMA–G OVER 0.46' A.C OVER 0.70' CLASS II A.B.
4. OVERLAY VARIABLE THICKNESS A.C (0.12' MIN.).
5. POWER POLE TO BE RELOCATED BY SOUTHERN CA. EDISON.
6. SAW–CUT SIDEWALK TO 6' WIDTH.
7. EX. E.M.W.D SEWER M.H, ADJUST TO GRADE. SEE SEWER M.H PROFILES. FOR VERTICAL ADJUSTMENT.
8. SAW–CUT EXIST. AC PAVEMENT OR CONCRETE FOR A SMOOTH JOINT. EXACT LOCATION OF SAW–CUT TO BE DETERMINED IN THE FIELD.
9. CONSTRUCT 8" CURB & GUTTER TYPE "A–8" PER RIV. CO. STD 201.
10. EX. SIGN, POST, MARKER, ETC. TO BE RELOCATED.
11. CONSTRUCT CLASS I BIKE PATH.
12. CONSTRUCT TYPE "D" DIKE PER CALTRANS STD. PLAN A87B.
13. REMOVE EXISTING A.C PER PLAN, REPLACE WITH 0.12' RHMA–G OVER 0.46' A.C OVER 0.70' CLASS II A.B., SUB–GRADE TO BE COMPACTED TO 95%.
14. A.C. OVERSIDE DRAIN, CONSTRUCT PER DETAIL SHEET 2.
15. PLACE 2–6" DIA. P.V.C., SCH. 80 DRAIN PIPES, LENGHT AS NOTED. (SCH 80 PVC PLASTIC PIPE COMPLY WITH ASTM 1785, TYPE 1120RMIN.)
16. CONSTRUCT STAMPED COLORED CONCRETE, BRICK PATTERN, BRICK RED COLOR, 4" THICKNESS.
17. INSTALL 12"x12" CONCRETE DRAIN BOX WITH METAL GRATE, AND INSTALL 2" P.V.C., SCH. 80, L=20' DRAIN PIPE & FITTINGS FOR POSITIVE OUTLET TO CURB @ GUTTER FLOWLINE. CORE DRILLING AT CURB WILL BE NECESSARY.
18. CONSTRUCT ACCESS RAMP (CASE A) PER A.D.A. & CO. OF RIV. STD. NO. 403. NOTE: RAISED TRUNCATED DOME DETECTABLE WARNING SURFACES ARE REQUIRED ON ALL CURB RAMPS THAT ENTER INTO A VEHICULAR TRAVEL WAY.
19. CONSTRUCT TYPE "A" DIKE PER CALTRANS STD. PLAN A87B.
20. CONSTRUCT CURB RAMP, CASE "C" PER CALTRANS STD. PLAN A88A.
21. CONSTRUCT 4" CONC. PAD.
22. COLD–PLAIN ALL AREAS WHERE NEW SECTION MEETS EXISTING PAVEMENT 6' WIDE X 0.12' DEEP.
23. CONSTRUCT CROSS–GUTTER & SPANDREL PER RIV CO. STD. 209.
24. GRADE AREA FROM EXISTING SIDEWALK TO NEW TOP OF CURB. PROTECT IRRIGATION SYSTEM AT SIDEWALK.
25. REPAIR/REPLACE IRRIGATION SYSTEM IF DAMAGED, REPLACE TURF(LAWN) WITH SOD IN REGRADED AREAS.
26. GRADE PARKWAY AREA FROM EDGE OF PAVEMENT TO 10' NORTH. PLANT GRADED AREA WITH GRASS SEED AND ORGANIC SOIL.
27. CONSTRUCT UNDERSIDEWALK DRAIN WITH 2 1/4" CHECKERED METAL PLATES, BOTH PLATES W=26", L=19–6"± FASTEN TO A CONCRETE CENTER SUPPORT. USE CO. OF RIV. STD. 303 FOR FABRICATION AND INSTALLATION DETAILS.
28. CONSTRUCT CONCRETE DRIVEWAY, 20' TAPERING TO 24' IN WIDTH, 6" THICKNESS.
29. CONSTRUCT DOUBLE THRIE BEAM BARRIER (WOOD POST WITH WOOD BLOCK) PER CALTRANS STD. PLAN A78A. WITH STEEL RAILING MOUNTED ON TOP PER A.P.W.A. STD. PLAN 606–2 (TYPE A). SEE DETAIL SHEET 14.

ABBREVIATIONS

RHMA–G – RUBBERIZED HOT MIX ASPHALT
FL – FLOW LINE
EG – EXISTING GRADE
FS – FINISHED SURFACE
CL – CENTERLINE
TC – TOP OF CURB
GB – GRADE BREAK
CF – CURB FACE
C&G – CURB & GUTTER
S/W – SIDEWALK
SD – STORM DRAIN
CB – CATCH BASIN
BCC – BEGINNING OF COMPOUND CURVE
BRC – BEGINNING OF REVERSE CURVE
BCR – BEGINNING OF CURB RETURN
ECR – END OF CURB RETURN
R/W – RIGHT OF WAY
EP – EDGE OF PAVEMENT
G&O – GRIND AND OVERLAY

PROJECT BENCHMARK

ELEVATIONS SHOWN HEREON ARE BASED ON COUNTY OF RIVERSIDE BENCHMARK, DESCRIBED AS "H–14–4" CENTERLINE INTERSECTION OF RAMONA BLVD. AND LYON AVE. FOUND 1" BRASS BENCH MARK MONUMENT WITH NIPPLE IN A 0.5' DIAMETER HAND WELL DOWN 1.3' LOCATED 1.2 MILES SOUTHEAST ALONG RAMONA BLVD. FROM THE INTERSECTION OF RAMONA BLVD. AND SANDERSON. LYON AVE. WAS PREVIOUSLY KNOWN AS POTTER ROAD.
ELEVATION = 1487.540'

LEGEND

- EXISTING ASPHALT, PROTECT IN PLACE. CONTRACTOR TO REPAIR ANY EXITING ASPHALT DAMAGED BY CONSTRUCTION ACTIVITIES. (EXISTING PAVEMENT STRUCTURAL SECTION: 0.12' RHMA/0.12' AC/0.33 RECYCLED AC/0.33' AB)
- OVERLAY VARIABLE THICKNESS A.C (0.12' MIN.)
- CONSTRUCT 0.12' RHMA–G OVER 0.46' A.C OVER 0.70' CLASS II A.B. CONTRACTOR TO PREPARE SUB–GRADE TO ACHIEVE 95% COMPACTION. OVER EXCAVATION DEPTH PER SOILS REPORT.
- HEADER GRIND 0.12' A.C, AND OVERLAY VARIABLE THICKNESS RHMA–G. *WIDTH TO BE DETERMINED IN THE FIELD (10' MIN., 16' MAX.)
- REMOVE EX. A.C AND A.B AND CONSTRUCT 0.12' RHMA–G OVER 0.46' A.C OVER 0.70' CLASS II A.B.

DIG ALERT
DIAL TOLL FREE
1–800–227–2600
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE
				CITY ENGINEER	

DESIGNED BY: E.B. / K.Y. DRAWN BY: K.Y. / R.G.L. CHECKED BY: E.B.

SEAL — REGISTERED PROFESSIONAL ENGINEER — ALAN D. FRENCH — No. 45702 Exp. 12-31-XX — CIVIL — STATE OF CALIFORNIA

COUNTY OF RIVERSIDE TRANSPORTATION DEPARTMENT APPROVED BY:

ALAN D. FRENCH — DATE
RECOMMENDED — DATE

SEAL — REGISTERED PROFESSIONAL ENGINEER — JADIS N. OTLAGA — No. 35163 — CIVIL — STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9–30–15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

SCALE AS SHOWN
DATE APRIL 2014

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE SUITE D
PERRIS CA 92570
(951) 943–6504

BENCHMARK: SEE ABOVE

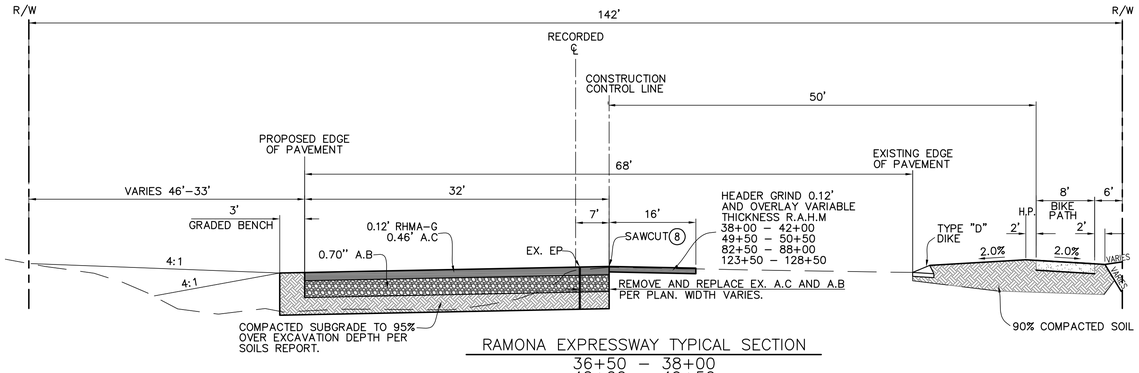
CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.

TITLE SHEET

FOR CITY OF SAN JACINTO W.O. SJ 369

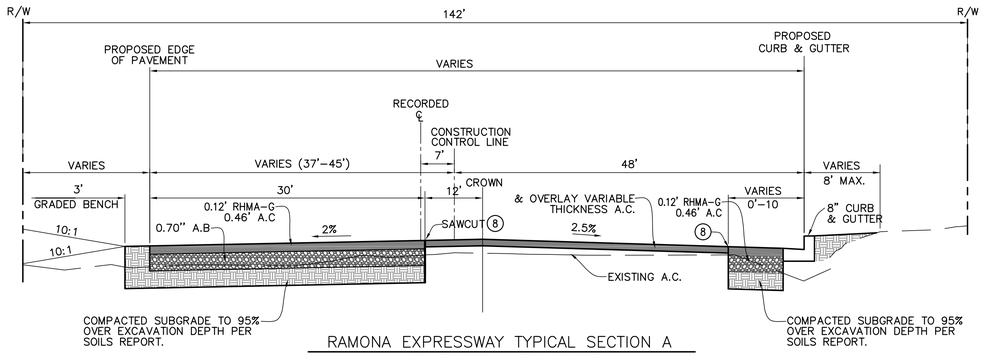
SHEET NO. 1 OF 30 SHEETS
FILE NO. sht 1 ph 2 NEW

APRIL 16, 2014



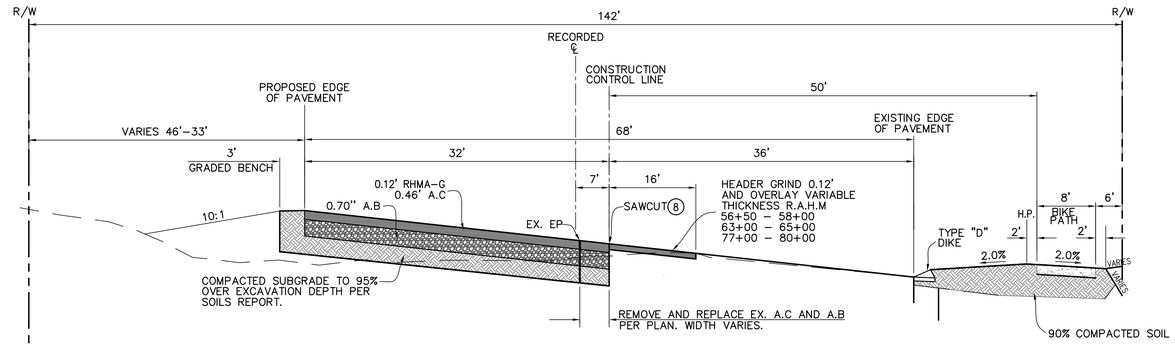
RAMONA EXPRESSWAY TYPICAL SECTION

36+50 – 38+00
42+00 – 49+50
80+00 – 82+50
88+00 – 89+50
101+00 – 123+50
128+50 – END OF PROJECT



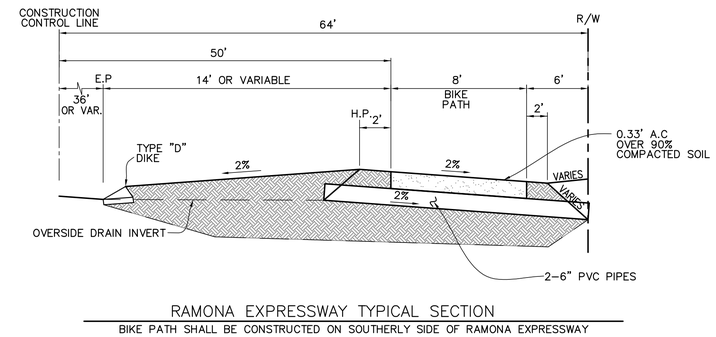
RAMONA EXPRESSWAY TYPICAL SECTION A

10+56.90 – 36+25.83



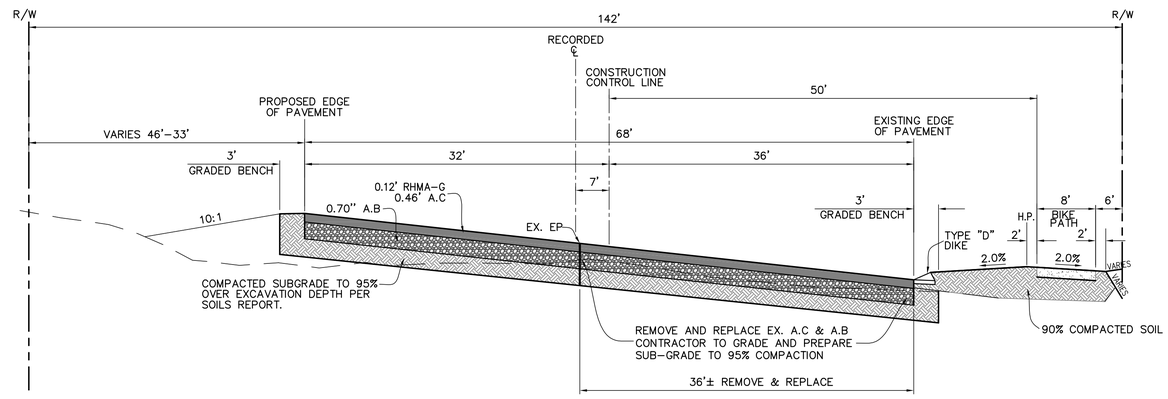
RAMONA EXPRESSWAY TYPICAL SUPER ELEVATION SECTION

50+50 – 56+50
58+00 – 63+00
65+00 – 77+00



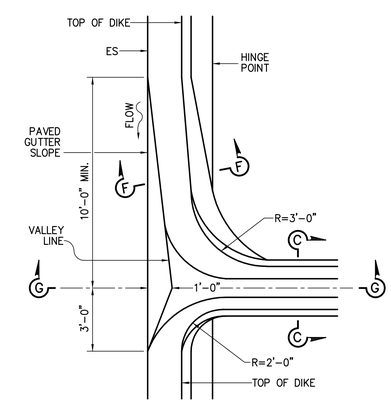
RAMONA EXPRESSWAY TYPICAL SECTION

BIKE PATH SHALL BE CONSTRUCTED ON SOUTHERLY SIDE OF RAMONA EXPRESSWAY



RAMONA EXPRESSWAY TYPICAL SUPER ELEVATION SECTION

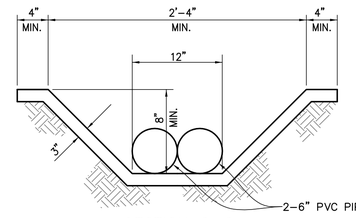
89+50 – 101+00



PLAN

MOUNTABLE DIKE

HOT MIX ASPHALT OVERSIDE DRAINS

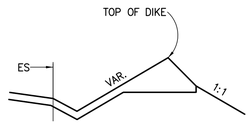


SECTION C–C

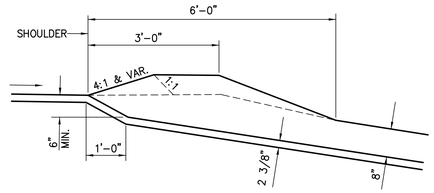
SEE NOTE 1

NOTE:

1. CROSS SECTION OF SLOPE DITCH MAY BE SEMICIRCULAR, VEE OR TRAPEZOIDAL.



SECTION F–F



SECTION G–G

DIG ALERT
DIAL TOLL FREE
1–800–227–2600
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE
				CITY ENGINEER	

DESIGNED BY: E.B. / K.Y. DRAWN BY: K.Y. / R.G.L. CHECKED BY: E.B.

SEAL

REGISTERED PROFESSIONAL ENGINEER — HABIB MOTLAGH — No. 35163 — CIVIL — STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9–30–15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

SCALE N.T.S.
DATE APRIL 2014

BENCHMARK:
SEE SHEET 1

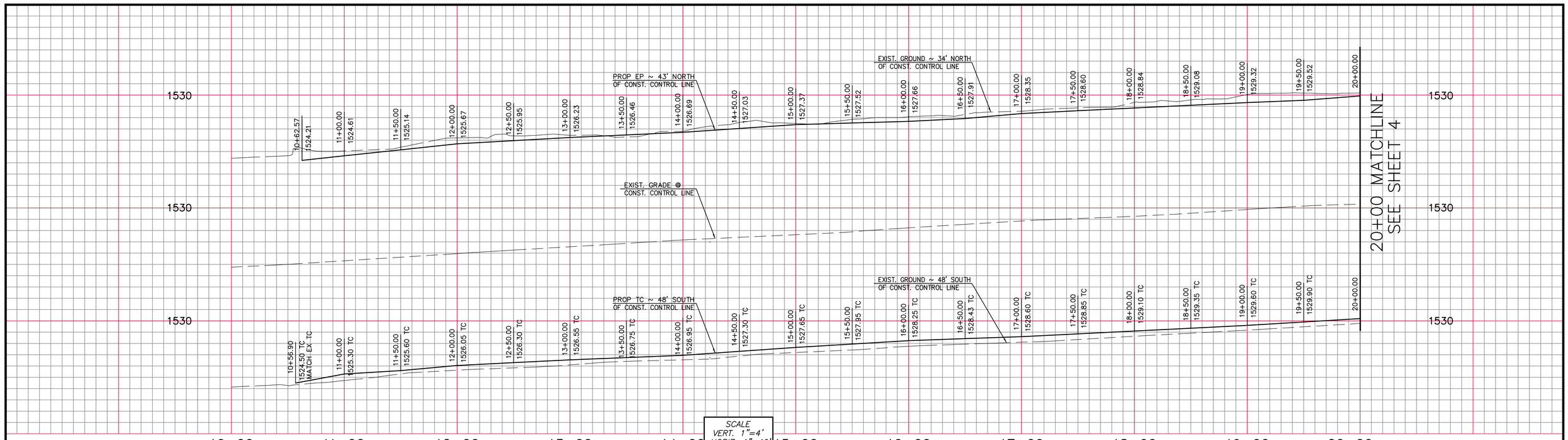
TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE
SUITE D
PERRIS CA 92570
(951) 943–6504

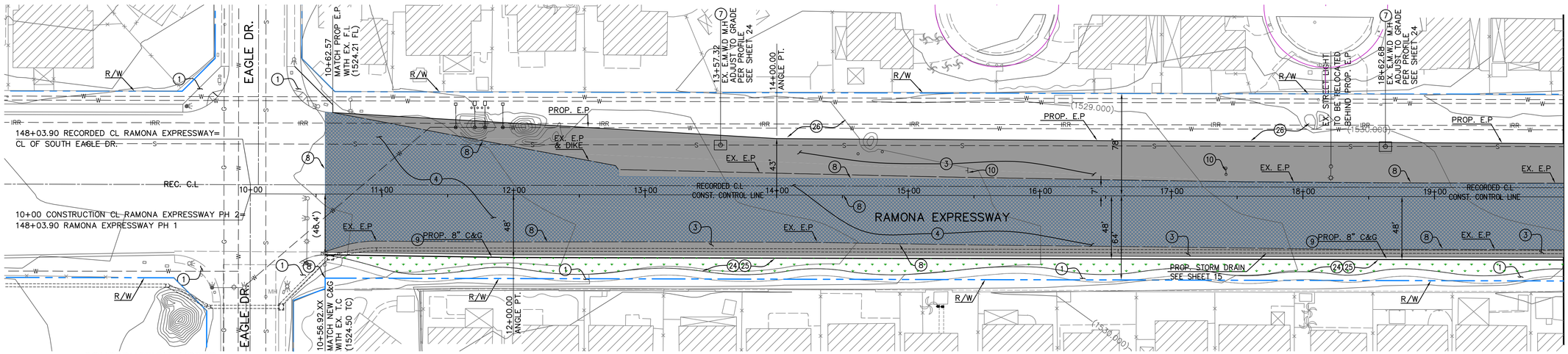
CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.
TYPICAL X-SECTIONS

FOR CITY OF SAN JACINTO W.O. SJ 369

SHEET NO. 2 OF 30 SHEETS
FILE NO. SHT 2 PH 2

APRIL 16, 2013





CONSTRUCTION NOTES

1. PROTECT IN PLACE.
2. HEADER GRIND 0.12' A.C., AND OVERLAY VARIABLE THICKNESS RHMA-G.
3. CONSTRUCT 0.12' RHMA-G OVER 0.46' A.C OVER 0.70' CLASS II A.B.
4. OVERLAY VARIABLE THICKNESS RHMA-G (0.12' MIN.).
5. POWER POLE TO BE RELOCATED BY SOUTHERN CA. EDISON.
6. SAW-CUT SIDEWALK TO 6' WIDTH.
7. EX. E.M.W.D SEWER M.H, ADJUST TO GRADE. SEE SEWER M.H PROFILES. FOR VERTICAL ADJUSTMENT.
8. SAW-CUT EXIST. AC PAVEMENT OR CONCRETE FOR A SMOOTH JOINT. EXACT LOCATION OF SAW-CUT TO BE DETERMINED IN THE FIELD.
9. CONSTRUCT 8" CURB & GUTTER TYPE "A-8" PER RIV. CO. STD 201.
10. EX. SIGN, POST, MARKER, ETC. TO BE RELOCATED.
11. CONSTRUCT CLASS I BIKE PATH.
12. CONSTRUCT TYPE "D" DIKE PER CALTRANS STD. PLAN A87B.
13. REMOVE EXISTING A.C PER PLAN, REPLACE WITH 0.12' RHMA-G OVER 0.46' A.C OVER 0.70' CLASS II A.B., SUB-GRADE TO BE COMPACTED TO 95%.
14. A.C. OVERSIDE DRAIN, CONSTRUCT PER DETAIL SHEET 2.
15. PLACE 2-6" DIA. P.V.C., SCH. 80 DRAIN PIPES, LENGHT AS NOTED. (SCH 80 PVC PLASTIC PIPE COMPLY WITH ASTM 1785, TYPE 1120RMIN.)
16. CONSTRUCT STAMPED COLORED CONCRETE, BRICK PATTERN, BRICK RED COLOR, 4" THICKNESS.
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18. CONSTRUCT ACCESS RAMP (CASE A) PER A.D.A. & CO. OF RIV. STD. NO. 403. NOTE: RAISED TRUNCATED DOME DETECTABLE WARNING SURFACES ARE REQUIRED ON ALL CURB RAMPS THAT ENTER INTO A VEHICULAR TRAVEL WAY.
19. CONSTRUCT TYPE "A" DIKE PER CALTRANS STD. PLAN A87B.
20. CONSTRUCT CURB RAMP, CASE "C" PER CALTRANS STD. PLAN A88A.
21. CONSTRUCT 4" CONC. PAD.
22. COLD-PLAIN ALL AREAS WHERE NEW SECTION MEETS EXISTING PAVEMENT 6' WIDE X 0.12' DEEP.
23. CONSTRUCT CROSS-GUTTER & SPANDREL PER RIV CO. STD. 209.
24. GRADE AREA FROM EXISTING SIDEWALK TO NEW TOP OF CURB. PROTECT IRRIGATION SYSTEM AT SIDEWALK.
25. REPAIR/REPLACE IRRIGATION SYSTEM IF DAMAGED, REPLACE TURF(LAWN) WITH SOD IN REGRADED AREAS.
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LEGEND

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- HEADER GRIND 0.12' A.C, AND OVERLAY VARIABLE THICKNESS RHMA-G. *WIDTH TO BE DETERMINED IN THE FIELD (10' MIN., 16' MAX.)

SCALE 1"=40'
40 0 40 80 120

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AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE
				CITY ENGINEER	

DESIGNED BY: E.B. / K.Y. DRAWN BY: K.Y. / R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER DEBBIE MOTLAGH No. 35163 CIVIL STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9-30-15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE SUITE D PERRIS CA 92570 (951) 943-6504

SCALE AS SHOWN
DATE APRIL 2014

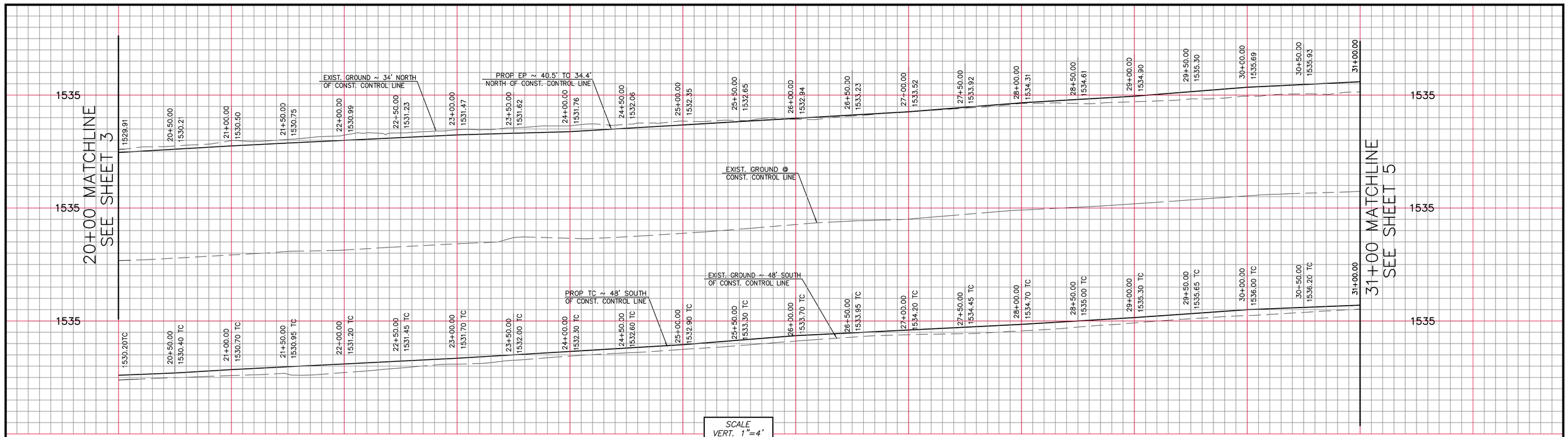
BENCHMARK: SEE SHEET 1

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.

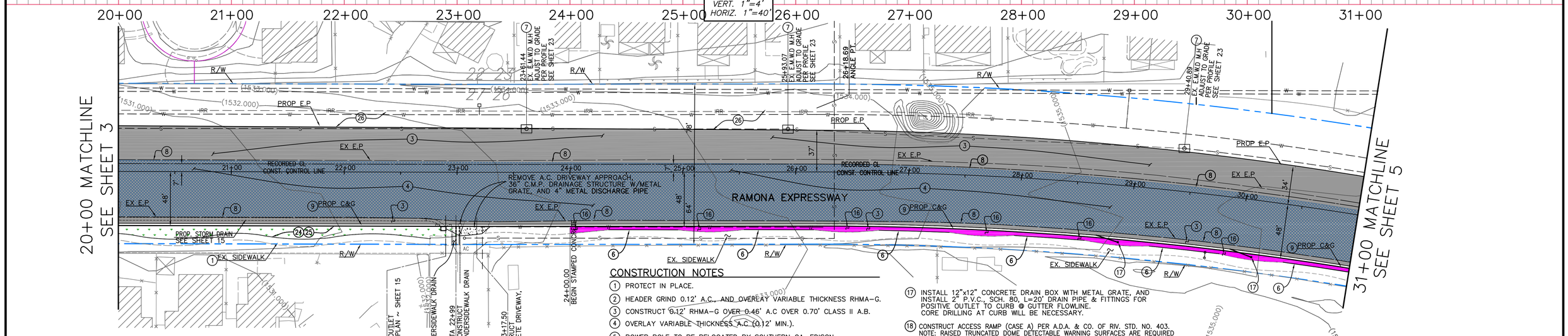
FOR CITY OF SAN JACINTO W.O. SJ 369

SHEET NO. 3 OF 30 SHEETS
FILE NO. SHT 3 PH 2

APRIL 16, 2014



SCALE
VERT. 1"=4'
HORIZ. 1"=40'



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CONSTRUCTION NOTES

1. PROTECT IN PLACE.
2. HEADER GRIND 0.12' A.C., AND OVERLAY VARIABLE THICKNESS RHMA–G.
3. CONSTRUCT 0.12' RHMA–G OVER 0.46' A.C OVER 0.70' CLASS II A.B.
4. OVERLAY VARIABLE THICKNESS A.C (0.12' MIN.).
5. POWER POLE TO BE RELOCATED BY SOUTHERN CA. EDISON.
6. SAW–CUT SIDEWALK TO 6' WIDTH.
7. EX. E.M.W.D SEWER M.H, ADJUST TO GRADE. SEE SEWER M.H PROFILES. FOR VERTICAL ADJUSTMENT.
8. SAW–CUT EXIST. AC PAVEMENT OR CONCRETE FOR A SMOOTH JOINT. EXACT LOCATION OF SAW–CUT TO BE DETERMINED IN THE FIELD.
9. CONSTRUCT 8" CURB & GUTTER TYPE "A–8" PER RIV. CO. STD 201.
10. EX. SIGN, POST, MARKER, ETC. TO BE RELOCATED.
11. CONSTRUCT CLASS I BIKE PATH.
12. CONSTRUCT TYPE "D" DIKE PER CALTRANS STD. PLAN A87B.
13. REMOVE EXISTING A.C PER PLAN, REPLACE WITH 0.12' RHMA–G OVER 0.46' A.C OVER 0.70' CLASS II A.B., SUB–GRADE TO BE COMPACTED TO 95%.
14. A.C. OVERSIDE DRAIN, CONSTRUCT PER DETAIL SHEET 2.
15. PLACE 2–6" DIA. P.V.C., SCH. 80 DRAIN PIPES, LENGHT AS NOTED. (SCH 80 PVC PLASTIC PIPE COMPLY WITH ASTM 1785, TYPE 1120RMIN.)
16. CONSTRUCT STAMPED COLORED CONCRETE, BRICK PATTERN, BRICK RED COLOR, 4" THICKNESS.
17. INSTALL 12"x12" CONCRETE DRAIN BOX WITH METAL GRATE, AND INSTALL 2" P.V.C., SCH. 80, L=20' DRAIN PIPE & FITTINGS FOR POSITIVE OUTLET TO CURB @ GUTTER FLOWLINE. CORE DRILLING AT CURB WILL BE NECESSARY.
18. CONSTRUCT ACCESS RAMP (CASE A) PER A.D.A. & CO. OF RIV. STD. NO. 403. NOTE: RAISED TRUNCATED DOME DETECTABLE WARNING SURFACES ARE REQUIRED ON ALL CURB RAMPS THAT ENTER INTO A VEHICULAR TRAVEL WAY.
19. CONSTRUCT TYPE "A" DIKE PER CALTRANS STD. PLAN A87B.
20. CONSTRUCT CURB RAMP, CASE "C" PER CALTRANS STD. PLAN A88A.
21. CONSTRUCT 4" CONC. PAD.
22. COLD–PLAIN ALL AREAS WHERE NEW SECTION MEETS EXISTING PAVEMENT 6' WIDE X 0.12" DEEP.
23. CONSTRUCT CROSS–GUTTER & SPANDREL PER RIV CO. STD. 209.
24. GRADE AREA FROM EXISTING SIDEWALK TO NEW TOP OF CURB. PROTECT IRRIGATION SYSTEM AT SIDEWALK.
25. REPAIR/REPLACE IRRIGATION SYSTEM IF DAMAGED, REPLACE TURF(LAWN) WITH SOD IN REGRADED AREAS.
26. GRADE PARKWAY AREA FROM EDGE OF PAVEMENT TO 10' NORTH. PLANT GRADED AREA WITH GRASS SEED AND ORGANIC SOIL.
27. CONSTRUCT UNDERSIDEWALK DRAIN WITH 2 1/4" CHECKERED METAL PLATES, BOTH PLATES W=26", L=19'–6"± FASTEN TO A CONCRETE CENTER SUPPORT. USE CO. OF RIV. STD. 303 FOR FABRICATION AND INSTALLATION DETAILS.
28. CONSTRUCT CONCRETE DRIVEWAY, 20' TAPERING TO 24' IN WIDTH, 6" THICKNESS.

SCALE 1"=40'
40 0 40 80 120

DIG ALERT
DIAL TOLL FREE
1–800–227–2600
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE
				CITY ENGINEER	

DESIGNED BY: E.B. / K.Y. DRAWN BY: K.Y. / R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER
HABIB MOTLAGH
No. 35163
CIVIL
STATE OF CALIFORNIA

APPROVED BY: DATE _____
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9–30–15

PREPARED BY: DATE _____
R.C.E. NO. _____ EXP. DATE _____

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE SUITE D
PERRIS CA 92570
(951) 943–6504

SCALE AS SHOWN
DATE APRIL 2014

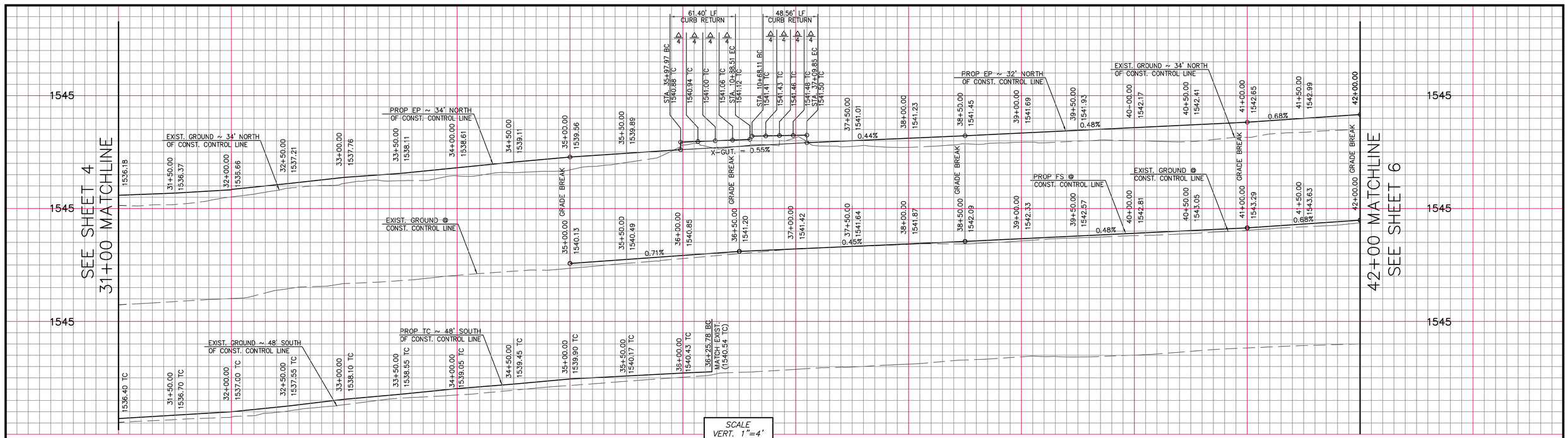
BENCHMARK:
SEE SHEET 1

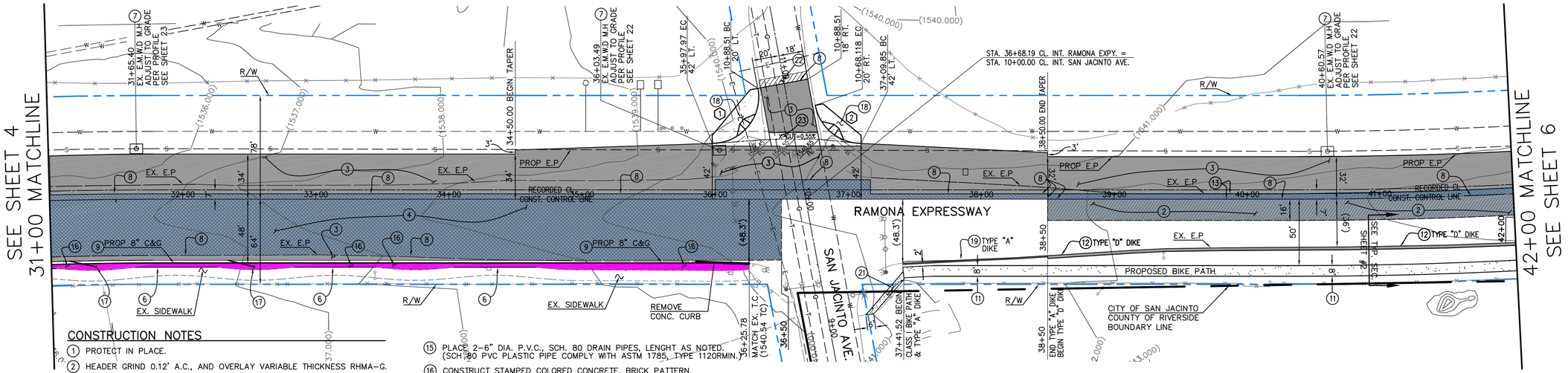
CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.

FOR CITY OF SAN JACINTO W.O. SJ 369

SHEET NO. 4 OF 30 SHEETS
FILE NO. SHT 4 PH 2

APRIL 16, 2014





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12. CONSTRUCT TYPE "D" DIKE PER CALTRANS STD. PLAN A87B.
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LEGEND

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- HEADER GRIND 0.12' A.C, AND OVERLAY VARIABLE THICKNESS RHMA–G. *WIDTH TO BE DETERMINED IN THE FIELD (10' MIN., 16' MAX.)
- REMOVE EX. A.C AND A.B AND CONSTRUCT 0.12' RHMA–G OVER 0.46' A.C OVER 0.70' CLASS II A.B.

CURB DATA					
NO	△/BEARING	RADIUS	LENGTH	TANGENT	COMMENTS
1	100°30'24"	35.00'	61.40'	42.09'	TYPE A–8 CURB & GUTTER
2	79°29'36"	35.00'	48.56'	29.11'	TYPE A–8 CURB & GUTTER

SCALE 1"=40'
40 0 40 80 120

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DATE	BY	MARK	REVISIONS	APPR.	DATE
				CITY ENGINEER	

DESIGNED BY: E.B. / K.Y. DRAWN BY: K.Y. / R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER — HABIB MOTLAGH — No. 35163 — CIVIL — STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9–30–15

PREPARED BY: DATE
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SCALE AS SHOWN
DATE APRIL 2014

BENCHMARK:
SEE SHEET 1

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE
SUITE D
PERRIS CA 92570
(951) 943–6504

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.

FOR CITY OF SAN JACINTO W.O. SJ 369

SHEET NO. 5 OF 30 SHEETS
FILE NO. SHT 5 PH 2

APRIL 16, 2014

SEE SHEET 5
42+00 MATCHLINE

54+00 MATCHLINE
SEE SHEET 7

EXIST. GROUND ~ 34' NORTH OF CONST. CONTROL LINE

PROP EP ~ 32' NORTH OF CONST. CONTROL LINE

PROP FS @ CONST. CONTROL LINE

EXIST. GROUND @ CONST. CONTROL LINE

STA	GRADE BREAK	EXIST. GROUND ~ 34' NORTH OF CONST. CONTROL LINE	PROP EP ~ 32' NORTH OF CONST. CONTROL LINE	PROP FS @ CONST. CONTROL LINE	EXIST. GROUND @ CONST. CONTROL LINE
42+00	1543.33				1543.97
42+50	1543.76				1544.40
43+00	1544.13				1544.77
43+50	1544.51				1545.15
44+00	1544.88				1545.52
44+50	1545.25				1545.89
45+00	1545.55				1546.19
45+30	1545.73				1546.37
45+50	1545.80				1546.44
46+00	1545.96				1546.60
46+50	1546.34				1546.98
47+00	1546.67				1547.31
47+50		1546.94		1547.58	
48+00	1547.20			1547.84	
48+50	1547.53			1548.17	
49+00	1547.86			1548.50	
49+50	1548.13			1548.77	
50+00	1548.27			1549.03	
50+21.15	END NORMAL CROWN 1548.58' EP				
50+50	1549.00			1549.23	
51+00	1549.71			1549.32	
51+41.26	BEGIN FULL SUPER 1550.30 EP				
51+50	1550.38			1549.52	
52+00	1550.59			1549.72	
52+50	1550.74			1549.88	
53+00	1550.84			1549.97	
53+50	1550.92			1550.06	
54+00	GRADE BREAK				

SCALE
VERT. 1"=4'
HORIZ. 1"=40'

42+00 43+00 44+00 45+00 46+00 47+00 48+00 49+00 50+00 51+00 52+00 53+00 54+00

SEE SHEET 5
42+00 MATCHLINE

54+00 MATCHLINE
SEE SHEET 7

RAMONA EXPRESSWAY

CITY OF SAN JACINTO
COUNTY OF RIVERSIDE

PROPOSED BIKE PATH

ALESSANDRO AVE.

43+57.03 EX. E.M.W.D M.H ADJUST TO GRADE PER PROFILE SEE SHEET 22

46+71.77 EX. E.M.W.D M.H ADJUST TO GRADE PER PROFILE SEE SHEET 22

50+04.30 EX. E.M.W.D M.H ADJUST TO GRADE PER PROFILE SEE SHEET 21

53+54.63 EX. E.M.W.D M.H ADJUST TO GRADE PER PROFILE SEE SHEET 21

EC 1547.87 EP

BC 1547.87 EP
50+52.69 EC
1548.99 EP

49+46.69 BC
1548.11 EP

49+41.59 BC

49+54.06 END TYPE "A" DIKE

50+45.07 BEGIN TYPE "A" DIKE

50+57.59 EC

52+50 END TYPE "A" DIKE
BEGIN TYPE "D" DIKE

47+50 END TYPE "D" DIKE
BEGIN TYPE "A" DIKE

46+00.00 SEE SHEET 22 FOR CONTINUATION

L=20'

L=20'

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DATE	BY	MARK	REVISIONS	APPR.	DATE
				CITY	

DESIGNED BY: E.B. / K.Y DRAWN BY: K.Y. / R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER — DENIS MOTLAGH — No. 35163 — CIVIL — STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9-30-15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE SUITE D
PERRIS CA 92570
(951) 943-6504

SCALE AS SHOWN
DATE APRIL 2014

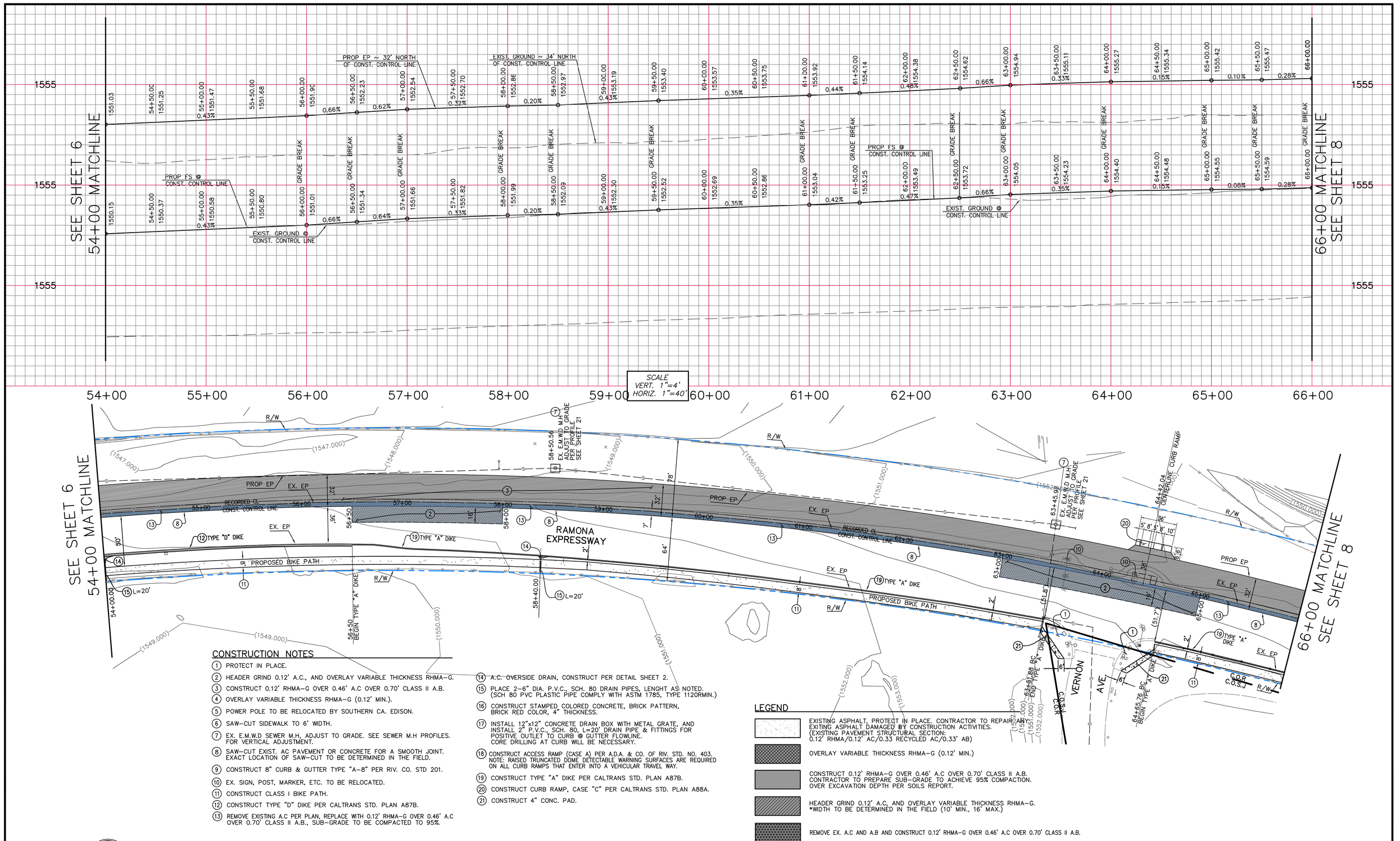
BENCHMARK:
SEE SHEET 1

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.

FOR CITY OF SAN JACINTO W.O. SJ 369

SHEET NO. 6 OF 30 SHEETS
FILE NO. SHT 6 PH 2

APRIL 16, 2014



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DATE	BY	MARK	REVISIONS	APPR.	DATE
				CITY ENGINEER	

DESIGNED BY: E.B. / K.Y DRAWN BY: K.Y. / R.G.L. CHECKED BY: E.B.

SEAL — REGISTERED PROFESSIONAL ENGINEER — HEIDI MOTLAGH — No. 35163 — CIVIL — STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9–30–15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE SUITE D PERRIS CA 92570 (951) 943–6504

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BENCHMARK: SEE SHEET 1

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RAMONA EXPRESSWAY WIDENING PHASE II, EAGLE DR - LAKE PARK DR.

FOR CITY OF SAN JACINTO W.O. SJ 369

SHEET NO. 7 OF 30 SHEETS
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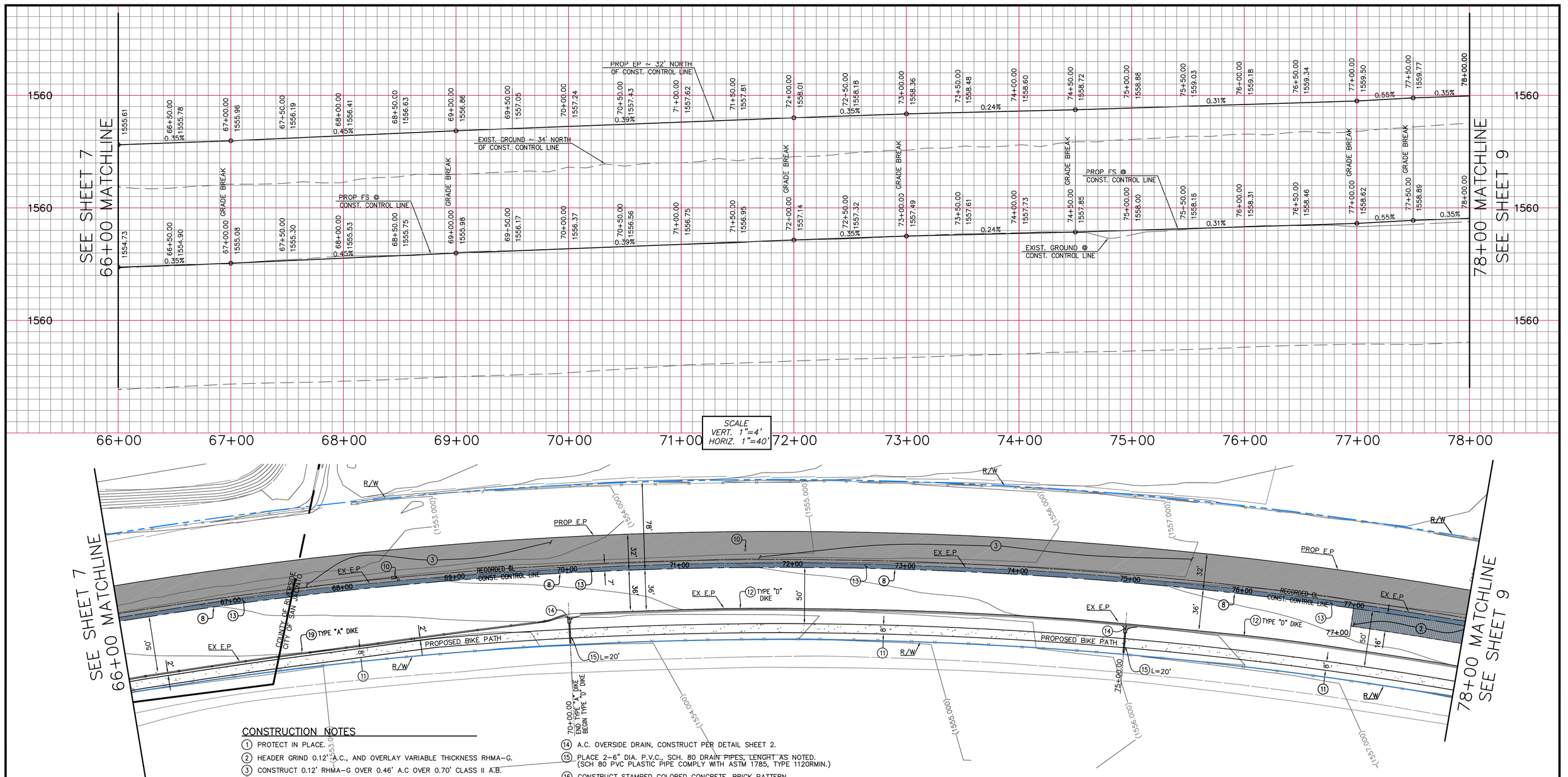

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20. CONSTRUCT CURB RAMP, CASE "C" PER CALTRANS STD. PLAN A88A.

LEGEND

- EXISTING ASPHALT, PROTECT IN PLACE. CONTRACTOR TO REPAIR ANY EXITING ASPHALT DAMAGED BY CONSTRUCTION ACTIVITIES. (EXISTING PAVEMENT STRUCTURAL SECTION: 0.12' RHMA/0.12' AC/0.33 RECYCLED AC/0.33' AB)
- OVERLAY VARIABLE THICKNESS RHMA–G (0.12' MIN.)
- CONSTRUCT 0.12' RHMA–G OVER 0.46' A.C OVER 0.70' CLASS II A.B. CONTRACTOR TO PREPARE SUB–GRADE TO ACHIEVE 95% COMPACTION. OVER EXCAVATION DEPTH PER SOILS REPORT.
- HEADER GRIND 0.12' A.C, AND OVERLAY VARIABLE THICKNESS RHMA–G. *WIDTH TO BE DETERMINED IN THE FIELD (10' MIN., 16' MAX.)
- REMOVE EX. A.C AND A.B AND CONSTRUCT 0.12' RHMA–G OVER 0.46' A.C OVER 0.70' CLASS II A.B.

SCALE 1"=40'
40 0 40 80 120

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DATE	BY	MARK	REVISIONS	APPR.	DATE

ENGINEER CITY

DESIGNED BY: E.B. / K.Y. DRAWN BY: K.Y. / R.G.L. CHECKED BY: E.B.

SEAL
HABIB MOTLAGH No. 35163 REGISTERED PROFESSIONAL ENGINEER CIVIL STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9–30–15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE
SUITE D
PERRIS CA 92570
(951) 943–6504

SCALE AS SHOWN
DATE APRIL 2014

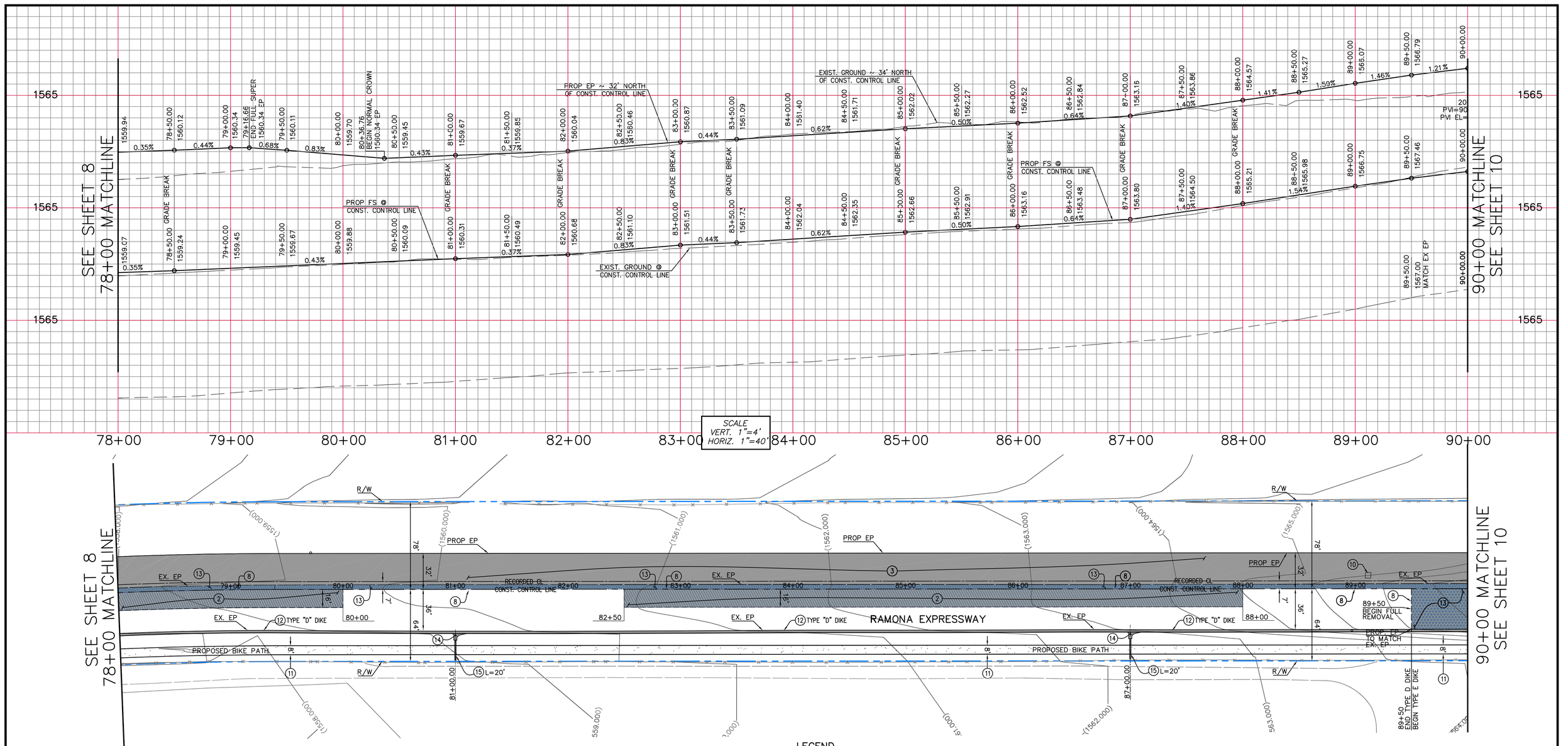
BENCHMARK:
SEE SHEET 1

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.

FOR CITY OF SAN JACINTO W.O. SJ 369

SHEET NO. 8 OF 30 SHEETS
FILE NO. SHT 8 PH 2

APRIL 16, 2014



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DESIGNED BY: E.B. / K.Y. DRAWN BY: K.Y. / R.G.L. CHECKED BY: E.B.

SEAL
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APPROVED BY: DATE
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TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE SUITE D
PERRIS CA 92570
(951) 943-6504

SCALE AS SHOWN
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BENCHMARK:
SEE SHEET 1

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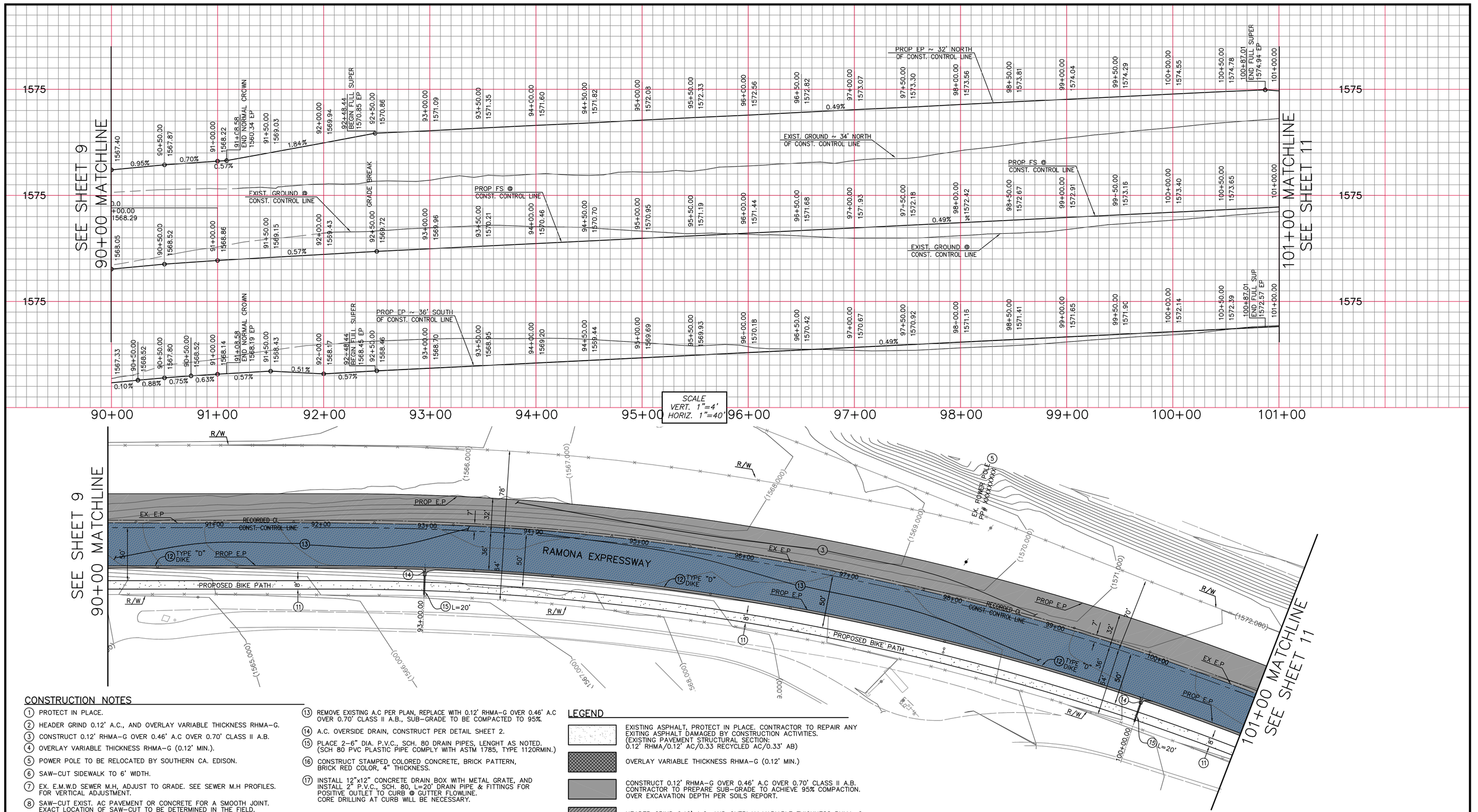
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.

FOR CITY OF SAN JACINTO W.O. SJ 369

SHEET NO. 9 OF 30 SHEETS
FILE NO. SHT 9 PH 2

APRIL 16, 2014



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FOR CITY OF SAN JACINTO W.O. SJ 369

SHEET NO. 10 OF 30 SHEETS
FILE NO. SHT 10 PH 2

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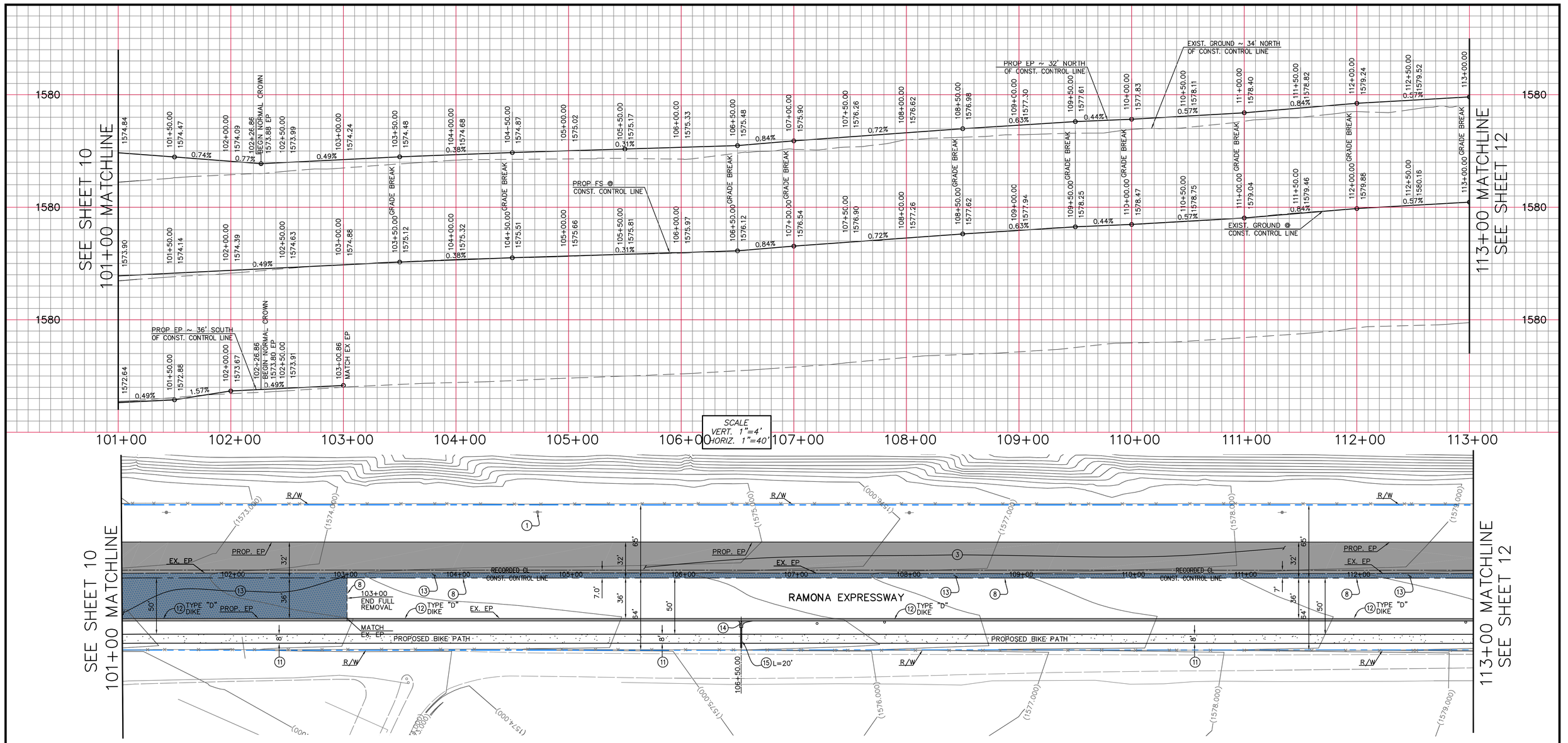

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SEE SHEET 1

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
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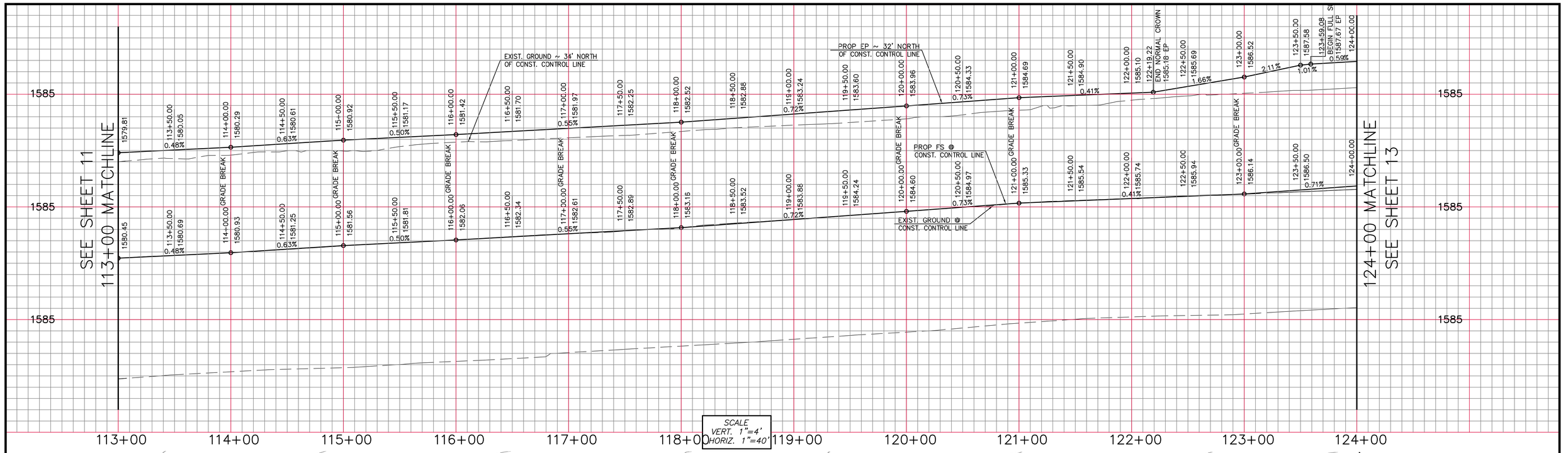
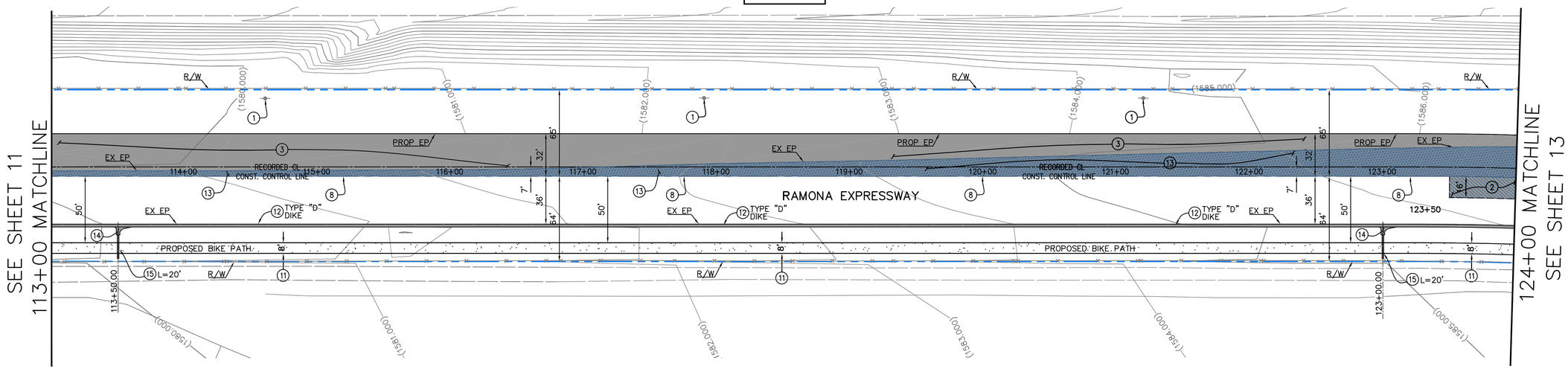
FOR CITY OF SAN JACINTO W.O. SJ 369

SHEET NO. 11 OF 30 SHEETS
FILE NO. SHT 11 PH 2

APRIL 16, 2014





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SHEET NO. 12 OF 30 SHEETS
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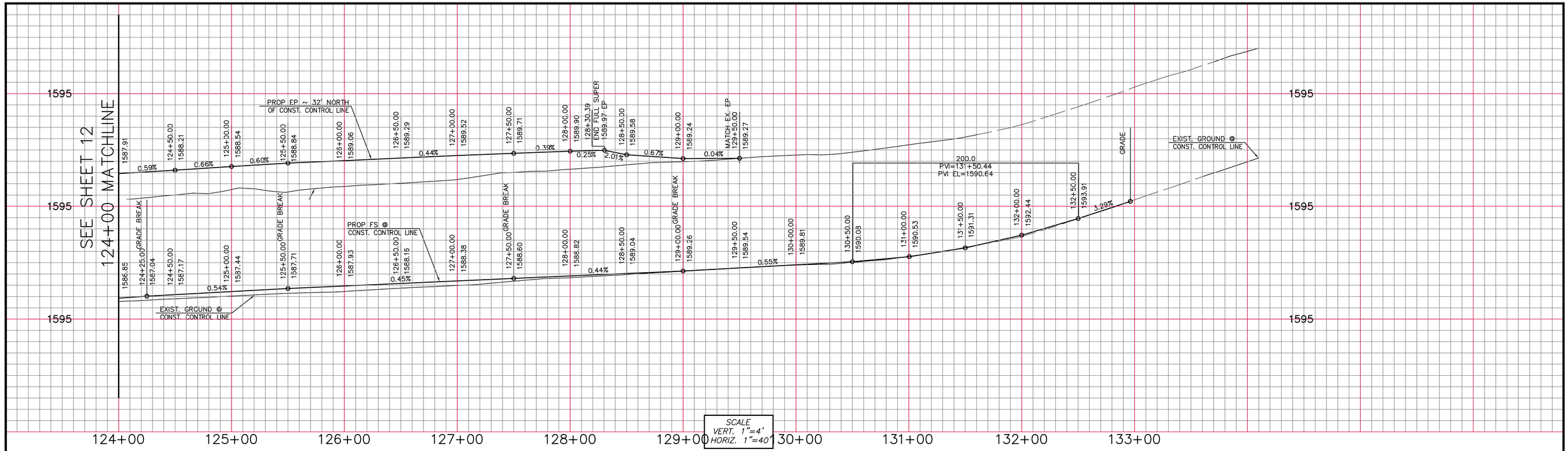

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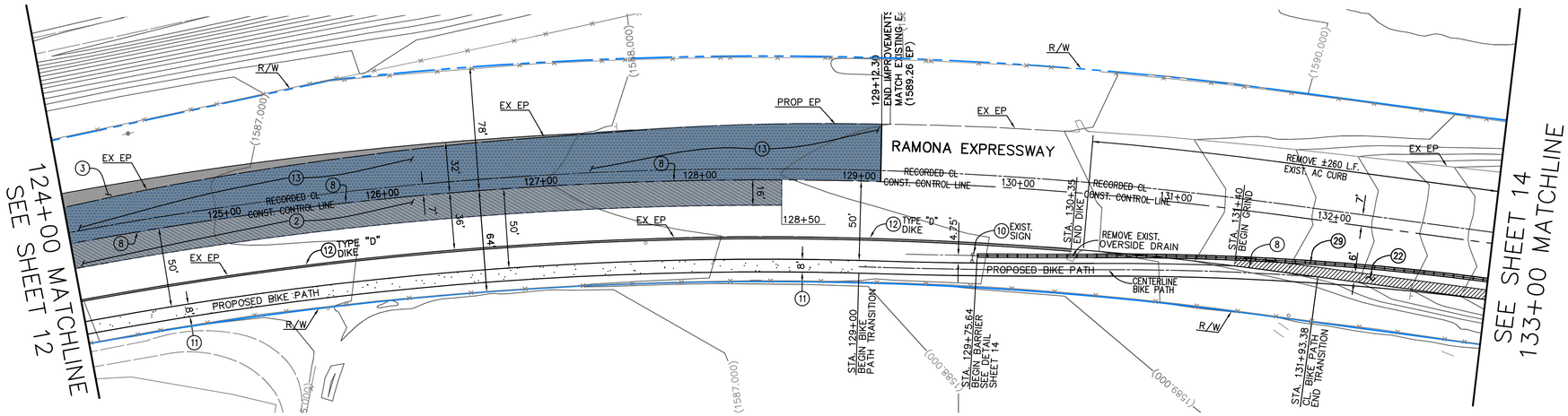

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22. COLD–PLAIN ALL AREAS WHERE NEW SECTION MEETS EXISTING PAVEMENT 6' WIDE X 0.12' DEEP.
29. CONSTRUCT DOUBLE THRIE BEAM BARRIER (WOOD POST WITH WOOD BLOCK) PER CALTRANS STD. PLAN A78A. WITH STEEL RAILING MOUNTED ON TOP PER A.P.W.A. STD. PLAN 606–2 (TYPE A). SEE DETAIL SHEET 14.

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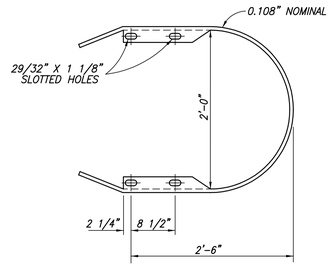
CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.

FOR CITY OF SAN JACINTO W.O. SJ 369

SHEET NO. 13 OF 30 SHEETS
FILE NO. SHT 13 PH 2

APRIL 16, 2014



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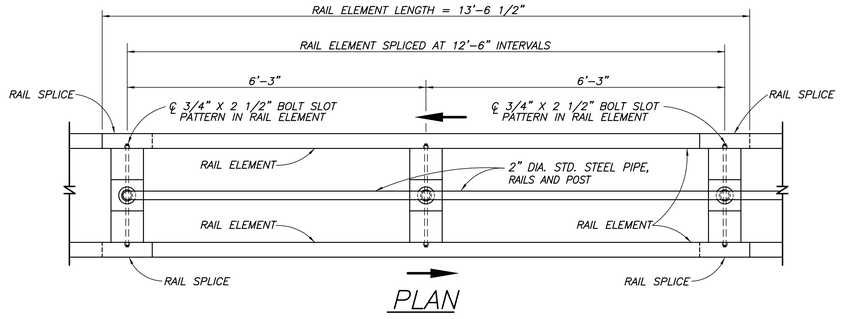
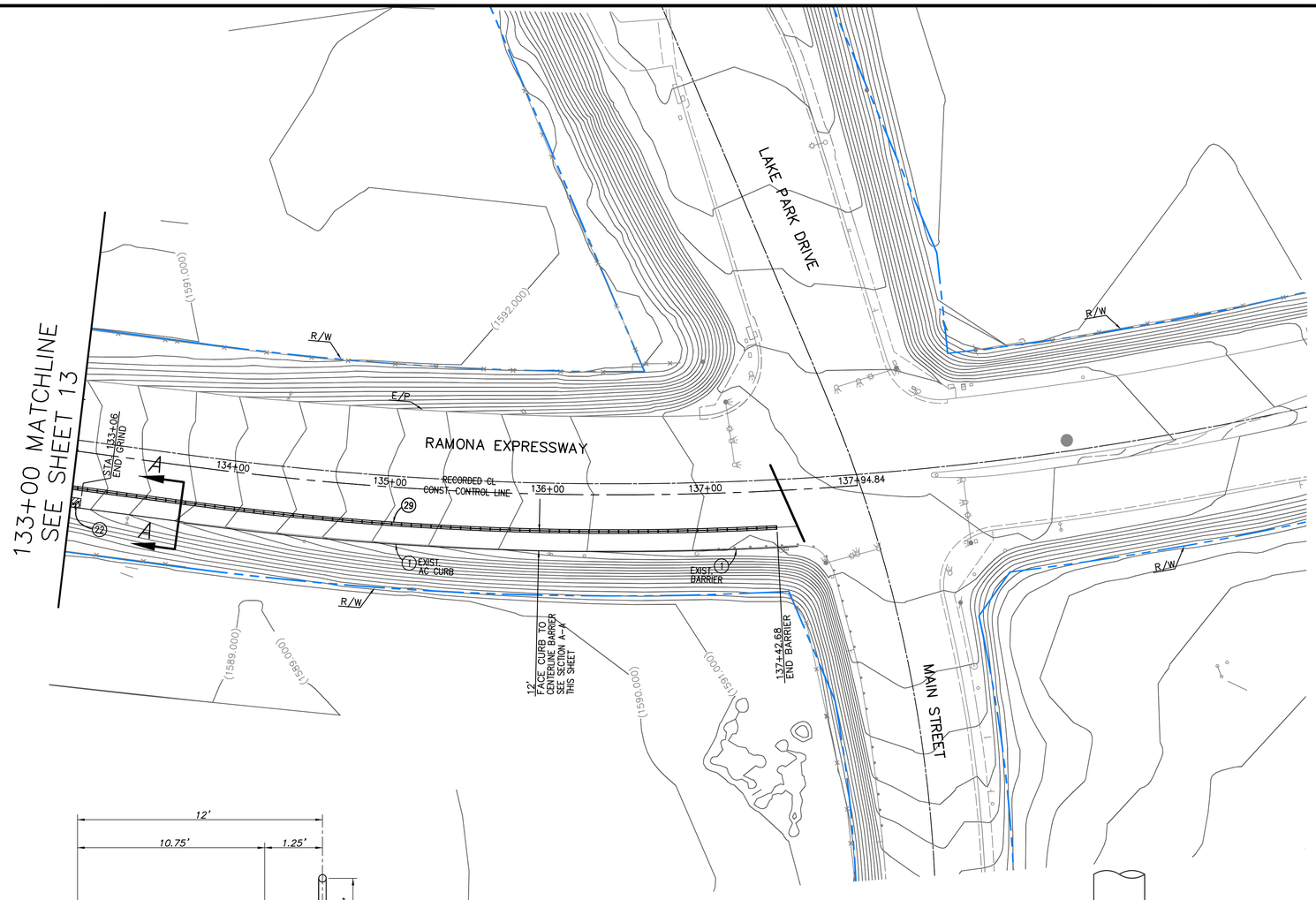
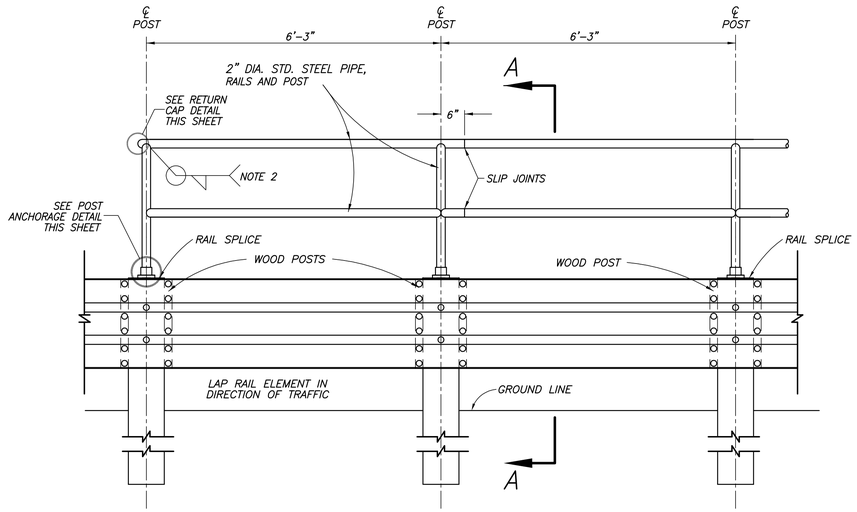
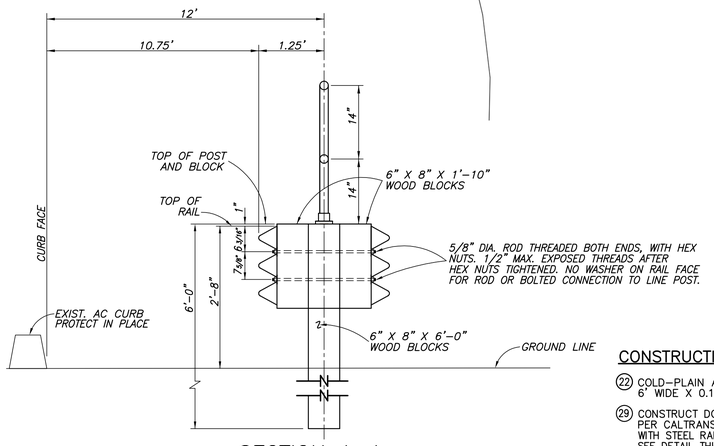


PLAN





ELEVATION
DOUBLE THRIE BEAM BARRIER
(WOOD POST AND BLOCKS)
STEEL RAILING MOUNTED ON TOP



SECTION A-A
TYPICAL WOOD LINE
POST INSTALLATION
STEEL RAILING MOUNTED ON TOP

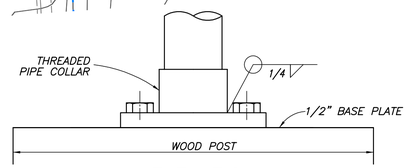
CONSTRUCTION NOTES

(22) COLD-PLAIN ALL AREAS WHERE NEW SECTION MEETS EXISTING PAVEMENT 6' WIDE X 0.12' DEEP.

(29) CONSTRUCT DOUBLE THRIE BEAM BARRIER (WOOD POST WITH WOOD BLOCK) PER CALTRANS STD. PLAN A78A. WITH STEEL RAILING MOUNTED ON TOP PER A.P.W.A. STD. PLAN 606-2 (TYPE A). SEE DETAIL THIS SHEET.

NOTES

1. RAILS AND POSTS SHALL BE GALVANIZED STEEL PIPE.
2. WELDS SHALL BE SLOT OR FILLET WELDS EQUAL TO THICKNESS OF PIPE. WELD ALL JOINTS ALL AROUND.



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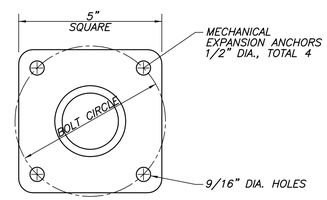


PLAN
POST ANCHORAGE DETAIL
DETAIL D

SCALE 1"=40'
40 0 40 80 120

DIG ALERT
DIAL TOLL FREE
1-800-227-2600
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE
				ENGINEER	CITY

DESIGNED BY: E.B. / K.Y DRAWN BY: K.Y. / R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER HABIB MOTLAGH No. 35163 CIVIL STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9-30-15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE SUITE D
PERRIS CA 92570
(951) 943-6504

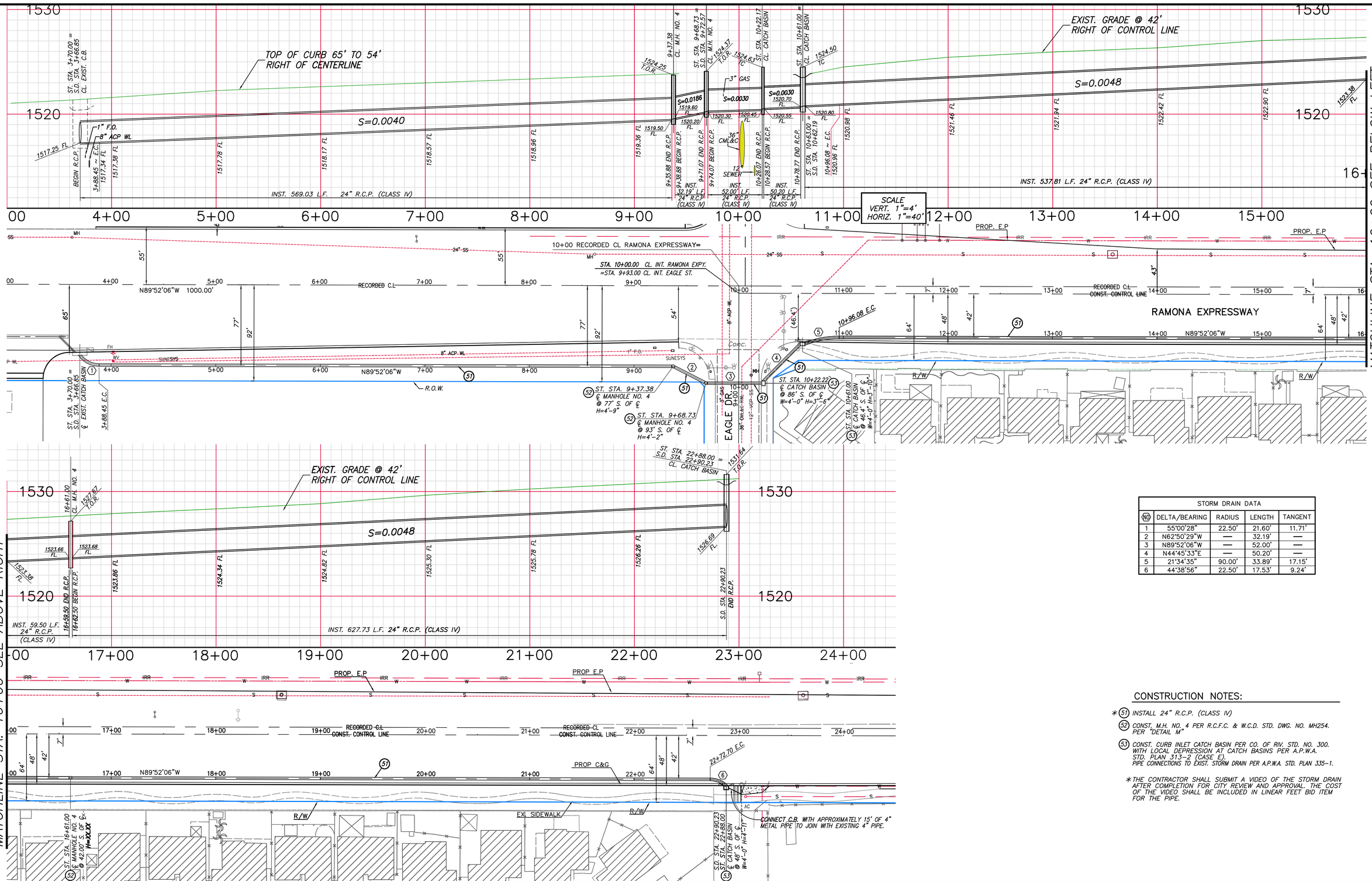
SCALE AS SHOWN
DATE APRIL 2014

BENCHMARK:
SEE SHEET 1

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.

FOR CITY OF SAN JACINTO W.O. SJ 369

SHEET NO. 14 OF 30 SHEETS
FILE NO. SHT 14 PH 2



STORM DRAIN DATA				
NO	DELTA/BEARING	RADIUS	LENGTH	TANGENT
1	55°00'28"	22.50'	21.60'	11.71'
2	N62°50'29"W	—	32.19'	—
3	N89°52'06"W	—	52.00'	—
4	N44°45'33"E	—	50.20'	—
5	21°34'35"	90.00'	33.89'	17.15'
6	44°38'56"	22.50'	17.53'	9.24'

CONSTRUCTION NOTES:

*(51) INSTALL 24" R.C.P. (CLASS IV)

(52) CONST. M.H. NO. 4 PER R.C.F.C. & W.C.D. STD. DWG. NO. MH254. PER "DETAIL M"

(53) CONST. CURB INLET CATCH BASIN PER CO. OF RIV. STD. NO. 300. WITH LOCAL DEPRESSION AT CATCH BASINS PER A.P.W.A. STD. PLAN 313–2 (CASE E). PIPE CONNECTIONS TO EXIST. STORM DRAIN PER A.P.W.A. STD. PLAN 335–1.

*THE CONTRACTOR SHALL SUBMIT A VIDEO OF THE STORM DRAIN AFTER COMPLETION FOR CITY REVIEW AND APPROVAL. THE COST OF THE VIDEO SHALL BE INCLUDED IN LINEAR FEET BID ITEM FOR THE PIPE.

SCALE 1"=40'
40 0 40 80 120

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DATE	BY	MARK	REVISIONS	APPR.	DATE
				ENGINEER	CITY

DESIGNED BY: E.B. / K.Y DRAWN BY: K.Y. / R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER — JACOB NICHOLAS — No. 35163 — CIVIL — STATE OF CALIFORNIA

APPROVED BY: _____ DATE _____
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9-30-15

PREPARED BY: _____ DATE _____
R.C.E. NO. _____ EXP. DATE _____

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE SUITE D
PERRIS CA 92570
(951) 943-6504

SCALE AS SHOWN
DATE APRIL 2014

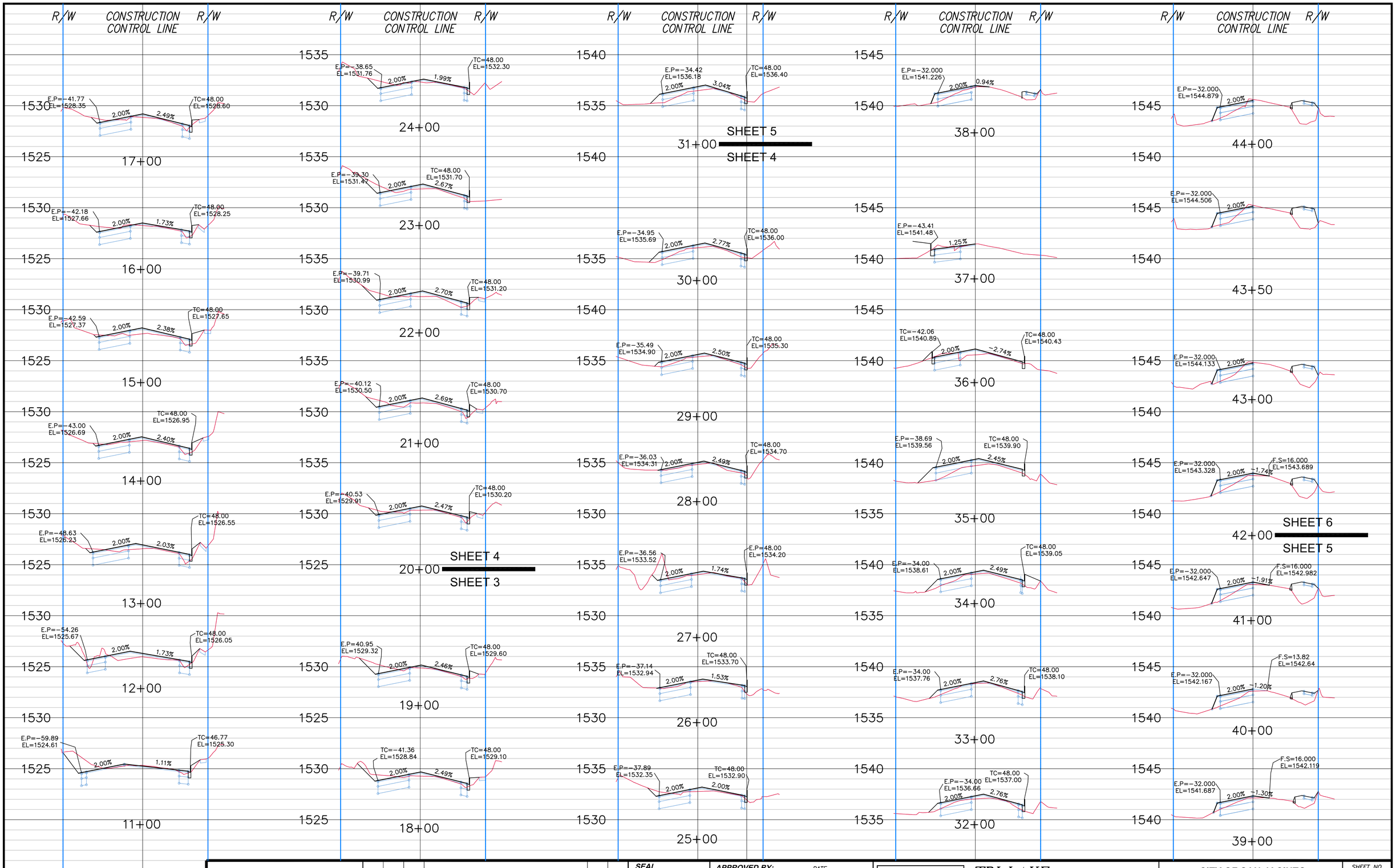
BENCHMARK:
SEE SHEET 1

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING PHASE II, EAGLE DR - LAKE PARK DR.
STORM DRAIN IMPROVEMENTS

FOR CITY OF SAN JACINTO W.O. SJ 369

SHEET NO. 15 OF 30 SHEETS
FILE NO. phase II STORM DRAIN SHT 15

APRIL 16, 2014



SCALE
VERT. 1"=4'
HORIZ. 1"=40'

DIG ALERT
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DATE	BY	MARK	APPR.	DATE
ENGINEER		REVISIONS	CITY	

DESIGNED BY: E.B. / K.Y. DRAWN BY: R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER — HABIB MOTLAGH — No. 35163 — CIVIL — STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9-30-15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE
SUITE D
PERRIS CA 92570
(951) 943-6504

SCALE AS SHOWN
DATE APRIL 2014

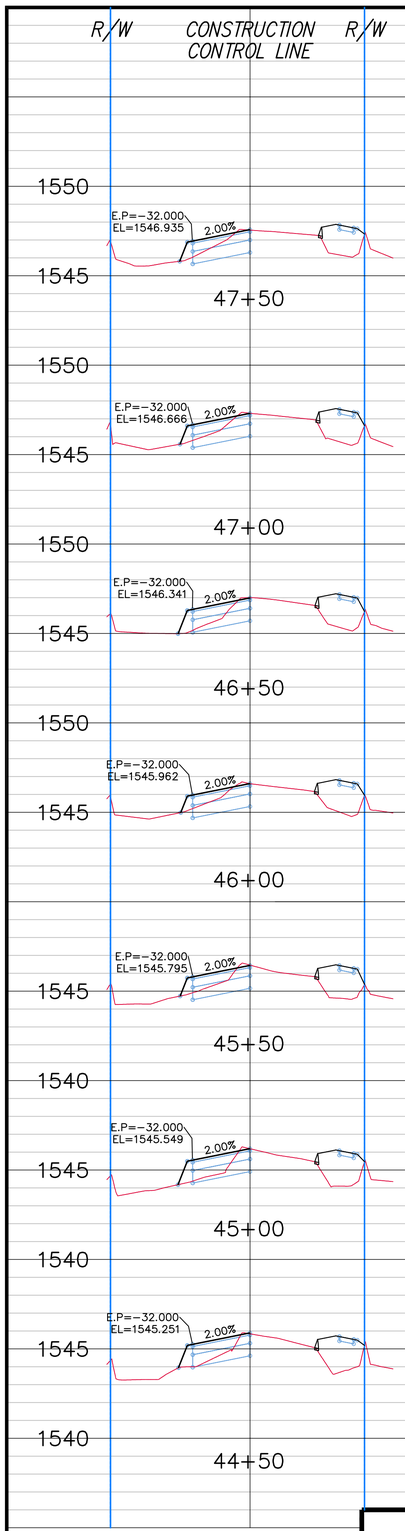
BENCHMARK:
SEE SHEET 1

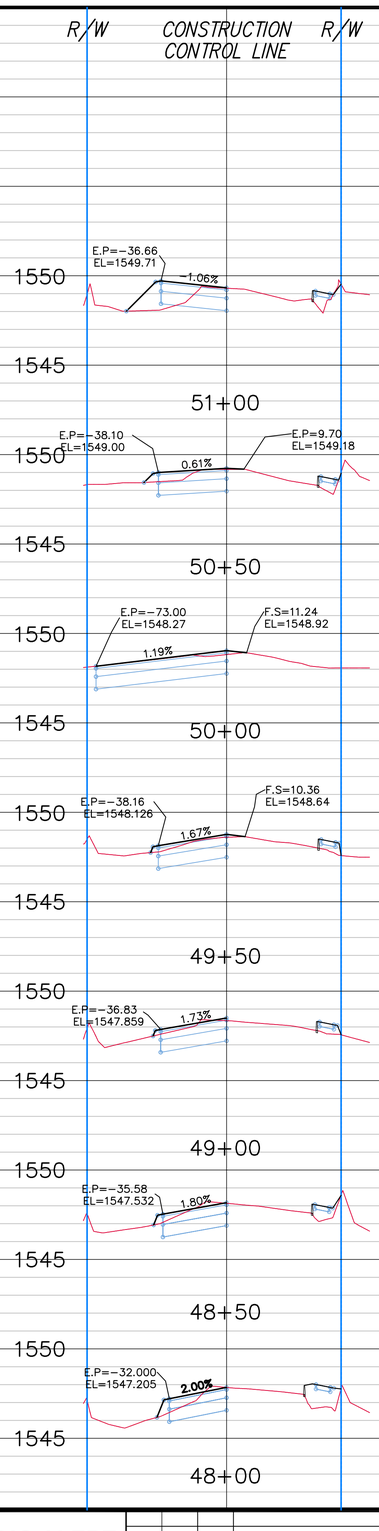
CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.
CROSS-SECTIONS

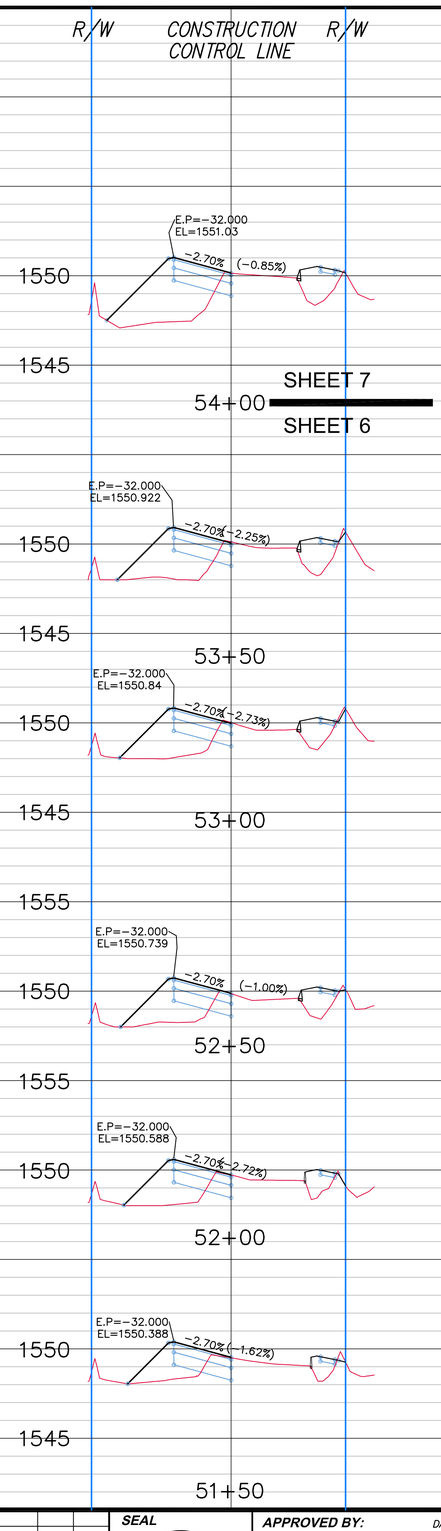
FOR CITY OF SAN JACINTO W.O. SJ 369

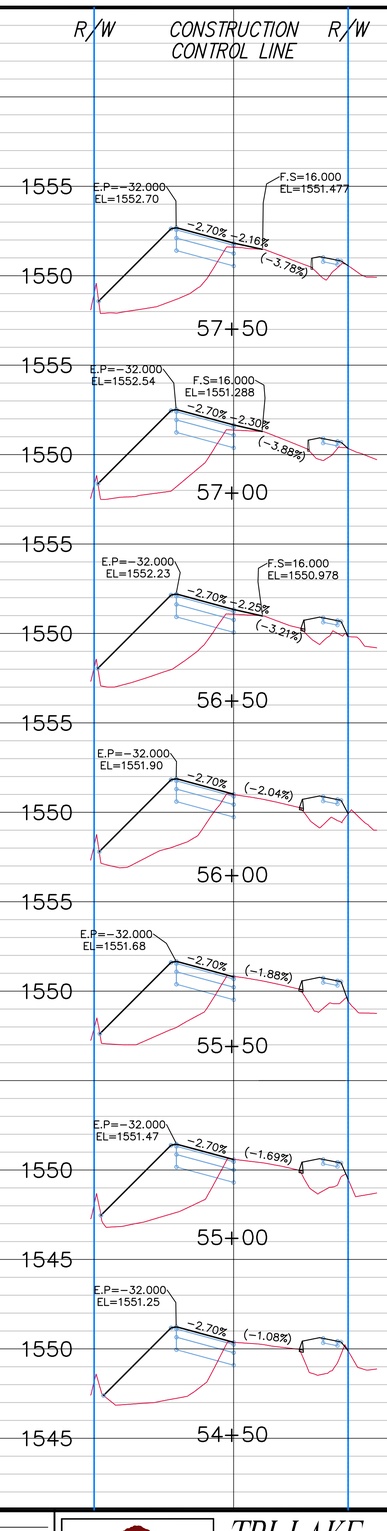
SHEET NO. 16 OF 30 SHEETS
FILE NO. 369-XSECTIONS rudys 100 COUNTY

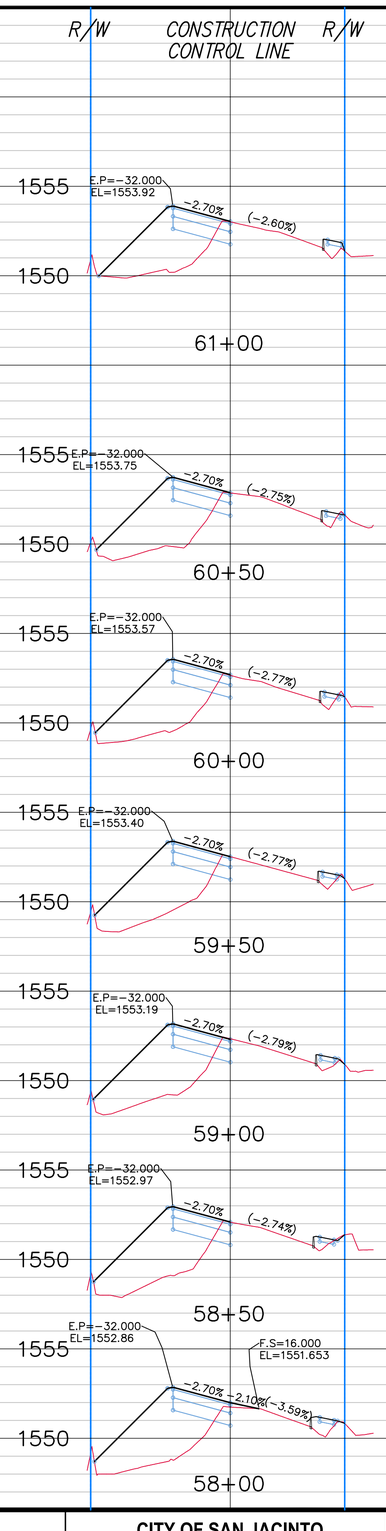
APRIL 16, 2014











SCALE
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HORIZ. 1"=40'

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UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE
				CITY ENGINEER	

DESIGNED BY: E.B. / K.Y. DRAWN BY: R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER — HANS MOTLAGH — No. 35163 — CIVIL — STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9-30-15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE SUITE D
PERRIS CA 92570
(951) 943-6504

SCALE AS SHOWN
DATE APRIL 2014

BENCHMARK:
SEE SHEET 1

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.
CROSS-SECTIONS

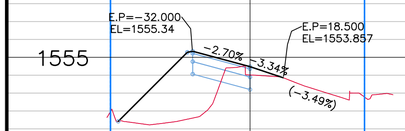
FOR CITY OF SAN JACINTO W.O. SJ 369

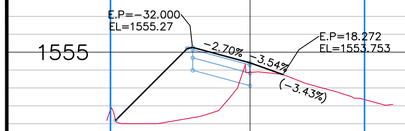
SHEET NO. 17 OF 30 SHEETS

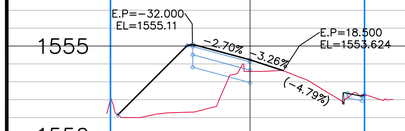
FILE NO. 369-XSECTIONS rudys 100 COUNTY

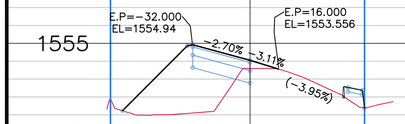
APRIL 16, 2014

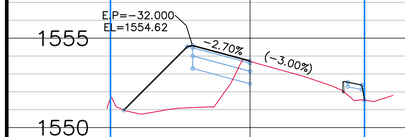
R/W CONSTRUCTION CONTROL LINE R/W

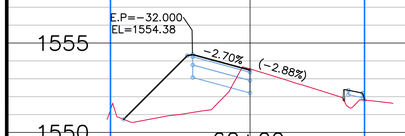


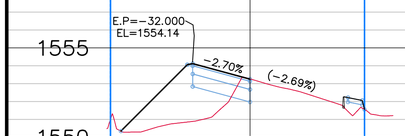




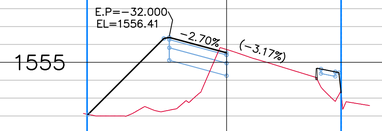


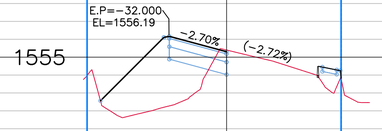


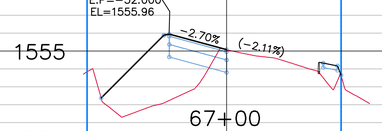


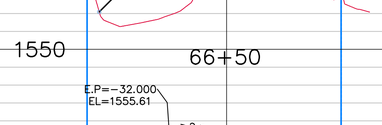


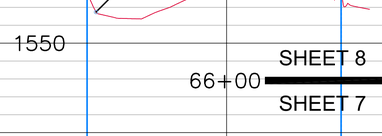
R/W CONSTRUCTION CONTROL LINE R/W





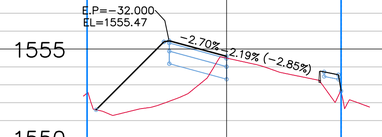


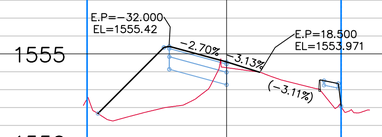




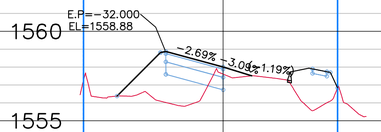
SHEET 8

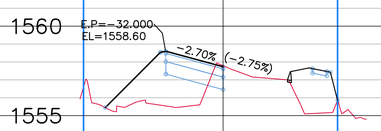
SHEET 7

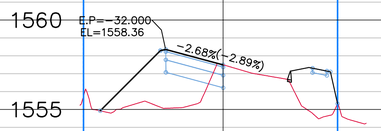


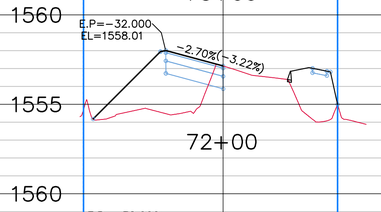


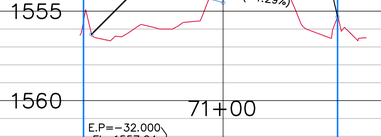
R/W CONSTRUCTION CONTROL LINE R/W

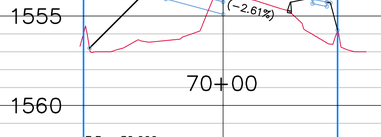


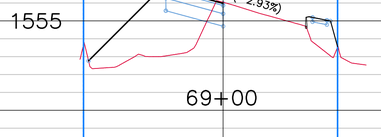




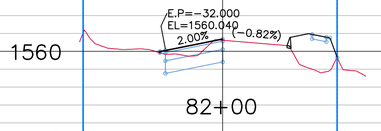


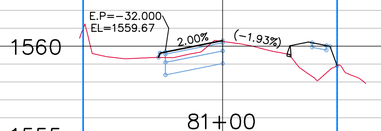


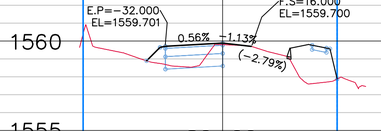


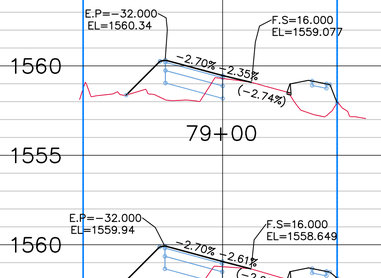


R/W CONSTRUCTION CONTROL LINE R/W



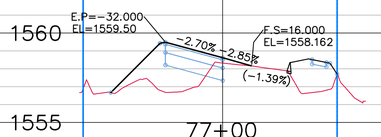


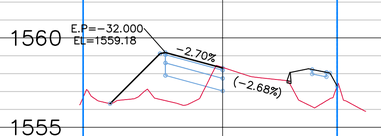




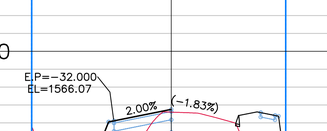
SHEET 9

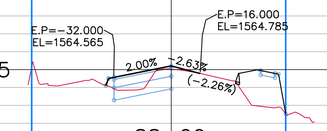
SHEET 8

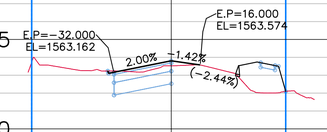


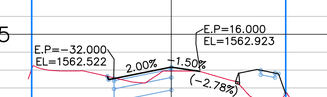


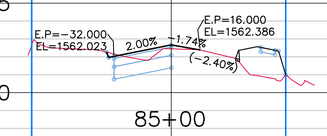
R/W CONSTRUCTION CONTROL LINE R/W

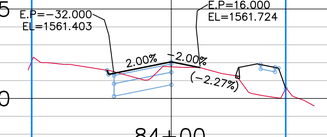


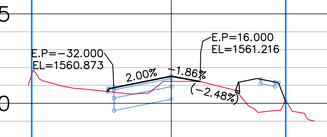












SCALE
VERT. 1"=4'
HORIZ. 1"=40'

DIG ALERT
DIAL TOLL FREE
1-800-227-2600
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE
ENGINEER				CITY	

DESIGNED BY: E.B. / K.Y. DRAWN BY: R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER
JOHN MOTLAGH
No. 35163
CIVIL
STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9-30-15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE SUITE D
PERRIS CA 92570
(951) 943-6504

SCALE AS SHOWN
DATE APRIL 2014

BENCHMARK:
SEE SHEET 1

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.

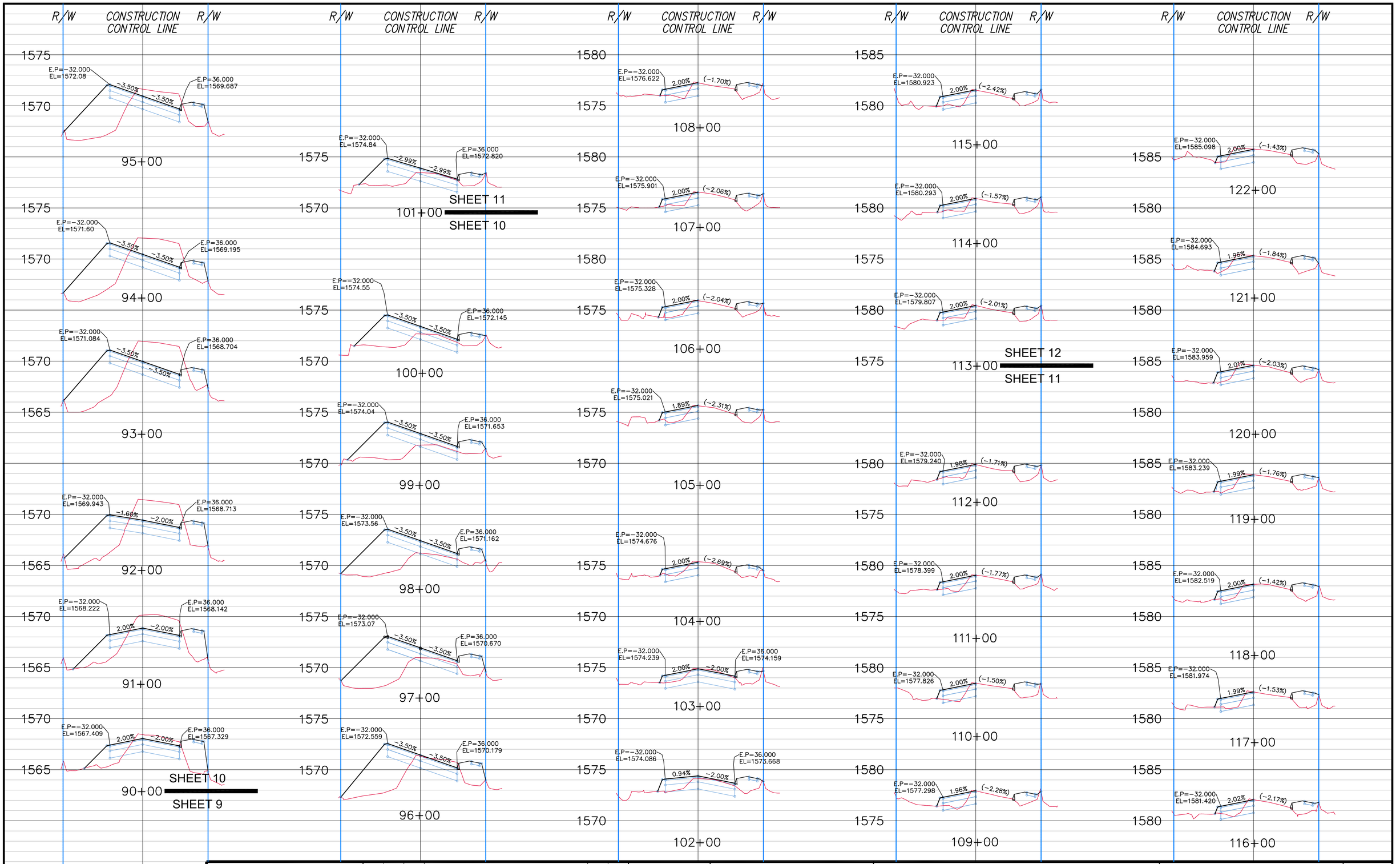
CROSS-SECTIONS

FOR CITY OF SAN JACINTO W.O. SJ 369

SHEET NO. 18 OF 30 SHEETS

FILE NO. 369-XSECTIONS rudys 100 COUNTY

APRIL 16, 2014



SCALE
VERT. 1"=4'
HORIZ. 1"=40'

DIG ALERT
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1-800-227-2600
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UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE
				CITY ENGINEER	

DESIGNED BY: E.B. / K.Y. DRAWN BY: R.G.L. CHECKED BY: E.B.

SEAL

APPROVED BY: _____ DATE _____
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9-30-15

PREPARED BY: _____ DATE _____
R.C.E. NO. _____ EXP. DATE _____

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE
SUITE D
PERRIS CA 92570
(951) 943-6504

SCALE AS SHOWN
DATE APRIL 2014

BENCHMARK:
SEE SHEET 1

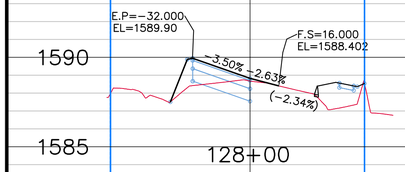
CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.
CROSS-SECTIONS

FOR CITY OF SAN JACINTO W.O. SJ 369

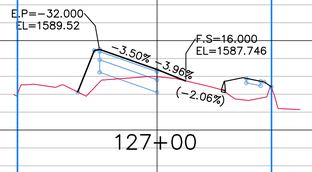
SHEET NO. 19 OF 30 SHEETS
FILE NO. 369-XSECTIONS rixdys 100 COUNTY

APRIL 16, 2014

R/W CONSTRUCTION CONTROL LINE R/W



128+00



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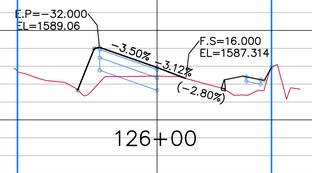

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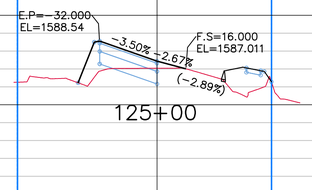
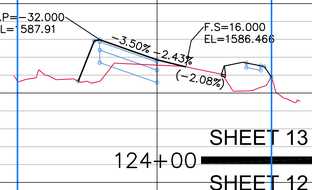


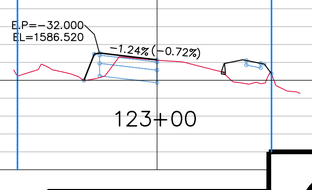
125+00



SHEET 13

124+00

SHEET 12



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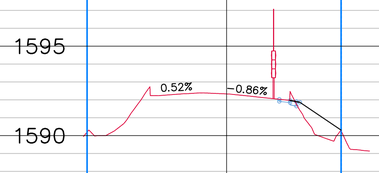
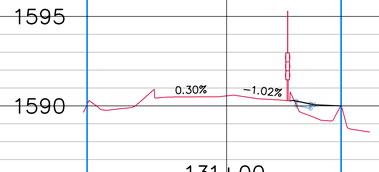
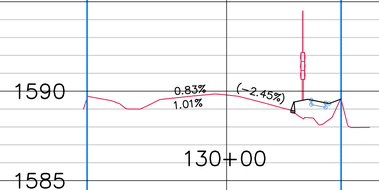


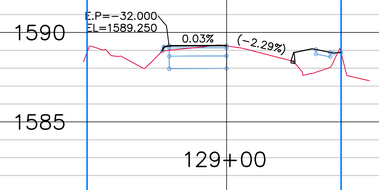
132+00



131+00



130+00



129+00

SCALE
VERT. 1"=4'
HORIZ. 1"=40'

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DATE	BY	MARK	REVISIONS	APPR.	DATE
ENGINEER				CITY	

DESIGNED BY: E.B. / K.Y. DRAWN BY: R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER
HABIB MOTLAGH
No. 35163
CIVIL
STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9-30-15

PREPARED BY: DATE
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TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE
SUITE D
PERRIS CA 92570
(951) 943-6504

SCALE AS SHOWN
DATE APRIL 2014

BENCHMARK:
SEE SHEET 1

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.

CROSS-SECTIONS

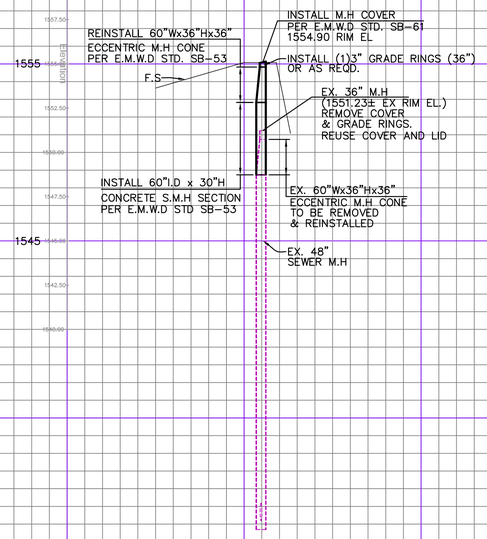
FOR CITY OF SAN JACINTO W.O. SJ 369

SHEET NO. 20 OF 30 SHEETS

FILE NO. 369-XSECTIONS rudys 100 COUNTY

APRIL 16, 2014

63+45.97



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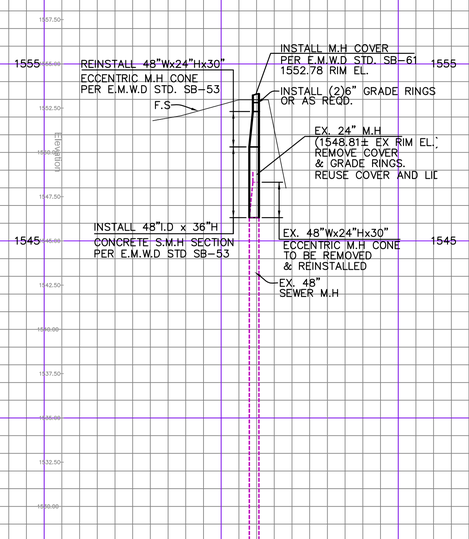
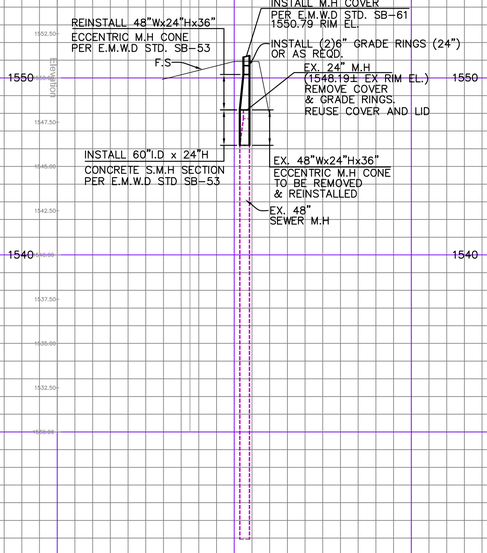
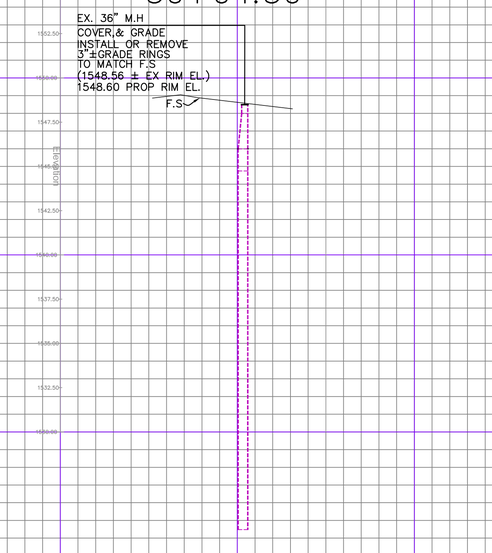


53+54.63

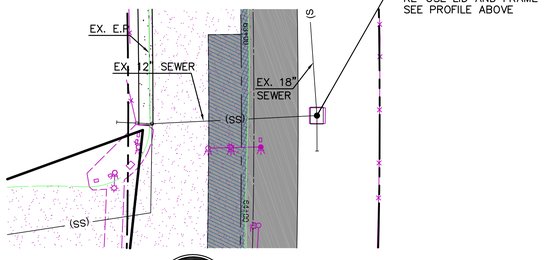


50+04.30



SCALE
VERTICAL 1"=4'
HORIZ 1'=40'

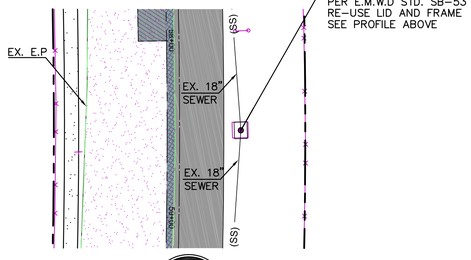
63+45.97



VERNON 1
60X36X36 H CONE
36 R/C W 24" LID
12" R/C + GRADE RINGS
60" SHAFTING
C/L 38'± BEHIND EXISTING A.C. BERM
1.5'± LOWER THAN E.P.

WORK NOTES:
1. REMOVE 36" M.H. RING AND COVER.
2. EXCAVATE AND REMOVE 60X36X36 H CONE.
3. INSTALL 60"I.D. X 30"H SEWER M.H. SHAFTING SECTION.
4. RESET 60X36X36 H CONE.
5. INSTALL 36" CONCRETE GRADE RINGS AS REQUIRED.
6. RESET 36" M.H. RING AND COVER.

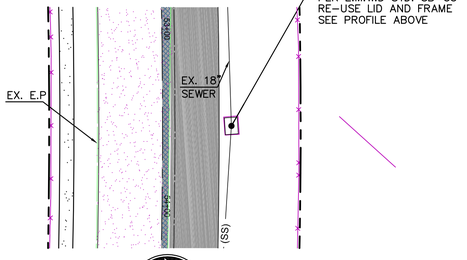
58+50.56



VERNON 2
48X24X30 H CONE
12" R/C + GRADE RINGS
24" R/C
3" H R/C
R 2.2'± TO E.P.

WORK NOTES:
1. REMOVE 24" M.H. RING AND COVER.
2. EXCAVATE AND REMOVE 48X24X30 H CONE.
3. INSTALL 48"I.D. X 36"H SEWER M.H. SHAFTING SECTION.
4. RESET 48X24X30 H CONE.
5. INSTALL 24" CONCRETE GRADE RINGS AS REQUIRED.
6. RESET 24" M.H. RING AND COVER.

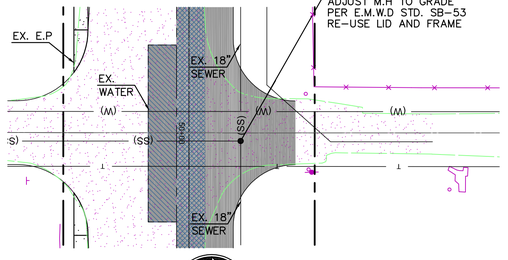
53+54.63



VERNON 3
48X24X36 H CONE
10" R/C + GRADE RINGS
24" R/C
3" H R/C
R 1.4'± TO E.P.

WORK NOTES:
1. REMOVE 24" M.H. RING AND COVER.
2. EXCAVATE AND REMOVE 48X24X36 H CONE.
3. INSTALL 48"I.D. X 30"H SEWER M.H. SHAFTING SECTION.
4. RESET 48X24X36 H CONE.
5. INSTALL 24" CONCRETE GRADE RINGS AS REQUIRED.
6. RESET 24" M.H. RING AND COVER.

50+04.30



ALESSANDRO
60X36X36 H CONE
36" R/C W 24" LID
26" R/C + GRADE RINGS
60" SHAFTING

WORK NOTES:
1. REMOVE 36" M.H. RING AND COVER.
2. REMOVE 36" CONCRETE GRADE RINGS AS REQUIRED.
3. RESET 36" M.H. RING AND COVER.

DIG ALERT
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1-800-227-2600
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UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE
				CITY	

DESIGNED BY: E.B. / K.Y. DRAWN BY: K.Y. / R.G.L. CHECKED BY: E.B.

SEAL — REGISTERED PROFESSIONAL ENGINEER — HABIB MOTLAGH — No. 35163 — CIVIL — STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9-30-15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE SUITE D
PERRIS CA 92570
(951) 943-6504

SCALE AS SHOWN
DATE APRIL 2014

BENCHMARK:
SEE SHEET 1

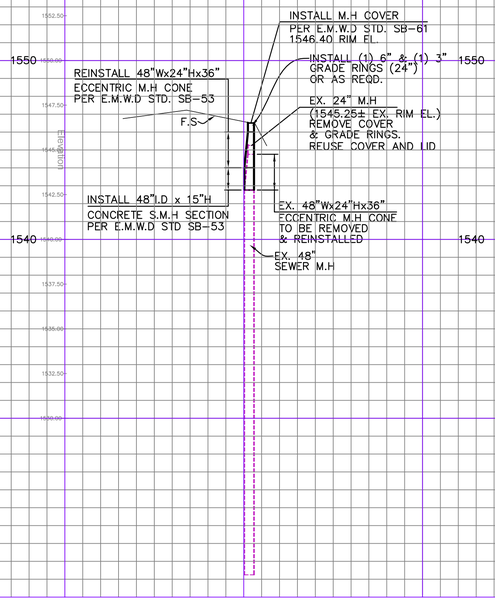
CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.

FOR CITY OF SAN JACINTO W.O. SJ 369

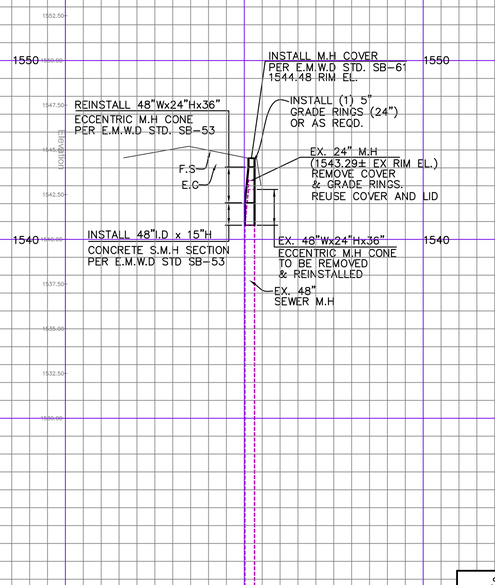
SHEET NO. 21 OF 30 SHEETS
FILE NO. SHT 21 SWR

APRIL 16, 2014

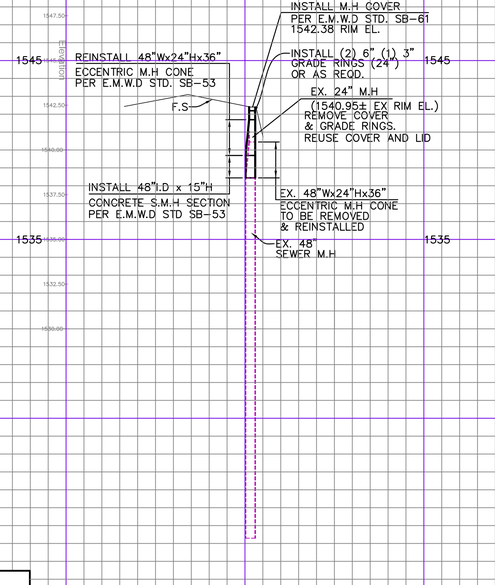
46+71.77



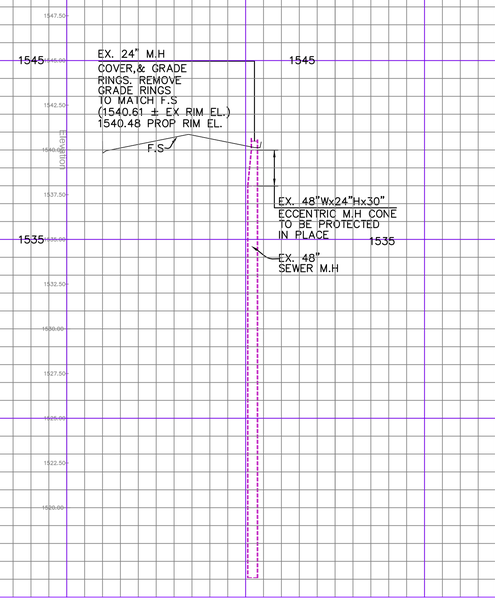
43+57.03



40+60.57

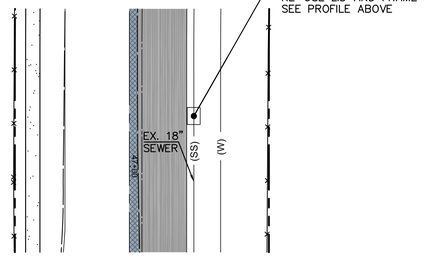


36+03.49



SCALE
VERTICAL 1"=4'
HORIZ 1'=40'

46+71.77

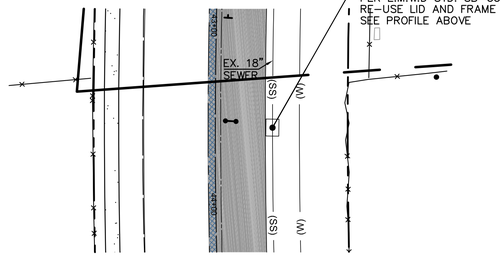


SCALE 1"=40'
40 0 40 80 120

ALESSANDRO 1
48X24X36 H CONE
20" R/C + GRADE RINGS
24" R/C
3" H R/C
R 1.6'± TO E.P.

WORK NOTES:
1. REMOVE 24" M.H. RING AND COVER.
2. EXCAVATE AND REMOVE 48X24X36 H CONE.
3. INSTALL 48"I.D. X 18"H SEWER M.H. SHAFTING SECTION.
4. RESET 48X24X36 H CONE.
5. INSTALL 24" CONCRETE GRADE RINGS AS REQUIRED.
6. RESET 24" M.H. RING AND COVER.

43+57.03

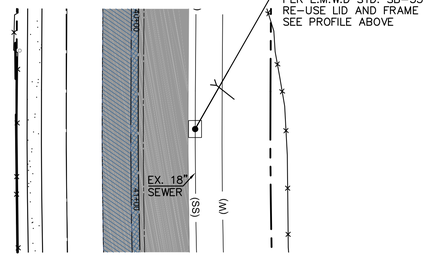


SCALE 1"=40'
40 0 40 80 120

ALESSANDRO 2
48X24X36 H CONE
12" R/C + GRADE RINGS
24" R/C
3" H R/C
R 2.0'± TO E.P.

WORK NOTES:
1. REMOVE 24" M.H. RING AND COVER.
2. EXCAVATE AND REMOVE 48X24X36 H CONE.
3. INSTALL 48"I.D. X 15"H SEWER M.H. SHAFTING SECTION.
4. RESET 48X24X36 H CONE.
5. INSTALL 24" CONCRETE GRADE RINGS AS REQUIRED.
6. RESET 24" M.H. RING AND COVER.

40+60.57

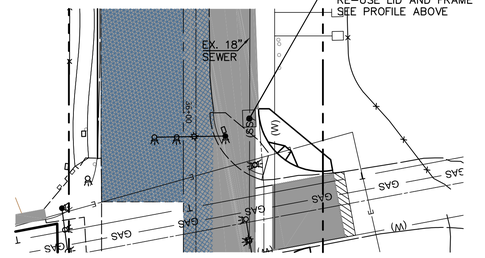


SCALE 1"=40'
40 0 40 80 120

ALESSANDRO 3
48X24X36 H CONE
20" R/C + GRADE RINGS
3" H R/C
R 1.9'± TO E.P.

WORK NOTES:
1. REMOVE 24" M.H. RING AND COVER.
2. EXCAVATE AND REMOVE 48X24X36 H CONE.
3. INSTALL 48"I.D. X 15"H SEWER M.H. SHAFTING SECTION.
4. RESET 48X24X36 H CONE.
5. INSTALL 24" CONCRETE GRADE RINGS AS REQUIRED.
6. RESET 24" M.H. RING AND COVER.

36+03.49



SCALE 1"=40'
40 0 40 80 120

SAN JACINTO
6' BEHIND NW RAMP, LEVEL WITH RAMP±
48X24X24 H CONE
30" R/C + GRADE RINGS
24" R/C
3" H R/C

WORK NOTES:
1. REMOVE 24" M.H. RING AND COVER.
2. REMOVE 24" CONCRETE GRADE RING AS REQUIRED.
3. RESET 24" M.H. RING AND COVER.

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DATE	BY	MARK	REVISIONS	APPR.	DATE

ENGINEER — CITY
DESIGNED BY: E.B. / K.Y. DRAWN BY: K.Y. / R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER
HABIB MOTLAGH
No. 35163
CIVIL
STATE OF CALIFORNIA

APPROVED BY: _____ DATE _____
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9-30-15

PREPARED BY: _____ DATE _____
R.C.E. NO. _____ EXP. DATE _____

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE
SUITE D
PERRIS CA 92570
(951) 943-6504

SCALE AS SHOWN
DATE APRIL 2014

BENCHMARK:
SEE SHEET 1

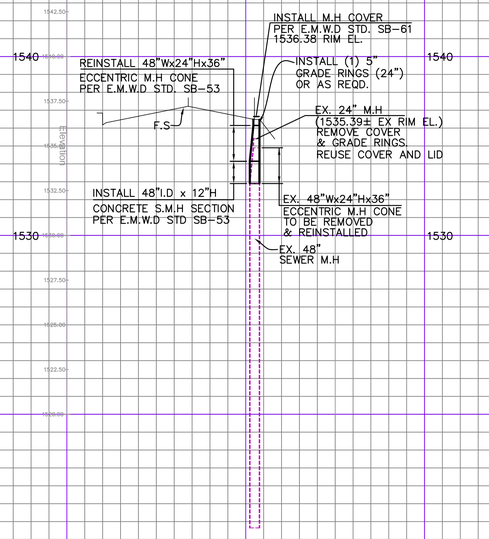
CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.

FOR CITY OF SAN JACINTO W.O. SJ 369

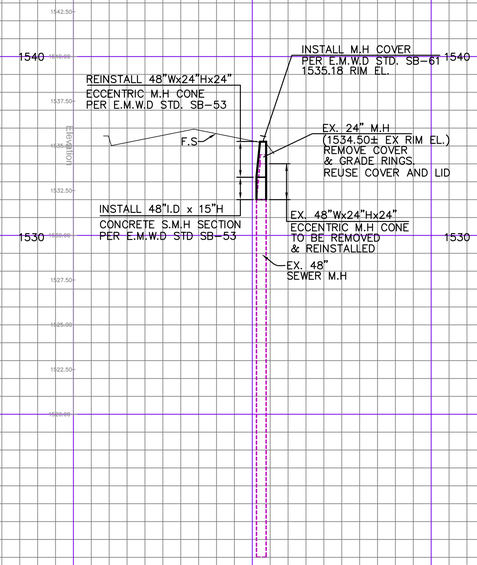
SHEET NO. 22 OF 30 SHEETS
FILE NO. SHT 22 SWR

APRIL 16, 2014

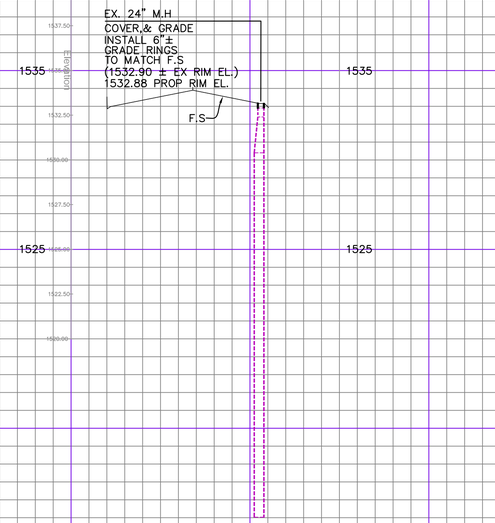
31+65.40



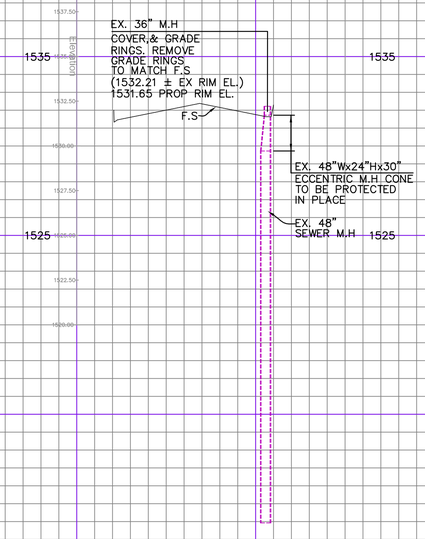
29+40.89



25+93.07

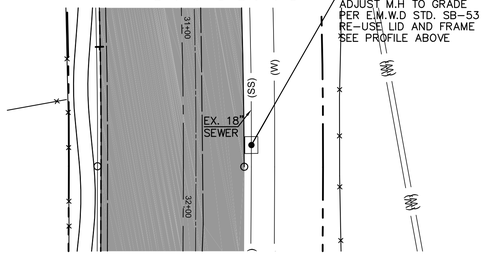


23+61.44



SCALE
VERTICAL 1"=4'
HORIZ 1'=40'

31+65.40



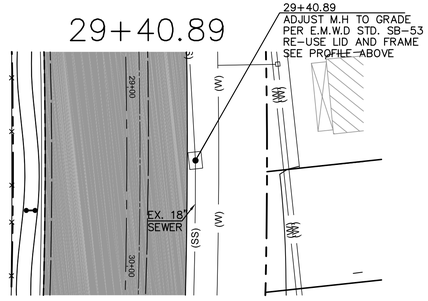
SCALE 1"=40'

40 0 40 80 120

EAGLE 6
48X24X36 H CONE
48" SHAFTING
12" R/C + GRADE RINGS
24" R/C
3" H R/C
R 1.2'± TO E.P.

WORK NOTES:
1. REMOVE 24" M.H. RING AND COVER.
2. EXCAVATE AND REMOVE 48X24X36 H CONE.
3. INSTALL 48"I.D. X 12"H SEWER M.H. SHAFTING SECTION.
4. RESET 48X24X36 H CONE.
5. INSTALL 24" CONCRETE GRADE RINGS AS REQUIRED.
6. RESET 24" M.H. RING AND COVER.

29+40.89



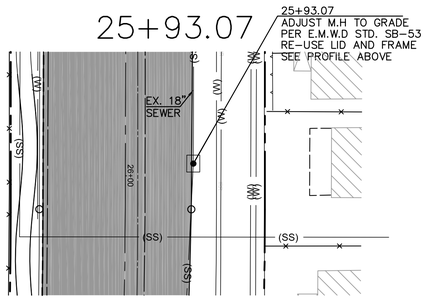
SCALE 1"=40'

40 0 40 80 120

EAGLE 5
48X24X24 H CONE
48" SHAFTING
18" R/C + GRADE RINGS
24" R/C
3" H R/C
R 0.75'± TO E.P.

WORK NOTES:
1. REMOVE 24" M.H. RING AND COVER.
2. EXCAVATE AND REMOVE 48X24X24 H CONE.
3. INSTALL 48"I.D. X 12"H SEWER M.H. SHAFTING SECTION.
4. RESET 48X24X24 H CONE.
5. INSTALL 24" CONCRETE GRADE RINGS AS REQUIRED.
6. RESET 24" M.H. RING AND COVER.

25+93.07



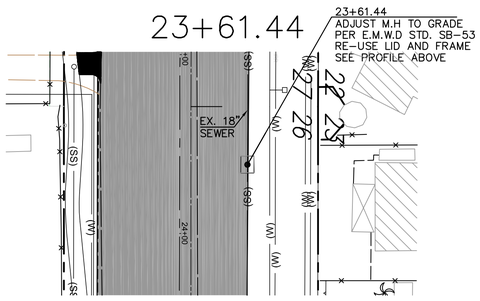
SCALE 1"=40'

40 0 40 80 120

EAGLE 4
48X24X36 H CONE
48" SHAFTING
23" R/C + GRADE RINGS
24" R/C
3" H R/C
R 0.35'± TO E.P.

WORK NOTES:
1. REMOVE 24" M.H. RING AND COVER.
2. REMOVE 24" CONCRETE GRADE RING AS REQUIRED.
3. RESET 24" M.H. RING AND COVER.

23+61.44



SCALE 1"=40'

40 0 40 80 120

EAGLE 3
48X24X36 H CONE
48" SHAFTING
15" R/C + GRADE RINGS
24" R/C
3" H R/C
R 0.0'± TO E.P.

WORK NOTES:
1. REMOVE 24" M.H. RING AND COVER.
2. REMOVE 24" CONCRETE GRADE RING AS REQUIRED.
3. RESET 24" M.H. RING AND COVER.

DIG ALERT
DIAL TOLL FREE
1-800-227-2600
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE

ENGINEER CITY

DESIGNED BY: E.B. / K.Y. DRAWN BY: K.Y. / R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER
HABIB MOTLAGH
No. 35163
CIVIL
STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9-30-15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE
SUITE D
PERRIS CA 92570
(951) 943-6504

SCALE AS SHOWN
DATE APRIL 2014

BENCHMARK:
SEE SHEET 1

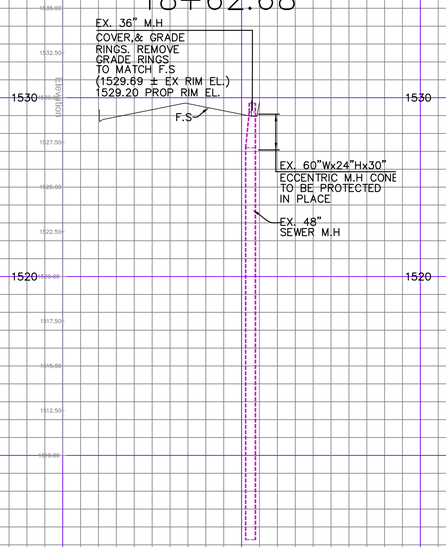
CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.

FOR CITY OF SAN JACINTO W.O. SJ 369

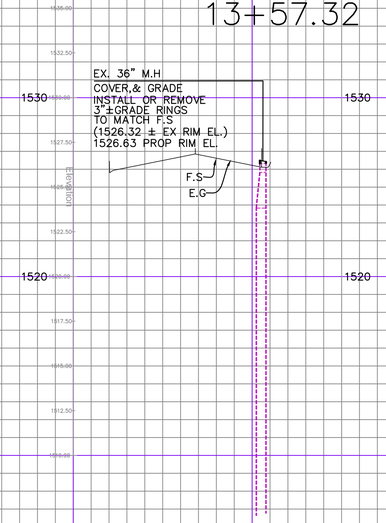
SHEET NO. 23 OF 30 SHEETS
FILE NO. SHT 23 SWR

APRIL 16, 2014

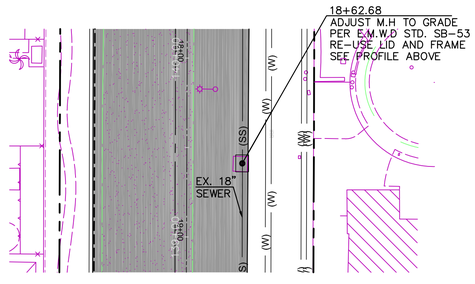
18+62.68



13+57.32



18+62.68



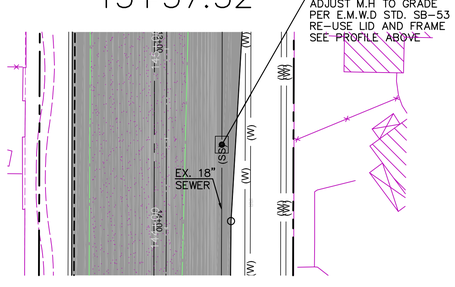
SCALE 1"=40'

40 0 40 80 120

EAGLE 2
48X24X24 H CONE
48" SHAFTING
15" R/C + GRADE RINGS
24" R/C
3" H R/C
R 0.35'± TO E.P.

WORK NOTES:
1. REMOVE 24" M.H. RING AND COVER.
2. REMOVE 24" CONCRETE GRADE RINGS AS REQUIRED.
3. RESET 24" M.H. RING AND COVER.

13+57.32



SCALE 1"=40'

40 0 40 80 120

EAGLE 1
48X24X30 H CONE
48" SHAFTING
19" R/C + GRADE RINGS
24" R/C
3" H R/C
R 0.15'± TO E.P.

WORK NOTES:
1. REMOVE 24" M.H. RING AND COVER.
2. ADD 24" CONCRETE GRADE RINGS AS REQUIRED.
3. RESET 24" M.H. RING AND COVER.

SCALE
VERTICAL 1"=4'
HORIZ 1'=40'

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UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE
ENGINEER				CITY	

DESIGNED BY: E.B. / K.Y DRAWN BY: K.Y. / R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER
NABIB MOTLAGH
No. 35163
CIVIL
STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9-30-15
PREPARED BY: DATE
R.C.E. NO. EXP. DATE

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE
SUITE D
PERRIS CA 92570
(951) 943-6504

SCALE AS SHOWN
DATE APRIL 2014

BENCHMARK:
SEE SHEET 1

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR - LAKE PARK DR.

FOR CITY OF SAN JACINTO W.O. SJ 369

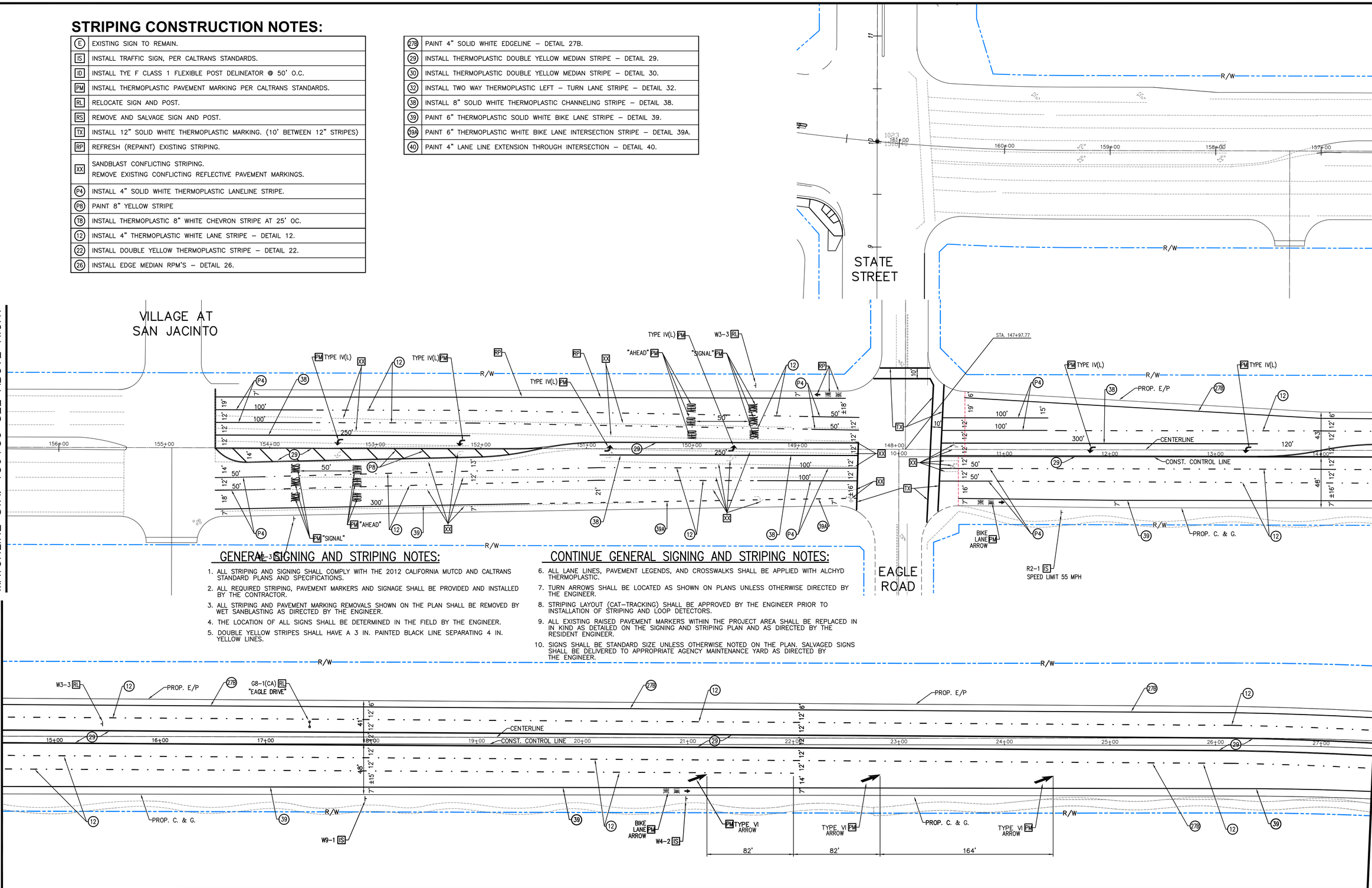
SHEET NO. 24 OF 30 SHEETS
FILE NO. SHT 24 SWR

APRIL 16, 2014

STRIPING CONSTRUCTION NOTES:

(E)	EXISTING SIGN TO REMAIN.
IS	INSTALL TRAFFIC SIGN, PER CALTRANS STANDARDS.
ID	INSTALL TYE F CLASS 1 FLEXIBLE POST DELINEATOR @ 50' O.C.
PM	INSTALL THERMOPLASTIC PAVEMENT MARKING PER CALTRANS STANDARDS.
RL	RELOCATE SIGN AND POST.
RS	REMOVE AND SALVAGE SIGN AND POST.
TX	INSTALL 12" SOLID WHITE THERMOPLASTIC MARKING. (10' BETWEEN 12" STRIPES)
RP	REFRESH (REPAINT) EXISTING STRIPING.
XX	SANDBLAST CONFLICTING STRIPING. REMOVE EXISTING CONFLICTING REFLECTIVE PAVEMENT MARKINGS.
(P4)	INSTALL 4" SOLID WHITE THERMOPLASTIC LANELINE STRIPE.
(P8)	PAINT 8" YELLOW STRIPE
(18)	INSTALL THERMOPLASTIC 8" WHITE CHEVRON STRIPE AT 25' OC.
(12)	INSTALL 4" THERMOPLASTIC WHITE LANE STRIPE – DETAIL 12.
(22)	INSTALL DOUBLE YELLOW THERMOPLASTIC STRIPE – DETAIL 22.
(26)	INSTALL EDGE MEDIAN RPM'S – DETAIL 26.

(27B)	PAINT 4" SOLID WHITE EDGELINE – DETAIL 27B.
(29)	INSTALL THERMOPLASTIC DOUBLE YELLOW MEDIAN STRIPE – DETAIL 29.
(30)	INSTALL THERMOPLASTIC DOUBLE YELLOW MEDIAN STRIPE – DETAIL 30.
(32)	INSTALL TWO WAY THERMOPLASTIC LEFT – TURN LANE STRIPE – DETAIL 32.
(38)	INSTALL 8" SOLID WHITE THERMOPLASTIC CHANNELING STRIPE – DETAIL 38.
(39)	PAINT 6" THERMOPLASTIC SOLID WHITE BIKE LANE STRIPE – DETAIL 39.
(39A)	PAINT 6" THERMOPLASTIC WHITE BIKE LANE INTERSECTION STRIPE – DETAIL 39A.
(40)	PAINT 4" LANE LINE EXTENSION THROUGH INTERSECTION – DETAIL 40.



GENERAL SIGNING AND STRIPING NOTES:

1. ALL STRIPING AND SIGNING SHALL COMPLY WITH THE 2012 CALIFORNIA MUTCD AND CALTRANS STANDARD PLANS AND SPECIFICATIONS.
2. ALL REQUIRED STRIPING, PAVEMENT MARKERS AND SIGNAGE SHALL BE PROVIDED AND INSTALLED BY THE CONTRACTOR.
3. ALL STRIPING AND PAVEMENT MARKING REMOVALS SHOWN ON THE PLAN SHALL BE REMOVED BY WET SANBLASTING AS DIRECTED BY THE ENGINEER.
4. THE LOCATION OF ALL SIGNS SHALL BE DETERMINED IN THE FIELD BY THE ENGINEER.
5. DOUBLE YELLOW STRIPES SHALL HAVE A 3 IN. PAINTED BLACK LINE SEPARATING 4 IN. YELLOW LINES.

CONTINUE GENERAL SIGNING AND STRIPING NOTES:

6. ALL LANE LINES, PAVEMENT LEGENDS, AND CROSSWALKS SHALL BE APPLIED WITH ALCHYD THERMOPLASTIC.
7. TURN ARROWS SHALL BE LOCATED AS SHOWN ON PLANS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
8. STRIPING LAYOUT (CAT–TRACKING) SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION OF STRIPING AND LOOP DETECTORS.
9. ALL EXISTING RAISED PAVEMENT MARKERS WITHIN THE PROJECT AREA SHALL BE REPLACED IN IN KIND AS DETAILED ON THE SIGNING AND STRIPING PLAN AND AS DIRECTED BY THE RESIDENT ENGINEER.
10. SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE NOTED ON THE PLAN. SALVAGED SIGNS SHALL BE DELIVERED TO APPROPRIATE AGENCY MAINTENANCE YARD AS DIRECTED BY THE ENGINEER.

SCALE 1"=40'

40 0 40 80 120

DIG ALERT
DIAL TOLL FREE
1–800–227–2600
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE

ENGINEER DESIGNED BY: E.B. DRAWN BY: R.G.L. CHECKED BY: E.B. CITY

SEAL
REGISTERED PROFESSIONAL ENGINEER
HABIB MOTLAGH
No. 35163
CIVIL
STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9–30–15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

SCALE 1" = 40'
DATE NOV 2013

BENCHMARK:
SEE SHEET 1

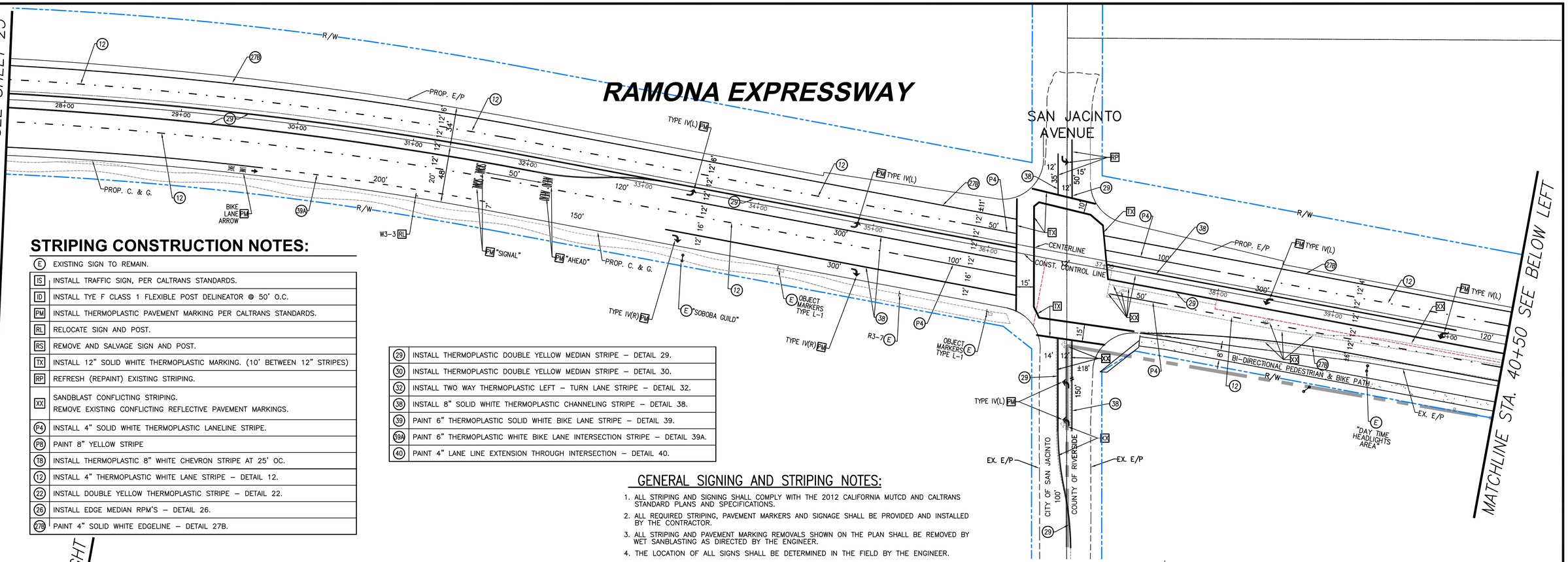
TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE SUITE D
PERRIS CA 92570
(951) 943–6504

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING PHASE II, EAGLE DR.-LAKE PARK DR.
STRIPING & SIGNING
FOR CITY OF SAN JACINTO W.O. SJ-369

SHEET NO. 25 OF 30 SHEETS
FILE NO. ramona east striping sht 25_26 EXTRA

APRIL 17, 2014

RAMONA EXPRESSWAY



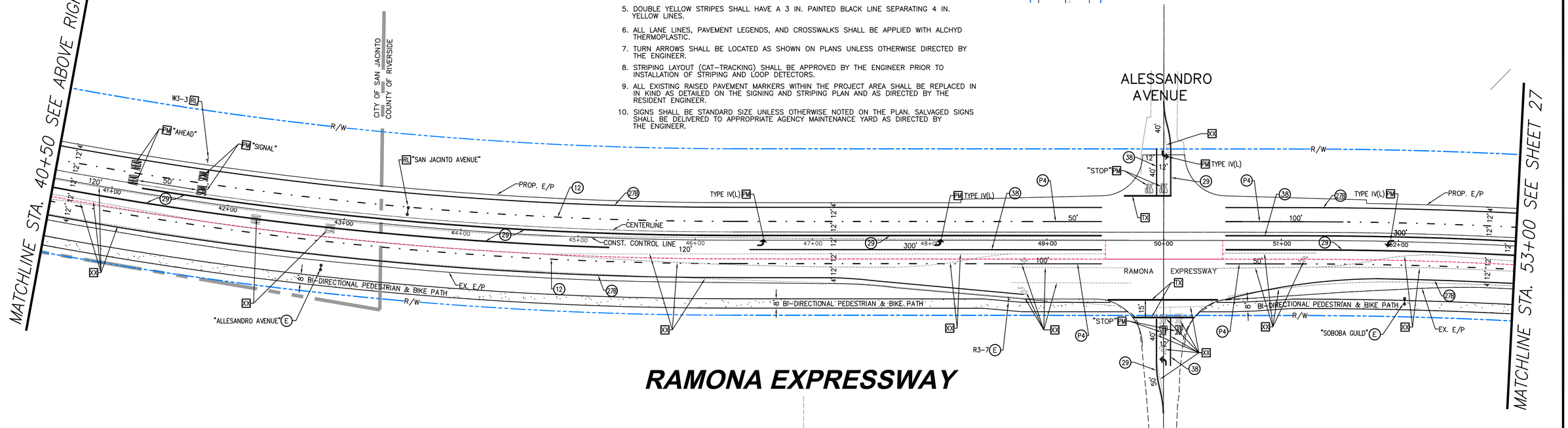
STRIPING CONSTRUCTION NOTES:

(E)	EXISTING SIGN TO REMAIN.
IS	INSTALL TRAFFIC SIGN, PER CALTRANS STANDARDS.
ID	INSTALL TYE F CLASS 1 FLEXIBLE POST DELINEATOR @ 50' O.C.
PM	INSTALL THERMOPLASTIC PAVEMENT MARKING PER CALTRANS STANDARDS.
RL	RELOCATE SIGN AND POST.
RS	REMOVE AND SALVAGE SIGN AND POST.
TX	INSTALL 12" SOLID WHITE THERMOPLASTIC MARKING. (10' BETWEEN 12" STRIPES)
RP	REFRESH (REPAINT) EXISTING STRIPING.
XX	SANDBLAST CONFLICTING STRIPING. REMOVE EXISTING CONFLICTING REFLECTIVE PAVEMENT MARKINGS.
(P4)	INSTALL 4" SOLID WHITE THERMOPLASTIC LANELINE STRIPE.
(P8)	PAINT 8" YELLOW STRIPE
(18)	INSTALL THERMOPLASTIC 8" WHITE CHEVRON STRIPE AT 25' OC.
(12)	INSTALL 4" THERMOPLASTIC WHITE LANE STRIPE – DETAIL 12.
(22)	INSTALL DOUBLE YELLOW THERMOPLASTIC STRIPE – DETAIL 22.
(26)	INSTALL EDGE MEDIAN RPM'S – DETAIL 26.
(27B)	PAINT 4" SOLID WHITE EDGELINE – DETAIL 27B.

(29)	INSTALL THERMOPLASTIC DOUBLE YELLOW MEDIAN STRIPE – DETAIL 29.
(30)	INSTALL THERMOPLASTIC DOUBLE YELLOW MEDIAN STRIPE – DETAIL 30.
(32)	INSTALL TWO WAY THERMOPLASTIC LEFT – TURN LANE STRIPE – DETAIL 32.
(38)	INSTALL 8" SOLID WHITE THERMOPLASTIC CHANNELING STRIPE – DETAIL 38.
(39)	PAINT 6" THERMOPLASTIC SOLID WHITE BIKE LANE STRIPE – DETAIL 39.
(39A)	PAINT 6" THERMOPLASTIC WHITE BIKE LANE INTERSECTION STRIPE – DETAIL 39A.
(40)	PAINT 4" LANE LINE EXTENSION THROUGH INTERSECTION – DETAIL 40.

GENERAL SIGNING AND STRIPING NOTES:

1. ALL STRIPING AND SIGNING SHALL COMPLY WITH THE 2012 CALIFORNIA MUTCD AND CALTRANS STANDARD PLANS AND SPECIFICATIONS.
2. ALL REQUIRED STRIPING, PAVEMENT MARKERS AND SIGNAGE SHALL BE PROVIDED AND INSTALLED BY THE CONTRACTOR.
3. ALL STRIPING AND PAVEMENT MARKING REMOVALS SHOWN ON THE PLAN SHALL BE REMOVED BY WET SANBLASTING AS DIRECTED BY THE ENGINEER.
4. THE LOCATION OF ALL SIGNS SHALL BE DETERMINED IN THE FIELD BY THE ENGINEER.
5. DOUBLE YELLOW STRIPES SHALL HAVE A 3 IN. PAINTED BLACK LINE SEPARATING 4 IN. YELLOW LINES.
6. ALL LANE LINES, PAVEMENT LEGENDS, AND CROSSWALKS SHALL BE APPLIED WITH ALCHYD THERMOPLASTIC.
7. TURN ARROWS SHALL BE LOCATED AS SHOWN ON PLANS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
8. STRIPING LAYOUT (CAT–TRACKING) SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION OF STRIPING AND LOOP DETECTORS.
9. ALL EXISTING RAISED PAVEMENT MARKERS WITHIN THE PROJECT AREA SHALL BE REPLACED IN IN KIND AS DETAILED ON THE SIGNING AND STRIPING PLAN AND AS DIRECTED BY THE RESIDENT ENGINEER.
10. SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE NOTED ON THE PLAN. SALVAGED SIGNS SHALL BE DELIVERED TO APPROPRIATE AGENCY MAINTENANCE YARD AS DIRECTED BY THE ENGINEER.



RAMONA EXPRESSWAY

SCALE 1"=40'

40 0 40 80 120

DIG ALERT
DIAL TOLL FREE
1-800-227-2600
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE
				CITY	

ENGINEER
DESIGNED BY: E.B. DRAWN BY: R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER
JAMES MOTLAGH
No. 35163
CIVIL
STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9-30-15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE SUITE D
PERRIS CA 92570
(951) 943-6504

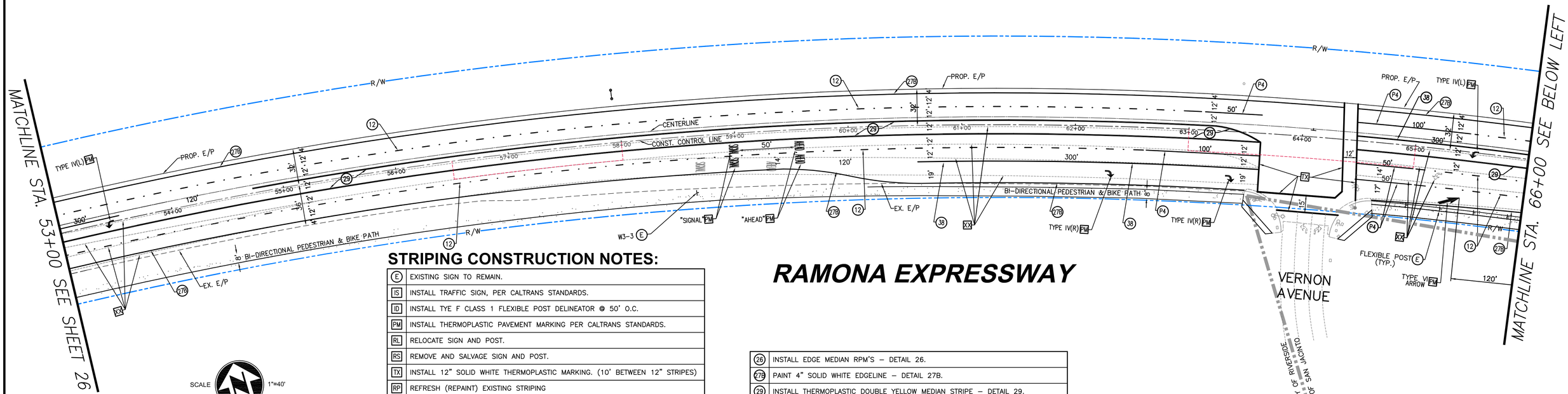
SCALE 1" = 40'
DATE NOV 2013

BENCHMARK:
SEE SHEET 1

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR.-LAKE PARK DR.
STRIPING & SIGNING
FOR CITY OF SAN JACINTO W.O. SJ-369

SHEET NO. 26 OF 30 SHEETS
FILE NO. ramona east striping sht 25_26 EXTRA

APRIL 17, 2014



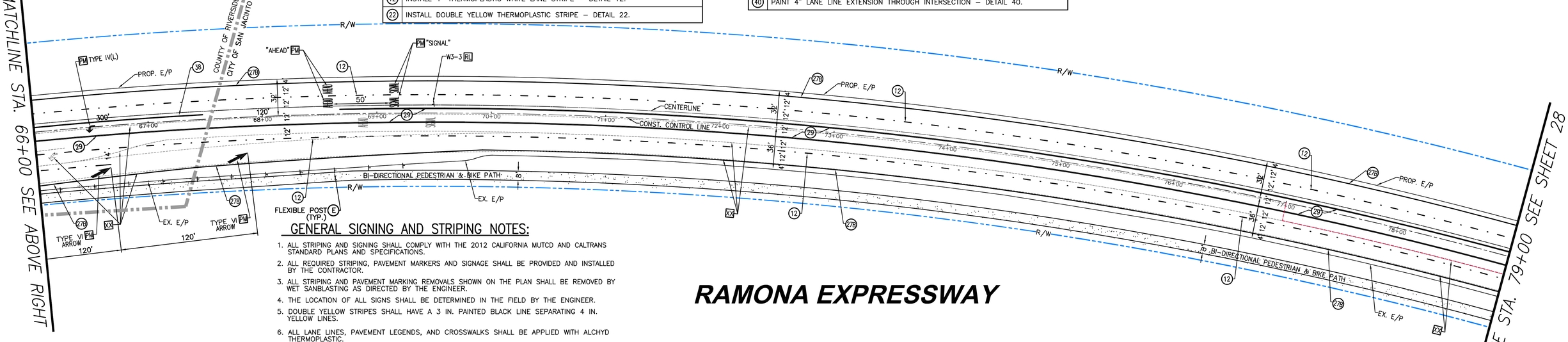
RAMONA EXPRESSWAY

STRIPING CONSTRUCTION NOTES:

E	EXISTING SIGN TO REMAIN.
IS	INSTALL TRAFFIC SIGN, PER CALTRANS STANDARDS.
ID	INSTALL TYE F CLASS 1 FLEXIBLE POST DELINEATOR @ 50' O.C.
PM	INSTALL THERMOPLASTIC PAVEMENT MARKING PER CALTRANS STANDARDS.
RL	RELOCATE SIGN AND POST.
RS	REMOVE AND SALVAGE SIGN AND POST.
TX	INSTALL 12" SOLID WHITE THERMOPLASTIC MARKING. (10' BETWEEN 12" STRIPES)
RP	REFRESH (REPAINT) EXISTING STRIPING
XX	SANDBLAST CONFLICTING STRIPING. REMOVE EXISTING CONFLICTING REFLECTIVE PAVEMENT MARKINGS.
P4	INSTALL 4" SOLID WHITE THERMOPLASTIC LANELINE STRIPE.
P8	PAINT 8" YELLOW STRIPE
18	INSTALL THERMOPLASTIC 8" WHITE CHEVRON STRIPE AT 25' OC.
12	INSTALL 4" THERMOPLASTIC WHITE LANE STRIPE – DETAIL 12.
22	INSTALL DOUBLE YELLOW THERMOPLASTIC STRIPE – DETAIL 22.

26	INSTALL EDGE MEDIAN RPM'S – DETAIL 26.
27B	PAINT 4" SOLID WHITE EDGELINE – DETAIL 27B.
29	INSTALL THERMOPLASTIC DOUBLE YELLOW MEDIAN STRIPE – DETAIL 29.
30	INSTALL THERMOPLASTIC DOUBLE YELLOW MEDIAN STRIPE – DETAIL 30.
32	INSTALL TWO WAY THERMOPLASTIC LEFT – TURN LANE STRIPE – DETAIL 32.
38	INSTALL 8" SOLID WHITE THERMOPLASTIC CHANNELING STRIPE – DETAIL 38.
39	PAINT 6" THERMOPLASTIC SOLID WHITE BIKE LANE STRIPE – DETAIL 39.
39A	PAINT 6" THERMOPLASTIC WHITE BIKE LANE INTERSECTION STRIPE – DETAIL 39A.
40	PAINT 4" LANE LINE EXTENSION THROUGH INTERSECTION – DETAIL 40.

SCALE 1"=40'
40 0 40 80 120



RAMONA EXPRESSWAY

GENERAL SIGNING AND STRIPING NOTES:

1. ALL STRIPING AND SIGNING SHALL COMPLY WITH THE 2012 CALIFORNIA MUTCD AND CALTRANS STANDARD PLANS AND SPECIFICATIONS.
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4. THE LOCATION OF ALL SIGNS SHALL BE DETERMINED IN THE FIELD BY THE ENGINEER.
5. DOUBLE YELLOW STRIPES SHALL HAVE A 3 IN. PAINTED BLACK LINE SEPARATING 4 IN. YELLOW LINES.
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7. TURN ARROWS SHALL BE LOCATED AS SHOWN ON PLANS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
8. STRIPING LAYOUT (CAT–TRACKING) SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION OF STRIPING AND LOOP DETECTORS.
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SCALE 1"=40'
40 0 40 80 120

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UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE
				CITY	

ENGINEER
DESIGNED BY: E.B. DRAWN BY: R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER — HANS MOTLAGH — No. 35163 — CIVIL — STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9–30–15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE SUITE D
PERRIS CA 92570
(951) 943–6504

SCALE 1" = 40'
DATE NOV 2013

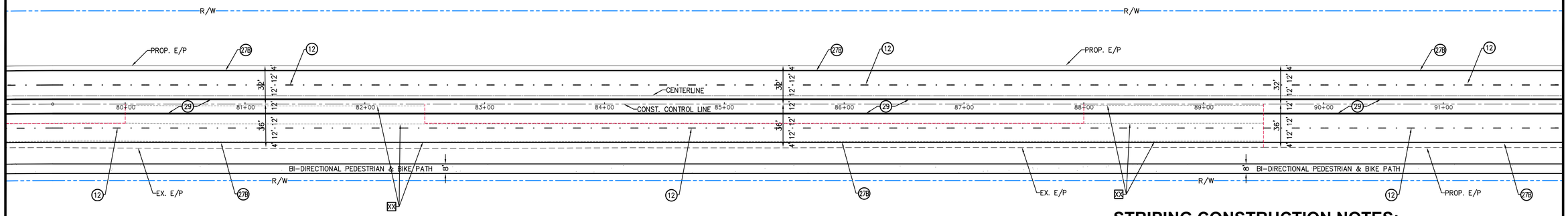
BENCHMARK:
SEE SHEET 1

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING PHASE II, EAGLE DR.-LAKE PARK DR.
STRIPING & SIGNING
FOR CITY OF SAN JACINTO W.O. SJ-369

SHEET NO. 27 OF 30 SHEETS
FILE NO. ramona east striping sht 27

MAR. 24, 2014

MATCHLINE STA. 79+00 SEE SHEET 27



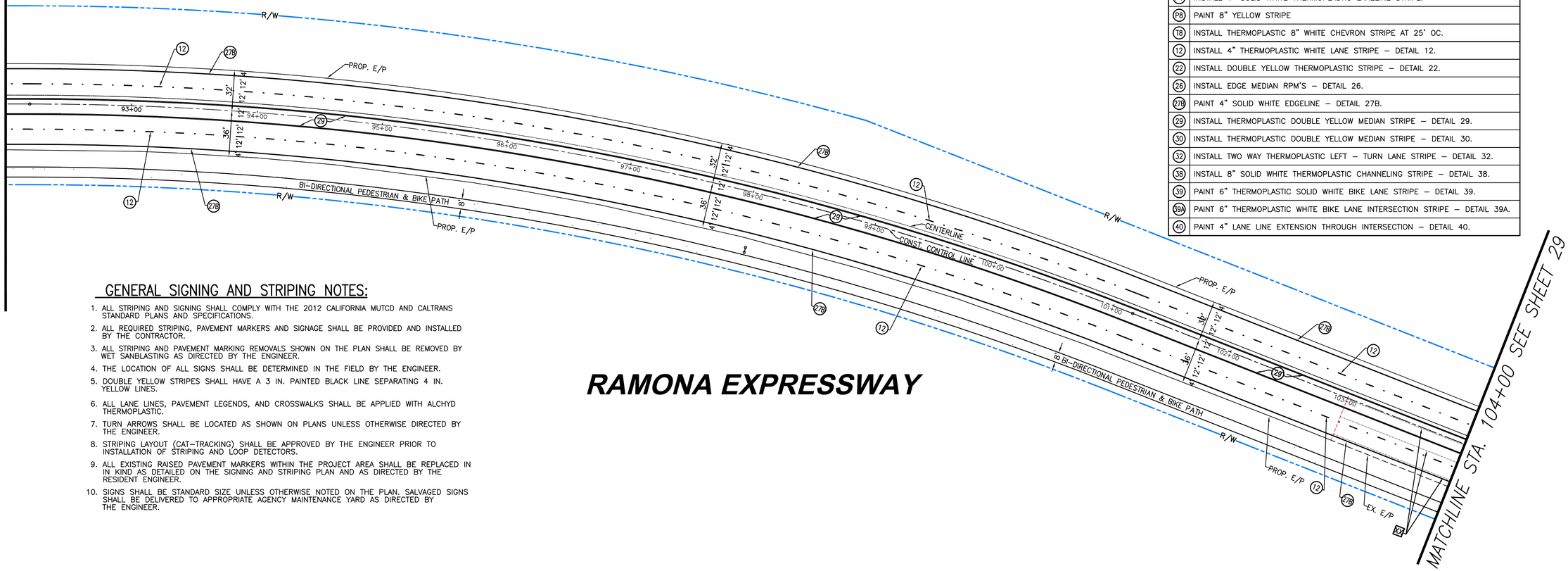
MATCHLINE STA. 92+00 SEE BELOW LEFT

RAMONA EXPRESSWAY

STRIPING CONSTRUCTION NOTES:

(E)	EXISTING SIGN TO REMAIN.
IS	INSTALL TRAFFIC SIGN, PER CALTRANS STANDARDS.
ID	INSTALL TYE F CLASS 1 FLEXIBLE POST DELINEATOR @ 50' O.C.
PM	INSTALL THERMOPLASTIC PAVEMENT MARKING PER CALTRANS STANDARDS.
RL	RELOCATE SIGN AND POST.
RS	REMOVE AND SALVAGE SIGN AND POST.
TX	INSTALL 12" SOLID WHITE THERMOPLASTIC MARKING. (10' BETWEEN 12" STRIPES)
RP	REFRESH (REPAINT) EXISTING STRIPING.
XX	SANDBLAST CONFLICTING STRIPING. REMOVE EXISTING CONFLICTING REFLECTIVE PAVEMENT MARKINGS.
(P4)	INSTALL 4" SOLID WHITE THERMOPLASTIC LANELINE STRIPE.
(P8)	PAINT 8" YELLOW STRIPE
(T8)	INSTALL THERMOPLASTIC 8" WHITE CHEVRON STRIPE AT 25' OC.
(12)	INSTALL 4" THERMOPLASTIC WHITE LANE STRIPE – DETAIL 12.
(22)	INSTALL DOUBLE YELLOW THERMOPLASTIC STRIPE – DETAIL 22.
(26)	INSTALL EDGE MEDIAN RPM'S – DETAIL 26.
(27B)	PAINT 4" SOLID WHITE EDGELINE – DETAIL 27B.
(29)	INSTALL THERMOPLASTIC DOUBLE YELLOW MEDIAN STRIPE – DETAIL 29.
(30)	INSTALL THERMOPLASTIC DOUBLE YELLOW MEDIAN STRIPE – DETAIL 30.
(32)	INSTALL TWO WAY THERMOPLASTIC LEFT – TURN LANE STRIPE – DETAIL 32.
(38)	INSTALL 8" SOLID WHITE THERMOPLASTIC CHANNELING STRIPE – DETAIL 38.
(39)	PAINT 6" THERMOPLASTIC SOLID WHITE BIKE LANE STRIPE – DETAIL 39.
(39A)	PAINT 6" THERMOPLASTIC WHITE BIKE LANE INTERSECTION STRIPE – DETAIL 39A.
(40)	PAINT 4" LANE LINE EXTENSION THROUGH INTERSECTION – DETAIL 40.

MATCHLINE STA. 92+00 SEE ABOVE RIGHT



RAMONA EXPRESSWAY

MATCHLINE STA. 104+00 SEE SHEET 29

GENERAL SIGNING AND STRIPING NOTES:

1. ALL STRIPING AND SIGNING SHALL COMPLY WITH THE 2012 CALIFORNIA MUTCD AND CALTRANS STANDARD PLANS AND SPECIFICATIONS.
2. ALL REQUIRED STRIPING, PAVEMENT MARKERS AND SIGNAGE SHALL BE PROVIDED AND INSTALLED BY THE CONTRACTOR.
3. ALL STRIPING AND PAVEMENT MARKING REMOVALS SHOWN ON THE PLAN SHALL BE REMOVED BY WET SANBLASTING AS DIRECTED BY THE ENGINEER.
4. THE LOCATION OF ALL SIGNS SHALL BE DETERMINED IN THE FIELD BY THE ENGINEER.
5. DOUBLE YELLOW STRIPES SHALL HAVE A 3 IN. PAINTED BLACK LINE SEPARATING 4 IN. YELLOW LINES.
6. ALL LANE LINES, PAVEMENT LEGENDS, AND CROSSWALKS SHALL BE APPLIED WITH ALCHYD THERMOPLASTIC.
7. TURN ARROWS SHALL BE LOCATED AS SHOWN ON PLANS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
8. STRIPING LAYOUT (CAT-TRACKING) SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION OF STRIPING AND LOOP DETECTORS.
9. ALL EXISTING RAISED PAVEMENT MARKERS WITHIN THE PROJECT AREA SHALL BE REPLACED IN IN KIND AS DETAILED ON THE SIGNING AND STRIPING PLAN AND AS DIRECTED BY THE RESIDENT ENGINEER.
10. SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE NOTED ON THE PLAN. SALVAGED SIGNS SHALL BE DELIVERED TO APPROPRIATE AGENCY MAINTENANCE YARD AS DIRECTED BY THE ENGINEER.

SCALE 1"=40'

40 0 40 80 120

DIG ALERT
DIAL TOLL FREE
1-800-227-2600
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE
				CITY	

DESIGNED BY: E.B. DRAWN BY: R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER — HABIB MOTLAGH — No. 35163 — CIVIL — STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9-30-15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

SCALE 1" = 40'
DATE NOV 2013

BENCHMARK:
SEE SHEET 1

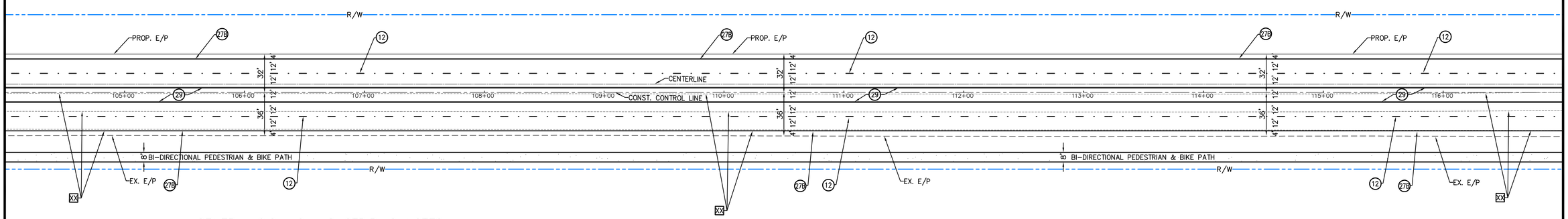
TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE
SUITE D
PERRIS CA 92570
(951) 943-6504

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING PHASE II, EAGLE DR.-LAKE PARK DR.
STRIPING & SIGNING
FOR CITY OF SAN JACINTO W.O. SJ-369

SHEET NO. 28 OF 30 SHEETS
FILE NO. ramona east striping sht 28

APRIL 17, 2014

MATCHLINE STA. 104+00 SEE SHEET 28



MATCHLINE STA. 117+00 SEE BELOW LEFT

GENERAL SIGNING AND STRIPING NOTES:

1. ALL STRIPING AND SIGNING SHALL COMPLY WITH THE 2012 CALIFORNIA MUTCD AND CALTRANS STANDARD PLANS AND SPECIFICATIONS.
2. ALL REQUIRED STRIPING, PAVEMENT MARKERS AND SIGNAGE SHALL BE PROVIDED AND INSTALLED BY THE CONTRACTOR.
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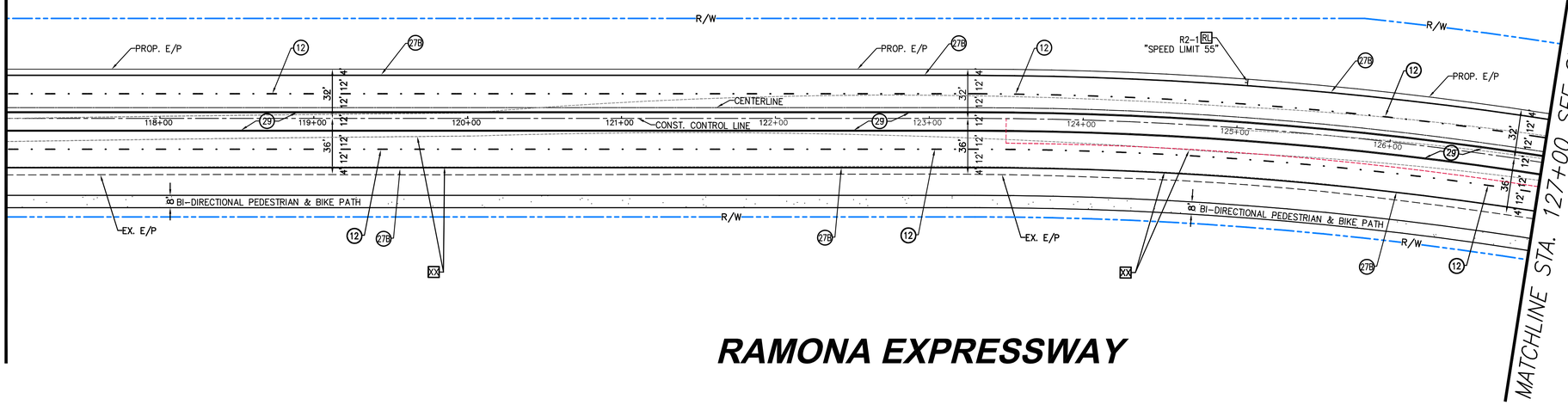
RAMONA EXPRESSWAY

MATCHLINE STA. 117+00 SEE ABOVE RIGHT



MATCHLINE STA. 127+00 SEE SHEET 30

RAMONA EXPRESSWAY

STRIPING CONSTRUCTION NOTES:

(E)	EXISTING SIGN TO REMAIN.
IS	INSTALL TRAFFIC SIGN, PER CALTRANS STANDARDS.
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XX	SANDBLAST CONFLICTING STRIPING. REMOVE EXISTING CONFLICTING REFLECTIVE PAVEMENT MARKINGS.
P4	INSTALL 4" SOLID WHITE THERMOPLASTIC LANELINE STRIPE.
P8	PAINT 8" YELLOW STRIPE
T8	INSTALL THERMOPLASTIC 8" WHITE CHEVRON STRIPE AT 25' OC.
12	INSTALL 4" THERMOPLASTIC WHITE LANE STRIPE – DETAIL 12.
22	INSTALL DOUBLE YELLOW THERMOPLASTIC STRIPE – DETAIL 22.
26	INSTALL EDGE MEDIAN RPM'S – DETAIL 26.
27B	PAINT 4" SOLID WHITE EDGELINE – DETAIL 27B.
29	INSTALL THERMOPLASTIC DOUBLE YELLOW MEDIAN STRIPE – DETAIL 29.
30	INSTALL THERMOPLASTIC DOUBLE YELLOW MEDIAN STRIPE – DETAIL 30.
32	INSTALL TWO WAY THERMOPLASTIC LEFT – TURN LANE STRIPE – DETAIL 32.
38	INSTALL 8" SOLID WHITE THERMOPLASTIC CHANNELING STRIPE – DETAIL 38.
39	PAINT 6" THERMOPLASTIC SOLID WHITE BIKE LANE STRIPE – DETAIL 39.
39A	PAINT 6" THERMOPLASTIC WHITE BIKE LANE INTERSECTION STRIPE – DETAIL 39A.
40	PAINT 4" LANE LINE EXTENSION THROUGH INTERSECTION – DETAIL 40.

SCALE 1"=40'
40 0 40 80 120

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UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE
				CITY	

DESIGNED BY: E.B. DRAWN BY: R.G.L. CHECKED BY: E.B.

SEAL
REGISTERED PROFESSIONAL ENGINEER
DENIS MOTLAGH
No. 35163
CIVIL
STATE OF CALIFORNIA

APPROVED BY: DATE
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9-30-15

PREPARED BY: DATE
R.C.E. NO. EXP. DATE

SCALE 1" = 40'
DATE NOV 2013

BENCHMARK:
SEE SHEET 1

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE
SUITE D
PERRIS CA 92570
(951) 943-6504

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING
PHASE II, EAGLE DR.-LAKE PARK DR.
STRIPING & SIGNING

FOR CITY OF SAN JACINTO W.O. SJ-369

SHEET NO. 29 OF 30 SHEETS
FILE NO. ramona east striping sht 29

MAR. 24, 2014

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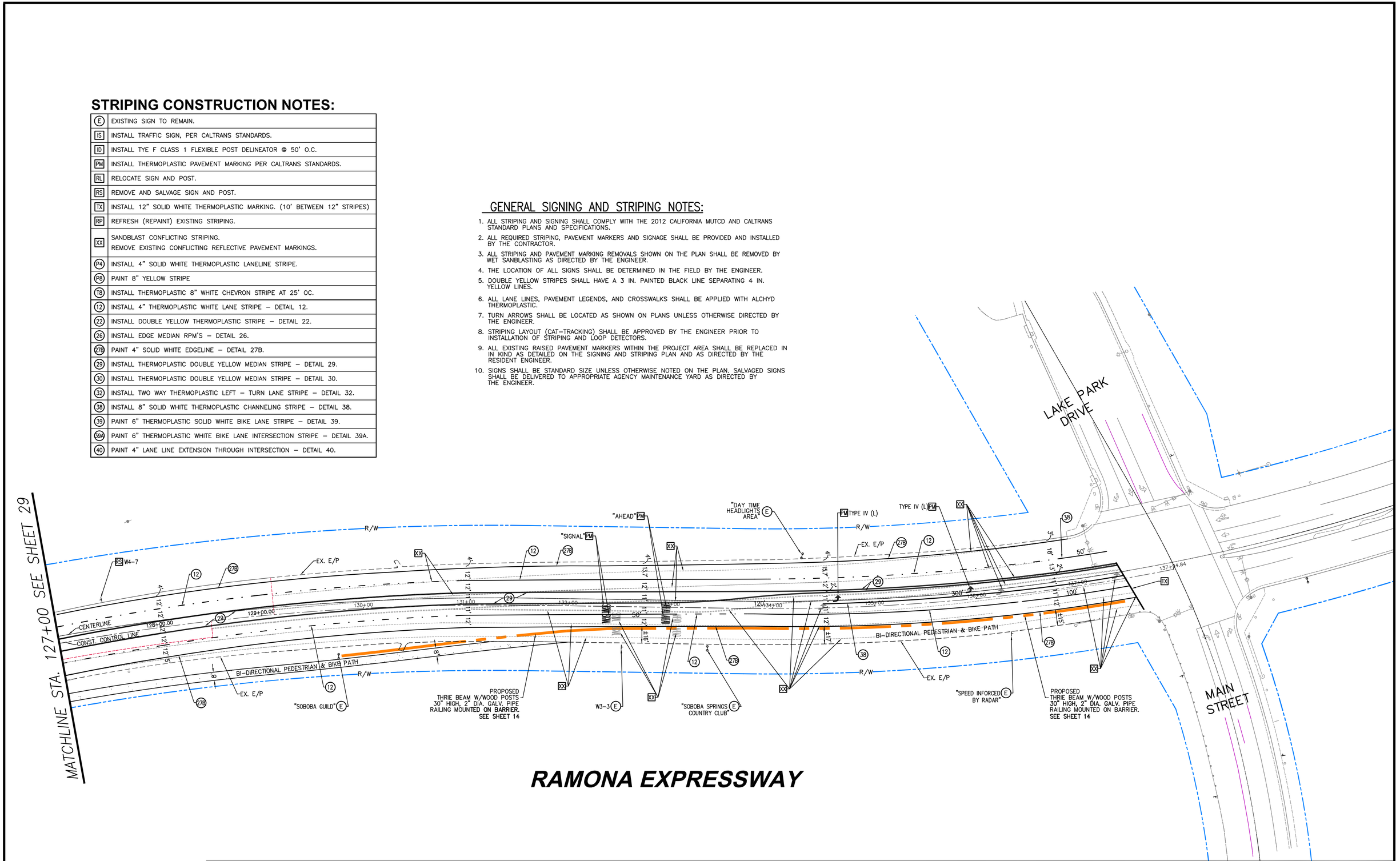

RAMONA EXPRESSWAY

SCALE 1"=40'
40 0 40 80 120

DIG ALERT
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1–800–227–2600
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE	BY	MARK	REVISIONS	APPR.	DATE
				CITY ENGINEER	

DESIGNED BY: E.B. DRAWN BY: R.G.L. CHECKED BY: E.B.

SEAL: REGISTERED PROFESSIONAL ENGINEER, HABIB MOTLAGH, No. 35163, CIVIL, STATE OF CALIFORNIA

APPROVED BY: _____ DATE _____
CITY ENGINEER
R.C.E. NO. 35163 EXP. DATE 9–30–15

PREPARED BY: _____ DATE _____
R.C.E. NO. _____ EXP. DATE _____

SCALE 1" = 40'
DATE NOV 2013

BENCHMARK:
SEE SHEET 1

TRI LAKE CONSULTANTS, INC.
CITY ENGINEER
170 WILKERSON AVENUE
SUITE D
PERRIS CA 92570
(951) 943–6504

CITY OF SAN JACINTO
RAMONA EXPRESSWAY WIDENING PHASE II, EAGLE DR.-LAKE PARK DR.
STRIPING & SIGNING
FOR CITY OF SAN JACINTO W.O. SJ-369

SHEET NO. 30 OF 30 SHEETS
FILE NO. ramona east striping sht 30

MAR. 24, 2014

Appendix D

Not Used

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Appendix E

Survey

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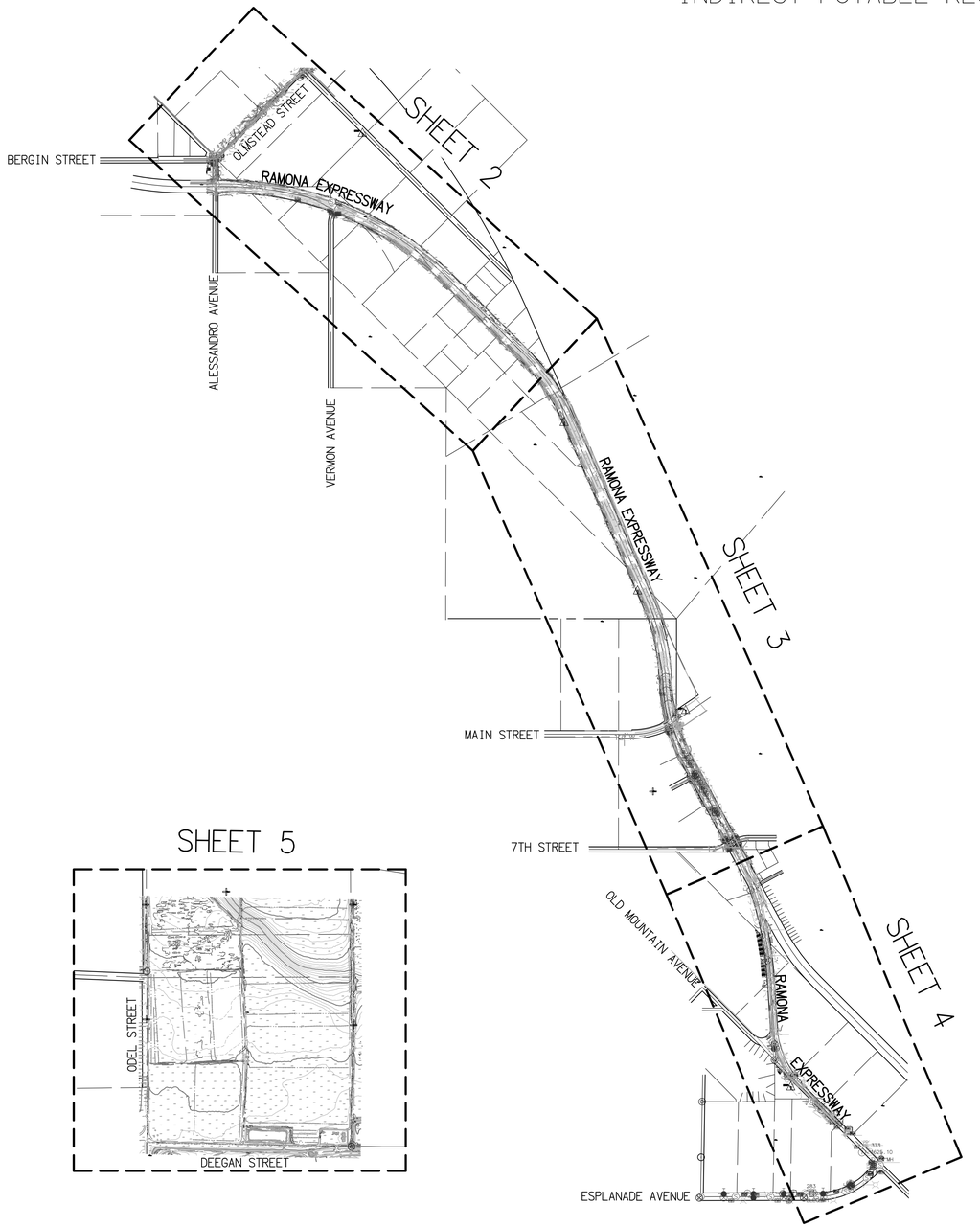
SURVEY EXHIBIT

FOR

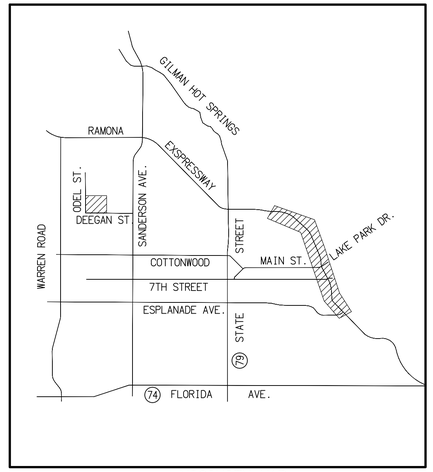
INDIRECT POTABLE REUSE PROGRAM (IPR)



SHEET 5

INDEX MAP

SCALE: 1"=800'



VICINITY MAP

SCALE: N.T.S

LEGEND AND ABBREVIATIONS

SFN	GAS METER	SCO
6OD	GAS VALVE	SDMH
AERIAL TARGET	GUY WIRE	SIGN
AV & AR	HOR CONTROL	SIGNAL POLE
BACKFLOW	HOSE BIB	SIGNAL RISER
BILLBOARD	HUB W/ TACK	SMH
BOLLARD	IP LEAD & TACK	SPEED LIMIT
BRASS DISK	MAILBOX	SPIKE
BUSHES	MISC WTR	STOP SIGN
CHISLED X	NAIL & SHINER	STREET LIGHT
CL MON	NAIL & TAG	STREET NAME SIGN
COLUMN	PIV	TAG
CONC NAIL	PK NAIL	TBM
COPPEDWELD	POTHOLE	TELE MH
DELINEATOR	PP	TELE RISER
DET. CHECK	PULL BOX	UTILITY BOX
DROP INLET	REBAR	VERT CONTROL
ELEC MH	RECT. IRR. VALVE	WM
FDC	ROUND IRR. VALVE	WTR MISC
FH	RR SPIKE	WV
FINISH FLOOR	RTO	YIELD
PALM	EVERGREEN	DECIDUOUS

A.C.	ASPHALTIC CONCRETE	N.G.	NATURAL GROUND
B.M.	BENCHMARK	N.T.S.	NOT TO SCALE
B.S.	TOE OF SLOPE	O.C.	ON CENTER
℄	CENTER LINE	P.E.	PAD ELEVATION
(E)	EXISTING	P.P.	POWER POLE
EA.	EACH	℗	PROPERTY LINE
FDN.	FOUNDATION	R	CURVE RADIUS
F.F.	FINISHED FLOOR	R/W	RIGHT OF WAY
F.G.	FINISHED GRADE	S.W.	SIDEWALK
℄	FLOW LINE	T.B.	TOP OF BERM
F.S.	FINISHED SURFACE	T.B.M.	TEMPORARY BENCHMARK
FTG.	FOOTING	T.C.	TOP OF CURB
G.B.	GRADE BREAK	T.F.	TOP OF FOOTING
GRD.	GRADE	T.G.	TOP OF GRATE
H.P.	HIGH POINT	T.W.	TOP OF WALL
MAS.	MASONRY	TYP.	TYPICAL
M.H.	MANHOLE	W.V.	WATER VALVE
		W.M.	WATER METER

SOURCE OF TOPOGRAPHY

LIMITED PROJECT CONTROL AND AERIAL TARGETS ESTABLISHED BY COZAD AND FOX, INC. 8/15/2017
AERIAL PHOTOGRAMMETRIC SURVEY PERFORMED BY INLAND AERIAL SURVEYS, INC. 9/14/2017
SUPPLEMENTAL FIELD SURVEY PERFORMED BY COZAD AND FOX, INC 8/15/2017-9/18/2017

SURVEY CONTROL

LIMITED SURVEY CONTROL FOR THIS PROJECT WAS ESTABLISHED BY STATICALLY OBSERVING AND POST-POSSESSING THE FOLLOWING CONTROL POINTS:

CP#1- A 2" IRON PIPE TAGGED RCE 13191 LOCATED AT THE INTERSECTION OF BEEKLEY RD AND SOUTH RD.
NAD83(2011)(2010 EPOCH) COORDINATES N: 2009512.83 E: 6685006.85

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE CALIFORNIA COORDINATE SYSTEM, ZONE 6, BASED LOCALLY ON CONTINUOUS OPERATING REFERENCE STATIONS (CORS) "MLFP","BILL" AND "P584" NAD83(2011) (EPOCH: 2010.00). ALL BEARINGS AND DISTANCES SHOWN ON THIS SURVEY ARE GRID. GROUND DISTANCES MAY BE OBTAINED BY DIVIDING THE GRID DISTANCE BY THE COMBINED SCALE FACTOR OF 0.99992014. CALCULATIONS ARE MADE AT "1BASE" WITH COORDINATES N: 2234982.512 E: 6329948.695,

GRID DISTANCE/0.99992014= GROUND DISTANCE

BENCHMARK

THE FOLLOWING BENCHMARK WAS OBSERVED BY COZAD & FOX, INC.:

A USGS MONUMENT DESIGNATED "3-A", PID "DX5386" BEING A 3.5IN BRASS DISK IN TOP OF CONCRETE MONUMENT

LOCATED 2.5 MILES NORTHWEST OF THE TOWN OF SAN JACINTO, AT THE SAN JACINTO RESERVOIR, 86 FEET SOUTH OF THE MOST NORTHERLY CORNER OF THE RESERVOIR CHAIN LINK FENCE, 45 FEET FROM THE NORTHWEST CHAIN LINK FENCE, 66 FEET FROM THE NORTHEAST CHAIN LINK FENCE
COORDINATES: N: 2237191.77 E: 6335284.67

ELEVATION = 1488.31 (NAVD 88)
PREVIOUS PLANS HELD ELEVATION 1485.08 (NGVD 29)

EASEMENTS

A TITLE REPORT IS NECESSARY TO IDENTIFY POTENTIAL EASEMENTS AND ENCUMBRANCES.

UTILITY NOTE:

COZAD AND FOX, INC. DID NOT PERFORM THE UTILITY RESEARCH. ALL RECORD INFORMATION WAS PROVIDED BY THE CLIENT AND PLOTTED THEREFROM. COZAD & FOX, INC. USED SURVEY DATA TO VERIFY UTILITY LOCATIONS. SEVERAL UTILITIES HAD AREAS WHERE FILED DATA CONFLICTED WITH RECORD DATA. COZAD AND FOX, INC. CONTRACTOR SHALL CONTACT UNDERGROUND SERVICE ALERT (USA) AT (800) 227-2600 TO VERIFY THE UTILITIES ON SITE BEFORE COMMENCING CONSTRUCTION.

EXISTING UTILITIES HAVE BEEN IDENTIFIED AND LOCATED ON THE PLANS BASED ON THE INFORMATION AVAILABLE. NO POTHOLES WERE PERFORMED. THE ENGINEER AND CONTRACTOR IS RESPONSIBLE FOR PERFORMING EXPLORATORY EXCAVATIONS (POTHOLING) ALONG THE ALIGNMENT OF THE PROJECT TO CONFIRM LOCATION OF ALL EXISTING UTILITIES AND TO ESTABLISH ANY CONNECTION REQUIREMENTS.

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THE USE OF THESE PLANS AND SPECIFICATION SHALL BE LIMITED TO THE SITE FOR WHICH THEY WERE PREPARED AND PUBLICATION THEREOF IS SPECIFICALLY LIMITED TO SUCH USE. REPRODUCTION, PUBLICATION, OR RE-USE BY ANY METHOD, IN WHOLE OR IN PART WITHOUT THE EXPRESS CONSENT OF COZAD AND FOX, INC. IS PROHIBITED. TITLE TO THE PLANS AND SPECIFICATION SHALL REMAIN IN COZAD AND FOX, INC. WITHOUT PREJUDICE. VISUAL CONTACT WITH THESE PLANS SHALL CONSTITUTE PRIMA FACIE EVIDENCE OF THE ACCEPTANCE OF THESE RESTRICTIONS. © 2017 COZAD & FOX, INC.

PROFESSIONAL LAND SURVEYOR BRIAN D. FOX NO. 7171 STATE OF CALIFORNIA

Cozad & Fox, Inc
CIVIL / STRUCTURAL ENGINEERS
MUNICIPAL CONSULTANTS / PLANNERS
SURVEYORS / GPS
151 SOUTH GIRARD STREET HEMET, CA 92544
TEL: (951) 652-4454 FAX (951) 766-8942
E-MAIL BFOX@KBCOZAD.COM

SURVEY EXHIBIT

PORTABLE RE-USE PROJECT

Sheet No. 1 OF 5 SHTS

9/15/2017 DATE

Z:\1702200\dwg\Exhibits\1702200_SURVEY EXHIBIT.dwg, 9/18/2017 2:43:28 PM, DWG To PDF.pc3

OLMSTEAD STREET RECORD DRAWINGS CONFLICT EACH OTHER AND FIELD DATA. CFI USED SURFACE APPURTENANCES TO SHIFT UTILITIES TO REFLECT A BEST FIT SOLUTION. SPECIAL CONSIDERATION SHOULD BE APPLIED TO THIS AREA IN REGARDS TO UNDERGROUND UTILITIES.

OLMSTEAD STREET RECORD DRAWINGS CONFLICT EACH OTHER AND FIELD DATA. CFI USED THE LATEST PLAN BY KENNEDY/KENKS D-43200, TO PLOT UTILITIES ALONG THE NORTH END OF OLMSTEAD. FIELD DATA SUPPORTED THEIR DEPICTION OF THE UTILITIES.

EXISTING SEWER APPEARS TO END HERE. NO MANHOLE WHERE OBSERVED BEYOND THIS POINT

BERGIND STREET

APN: 433-050-016

MB 8/357 S.D. CO. APN:434-170-048

RAMONA EXPRESSWAY

ALESSANDRO AVE.

MATCH LINE BELOW LEFT

OLMSTEAD STREET

APN:433-060-007

APN:433-060-008

APN:433-060-009

APN:433-070-002

APN:433-070-021

FOUND 1" I.P. ILLEGIBLE, FLUSH

MB 8/357 S.D. CO. APN: 433-418-006

MATCH LINE ABOVE LEFT

APN:433-070-033

APN:433-070-030

APN: 433-070-024

APN:433-070-031

MB 4/261 S.D. CO.

APN:433-070-038

CURB AND GUTTER

MB 4/261 S.D. CO. APN:433-070-050

MB 8/357 S.D. CO. APN:434-180-007

APN: 433-070-049

APN: 433-070-048

APN:433-070-042

MB 4/261 S.D. CO.

MATCH LINE BELOW LEFT

RAMONA EXPRESSWAY

SCALE: 1"=100'

VERNON AVE.

MB 4/261 S.D. CO.

APN:433-110-038

MB 4/261 S.D. CO.

APN:433-110-036

APN:433-110-037

MB 14/649 APN:433-110-030

MB 14/649 APN:433-110-035

MATCH LINE SHEET 3

APN:433-070-038

APN:433-070-043

APN:433-070-051

APN:433-110-031

MB 14/649 APN:433-110-029

MB 14/649 S.D CO. APN:433-110-033

MB 4/261 S.D. CO.

MB 4/261 S.D. CO.

MATCH LINE ABOVE RIGHT

APN:433-070-042

RAMONA EXPRESSWAY

SCALE: 1"=100'

LEGEND AND ABBREVIATIONS

SFN	GAS METER	SCO
GOD	GAS VALVE	SDMH
AERIAL TARGET	GUY WIRE	SIGN
AV & AR	HOR CONTROL	SIGNAL POLE
BACKFLOW	HOSE BIB	SIGNAL RISER
BILLBOARD	HUB W/ TACK	SMH
BOLLARD	IP LEAD & TACK	SPEED LIMIT
BRASS DISK	MAILBOX	SPIKE
BUSHES	MISC WTR	STOP SIGN
CHISLED X	NAIL & SHINER	STREET LIGHT
CL MON	NAIL & TAG	STREET NAME SIGN
COLUMN	P.I.V	TAG
CONC NAIL	PK NAIL	TBM
COPPEDWELD	POTHOLE	TELE MH
DELINEATOR	PP	TELE RISER
DET. CHECK	PULL BOX	UTILITY BOX
DROP INLET	REBAR	VERT CONTROL
ELEC MH	RECT. IRR. VALVE	WM
FDC	ROUND IRR. VALVE	WTR MISC
FH	RR SPIKE	WV
FINISH FLOOR	RTO	YIELD
PALM	EVERGREEN	DECIDUOUS

A.C.	ASPHALTIC CONCRETE	N.G.	NATURAL GROUND
B.M.	BENCHMARK	N.T.S.	NOT TO SCALE
B.S.	TOE OF SLOPE	O.C.	ON CENTER
℄	CENTER LINE	P.E.	PAD ELEVATION
(E)	EXISTING	P.P.	POWER POLE
EA.	EACH	P	PROPERTY LINE
FDN.	FOUNDATION	R	CURVE RADIUS
F.F.	FINISHED FLOOR	R/W	RIGHT OF WAY
F.G.	FINISHED GRADE	S.W.	SIDEWALK
℄	FLOW LINE	T.B.	TOP OF BERM
F.S.	FINISHED SURFACE	T.B.M.	TEMPORARY BENCHMARK
FTG.	FOOTING	T.C.	TOP OF CURB
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H.P.	HIGH POINT	T.W.	TOP OF WALL
MAS.	MASONRY	TYP.	TYPICAL
M.H.	MANHOLE	W.V.	WATER VALVE
		W.M.	WATER METER

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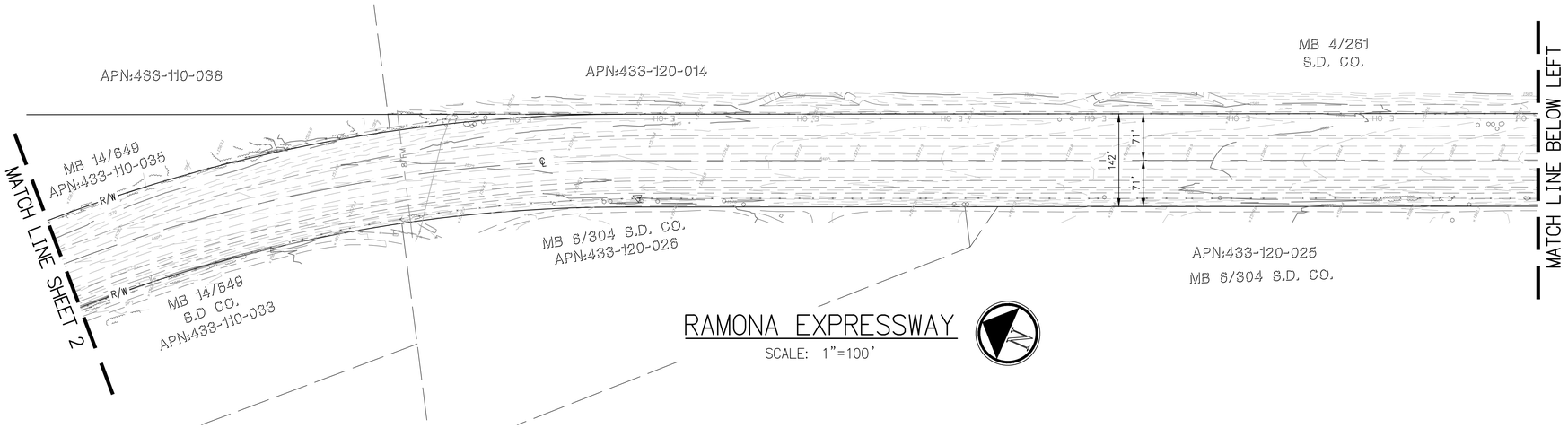

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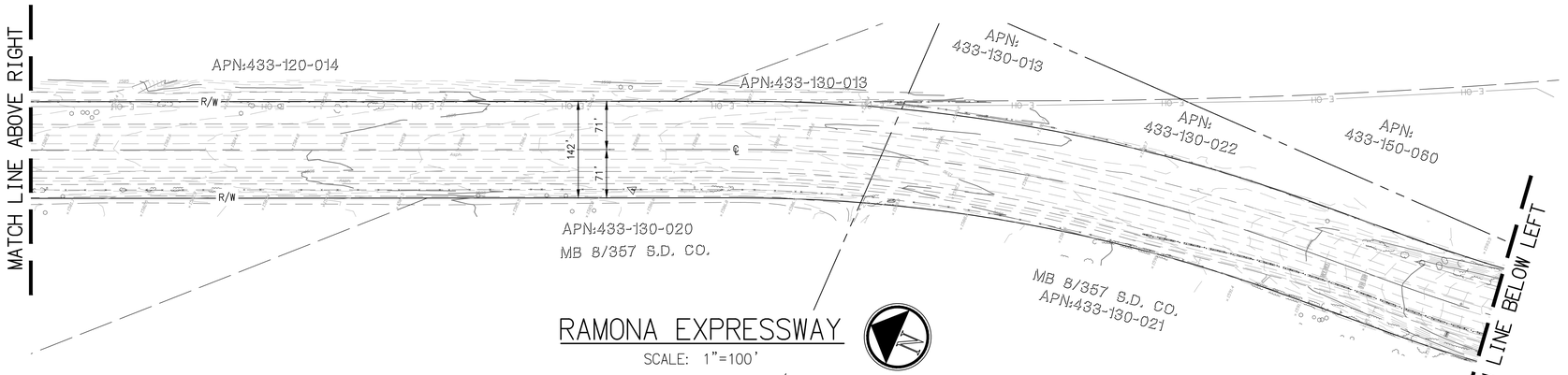

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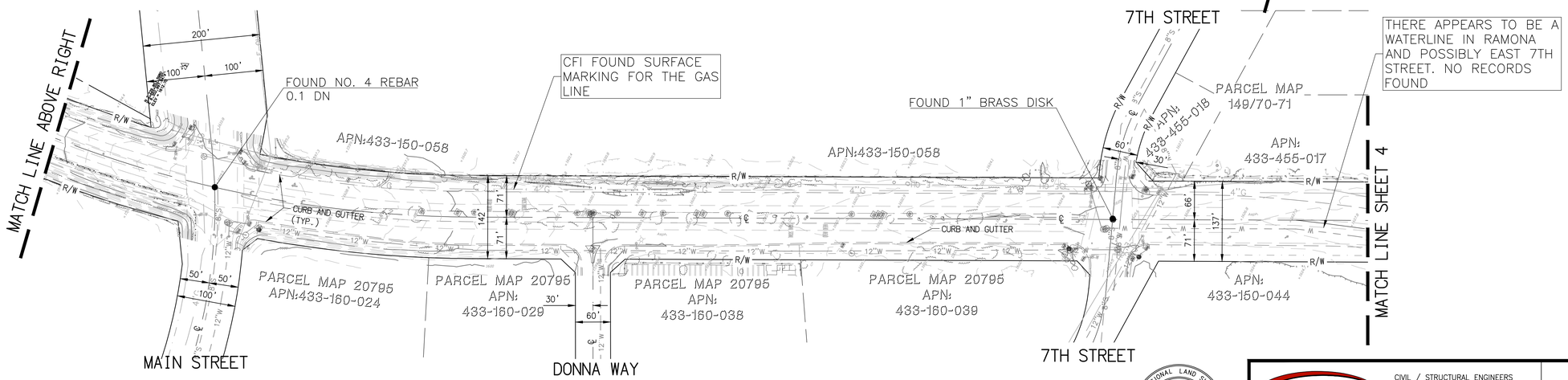

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LEGEND AND ABBREVIATIONS

SFN	GAS METER	SCO
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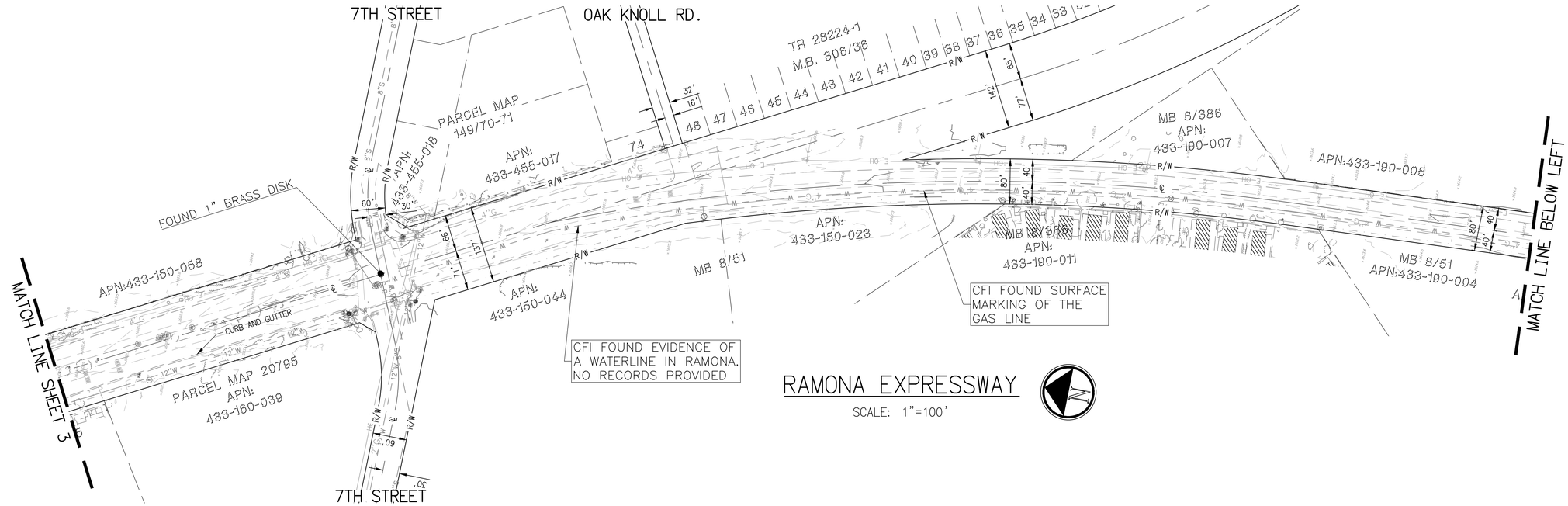

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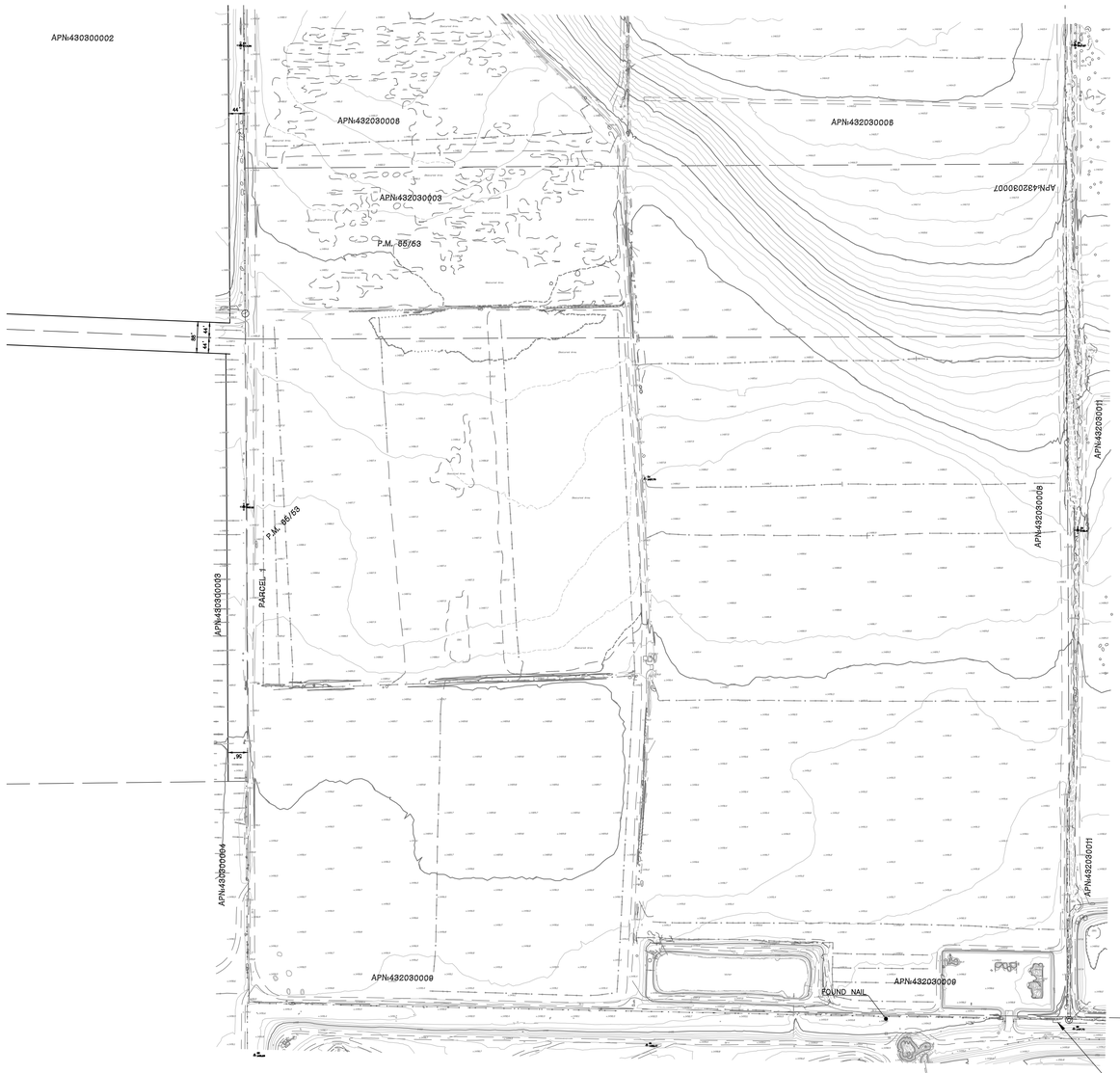

AWTF AREA

SCALE: 1"=200'

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LEGEND AND ABBREVIATIONS

SFN	GAS METER	SCO
6OD	GAS VALVE	SDMH
AERIAL TARGET	GUY WIRE	SIGN
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Appendix F

Geotechnical Investigation Report

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November 3, 2017
Kleinfelder Project No. 20174013.001A

Mr. Bruce Chalmers, PE
CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617

SUBJECT: Geotechnical Engineering Services
Indirect Potable Reuse (IPR) Preliminary Design
Eastern Municipal Water District
San Jacinto, California

Dear Mr. Chalmers:

Kleinfelder is pleased to present this report to provide geotechnical engineering services for preliminary design of the indirect Potable Reuse (IPR) program for the subject site, located in the San Jacinto area of California. Our work consisted of a subsurface exploration, laboratory testing, engineering analyses, and preparation of this report.

We appreciate the opportunity to provide geotechnical engineering services to you on this project. If you have any questions regarding this report or if we can be of further service, please do not hesitate to contact the undersigned.

Sincerely,

KLEINFELDER

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MICHAEL O. COOK
CEG #1716
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Joab Campos
Staff Engineer, EIT

Michael O. Cook, PG, CEG
Senior Engineering Geologist

REGISTERED PROFESSIONAL ENGINEER
ERIC W. NOEL
No. 2506
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GEOTECHNICAL
STATE OF CALIFORNIA

Eric W. Noel, PE, GE
Principal Geotechnical Engineer

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GEOTECHNICAL ENGINEERING SERVICES
INDIRECT POTABLE REUSE (IPR)
PRELIMINARY DESIGN
EASTERN MUNICIPAL WATER DISTRICT
SAN JACINTO, CALIFORNIA
KLEINFELDER PROJECT NO. 20174013.001A

NOVEMBER 3, 2017

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A Report Prepared for:

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617

GEOTECHNICAL ENGINEERING SERVICES
INDIRECT POTABLE REUSE (IPR) PRELIMINARY DESIGN
EASTERN MUNICIPAL WATER DISTRIC
SAN JACINTO, CALIFORNIA

Prepared by:

Joab Campos
Staff Engineer, EIT

Michael O. Cook, PG, CEG
Senior Engineering Geologist



Reviewed by:

Eric W. Noel, PE, GE
Principal Geotechnical Engineer



KLEINFELDER
2280 Market Street, Suite 300
Riverside, California 92501
Phone: 951.801.3681
Fax: 951.682.0192

November 3, 2017
Kleinfelder Project No. 20174013.001A

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FIGURES

1A and 1B Site Vicinity Map - IPR Pipeline and AWTF Basin
2A and 2B Boring Location Map - IPR Pipeline and AWTF Basin
3A and 3B Regional Geology Map - IPR Pipeline and AWTF Basin
4A and 4B Fault Zone Map - IPR Pipeline and AWTF Basin

APPENDICES

A Field Explorations
B Laboratory Testing
C GBA Insert

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1 INTRODUCTION

1.1 GENERAL

This report presents the results of Kleinfelder's geotechnical evaluation performed for the Indirect Potable Reuse (IPR) Preliminary Design project. The current phase of the IPR project includes two study areas. The first study area includes the conveyance system for the IPR project along Ramona Expressway in the City of San Jacinto as shown on Figure 1A. The conveyance system is proposed to consist of an existing 18-inch abandoned reclaimed water line and three 24 to 36-inch proposed pipelines associated with the IPR project. The majority of of the proposed pipeline alignment route is located along Ramona Expressway between Olmstead Street and East Esplanade Avenue, and portion of the alignment is located along Alessandro Avenue and Olmstead Street connecting the pipelines to the Alexandro Ponds (See Figure 1A). The second study area includes a proposed Advanced Water Treatment Facility (AWTF) and associated Brine Ponds located north of the existing Eastern Municipal Water District (EMWD) San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) as shown on Figure 1B. The proposed advanced water treatment facility (AWTF) and Brine Ponds are located between Sanderson Avenue and Odel Street approximately one mile north of Cottonwood Avenue in the City of San Jacinto, California. We understand proposed AWTF will consist of various support buildings, tanks, and various equipment pads and pump stations. Our evaluation was performed in general accordance with Kleinfelder's proposal dated June 17, 2016.

This report includes the findings of our geotechnical evaluations. Our findings are based upon the subsurface conditions encountered at the locations of our explorations and are subject to the provisions stated in the limitation section of this report. In addition, an article prepared by The Geoprofessional Business Association (GBA), Important Information about This Geotechnical Engineering Report, has been included in Appendix C. We recommend that all individuals using recommendations from this report read the limitation section of this report along with the included GBA document.

1.2 PROJECT DESCRIPTION

We understand that EMWD has initiated the development of an IPR program to replenish groundwater aquifers to supplement the local water supply. The benefits of an IPR program include enhanced groundwater quality and reduced salinity, higher regional groundwater levels

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which decrease pumping costs, increased groundwater availability, and various other benefits. The project has been separated into a two-phase approach with a Phase I goal of 4,000 acre-feet per year (AFY) and a proposed Phase II expansion of 11,000 AFY for a total of 15,000 AFY for the IPR program. The Phase I improvements will include the construction of new conveyance (pipeline) facilities along Ramona Expressway, and the construction of an AWTF located north of the existing SJVRWRF in the city of San Jacinto, California. Figures 1A and 1B show the proposed improvements for Phase I and the eventual expansion for Phase II of the IPR project.

The project involves maximizing the San Jacinto Pressure Management Zone (SJUPMZ) by delivering a blend of reverse osmosis permeate and tertiary recycled water into spreading ponds along the San Jacinto River corridor. Our report presents recommendations for the preliminary design of the IPR Phase 1 project which includes:

- 2.2 MGD MF/RO advanced water treatment facility (AWTF);
- Extension of the 24" RO, 36" T22/RO, and T22 pipelines;
- Recharge ponds blending structure; and
- Evaporation (Brine) ponds.

Based on our understanding of the project described above and our experience with similar EMWD projects located nearby, we have made the following assumptions for our design:

- The proposed pipelines will have invert depths anticipated to range from approximately 5 to 15 feet below ground surface and will likely be constructed using open-cut construction techniques.
- Grading for the AWTF will be within approximately 5 feet of existing grades.
- Structural loading for buildings and structures associated with the AWTF is assumed to be on the order of 75 kips for column loads and up to 10 kips/foot for continuous footings.
- Slopes for the Brine ponds are anticipated to have a maximum inclination of 2:1 (horizontal:vertical) and will have a slope height of less than 20 feet.

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1.3 SCOPE OF SERVICES

The scope of our geotechnical investigation consisted of a research and literature review including a geohazards study, a geotechnical investigation, laboratory testing, engineering analysis, and preparation of this report. A more detail scope is presented below.

Task 1 - Research and Review of Previous Work, Geohazards Study

We began our work by researching reports at the SJVRWRF site and along the proposed pipeline alignments. We requested assistance from EMWD to provide documents from their projects for our review. We reviewed available documents from the Cities along the pipeline routes, as well as reports within our files. We performed a field reconnaissance of the proposed pipeline alignments, treatment facility expansion, and evaporation ponds and evaluated the surface conditions and potential geotechnical constraints and then performed a geotechnical evaluation of the collected data from the reviewed background documents and project plans. Kleinfelder also reviewed select publicly available maps, literature and reports that pertain to the geologic conditions and geologic hazards along the proposed alignment. The potential impact of identified geologic hazards have been evaluated. Potential sources of maps and literature include:

- United States Geologic Survey (USGS);
- United States Department of Agriculture, Natural Resources Conservation Service (NRCS);
- California Geologic Survey (CGS);
- California Department of Conservation, Division of Oil, Gas & Geothermal Resources (DOGGR);
- Riverside County; and
- Dibblee Foundation.

The results of our geohazards study are presented in this report, along with the preliminary geotechnical study.

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Task 2 – Geotechnical Investigation

Pre-Field Activities

Kleinfelder prepared a project-specific Health and Safety Safety (HASP) to address worker health and safety. The plan included contingency plans for emergencies that may arise and provide guidelines for personal protection equipment and safety procedures to be used by Kleinfelder staff during field operations. This plan was based on the known physical, environmental, and biological hazards associated with project activities and conditions. Based on the proposed field services and our experience in the area, we assumed that Level D Protection (steel-toe boots, hard hat, and eye protection) was adequate for performing the field activities described herein. Together with the HASP, a daily tail-gate safety meeting was held with subcontractors and other site personnel to communicate the project requirements and safe work procedures. Kleinfelder also obtained an encroachment permit from the City of San Jacinto prior to performing work along Ramona Expressway.

Kleinfelder performed a site reconnaissance of the proposed AWTF and brine ponds as well as the proposed pipeline alignments and marked our proposed boring locations in accordance with standard practice, and notified Underground Service Alert (USA) of our intent to excavate in accordance with State law. We also requested that all available information identifying the type and location of utility lines and other man-made objects in the vicinity of proposed borings be provided to us.

Field Exploration

The subsurface exploration consisted of the excavation, sampling, and logging of nine small-diameter hollow-stem auger borings. Seven of our borings (B-1 through B-7) were drilled to depths of approximately 20 to 25 feet below ground surface (bgs) along the proposed pipeline alignments (approximately one boring per approximately 1,000 lineal feet). Note that boring B-8 was not performed due to underground and overhead utility conflicts along Olmstead Street, located west of the Alessandro Ponds. Two of our borings (B-9 and B-10) were drilled to depths of approximately 50 feet (bgs) near the proposed AWTF and Brine Ponds. The locations of our borings are shown on Figures 2A and 2B, Boring Location Map.

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The borings were drilled with a truck-mounted drill rig and our typical sampling interval was every 5 feet to full depths explored. An engineer from our firm observed the drilling, maintain continuous logs of the subsurface conditions encountered and collect samples for visual examination, classification, and subsequent laboratory testing. The number of blows necessary to drive both Standard Penetration Test (SPT) and modified California-type samplers were recorded. The soil samples were transported to our laboratory for testing. Borings were backfilled soil cuttings generated from the drilling operations. A description of the field exploration and the logs of the borings, including a Legend to the Logs of Borings, are presented in Appendix A.

Laboratory Testing

Laboratory testing was performed on representative samples of soil collected from our excavations to substantiate field classifications and to provide engineering parameters for geotechnical design. Laboratory testing included moisture content and unit weight, sieve analysis, Atterberg limits (plasticity index), direct shear, consolidation, collapse potential, R-value testing, and preliminary corrosion testing. A summary of the laboratory testing performed and results are presented in Appendix B.

Engineering Analysis and Geotechnical Report

The available field and laboratory data were analyzed in conjunction with our understanding of the project and our assumed structural loads to develop geotechnical recommendations for the design and construction of the proposed development. Our report includes:

- Suitability of the pipe alignment for the proposed construction from a geotechnical perspective.
- Description of the geology and soils anticipated during construction, including an evaluation of geologic and seismic hazards that might be present along the pipeline alignment.
- Evaluation of the depth to groundwater, based on our field explorations.
- Evaluation of site seismicity and applicable CBC seismic design coefficients.
- Excavation characteristics of the on-site materials, including anticipated excavation characteristics, caving potential, and oversize material handling.

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- Foundation recommendations for spread footings, including allowable bearing capacity, lateral resistance, recommended embedment depth, and anticipated settlement.
- Fill material and compaction requirements, including structure pad preparation, appropriate earthwork to provide support for pipelines, pipe bedding requirements and suitability of the on-site soils for use as structural fill, bedding and pipe zone material, and trench backfill. Stability of temporary excavations and trenches with shoring pressures, including allowable lateral earth pressures and allowable passive pressures.
- Retaining wall lateral earth pressures (active, passive, and seismic) and appropriate subsurface drainage.
- Preliminary evaluation of the corrosion potential of on-site soils.

This Geotechnical Report for the Phase I portion of the EMWD IPR Project includes an illustrated site plan and boring locations, boring logs, and laboratory test results. This report presents our findings, conclusions, and recommendations for the subject project.

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2 SITE AND SUBSURFACE CONDITIONS

2.1 SITE DESCRIPTION

The project is located in San Jacinto, California. As discussed previously, the project is separated into two study areas. The first study area includes the proposed conveyance system, which is located along Ramona Expressway between Olmstead Street and East Esplanade Avenue, and extends to Alessandro Avenue and Olmstead Street, west of the Alessandro Ponds as shown on Figure 2A. This portion of the project consists of a four-lane highway located in a primarily residential area within the City of San Jacinto, California. Ramona Expressway runs approximately north-south in the vicinity of the project alignment and has a dirt shoulder along the east side and an existing bike path along the west shoulder. Further east of Ramona Expressway is the San Jacinto River. The project alignment extends from the proposed Mountain Avenue Ponds to the existing EMWD facilities located at the Alessandro Ponds. Approximate ground surface elevations along the pipeline alignment ranges from approximately 1,545 to 1,620 feet Mean Sea Level (MSL).

The second study area of the project includes the proposed Advanced Water Treatment Facility (AWTF) and associated Brine Ponds located north of the existing EMWD SJVRWRF as shown on Figure 2B. The site currently consists of undeveloped farmland that EMWD leases for agricultural purposes. At the time of our investigation, the area was being used as an alfalfa field, which was watered regularly. Existing dirt roads surround the property. To the south of the proposed AWTF and Brine Ponds is the EMWD SJVRWRF. The existing site elevation for the proposed AWTF and Brine Ponds elevation are at elevation 1,495 feet above MSL.

2.2 SUBSURFACE CONDITIONS

The site is generally underlain by artificial fill and mostly alluvial deposits. A discussion of the subsurface deposits encountered is presented in the following sections. Detailed descriptions of the deposits are provided in our boring logs presented in Appendix A.

2.2.1 Proposed Conveyance System along Ramona Expressway

Artificial Fill

Artificial fill was encountered in all our borings drilled along the proposed pipeline alignment (B-1 through B-7), and the thickness ranged from approximately 2.5 to 8.5 feet. The fill soils

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encountered generally consisted of silty sands, poorly graded sands with silt, and poorly graded sands with varying amounts of gravel content. The fill soils are generally associated with grading efforts associated with the construction of Ramona Expressway, with the exception of B-7, which is located along the perimeter dirt access road at the Alessandro Ponds. The moisture content of the fill soils ranged from 2.4 to 13.1 percent based on the results of the samples tested. Dry unit weights of the fill ranged from 91 to 118 pounds per cubic foot (pcf) of the samples tested.

Alluvium

Underlying the artificial fill was alluvium, which generally consisted of loose to dense sands and silty sands with varying amounts of gravel content. The alluvium was encountered to the maximum depth explored in our borings, or approximately 26 ½ feet bgs. The moisture content of the fill soils ranged from 1.7 to 12.3 percent based on the results of the samples tested. Dry unit weights of the fill ranged from 90 to 124 pounds per cubic foot (pcf) of the samples tested.

2.2.2 Proposed AWTF and Brine Ponds

Undocumented Fill

Undocumented artificial fill was encountered in borings B-9 and B-10 drilled in the vicinity of the proposed AWTF and Brine Ponds, and the thickness was approximately 4.5 feet. The fill soils encountered generally consisted of silt with sands, sandy silts, and silty sands. The artificial fill is considered undocumented and is believed to be associated with filling of the previous EMWD ponds located at the site prior to 2002.

Alluvium

Underlying the artificial fill was alluvium, which generally consisted of both fine-grained and coarse-grained soils, including loose to dense sands and silty sands and soft to silts, sandy silts, and fat clay with sand. The alluvium was encountered to the maximum depth explored in our borings, or approximately 51½ feet bgs. The moisture content of the fill soils ranged from 3.8 to 22.1 percent based on the results of the samples tested. Dry unit weights of the fill ranged from 94 to 125 pounds per cubic foot (pcf) of the samples tested.

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2.3 GROUNDWATER CONDITIONS

IPR pipeline borings B-1 to B-6 were drilled to a maximum depth of 21.5 feet bgs and did not encounter groundwater. Groundwater was encountered in IPR pipeline boring B-7 at approximately 25 feet bgs (see boring log B-7). Water was measured at a depth of approximately 23 feet bgs at the completion of drilling. B-7 was drilled within the existing EMWD Alessandro Ponds near the northwesterly end of the proposed IPR pipeline alignment. AWTF borings B-9 and B-10 were drilled to a maximum depth of 51½ feet bgs and did not encounter groundwater.

Based on well data from the Western Municipal Water District Cooperative Well Measuring Program (WMWD, 2016) and the California Department of Water Resources (DWR) website the regional groundwater is estimated to be at depths greater than 150 feet bgs below the proposed IPR pipeline and the proposed AWTF site. The relatively shallow depth to groundwater encountered in Boring B-7 is likely a perched condition base on greater depths to groundwater in existing nearby wells. It is possible that local variations in groundwater levels may occur due to seasonal changes, run-off, precipitation, irrigation and / or construction activities.

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3 GEOLOGIC CONDITIONS

3.1 REGIONAL GEOLOGY

California is divided into eleven natural geomorphic provinces that are recognized based on geology, landscape or landform, topographic relief, and climate (Norris and Webb, 1990). Based on the geomorphic provinces defined by the California Geological Survey (CGS), the project study area is situated near the northwestern end of the landward portion of the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges Province is a distinct geomorphic region characterized as a complex series of northwest-southeast oriented mountain ranges and valleys generally sub parallel to faults comprising the San Andreas rift zone. In the vicinity of the IPR alignment and the AWTF project site, the Peninsular Ranges Province is further described by sub-units, which include the Perris Block, the San Jacinto Mountains, and the Santa Ana Mountains. The project sites are located within the eastern portion of the Perris Block, south of the San Jacinto Mountains and situated between branch fault traces of the San Jacinto fault zone. The Perris Block is characterized as a broad area of intermixed valleys and low mountain ranges situated between the Elsinore and San Jacinto fault zones. Bedrock of the Perris Block is comprised principally of Cretaceous-age igneous rocks and older metasedimentary rocks.

The IPR pipeline alignment and AWTF sites are located within the San Jacinto Valley which is a broad relatively flat-floored alluvial valley surrounded by granitic and metasedimentary bedrock hills. This alluvial valley is drained by the San Jacinto River which drains northwest to approximately 11 miles north of the City of San Jacinto where river turns and flow southwest towards the city of Perris. Lithologically, the project site is underlain by Quaternary-age alluvial deposits (Morton and Matti, 2001, Dibblee, 2003, Morton and Miller, 2006) as shown in Figures 3A and 3B, Regional Geology Map. The alluvial soils consist of primarily of fine-grained mixtures of clays and sandy clays with minor interbedded silty sand and clayey sand. The alluvial deposits were encountered in all borings drilled for this investigation.

The project site is located in the highly seismic southern California region within the influence of several fault systems that are considered to be active or potentially active. An active fault is defined by the State of California (Bryant and Hart, 2007) as a "sufficiently active and well defined fault" that has exhibited surface displacement within the Holocene time (about the last 11,000 years). A potentially active fault is defined by the State as "a fault with a history of

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movement within Pleistocene time (between 11,000 and 1.6 million years ago)." These active and potentially active faults are capable of producing potentially damaging seismic shaking at the site. It is anticipated that the project site will periodically experience ground acceleration as the result of small to large magnitude earthquakes.

Faults identified by the State or the County of Riverside as being either active or potentially active are not known to be present on or crossing the proposed IPR pipeline alignment. The IPR pipeline alignment is not located within a State of California or County of Riverside designated Earthquake Fault Zone (EFZ) for ground rupture (Bryant and Hart, 2007; Riverside, 2017). The nearest active fault zone to the IPR pipeline alignment is the Claremont fault of the San Jacinto fault zone approximately 2,600 feet northeast of the alignment at the closest point. The potential of surface fault rupture along the IPR pipeline alignment is considered low due to distance to the nearest active fault trace.

The northeast corner of the proposed brine ponds for the AWTF is situated within the EFZ for the Casa Loma fault of the San Jacinto fault zone (CGS, 1987, 1988). See Figures 4A and 4B – Fault Zone Map The proposed AWTF facility is not located within a known fault zone area. The Casa Loma fault of the San Jacinto fault zone is located approximately 1,000 feet northeast of the proposed AWTF site. The potential of surface fault rupture within the AWTF site is considered moderate to high due to the near proximity to active fault traces.

A major seismic event on the San Jacinto fault (Claremont or Casa Loma branches) have the potential to cause strong ground shaking at the site. The project site may also be subjected to ground motion from a seismic event occurring on any of the other numerous active faults in the region.

The IPR pipeline is located on the USGS San Jacinto, California 7.5-minute Quadrangle Map, at approximate Latitude 33.789°N and Longitude 116.938°W located at the approximate center of the alignment and the proposed AWTF is located on the USGS Lakeview, California 7.5-minute Quadrangle Map, at approximate Latitude 33.801° and Longitude -117.0185°.

3.2 SUBSIDENCE

Both the IPR pipeline and the AWTF project sites are located within an area designated as undergoing “Active Subsidence” by the County of Riverside RCIT (Riverside, 2017).

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3.3 LIQUEFACTION

Both the IPR pipeline and the AWTF project sites are located within an area designated as having “Moderate” potential for liquefaction “Active Subsidence” by the County of Riverside RCIT (Riverside, 2017). The northern most portion of the IPR pipeline alignment in the area of Olmstead Street and the Alessandro Pond is designated as having a “High” potential for liquefaction by the County of Riverside.

3.4 FLOODING

Flood plain data reviewed for the IPR pipeline indicates the alignment is in an area designated by the Federal Emergency Management Agency as an area that is protected from the 1-percent-annual-chance or greater flood hazard by a levee system (FEMA, 2017). Overtopping or failure of any levee system is possible. The AWTF project site is located within an area designated at Zone X outside the 0.2% annual chance floodplain (FEMA, 2008). Appropriate project design, construction, and maintenance can reduce sheet flooding potentials.

3.5 LANDSLIDES

The IPR and AWTF sites are relatively flat and level away from any significant topographic relief. The low topographic relief is considered to have a low potential for hazards due to landslides. There are no nearby defined highlands with drainage courses topographically above the IPR pipeline alignment or the AWTF project site. Therefore, the potential for debris flow hazards at either site is considered to be very low.

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4 CONCLUSIONS AND RECOMMENDATIONS

4.1 GENERAL

Based on the results of our field exploration, laboratory testing and geotechnical analyses conducted during this study, it is our professional opinion that the proposed project is geotechnically feasible, provided the recommendations presented in this report are incorporated into the project design and construction.

The following opinions, conclusions, and recommendations are based on the properties of the materials encountered in the borings, the seismic refraction lines, the results of our literature review, the results of the laboratory-testing program, and our engineering analyses performed. Our recommendations regarding the geotechnical aspects of the design and construction of the project are presented in the following sections. The recommendations presented below are based on our understanding of the project and our assumptions described in the project description.

Based on our findings, the proposed structures associated with the AWTF are suitable for shallow spread foundations provided the recommendations presented in the following sections are followed. We anticipate that the onsite soils may be reusable as engineered fill once organic vegetation, debris, and oversized materials are removed. Overexcavation and recompaction of the upper fill and native materials should provide adequate support for both shallow foundations and flexible and rigid pavements.

The onsite soils from borings B-1 to B-7 generally consist of loose to dense coarse-grained silty sands and sands. These soils may be prone to caving during excavation efforts and should be properly shored during trenching activities for the proposed pipeline. Recommendations for trenching and shoring are presented in Section 5 of this report, including anticipated excavation characteristics. Additionally, undocumented fill was encountered in borings B-9 and B-10 to a depth of approximately 4.5 feet bgs. The undocumented fill is considered unsuitable for support of foundations and should be overexcavated and recompacted prior to placement of footings. Recommendations for earthwork, including overexcvations and fill placement are presented in Section 5 of this report.

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4.2 SEISMIC DESIGN CONSIDERATIONS

4.2.1 General

The site is located in a seismically active region of southern California. The proposed site can be expected to be subject to strong seismic shaking during its design life. Potential seismic hazards include ground shaking, localized liquefaction, ground rupture due to faulting, and seismic settlement. The following sections discuss these potential seismic hazards where relevant with respect to this site.

4.2.2 Seismic Site Class

Based on information obtained from the investigation, published geologic literature and maps, and our in-house analysis the project site may be classified as Site Class D, stiff soil.

4.2.3 Seismic Design Parameters

According to the 2016 CBC, every structure, and portion thereof, including non-structural components that are permanently attached to structures and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance with ASCE 7-10 (ASCE, 2010), excluding Chapter 14 and Appendix 11A. The seismic design category for a structure may be determined in accordance with Section 1613 of the 2016 CBC or ASCE 7-10. Based on the subsurface conditions encountered, we classify the site as Site Class D. The 2016 parameters are summarized in Table 1, 2016 CBC Seismic Design Parameters.

We have evaluated the seismic design parameters at both study areas (proposed AWTF/Brine Ponds and the proposed pipelines). Due to the relatively close proximity of both study areas, we have provided the more conservative (higher) seismic design parameters, which may be used for both study areas. The approximate coordinates of the evaluated seismic design parameters (proposed AWTF) are noted below:

Latitude: 33.8009°N
Longitude: -117.0185°W

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TABLE 1

SEISMIC DESIGN PARAMETERS

Design Parameter	Value
Site Class	D
S_s (g)	2.455
S_1 (g)	1.069
F_a	1.0
F_v	1.5
S_{MS} (g)	2.445
S_{M1} (g)	1.604
S_{DS} (g)	1.637
S_{D1} (g)	1.069
PGA_M (g)	0.945
Seismic Design Category	E

4.2.4 Liquefaction-Induced Settlement

Liquefaction occurs when loose, coarse-grained or silty soils are subjected to strong shaking resulting from earthquake motions. The coarse-grained or silty soils typically lose a portion or all of their shear strength, and regain strength sometime after the shaking stops. Soil movements (both vertical and lateral) have been observed under these conditions due to consolidation of the liquefied soils.

In general, the site soils consist of loose to medium dense sands which may be susceptible to liquefaction settlement. However, due to the lack of groundwater (e.g., groundwater was not encountered in our borings and is anticipated to be deep), the potential for liquefaction induced settlement is considered relatively low and unlikely to impact the project.

The assessment above is based on the assumption that groundwater is relatively deep (e.g., greater than 50 feet bgs). However, because the EMWD IPR project involves groundwater recharge through percolation in ponds, there is a potential that groundwater mounding may occur and groundwater levels may rise over time. While not in our scope, we have performed a preliminary assessment of the liquefaction potential at the site if groundwater levels were to rise greater than 50 feet bgs. In order to assess the potential for liquefaction of subsurface soils at

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the site, we used the simplified liquefaction analysis procedure recommended by NCEER (Youd and Idriss, 1997, 2001). For estimating the resulting ground settlements, we used the method proposed by Tokimatsu and Seed (1987). Both these methods utilize the standard penetration test (SPT) blow count data to characterize the liquefaction resistance of sandy soils to evaluate the triggering of liquefaction and estimate the amount of volumetric compaction or settlement during an earthquake. We utilized an earthquake magnitude of 7.5 and a design level peak ground acceleration (PGA_M) of 0.95 for site class effects, and soil parameters such as unit weight, friction angle and cohesion.

Based on our analyses, we have estimated that liquefaction settlement will likely occur during an earthquake if groundwater levels were to rise greater than 50 feet bgs. We estimate that liquefaction settlement on the order of 4 to 6 inches may occur during a design level earthquake. This order-of-magnitude estimate is for informational purposes only and the actual liquefaction settlement may vary significantly depending on the actual groundwater conditions.

4.2.5 Dynamic Compaction and Seismic Settlement

Dry, loose sands and non-plastic silts may experience some settlement or subsidence when subjected to cyclic application of loads such as ground shaking from near-by-seismic events. Analysis of the seismic settlement of the unsaturated soil in the upper 50 feet was performed using a peak ground acceleration equal to the PGA_m (0.95g) and an earthquake magnitude of 7.5. The analysis indicates that the there is a potential for seismic induced settlement of the non-saturated soil to occur at the site. The total estimated seismic induced settlement is approximately 7 inches and the estimated differential settlement is about than 3.5 inches.

4.3 FOUNDATIONS

4.3.1 General

Based on our analysis, the structural loads for the proposed advanced water treatment facility (AWTF) may be supported on conventional shallow foundations (spread footings) underlain by engineered fill provided that the pad preparation recommendations included in this report are implemented. Recommendations for shallow foundations are presented in the following sections.

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4.3.2 Allowable Bearing Capacity

Spread and continuous foundations underlain by a minimum of 3 feet of engineered fill may be designed for an allowable bearing pressure of 2,000 psf. All footings should have a minimum width of 2 feet and be established at a depth of at least 2 feet below the lowest adjacent grade or finished slab grade, whichever is deeper.

The footing dimensions and reinforcement should be designed by the structural engineer. Footings should be deepened as recommended in Section 4.3.5 to avoid surcharging existing buried utilities and/or walls. The engineered fill should be prepared as recommended in Section 4.4.

The allowable bearing pressure provided above is a net value; therefore, the weight of the foundation (which extends below grade) may be neglected when computing dead loads. The allowable bearing pressure applies to dead plus live loads. This value may be increased by one-third for short-term loading due to wind or seismic forces.

4.3.3 Estimated Settlements

The total and differential settlement of the proposed structures supported on conventional shallow spread or continuous foundations are anticipated to be less than 1 inch and ½ inch, respectively. Note that this settlement is in addition to an estimated seismic induced settlement of approximately 7 inches total and 3 ½ inches differential.

4.3.4 Lateral Resistance

Lateral load resistance may be derived from passive resistance along the vertical sides of the footings, friction acting at the base of the footing, or a combination of the two. An allowable passive resistance of 240 psf per foot of depth may be used for design. Allowable passive resistance values should not exceed 2,400 psf. An allowable coefficient of friction of 0.30 between the base of the footings and the engineered fill soils can be used for sliding resistance using the dead load normal stresses. Friction and passive resistance may be combined without reduction. We recommend that the first foot of soil cover be neglected in the passive resistance calculations if the ground surface is not protected from erosion or disturbance by a slab, pavement or in a similar manner.

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4.3.5 Foundations Adjacent to Buried Utilities

To avoid surcharging existing utilities and walls below grade, foundations should be deepened below a 1:1 (H:V) plane projected from the bottom of the utility or wall. Alternatively, the utilities or wall could be evaluated for potential surcharge pressures due to the foundation loads.

4.4 EARTHWORK

4.4.1 Site Preparation

Prior to general site grading, existing vegetation, organic topsoil, debris, and oversized materials (greater than 3 inches in maximum dimension) should be stripped and disposed of outside the construction limits. We estimate the depth of stripping to be approximately 3 to 4 inches over most portions of the site. Deeper stripping or grubbing may be required where higher concentrations of vegetation are encountered during site grading. The stripping work should include the removal of existing fill embankments, undocumented fill, and topsoil that, in the judgment of the geotechnical engineer, is compressible or contains significant voids. The stripping operation must expose a firm, non-yielding subgrade that is free of large voids. Stripped topsoil (less any debris) and/or boulders may be stockpiled and reused for landscaping purposes; however, this material should be evaluated for suitability if it is desired to use this material for engineered fill below structures.

All debris, including any produced by demolition operations, (wood, steel, piping, plastics, etc.), should be separated and disposed off-site. A diligent search should be conducted during grading operations in an effort to uncover any underground structures, irrigation, or utility lines which should be removed within the property line prior to site development. Existing utility pipelines which extend beyond the property line and are to be abandoned in place should be plugged with cement grout to prevent migration of soil and/or water. The grading contractor should anticipate the complete removal and abandonment of any utilities and other underground structures prior to site development.

4.4.2 Overexcavation

Recommendations for overexcavation of shallow foundations (spread footings) within the proposed AWTF area are presented below. All site preparation and earthwork operations should be performed in accordance with applicable codes, safety regulations and other local,

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state or federal specifications. All references to maximum unit weights are established in accordance with the latest version of ASTM Standard Test Method D1557.

As discussed in the subsurface conditions section of this report, undocumented fill was encountered to approximately 4.5 feet bgs in borings B-9 and B-10 near the proposed AWTF. Undocumented fill is not suitable for support of spread foundations and we recommend that all the undocumented fill be removed prior to the placement of engineered fill and spread footings. Note that the fill depth may vary and deeper removals may be required in some areas. However, at a minimum, in order to provide a uniform blanket of engineered fill beneath spread footings and to reduce the potential for differential settlements, we recommend that the site soils be overexcavated and replaced as engineered fill to a depth of 5 feet below existing grades, and at least 3 feet below the bottom of footings, whichever is greater. All overexcavations should extend horizontally beyond the edges of all foundation elements a minimum of 5 feet, or equal to the depth of fill beneath foundations, whichever is greater. Existing undocumented artificial fill soils are not considered suitable for support of the foundations and should be overexcavated, processed, and replaced as engineered fill.

After overexcavating as recommended, and prior to placing fill, the area should be proofrolled and evaluated by the geotechnical engineer of record for suitability to support the proposed pavements and additional fill.

4.4.3 Scarification and Compaction

Following site stripping and any required grubbing and/or overexcavation, we recommend all areas to receive engineered fill be scarified to a minimum depth of 8 inches, uniformly moisture-conditioned and compacted to at least 90 percent of the maximum dry density obtained using ASTM (American Society for Testing and Materials) Test Method D 1557. The moisture content of fine-grained soils (silts and clays) should be within 1 to 5 percent above optimum moisture at the time of compaction and the moisture content of granular soils (sands, silty sands and gravels) should be within 2 percent of the optimum moisture content at the time of compaction.

Grading operations during the wet season or in areas where the soils are saturated may require significant provisions for drying of soils prior to compaction. If the project necessitates fill

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placement and compaction in wet conditions, we can provide alternatives for drying the soil. Conversely, additional moisture may be required during the dry months. A sufficient water source should be available to provide adequate water during compaction. During dry months, moisture conditioning of the subgrade soils may be required if left exposed for greater than a few days.

4.4.4 Excavation Characteristics

The borings drilled as part of our field exploration were advanced using a truck-mounted drill rig equipped with hollow-stem augers to a maximum depth of approximately 51½ feet bgs. It is anticipated that conventional heavy-duty earthmoving equipment maintained in good condition should be capable of excavating the existing soils.

4.4.5 Engineered Fill

We anticipate that most of the on-site soils may be reusable as engineered fill once any debris and oversized materials greater than 3 inches in diameter have been removed, and after any vegetation and organic debris is cleared and disposed offsite. Fill should be placed in lifts no greater than 8 inches thick, loose measurement, and should be compacted to at least 90 percent of the maximum dry density. The moisture content of fine-grained soils (silts and clays) should be within 1 to 5 percent above optimum moisture at the time of compaction and the moisture content of granular soils (sands, silty sands and gravels) should be within 2 percent of the optimum moisture content at the time of compaction.

4.4.6 Import Soils

We recommend that import materials be granular in nature and have an expansion index of less than 20 and be uniformly graded with no more than 30 percent of the particles passing the No. 200 sieve and no particles greater than 3 inches in maximum dimension. Other import soils may be acceptable, but should be evaluated on a case by case basis by the geotechnical engineer of record. Kleinfelder should evaluate all proposed import materials for suitability as engineered fill prior to their transportation to the site. The earthwork operations should be observed and tested by a representative of Kleinfelder.

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4.4.7 Excavations

All excavations must comply with applicable local, state, and federal safety regulations including the current OSHA Excavation and Trench Safety Standards. Construction site safety generally is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing the information below solely as a service to our client. Under no circumstances should the information provided be interpreted to mean that Kleinfelder is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

Temporary cut slopes up to 15 feet high may be sloped back at an inclination of no steeper than 1.5:1 (horizontal to vertical) in the existing site soils. Minor sloughing and/or raveling of sandy slopes should be anticipated as they dry out. If signs of slope instability are observed, the inclination recommended above should be decreased until stability of the slope is obtained. In addition, at the first signs of slope instability, Kleinfelder should be contacted. Where space for sloped embankments is not available, shoring will be necessary. All applicable excavation safety requirements and regulations, including OSHA requirements, should be met.

Where sloped excavations are used, the tops of the slopes should be barricaded so that vehicles and storage loads do not encroach the tops of excavated slopes within a distance equal to the depth of the excavation. Greater setback may be necessary when considering heavy vehicles, such as concrete trucks and cranes. Kleinfelder should be advised of such heavy vehicle loadings so that specific setback requirements can be established. If temporary construction slopes are to be maintained during the rainy season, berms are recommended along the tops of the slopes to reduce runoff that may enter the excavation and erode the slope faces.

Temporary, shallow excavations with vertical side slopes less than 4 feet high should generally be stable, although sloughing may be encountered in the granular deposits. Vertical excavations greater than 4 feet high should not be attempted without appropriate shoring to prevent local instability. All trench excavations should be braced and shored in accordance with good construction practice and all applicable safety ordinances and codes. The contractor should be responsible for the structural design and safety of the temporary shoring system, and we recommend that this design be submitted to Kleinfelder for review to check that our

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recommendations have been incorporated. For planning purposes, the on-site soils may be considered as a Type C soil, as defined using the current OSHA soil classification.

4.4.8 Permanent Slopes

Based on our current understanding of the proposed project, we anticipate the construction of new fill slopes or cut slopes on the order of 20 feet in height may be required for the brine ponds. Permanent slopes, either in cut or fill, should be no steeper than 2:1 H:V. Slopes excavated into native soil or bedrock should be mapped by a qualified engineering geologist during slope grading. Kleinfelder should review the final grading plans to evaluate the proposed slopes. Additional recommendations or analysis may be needed based on the final project design.

4.4.9 Pipe Bedding and Trench Backfill

Pipe bedding and pipe zone material should consist of sand or similar granular material having a minimum sand equivalent value of 20. The sand should be placed in a zone that extends a minimum of 6 inches below and 12 inches above the pipe for the full trench width. The bedding material should be compacted to a minimum of 90 percent of the maximum dry density or to the satisfaction of the geotechnical engineer's representative observing the compaction of the bedding material. Bedding material should consist of sand, gravel, crushed aggregate, or native free-draining granular material with a maximum particle size of ¾ inch. Bedding materials should also conform to the pipe manufacturer's specifications, if available. Trench backfill above bedding and pipe zone materials may consist of approved, on-site or import soils placed in lifts no greater than 8 inches loose thickness and compacted to 90 percent of the maximum dry density based on ASTM Test Method D1557. Jetting of backfill is not recommended. The on-site soils are not suitable for pipe bedding. However, the on-site soils are suitable for backfill of utility trenches from one foot above the top of the pipe to the surface provided the material is free of organic and deleterious substances.

4.4.10 Temporary Shoring

Shoring may be required where soil conditions, space or other restrictions do not allow a sloped excavation. A braced or cantilevered shoring system may be used.

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A temporary cantilevered shoring system should be designed to resist an active earth pressure equivalent to a fluid weighing 40 pounds per cubic foot (pcf). Braced or restrained excavations above the groundwater table should be designed to resist a uniform horizontal equivalent soil pressure of 65 pounds per cubic foot (pcf). The values provided above assume a level ground surface adjacent to the top of the shoring and do not include a factor of safety.

Fifty percent of an aerial surcharge placed adjacent to the shoring may be assumed to act as a uniform horizontal pressure against the shoring. Special cases such as combinations of slopes and shoring or other surcharge loads may require an increase in the design values recommended above. These conditions should be evaluated by the project geotechnical engineer on a case-by-case basis. The above pressures do not include hydrostatic pressures; it is assumed that drainage will be provided. If drainage is not provided, shoring extending below the groundwater level should be evaluated on a case-by-case basis.

Cantilevered shoring must extend to a sufficient depth below the excavation bottom to provide the required lateral resistance. We recommend required embedment depths be determined using methods for evaluating sheet pile walls and based on the principles of force and moment equilibrium. For this method, the allowable passive pressure against shoring, which extends below the level of excavation may be assumed to be equivalent to a fluid weighing 240 pcf. Additionally, we recommend a factor of safety of at least 1.2 be applied to the calculated embedment depth and that passive pressure be limited to 2,000 psf.

The contractor should be responsible for the structural design and safety of all temporary shoring systems.

4.4.11 Stockpiling Excess Material

All stockpiles of excess soil materials should be kept away from the top of the excavations a minimum distance equal to the depth of the excavation. We recommend that stockpiles be constructed with a slope ratio of at least 2:1 (horizontal to vertical) and compacted to at least 85 percent relative compaction. The height of stockpiles should not exceed 10 feet. Compaction requirements and slope ratios are provided only for temporary stockpiling considerations, such as erosion control and temporary influences on excavations. We have not considered any long-term or structural support usage of stockpiles.

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4.5 EXPANSIVE SOILS

Expansive soils are characterized by their ability to undergo significant volume change (shrink or swell) due to variations in moisture content. Changes in soil moisture content can result from rainfall, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors, and may cause unacceptable settlement or heave of structures, concrete slabs supported-on-grade, or pavements supported over these materials. Depending on the extent and location below finished subgrade, expansive soils can have a detrimental effect on structures. Due to the granular nature of the near surface soils, the expansion potential for the near surface soils is considered low.

4.6 COLLAPSIBLE SOILS

Soils with the potential for collapse generally consist of loose granular soils in dry arid climates that have not been subjected to flooding or irrigation. Table 2 presents the results of collapse potential testing conducted on soils encountered in the exploration performed for this study. These test results indicate the upper soils have a low collapse potential when saturated.

TABLE 2

COLLAPSE POTENTIAL TEST RESULTS

Boring	Depth (ft)	Soil Classification (ASTM)	Collapse Potential
B-1	5	Poorly Graded Sand (SP)	0.7%
B-4	5	Poorly Graded Sand (SP)	0.5%

4.7 DRAINAGE AND LANDSCAPING

It is important that positive surface drainage be provided to prevent ponding and/or saturation of the soils in the vicinity of foundations, concrete slabs-on-grade, or pavements. We recommend that the site be graded to carry surface water away from the improvements and that positive measures be implemented to carry away roof runoff. Poor perimeter or surface drainage could allow migration of water beneath the pavement areas, which may result in distress to project improvements.

If planted areas adjacent to structures are desired, we suggest that care be taken not to over irrigate and to maintain a leak-free sprinkler piping system. In addition, it is recommended that

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planter areas next to structures have a minimum of 5 percent positive fall away from foundations. Landscaping after construction should not promote ponding of water adjacent to structures.

4.8 CORROSIVITY

Kleinfelder has completed laboratory testing to provide data regarding corrosivity of onsite soils. Our scope of services does not include corrosion engineering and, therefore, a detailed analysis of the corrosion test results is not included in this report. A qualified corrosion engineer should be retained to review the test results and design protective systems that may be required. Kleinfelder may be able to provide those services.

Laboratory chloride concentration, sulfate concentration, pH, and electrical resistivity tests were performed for soil samples obtained from the borings. The results of the tests are attached and are summarized in Table 3. If fill materials will be imported to the project site, similar corrosion potential laboratory testing should be completed on the imported material.

TABLE 3

PRELIMINARY CORROSION TESTING RESULTS

Boring	Depth (ft)	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
B-1	0-3	2.138	8.2	54	35
B-7	0-5	7,229	8.1	40	35
B-10	0-5	445	7.9	313	623

Ferrous metal and concrete elements in contact with soil, whether part of a foundation or part of the supported structure, are subject to degradation due to corrosion or chemical attack. Therefore, buried ferrous metal and concrete elements should be designed to resist corrosion and degradation based on accepted practices.

Based on the results of the resistivity testing, the soils along the proposed pipeline alignment (Borings B-1 and B-7) are considered moderately to highly corrosive for buried ferrous metal piping, cast iron pipes, or other objects made of these materials. At location B-10 in the vicinity of the proposed AWTF and brine ponds, the soils are considered extremely corrosive to buried

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ferrous metal piping, cast iron pipes, and other objects made of these materials (Roberge, 2006). We recommend that a corrosion engineer be consulted to recommend appropriate protective measures.

The concentrations of soluble sulfates for both the proposed pipeline alignment and AWTF and brine pond locations indicate that the subsurface soils represent a Class S0 exposure to sulfate attack on concrete in contact with the soil based on ACI 318 Table 4.2.1 (ACI, 2011). Therefore, in accordance with ACI Building Code 318-11, no special provisions for selection of cement type are required.

4.9 PAVEMENT SECTIONS

The recommended pavement structural sections presented below are for flexible pavements and a design R-Value of 50 was used for our analysis. The required pavement structural sections will depend on the expected wheel loads, volume of traffic, and subgrade soils. The Traffic Indexes (TI's) assumed should be reviewed by the project Owner, Architect, and/or Civil Engineer to evaluate their suitability for this project. Changes in the TI's will affect the corresponding pavement section. The pavement subgrade should be prepared just prior to placement of the base course. Positive drainage of the paved areas should be provided since moisture infiltration into the subgrade may decrease the life of pavements. Below are the recommendations:

TABLE 4

PRELIMINARY FLEXIBLE ASPHALT CONCRETE PAVEMENT SECTIONS

Assumed Traffic Index (TI)	Asphalt Concrete (inches)	Aggregate Base (inches)
5	3.0	4.5
7	3.5	6.0
8	4.0	7.5

4.9.1 Subgrade Preparation and Engineered Fill

We anticipate the final subgrade soils will consist of a blend of the near surface materials. Since the characteristics of the near-surface soils can change as a result of grading, we recommend that the subgrade soils be retested for pavement support characteristics, to confirm the

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parameters used in design and allow for a possible reduction in structural section thickness. Pavement sections provided above are contingent on the following recommendations being implemented during construction.

- The pavement sections recommended above should be placed on at least 18 inches of engineered fill compacted to at least 90 percent of maximum dry density. The upper 12 inches of the engineered fill in the pavement area should be compacted to at least 95 percent relative compaction. Overexcavation of the pavement areas should extend a minimum of 12 inches below the existing grades, or 18 inches below the bottom of the finished pavement section, whichever is deeper.
- Subgrade soils should be in a stable, non-pumping condition at the time aggregate base materials are placed and compacted.
- Aggregate base materials should be compacted to at least 95 percent relative compaction.
- Adequate drainage (both surface and subsurface) should be provided such that the subgrade soils and aggregate base materials are not allowed to become wet.
- Aggregate base materials should meet current Caltrans specifications for Class 2 aggregate baserock, or crushed miscellaneous base as specified in "Standard Specifications for Public Work Construction" ("Greenbook").
- The asphalt pavement should be placed in accordance with “Green Book” specifications. We recommend that the asphalt pavement be placed in a single layer of ½-inch aggregate mix.
- Based on our analyses and our experience with similar projects, it is our professional opinion that the as-built asphalt pavement sections should have a tolerance of +/- ¼-inch in order to remain valid for satisfying the intent of the recommendations presented herein. Typically, the loose thickness should be ¼ inch per inch greater than the required compacted thickness. In addition to loose measurements prior to compaction, this is typically evaluated by averaging the thickness of several cores in a specific area. Individual measurements (loose thickness or core dimension) should be within at least ¾-inch of the design thickness.
- All concrete curbs separating pavement and landscaped areas should extend into the subgrade and below the bottom of adjacent, aggregate base materials.

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Pavement sections provided above are based on the soil conditions encountered during our field investigation, our assumptions regarding final site grades, and R-Value testing results. Since the actual pavement subgrade materials exposed during grading may be different than those tested for this study, we recommend that representative subgrade samples be obtained and additional R-value tests performed during grading. Should the results of these tests indicate a significant difference, the design pavement section(s) provided above may need to be revised.

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5 ADDITIONAL SERVICES

5.1 PLANS AND SPECIFICATIONS REVIEW

We recommend that a general review of the project plans and specifications be conducted before they are finalized to verify that our geotechnical recommendations have been properly interpreted and implemented during design. If we are not accorded the privilege of performing this review, we can assume no responsibility for misinterpretation of our recommendations. The review can be completed on a time-and-expense basis in accordance with our current Fee Schedule.

5.2 CONSTRUCTION OBSERVATION AND TESTING

The construction process is an integral design component with respect to the geotechnical aspects of a project. Because geotechnical engineering is an inexact science due to the variability of natural processes and materials, and because we sample only a small portion of the soils affecting the performance of the proposed project, unanticipated or changed conditions can be disclosed during grading. Proper geotechnical observation and testing during construction is imperative to allow the geotechnical engineer the opportunity to verify assumptions made during the design process. Therefore, we recommend that Kleinfelder be retained during the construction of the proposed development to observe compliance with the design concepts and geotechnical recommendations, and to allow design changes in the event that subsurface conditions or methods of construction differ from those assumed while completing this study.

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6 LIMITATIONS

This report has been prepared for the exclusive use of CDM Smith and its consultants and contractors. The findings, conclusions and recommendations presented in this report were prepared in a manner consistent with the standards of care and skill ordinarily exercised by members of our profession practicing under similar conditions in the geographic vicinity and at the time the services will be performed. No warranty or guarantee, express or implied, is made. We have not reviewed the final grading plans or foundation plans for the project. Our field exploration program for the geotechnical study of this project was based on the approximate tank locations provided to us by Kleinfelder's design group.

The client has the responsibility to see that all parties to the project, including the designer, contractor, subcontractors, etc., are made aware of this report in its entirety. This report contains information that may be useful in the preparation of contract specifications. However, this report is not designed as a specification document and may not contain sufficient information for this use without proper modification.

This report may be used only by the client and only for the purposes stated, within a reasonable time from its issuance, but in no event later than one year from the date of the report. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. Any party, other than the client who wishes to use this report shall notify Kleinfelder of such intended use. Based on the intended use of this report and the nature of the new project, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party and the client agrees to defend, indemnify, and hold harmless Kleinfelder from any claims or liability associated with such unauthorized use or non-compliance.

The scope of our geotechnical services did not include any environmental site assessment for the presence or absence of hazardous/toxic materials, including methane or other landfill related gases. Kleinfelder will assume no responsibility or liability whatsoever for any claim, damage, or injury which results from pre-existing hazardous materials being encountered or present on the project site, or from the discovery of such hazardous materials.

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FIGURES

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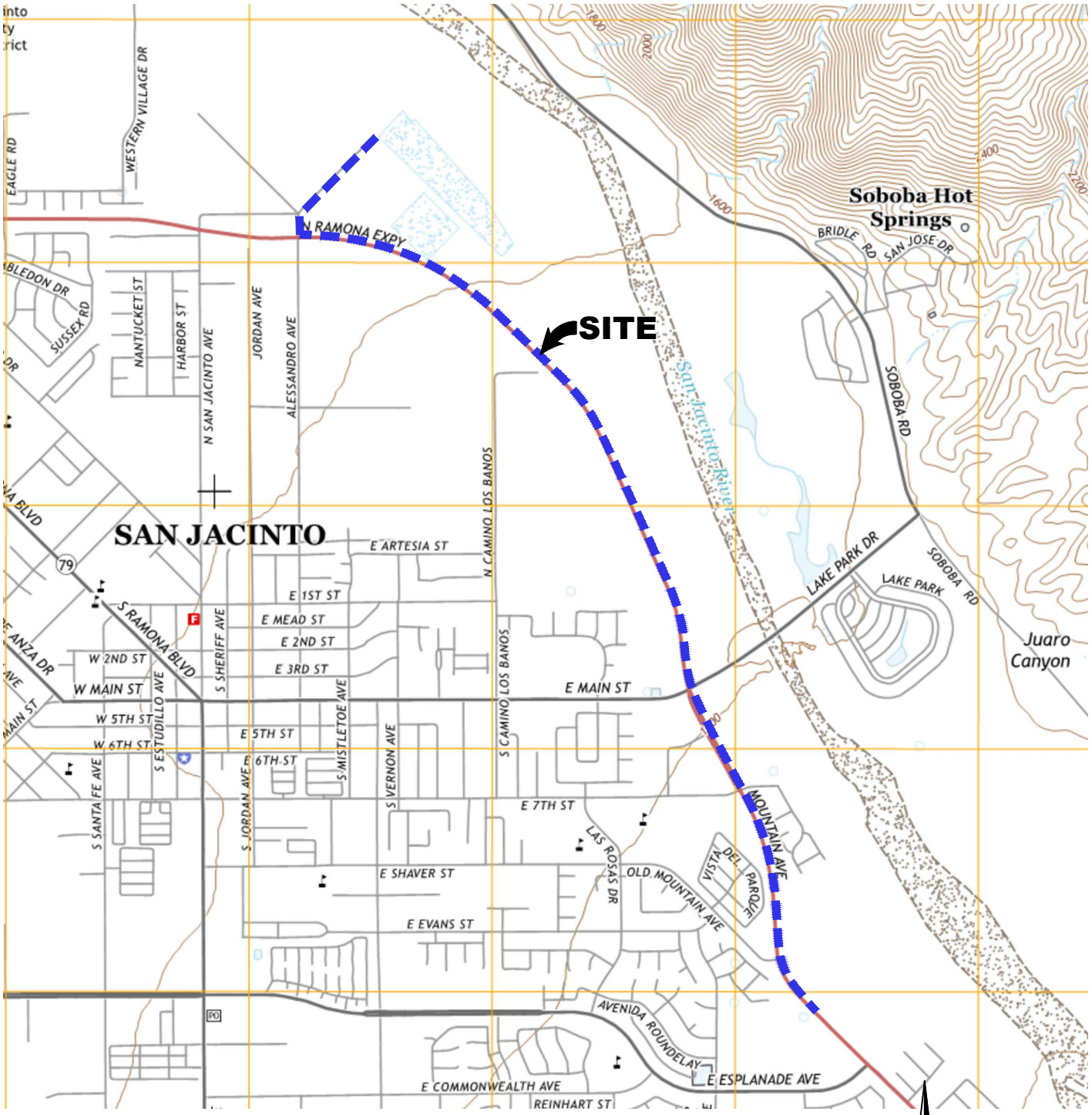

SOURCE: U.S.G.S. 7.5' Topographic series, San Jacinto, California Quadrangle 2015.

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SITE VICINITY MAP
IPR PIPELINE

INDIRECT PORTABLE REUSE (IPR)
PRELIMINARY DESIGN
EASTERN MUNICIPAL WATER DISTRICT
SAN JACINTO, CALIFORNIA

FIGURE
1A

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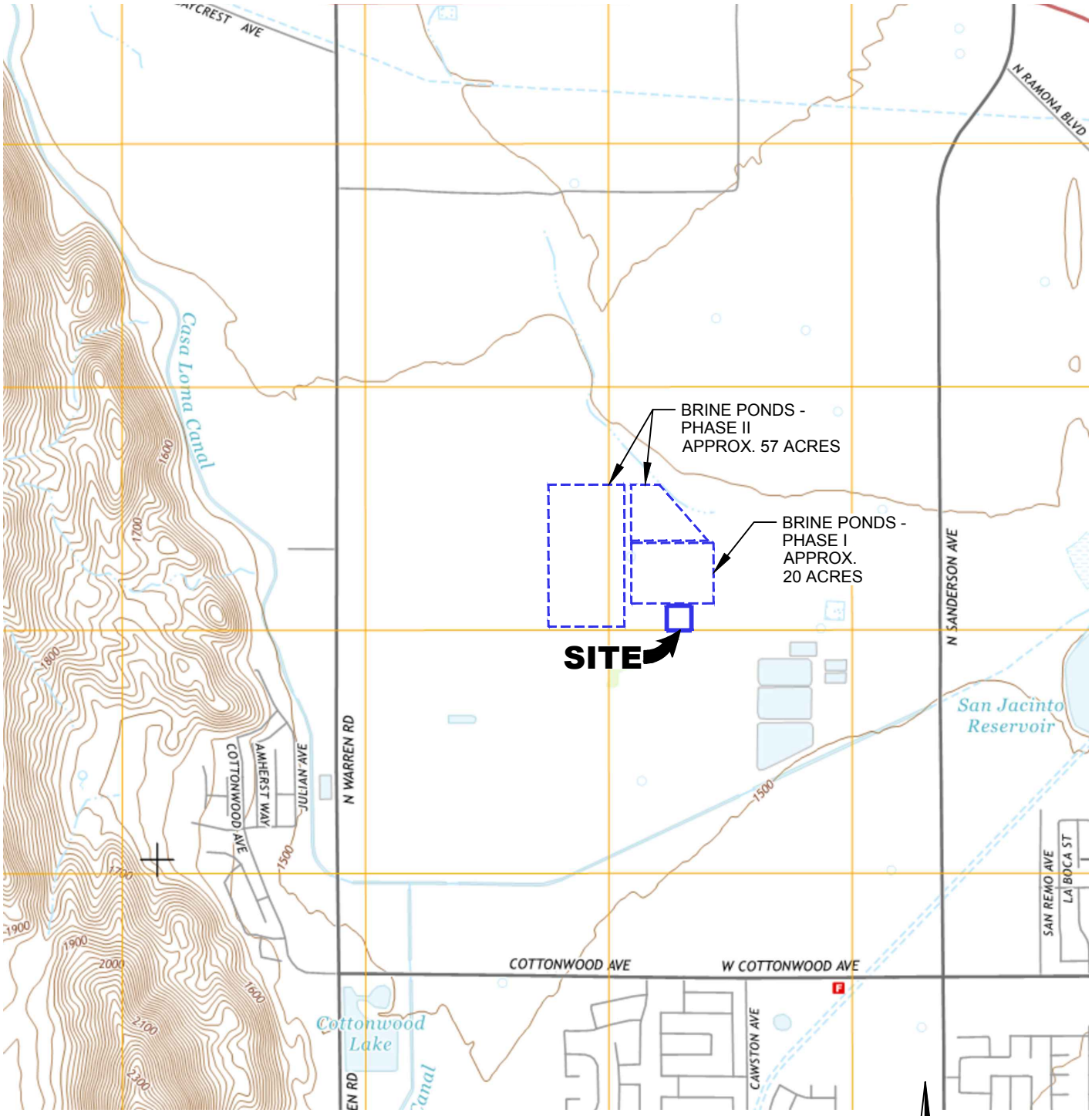

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SITE VICINITY MAP
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FIGURE
1B

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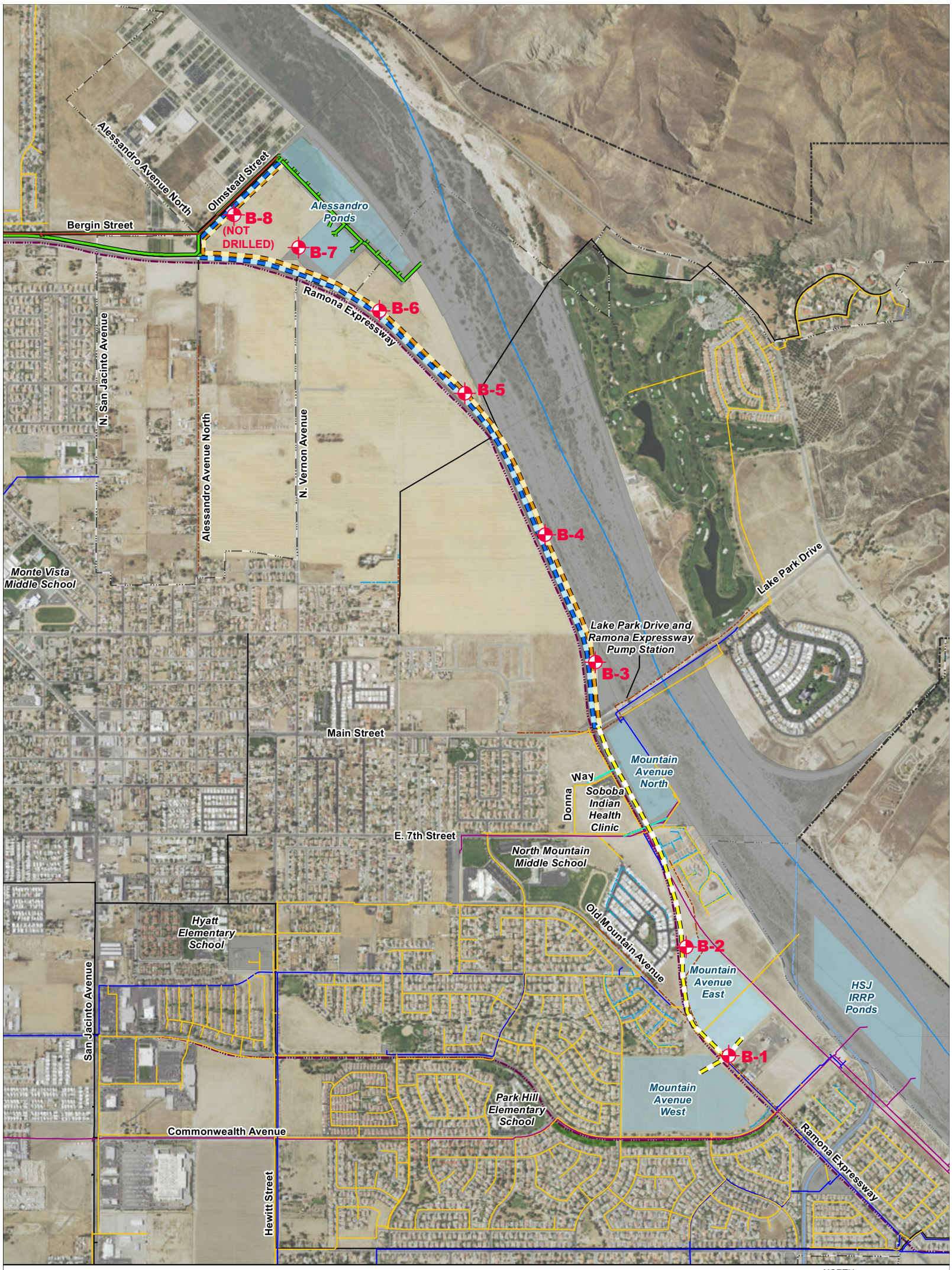

Legend

- Incorporated City Boundary
- Eastern Municipal Water District Boundary
- Easements
- Approximate Location of San Jacinto Sewer Line
- Distribution Water Line
- Raw Water Line
- Transmission Water Line
- Sewer Line
- Existing Time Warner Aerial Facilities within Project Limits
- Existing Time Warner Underground Facilities within Project Limits
- Existing 18" Abandoned Reclaimed Water Line
- Existing 36" Tertiary Water Pipeline
- Proposed 24" Reverse Osmosis Treated Blend - Alternative 1
- Proposed 36" T22 and Reverse Osmosis Treated Blend - Alternative 1
- Proposed T22 Pipeline - Alternative 1
- Bike Trail
- Canals
- San Jacinto River
- Other Streams

NORTH

0 625 1,250 2,500

Feet

Eastern Municipal Water District
Indirect Potable Reuse
Preliminary Design

Figure 2-1

Alternative No. 1 - Along Roadway

Overall Plan for Conveyance of Indirect Potable Reuse Project

REFERERNCE:

1. BASE MAP EASTERN MUNICIPAL WATER DISTRICT, UNDATED

EXPLANATION

B-8 APPROXIMATE SOIL BORING LOCATION

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BORING LOCATION MAP
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FIGURE
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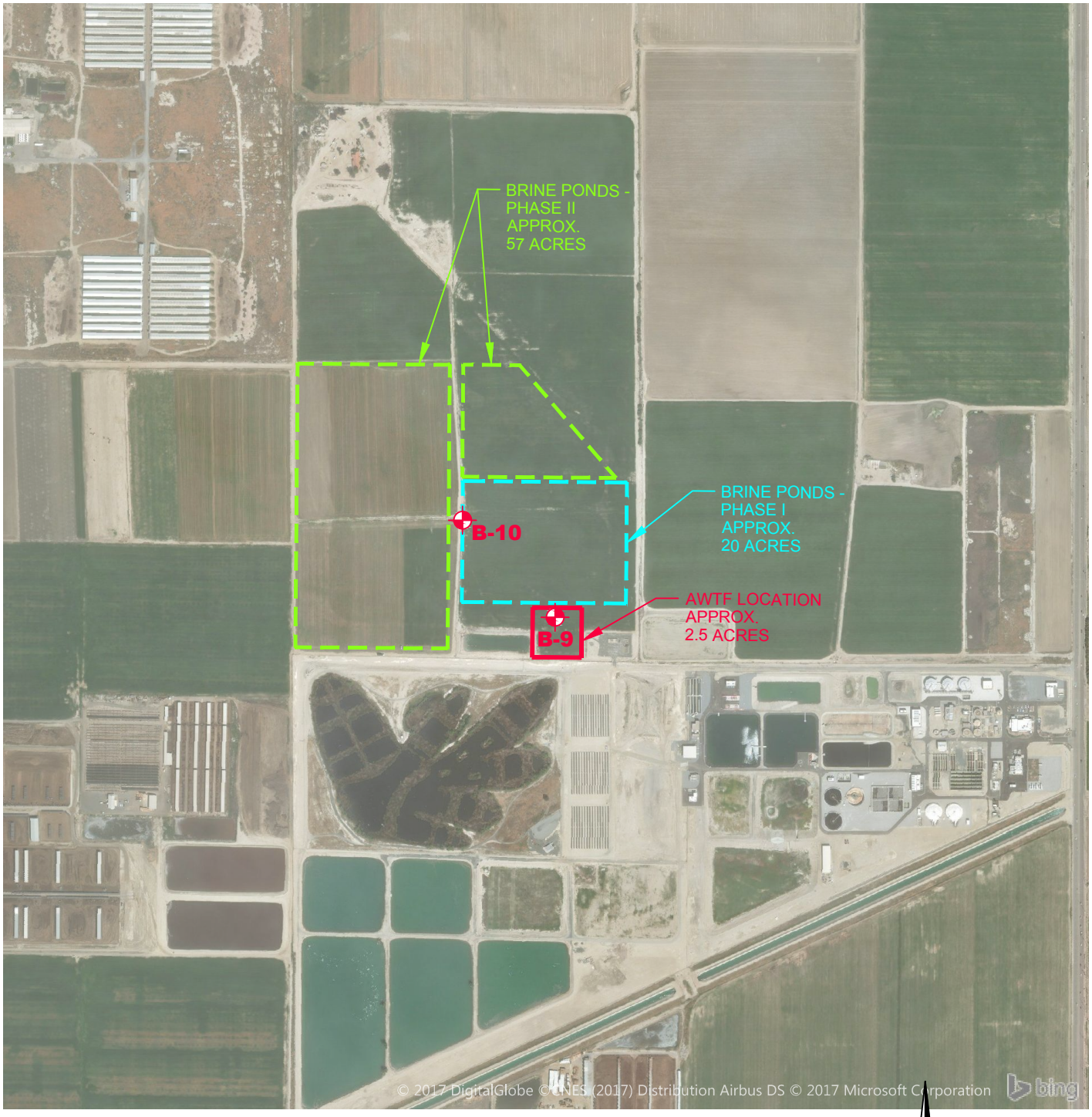

SOURCE: CDM Smith, 07/10/17

EXPLANATION

B-10 APPROXIMATE SOIL BORING LOCATION

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BORING LOCATION MAP
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SAN JACINTO, CALIFORNIA

FIGURE
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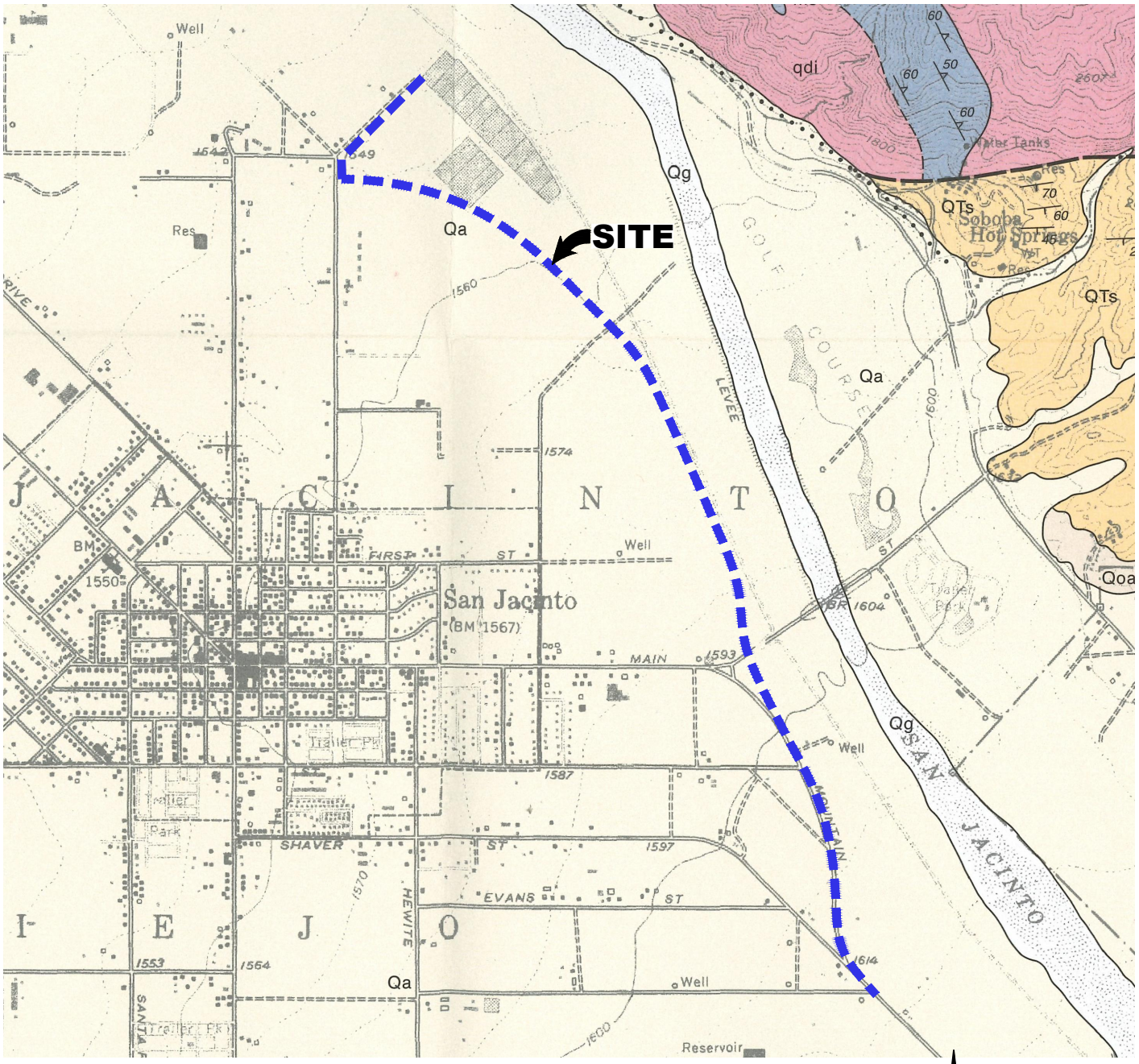

SOURCE: Geologic Map of the San Jacinto 7.5' Quadrangle, Riverside County, California by Thomas W. Dibblee, Jr., 2003.

LEGEND

Qg / Qa

SURFICIAL SEDIMENTS

Alluvial sediments, unconsolidated, undissected

Qg *Alluvial sand and gravel of major stream channels*

Qa *Alluvial sand and clay of valley areas, covered by gray soil, includes stream channel gravel and sand in mountain area*

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REGIONAL GEOLOGY MAP
IPR PIPELINE

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FIGURE
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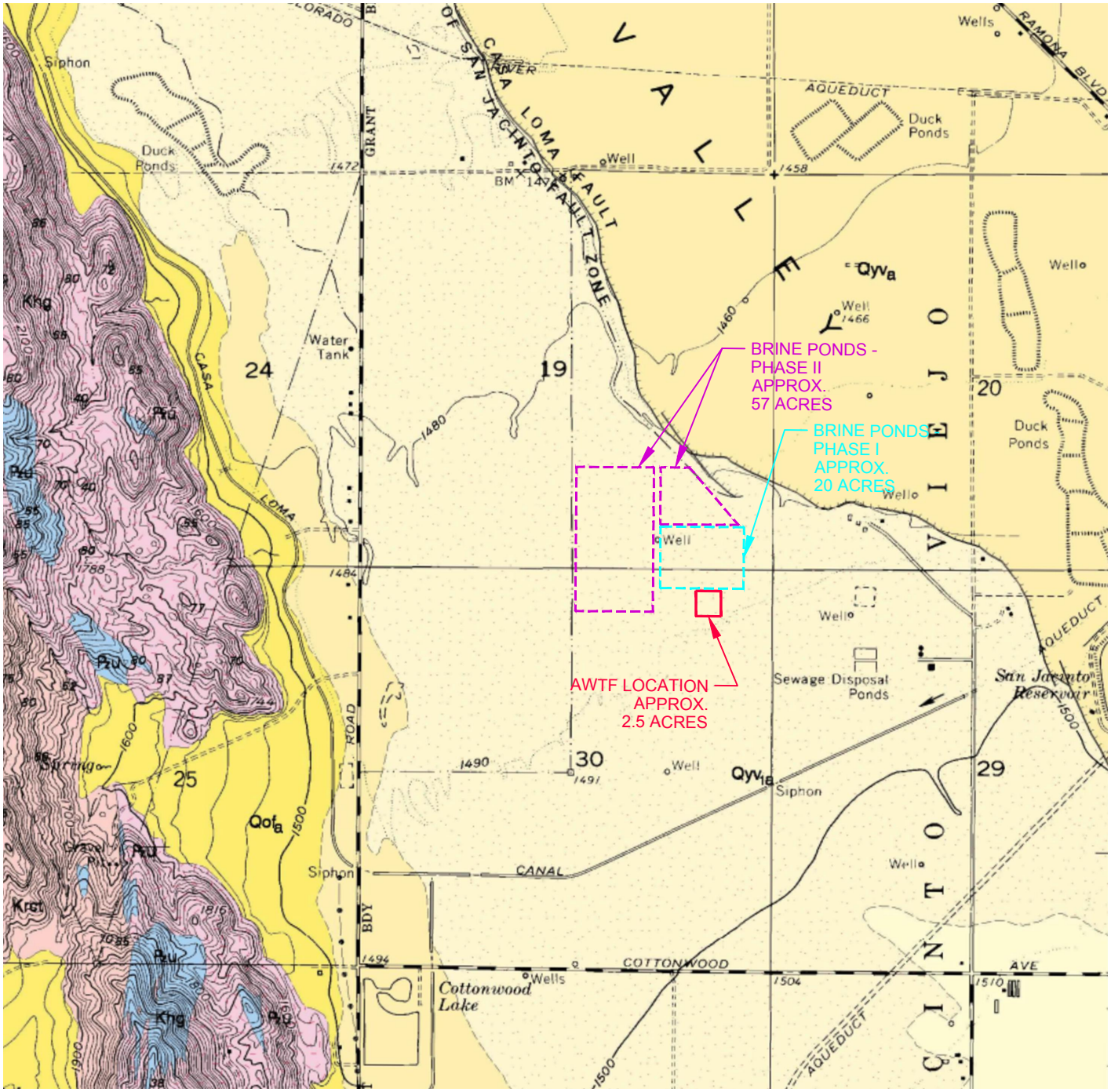

SOURCE: Geologic Map of the Lakeview 7.5' Quadrangle, Riverside County, California, by U.S.G.S., Morton and Matti, OF-01-174, 2001.

EXPLANATION

Qyv — **Young alluvial-valley deposits (Holocene and late Pleistocene)**—Silty to sandy alluvium on valley floors; gray, unconsolidated

Qyv1 — **Young alluvial-valley deposits, Unit 1 (early Holocene and late Pleistocene)**—Gray, unconsolidated silt and silty alluvium covering parts of western San Jacinto Valley east of Lakeview Mountains and west of Casa Loma Fault scarp. Alluvial deposition of unit essentially ended with slight elevation of area by Casa Loma Fault

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BORING LOCATION MAP
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SAN JACINTO, CALIFORNIA

FIGURE
3B

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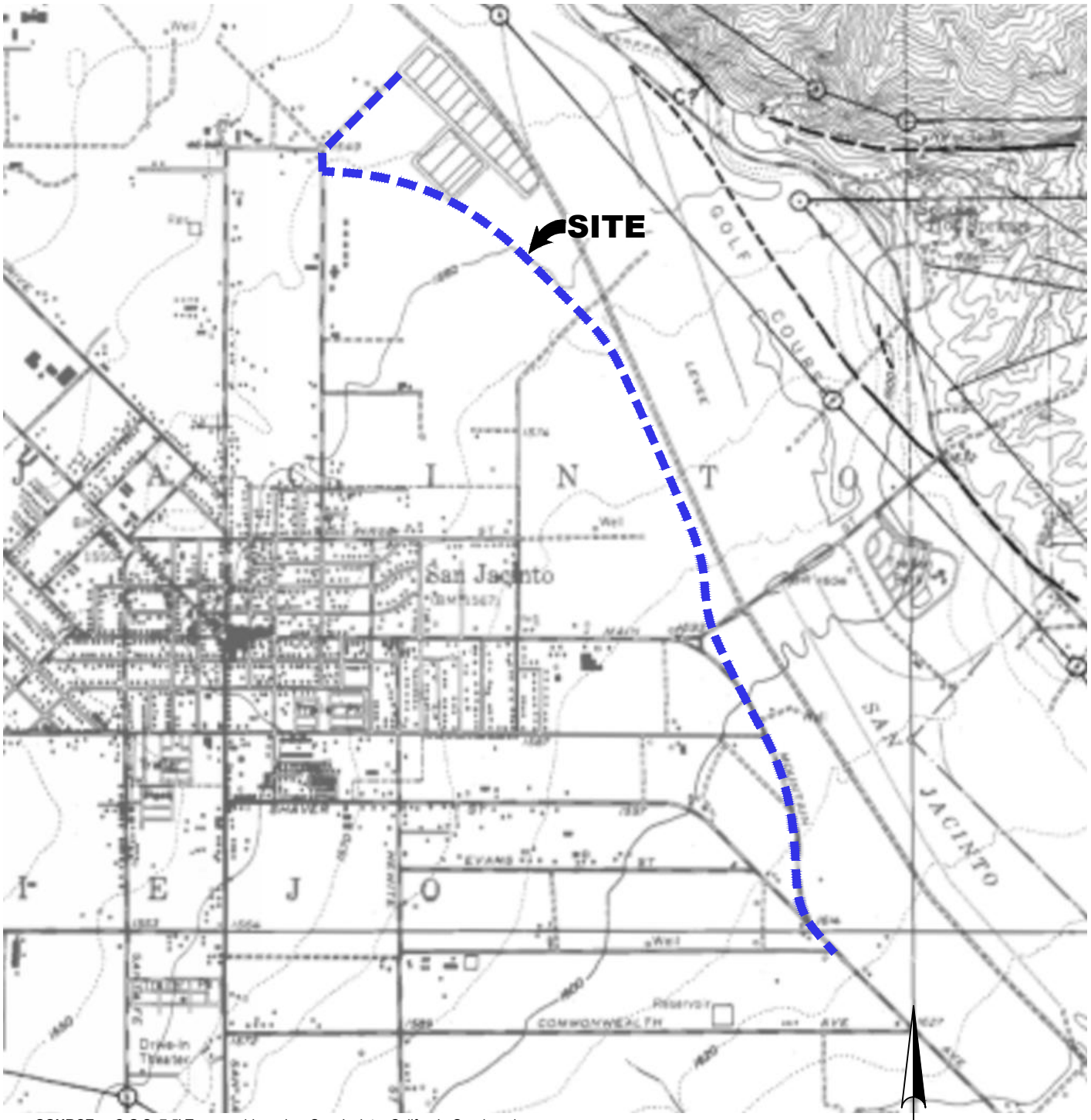

SOURCE: C.G.S. 7.5' Topographic series, San Jacinto, California Quadrangle, Alquist-Priolo Special Studies Zone, 01/01/1980.

0 2000 4000

SCALE: 1" = 2000' SCALE IN FEET

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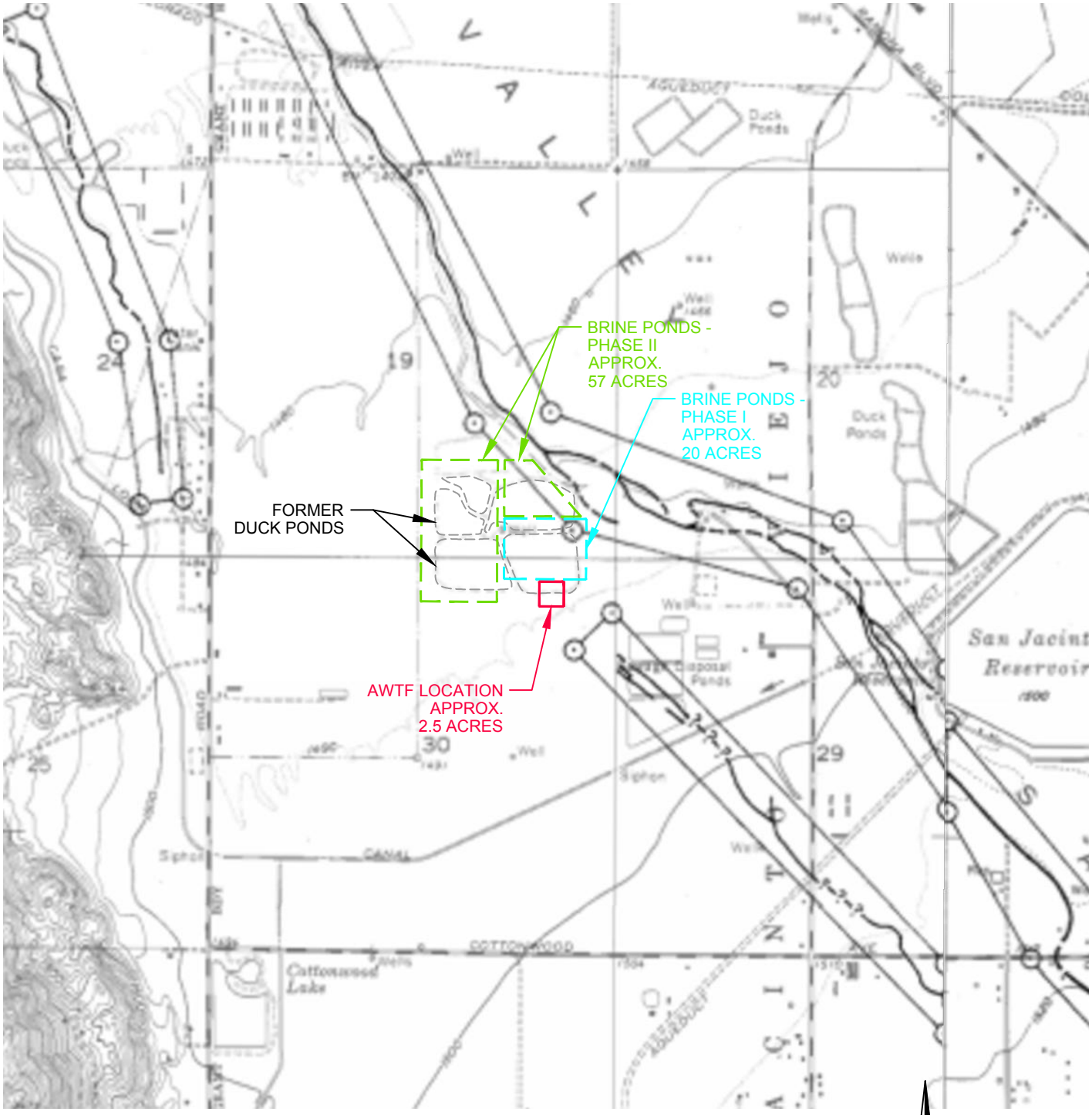
CHECKED BY:	ZJ
DATE:	09/2017
REVISED:	09/2017

FAULT ZONE MAP
IPR PIPELINE

INDIRECT PORTABLE REUSE (IPR)
PRELIMINARY DESIGN
EASTERN MUNICIPAL WATER DISTRICT
SAN JACINTO, CALIFORNIA

FIGURE
4A

PLOTTED: 10/2/2017 8:51 AM BY: dean fahmey
CAD FILE: U:\Projects\CADD\CADD 2017\20174013\20174013_F4.dwg



SOURCE: C.G.S. 7.5' Topographic series, Lakeview, California Quadrangle, Alquist-Priolo Special Studies Zone, 03/01/1988

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0 2000 4000

SCALE: 1" = 2000' SCALE IN FEET

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FAULT ZONE MAP
AWTF BASIN

INDIRECT PORTABLE REUSE (IPR)
PRELIMINARY DESIGN
EASTERN MUNICIPAL WATER DISTRICT
SAN JACINTO, CALIFORNIA

FIGURE
4B

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APPENDIX A
FIELD EXPLORATION

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APPENDIX A
FIELD EXPLORATION

The subsurface exploration program for the proposed project consisted of the excavation and logging a total of nine hollow-stem auger borings. The borings were drilled with a Mobile B-61 truck-mounted drill rig equipped with 8-inch diameter hollow-stem augers, provided by California Pacific Drilling of Calimesa, California. The locations of the borings are shown on Figures 2A and 2B, Boring Location Maps.

The logs of borings are presented as Figures A-3 through A-13. An explanation to the logs is presented on Figures A-1 and A-2. The Logs of Borings describe the earth materials encountered, samples obtained, and show field and laboratory tests performed. The logs also show the boring number, drilling date, boring elevation and the name of the logger and drilling subcontractor. A Kleinfelder staff engineer logged the borings utilizing the Unified Soil Classification System. The boundaries between soil types shown on the logs are approximate because the transition between different soil layers may be gradual. Bulk and drive samples of representative earth materials were obtained from the borings and pits at maximum intervals of about 5 feet.

A California sampler was used to obtain drive samples of the soil encountered. This sampler consists of a 3 inch O.D., 2.4 inch I.D. split barrel shaft that is driven a total of 12 inches into the soil at the bottom of the boring. The soil was retained in six 1-inch brass rings for laboratory testing. The sampler was driven using a 140-pound hammer falling 30 inches. The total number of hammer blows required driving the sampler the 12 inches is termed the blow count and is recorded on the Logs of Borings. Where the sample was driven less than 12 inches, the number of blows to drive the sample for each 6-inch segment, or portion thereof, is shown on the logs. For example, 50/4" indicates 50 blows to drive the sampler 4 inches to refusal.

Samples were also obtained using a Standard Penetration Sampler (SPT). This sampler consists of a 2-inch O.D., 1.4-inch I.D. split barrel shaft that is advanced into the soils at the bottom of the drill hole a total of 18 inches. The sampler was driven using a 140 pounds hammer falling 30 inches. The total number of hammer blows required to drive the sampler the final 12 inches is termed the blow count (N-value) and is recorded on the Logs of Borings. Where the sample was driven less than 12 inches, the number of blows to drive the sample for each 6-inch segment, or portion thereof, is shown on the logs. The procedures we employed in the field are generally consistent with those described in ASTM Standard Test Method D-1586.

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Soil samples obtained by the SPT were stored in plastic bags. Bulk samples of the sub-surface soils were retrieved directly from the soil cuttings and placed in large plastic bags.

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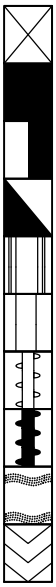
SAMPLER AND DRILLING METHOD GRAPHICS



BULK / GRAB / BAG SAMPLE

MODIFIED CALIFORNIA SAMPLER
(2 or 2-1/2 in. (50.8 or 63.5 mm.) outer diameter)

CALIFORNIA SAMPLER
(3 in. (76.2 mm.) outer diameter)

STANDARD PENETRATION SPLIT SPOON SAMPLER
(2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

HQ CORE SAMPLE
(2.500 in. (63.5 mm.) core diameter)

SHELBY TUBE SAMPLER

HOLLOW STEM AUGER

SOLID STEM AUGER

WASH BORING

SONIC CONTINUOUS SAMPLER

GROUND WATER GRAPHICS

WATER LEVEL (level where first observed)

WATER LEVEL (level after exploration completion)

WATER LEVEL (additional levels after exploration)

OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

ABBREVIATIONS
WOH - Weight of Hammer
WOR - Weight of Rod

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	**GRAVELS** (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu ≥4 and 1≤ Cc≤3		**GW**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			Cu <4 and/ or 1>Cc >3		**GP**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5% TO 12% FINES	Cu ≥4 and 1≤ Cc≤3		**GW-GM**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
					GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			Cu <4 and/ or 1>Cc >3		**GP-GM**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
					GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH > 12% FINES			**GM**	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
					GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
					GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu ≥6 and 1≤ Cc≤3		**SW**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			Cu <6 and/ or 1>Cc >3		**SP**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	Cu ≥6 and 1≤ Cc≤3		**SW-SM**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
					SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			Cu <6 and/ or 1>Cc >3		**SP-SM**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
					SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH > 12% FINES			**SM**	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
					SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
					SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES

FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)	**ML**	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid Limit greater than 50)	**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

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CHECKED BY:	ZJ
DATE:	9/28/2017
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GRAPHICS KEY

Indirect Potable Reuse (IPR)
Preliminary Design
Eastern Municipal Water District
San Jacinto, California

FIGURE

A-1

gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [LEGEND 1 (GRAPHICS KEY) USCS_SOU_CAL]
PROJECT NUMBER: 20174013.001A
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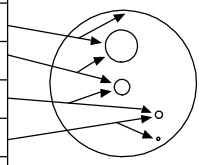
GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles		3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse	3/4 -3 in. (19 - 76.2 mm.)	3/4 -3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine	#4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine	#200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines		Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller



SECONDARY CONSTITUENT

	AMOUNT	
Term of Use	Secondary Constituent is Fine Grained	Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	≥5 to <15%	≥15 to <30%
Modifier	≥15%	≥30%

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT - N_{60} (# blows / ft)	Pocket Pen (tsf)	UNCONFINED COMPRESSIVE STRENGTH (Q_u)(psf)	VISUAL / MANUAL CRITERIA
Very Soft	<2	PP < 0.25	<500	Thumb will penetrate more than 1 inch (25 mm). Extrudes between fingers when squeezed.
Soft	2 - 4	0.25≤ PP <0.5	500 - 1000	Thumb will penetrate soil about 1 inch (25 mm). Remolded by light finger pressure.
Medium Stiff	4 - 8	0.5≤ PP <1	1000 - 2000	Thumb will penetrate soil about 1/4 inch (6 mm). Remolded by strong finger pressure.
Stiff	8 - 15	1≤ PP <2	2000 - 4000	Can be imprinted with considerable pressure from thumb.
Very Stiff	15 - 30	2≤ PP <4	4000 - 8000	Thumb will not indent soil but readily indented with thumbnail.
Hard	>30	4≤ PP	>8000	Thumbnail will not indent soil.

FROM TERZAGHI AND PECK, 1948; LAMBE AND WHITMAN, 1969; FHWA, 2002; AND ASTM D2488

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N_{60} (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12 - 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

FROM TERZAGHI AND PECK, 1948

PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm.) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit.
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit.

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness.
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

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SOIL DESCRIPTION KEY

Indirect Potable Reuse (IPR)
Preliminary Design
Eastern Municipal Water District
San Jacinto, California

FIGURE

A-2

PLOTTED: 10/23/2017 05:16 PM BY: RFerryman
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PROJECT NUMBER: 20174013.001A
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [LEGEND 2 (SOIL DESC KEY)]

Date Begin - End:	9/01/2017	**Drilling Company:**	Cal Pac Drilling	**BORING LOG B-1**	
Logged By:	Z. Jarecki	**Drill Crew:**	James and Jeff		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B53 Mobile	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Sunny, Clear	**Exploration Diameter:**	6.5 in. O.D.		

FIELD EXPLORATION

Latitude: 33.77244° N
Longitude: -116.93144° E
Approximate Ground Surface Elevation (ft.): 1,623
Surface Condition: Gravel

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Artificial Fill **Silty SAND (SM)**: fine-grained, olive brown, moist, trace medium-grained sand, trace gravel	1											**R-Value=** 72 Hand auger to 5 ft
1620			**Alluvium** **Poorly graded SAND (SP)**: fine-grained, olive brown, moist												
	5		**Poorly graded SAND (SP)**: fine to medium-grained, pale olive, moist, medium dense, cohesionless	2		BC=5 9 10			2.1	97.8					Collapse Potential
1615				3		BC=4 5 6						4.5			
	10		**Poorly graded SAND with Gravel (SP)**: fine to coarse-grained, pale olive, moist, medium dense, with subrounded fine gravel	4		BC=6 9 10			1.8	124.0					
1610															
	15		**Poorly graded SAND (SP)**: fine to medium-grained, olive, moist, medium dense, micaceous	5		BC=5 8 10									
1605															
	20		**Poorly graded SAND with Gravel (SP)**: fine to coarse-grained, pale olive, moist, dense, with fine to coarse subrounded gravel up to 1.5 inches diameter	6		BC=16 21 30									
1600															
	25														
1595															
	30														
1590															

The boring was terminated at approximately 21.5 ft. below ground surface. The boring was backfilled with auger cuttings on September 01, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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CHECKED BY:	ZJ
DATE:	9/28/2017
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BORING LOG B-1

Indirect Potable Reuse (IPR)
Preliminary Design
Eastern Municipal Water District
San Jacinto, California

FIGURE
A-3

PAGE: 1 of 1

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PROJECT NUMBER: 20174013.001A OFFICE FILTER: RIVERSIDE
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [_KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End:	8/23/2017	**Drilling Company:**	Cal Pac Drilling	**BORING LOG B-2**	
Logged By:	Z. Jarecki	**Drill Crew:**	James and Jeff		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B61 Mobile	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Sunny, Clear	**Exploration Diameter:**	6.5 in. O.D.		

FIELD EXPLORATION

Latitude: 33.77625° N
Longitude: -116.93330° E
Approximate Ground Surface Elevation (ft.): 1,611
Surface Condition: Bare Earth

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
1610	0		**Artificial Fill** **Poorly graded SAND with Silt (SP-SM)**: fine to medium-grained, dry to moist	1											Hand auger to 5 ft
			medium to coarse-grained	2											Hole is caving in at 3 FT.
1605	5		**Alluvium** **Poorly graded SAND (SP)**: medium to coarse-grained, pale olive, moist to dry, loose, with trace of fine sand and trace of fine gravel	3		BC=2 6 8		SP	1.7	102.8	99	2.9			
			loose	4		BC=3 2 1									
1600	10		medium dense	5		BC=8 11 15			2.7	108.9					
1595	15			6		BC=4 7 8									
1590	20			7		BC=8 12 16									
1585	25														
1580	30														

LABORATORY RESULTS

The boring was terminated at approximately 21.5 ft. below ground surface. The boring was backfilled with auger cuttings on August 23, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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DATE:	9/28/2017
REVISED:	-

BORING LOG B-2

Indirect Potable Reuse (IPR)
Preliminary Design
Eastern Municipal Water District
San Jacinto, California

FIGURE
A-4

PAGE: 1 of 1

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PROJECT NUMBER: 20174013.001A
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [__KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End:	9/01/2017	**Drilling Company:**	Cal Pac Drilling	**BORING LOG B-3**	
Logged By:	Z. Jarekci	**Drill Crew:**	James and Jeff		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B53 Mobile	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Sunny Clear	**Exploration Diameter:**	6.5 in. O.D.		

Latitude: 33.78671° N
Longitude: -116.93752° E
Approximate Ground Surface Elevation (ft.): 1,587
Surface Condition: Bare Earth

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
1585	0	**Artificial Fill** **Silty SAND (SM)**: fine-grained, olive brown, moist	1											Hand auger to 5 FT.
		Poorly graded SAND with Silt (SP-SM): fine-grained, pale olive, moist, with trace of fine gravel	2											
	5	**Alluvium** **Silty SAND (SM)**: pale olive, moist, loose, micaceous	3		BC=4 6 6									Direct Shear
1580		loose, increase in fines content	4		BC=4 3 4						25			
	10	olive brown, medium dense, trace medium to coarse-grained sand, increase in moisture, micaceous	5		BC=5 10 13			8.7	111.9					
1575		**Poorly graded SAND (SP)**: medium to coarse-grained, pale olive, moist, medium dense, clean, cohesionless												
	15		6		BC=6 9 9									
1570														
	20	dense, increase in fines content, fine gravel	7		BC=11 16 34									
1565														
	25													
1560														
	30													
1555														

The boring was terminated at approximately 21.5 ft. below ground surface. The boring was backfilled with auger cuttings on September 01, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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BORING LOG B-3

Indirect Potable Reuse (IPR)
Preliminary Design
Eastern Municipal Water District
San Jacinto, California

FIGURE
A-5
PAGE: 1 of 1

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Date Begin - End:	9/01/2017	**Drilling Company:**	Cal Pac Drilling	**BORING LOG B-4**	
Logged By:	Z. Jarekci	**Drill Crew:**	James and Jeff		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B53 Mobile	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Sunny, Dry	**Exploration Diameter:**	8 in. O.D.		

Latitude: 33.79165° N
Longitude: -116.93984° E
Approximate Ground Surface Elevation (ft.): 1,580
Surface Condition: Dirt and Gravel

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Artificial Fill **Silty SAND with Gravel (SM)**: olive gray, moist, fine gravel, debris in upper 2 ft	1											Hand auger to 5 FT.
			Alluvium **Poorly graded SAND (SP)**: fine to coarse-grained, olive gray, moist	2											Encountered unknown debris, moved boring 2 FT.
1575	5			3		BC=3 4 6			3.0	96.9					Collapse
				4		BC=4 5 6		SP			96	4.0			
1570	10			5		BC=8 11 13			4.5	95.9					
			Silty SAND (SM): fine-grained, olive gray, moist, trace medium grained sand	6		BC=5 4 6									
1560	20		**Poorly graded SAND (SP)**: fine to medium-grained, pale olive, moist	7		BC=16 17 17									
1555	25														
1550	30														

The boring was terminated at approximately 21.5 ft. below ground surface. The boring was backfilled with auger cuttings on September 01, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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BORING LOG B-4

Indirect Potable Reuse (IPR)
Preliminary Design
Eastern Municipal Water District
San Jacinto, California

FIGURE
A-6
PAGE: 1 of 1

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Date Begin - End:	9/01/2017	**Drilling Company:**	Cal Pac Drilling	**BORING LOG B-5**	
Logged By:	Z. Jarekci	**Drill Crew:**	James and Jeff		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B53 Mobile	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Sunny, Dry	**Exploration Diameter:**	8 in. O.D.		

FIELD EXPLORATION

Latitude: 33.79604° N
Longitude: -116.94287° E
Approximate Ground Surface Elevation (ft.): 1,564
Surface Condition: Gravel and Dry

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
1560			**Artificial Fill** **Poorly graded SAND with Gravel (SP)**: fine to medium-grained, olive, dry, with fine gravel	1											Hand auger to 5 FT.
	5		**Alluvium** **Poorly graded SAND with Gravel (SP)**: fine to coarse-grained, olive yellow, moist, medium dense, with fine gravel	2		BC=4 9 12			2.4	118.3					
			Poorly graded SAND (SP): fine to coarse-grained, olive yellow, moist, medium dense	3		BC=4 8 9		SP			98	1.8			
1555	10			4		BC=5 7 7			12.3	104.9					
			Silty SAND (SM): fine to coarse-grained, olive gray, dry to moist, trace medium sand, micaceous												
1550	15		trace fine subrounded gravel	5		BC=4 7 6									
1545	20		**SILT with Sand (ML)**: low plasticity, olive gray, moist, fine sand, micaceous, some clay	6		BC=4 6 14							36	9	
1540	25														
1535	30														
1530															

The boring was terminated at approximately 21.5 ft. below ground surface. The boring was backfilled with auger cuttings on September 01, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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BORING LOG B-5

Indirect Potable Reuse (IPR)
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Eastern Municipal Water District
San Jacinto, California

FIGURE
A-7

PAGE: 1 of 1

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Date Begin - End:	9/01/2017	**Drilling Company:**	Cal Pac Drilling	**BORING LOG B-6**	
Logged By:	Z. Jarekci	**Drill Crew:**	James and Jeff		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B53 Mobile	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Sunny, Dry	**Exploration Diameter:**	8 in. O.D.		

Latitude: 33.79913° N
Longitude: -116.94668° E
Approximate Ground Surface Elevation (ft.): 1,556
Surface Condition: Gravel and Dry

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
1555			**Artificial Fill** **Silty SAND (SM)**: fine-grained, olive gray, moist, trace fine to course gravel, micaceous.	1											**R-Value=** 73 Hand auger to 5 FT
				2											
	5		**Alluvium** **Silty SAND (SM)**: fine-grained, olive, moist, loose, trace medium grained sand	3		BC=4 5 6						26			Direct Shear
1550			loose, micaceous	4		BC=3 3 4									
	10		medium dense	5		BC=6 9 14			14.2	95.3					
1545															
	15			6		BC=3 3 7									
1540															
	20		**Silty SAND with Gravel (SM)**: fine to coarse-grained, pale olive, mosit, loose, micacaous	7		BC=4 4 3									
1535															
	25														
1530															
	30														
1525															

The boring was terminated at approximately 21.5 ft. below ground surface. The boring was backfilled with auger cuttings on September 01, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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BORING LOG B-6

Indirect Potable Reuse (IPR)
Preliminary Design
Eastern Municipal Water District
San Jacinto, California

FIGURE
A-8

PAGE: 1 of 1

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Date Begin - End:	8/23/2017	**Drilling Company:**	Cal Pac Drilling	**BORING LOG B-7**	
Logged By:	Z. Jarekci	**Drill Crew:**	James and Jeff		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B61 Mobile	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Sunny, Clear	**Exploration Diameter:**	6.5 in. O.D.		

FIELD EXPLORATION

Latitude: 33.80149° N
Longitude: -116.95047° E
Approximate Ground Surface Elevation (ft.): 1,554
Surface Condition: Dirt Road

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Artificial Fill **Silty SAND (SM)**: fine to medium-grained, olive brown, moist, trace fine gravel	1											hand auger to 5 FT.
1550	5		very loose, trace fine subrounded gravel	2		BC=3 3 3			13.1	91.2					
			Poorly graded SAND (SP): fine-grained, olive, moist, very loose, decrease in fines content	3		BC=1 1 1									
1545			**Alluvium** **Silty SAND (SM)**: fine-grained, olive brown, moist, soft, micaceous												
	10		at 10 ft, interbedded sand lense (SP) , light brownish to pale olive, fine grained sand	4		BC=2 3 3			10.8	89.7		31			
1540			trace medium grained sand												
	15			5		BC=2 2 3									
1535															
	20			6		BC=4 6 9									
			Poorly graded SAND (SP): fine to medium-grained, olive gray, moist, medium dense, sample top is SM and bottom is SP.												
1530 ▽	25		**Silty SAND (SM)**: fine-grained, olive grey, wet, medium dense, micaceous	7		BC=5 6 11									
1525	30														
1520															

The boring was terminated at approximately 26.5 ft. below ground surface. The boring was backfilled with auger cuttings on August 23, 2017.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 25 ft. below ground surface during drilling.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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BORING LOG B-7

Indirect Potable Reuse (IPR)
Preliminary Design
Eastern Municipal Water District
San Jacinto, California

FIGURE
A-9

PAGE: 1 of 1

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BORING LOG B-9

Date Begin - End:	8/23/2017	**Drilling Company:**	Cal Pac Drilling		
Logged By:	Z. Jarekci	**Drill Crew:**	James and Jeff		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B61 Mobile	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Sunny, Clear	**Exploration Diameter:**	6.5 in. O.D.		

FIELD EXPLORATION

Latitude: 33.80096° N
Longitude: -117.01769° E
Approximate Ground Surface Elevation (ft.): 1,493
Surface Condition: Alfalfa field

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Undocumented Fill	1											Hand auger to 5 FT.
			SILT with Sand (ML): olive brown, moist, soft, approximate top 12 inches of soil contained organic material												
1490			**Silty SAND (SM)**: fine-grained, olive brown, moist												
	5		**Alluvium**												
			Fat CLAY with Sand (CH): fine-grained, medium plasticity, olive brown, moist, soft	2		BC=2 4 5			21.0	93.8					Consolidation Test Direct Shear
1485				3		BC=1 2 3							59	34	
	10		**Silty SAND (SM)**: fine-grained, olive brown, moist, medium dense, micaceous	4		BC=4 7 8			12.7	95.0					
1480															
	15		pale olive	5		BC=4 7 8					100	15			
1475															
	20		olive brown	6		BC=5 11 17			12.4	124.0					
1470															
	25		**Lean CLAY with Sand (CL)**: fine-grained, medium plasticity, olive, moist, medium stiff, trace medium grained sand and trace mica	7		BC=2 4 5							38	17	
1465															
	30		**Silty SAND (SM)**: fine-grained, olive, moist, medium dense, micaceous	8		BC=5 10 13			14.2	112.1		43			
1460			olive brown, trace medium grained sand												

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BORING LOG B-9

Indirect Potable Reuse (IPR)
Preliminary Design
Eastern Municipal Water District
San Jacinto, California

FIGURE
A-10

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BORING LOG B-9

Date Begin - End:	8/23/2017	**Drilling Company:**	Cal Pac Drilling		
Logged By:	Z. Jarekci	**Drill Crew:**	James and Jeff		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B61 Mobile	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Sunny, Clear	**Exploration Diameter:**	6.5 in. O.D.		

FIELD EXPLORATION

Latitude: 33.80096° N
Longitude: -117.01769° E
Approximate Ground Surface Elevation (ft.): 1,493
Surface Condition: Alfalfa field

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
1455			**Silty SAND (SM)**: fine-grained, olive, moist, medium dense, micaceous	9		BC=7 11 14									
	40		**Poorly graded SAND (SP)**: fine to medium-grained, olive brown, moist, dense, micaceous	10		BC=11 17 29			3.8	109.3					
1450															
	45		medium dense	11		BC=8 12 16									
1445			**Silty SAND (SM)**: fine-grained, olive brown, moist, dense												
	50			12		BC=7 17 28			6.3	125.2					
1440															
	55														
1435															
	60														
1430															
	65														
1425															

The boring was terminated at approximately 51.5 ft. below ground surface. The boring was backfilled with auger cuttings on August 23, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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BORING LOG B-9

Indirect Potable Reuse (IPR)
Preliminary Design
Eastern Municipal Water District
San Jacinto, California

FIGURE
A-11

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BORING LOG B-10

Date Begin - End:	8/23/2017	**Drilling Company:**	Cal Pac Drilling		
Logged By:	Z. Jarekci	**Drill Crew:**	James and Jeff		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B61 Mobile	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Sunny, Clear	**Exploration Diameter:**	6.5 in. O.D.		

FIELD EXPLORATION

Latitude: 33.80376° N
Longitude: -117.02066° E
Approximate Ground Surface Elevation (ft.): 1,486
Surface Condition: Dirt Road

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
1485			**Undocumented Fill** **Sandy SILT (ML)**: fine-grained, low plasticity, olive brown, moist, medium stiff	1											Hand auger to 5 FT
			increase in sand content												
	5		**Alluvium** **Sandy SILT (ML)**: fine-grained, low plasticity, olive brown, moist, medium dense	2		BC=5 7 10			16.5	107.4					
1480			**Silty SAND (SM)**: fine-grained, olive brown, moist, medium dense, micaceous	3		BC=4 7 11			13.4	107.4		29			
	10			4		BC=3 8 14			7.9	100.6					
1475			**Poorly graded SAND with Silt (SP-SM)**: fine-grained, light brownish gray, moist, medium dense, trace mica												
			SILT with Sand (ML): fine-grained, low plasticity, olive brown, moist, soft, micaceous												
	15			5		BC=3 3 5									
1470															
	20		decrease in sand content	6		BC=4 8 10			22.1	98.0					
1465			**Silty SAND (SM)**: fine to medium-grained, olive brown, moist, loose, trace clay												
	25			7		BC=3 4 6									
1460			thin sandy silt lense, approximately 2 inches thick												
	30		medium dense, thin interbedded sandy silt lense, color streaks	8		BC=4 10 13			18.0	105.4					
1455															

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BORING LOG B-10

Indirect Potable Reuse (IPR)
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San Jacinto, California

FIGURE
A-12

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BORING LOG B-10

Date Begin - End:	8/23/2017	**Drilling Company:**	Cal Pac Drilling		
Logged By:	Z. Jarekci	**Drill Crew:**	James and Jeff		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B61 Mobile	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Sunny, Clear	**Exploration Diameter:**	6.5 in. O.D.		

FIELD EXPLORATION

Latitude: 33.80376° N
Longitude: -117.02066° E
Approximate Ground Surface Elevation (ft.): 1,486
Surface Condition: Dirt Road

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
1450			**Silty SAND (SM)**: fine to medium-grained, olive brown, moist, loose, trace clay	9		BC=4 6 9									
			Sandy SILT (ML): fine-grained, low plasticity, olive gray, moist, stiff, trace clay, trace mica												
1445	40			10		BC=6 11 14			17.0	111.4					
			Poorly graded SAND (SP): fine-grained, olive, moist, medium dense, micaceous												
1440	45		**Silty SAND (SM)**: fine-grained, olive brown, moist, medium dense, trace fine gravel, increase fines content with depth	11		BC=7 10 12									
			SILT with Sand (ML): fine-grained, low plasticity, olive brown, moist, stiff, trace mica, trace clay												
1435	50			12		BC=3 7 11			18.1	110.2					
1430	55														
1425	60														
1420	65														

The boring was terminated at approximately 51.5 ft. below ground surface. The boring was backfilled with auger cuttings on August 23, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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BORING LOG B-10

Indirect Potable Reuse (IPR)
Preliminary Design
Eastern Municipal Water District
San Jacinto, California

FIGURE
A-13

APPENDIX B
LABORATORY TESTING

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APPENDIX B
LABORATORY TESTING

Laboratory tests were performed on representative intact and bulk soil samples to estimate engineering characteristics of the various earth materials encountered. Laboratory testing was performed by both Kleinfelder and AP Engineering and Testing Inc. of Pomona, California. Testing was performed in accordance with one of the following references:

1. Lambe, T. William, Soil Testing for Engineers, Wiley, New York, 1951.
2. Laboratory Soils Testing, U.S. Army, Office of the Chief of Engineers, Engineering Manual No. 1110-2-1906, November 30, 1970.
3. ASTM Standards for Soil Testing, latest revisions.
4. State of California Department of Transportation, Standard Test Methods, latest revisions.

LABORATORY MOISTURE DETERMINATIONS AND UNIT WEIGHTS

Natural moisture content and unit weight tests were performed on selected samples. The moisture content and unit weight tests were performed in general accordance with ASTM Test Method D2216 and ASTM Test Method D7263 respectively. The results are presented on the Logs of Borings and in Table B-1.

SIEVE ANALYSIS

Sieve analyses were performed on selected samples of the on-site soils to determine the grain size distribution characteristics and classification. The tests were performed in general accordance with ASTM Test Method D422. The test results are presented on Figure B-1.

PLASTICITY INDEX

Plasticity index testing was performed on selected samples of the on-site soils to determine plasticity characteristics and to aid in the classification of the soil. The testing was performed in accordance with ASTM Standard Test Method D4318. The test results are presented on the Logs of Borings and on Figure B-2.

DIRECT SHEAR

Selected samples of a relatively undisturbed soil were subjected to direct shear testing for shear strength and cohesion values of the in situ soils in accordance with ASTM Standard Test Method D3080. The results are presented on Figures B-3, B-4 and B-5.

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R-VALUE TEST

Resistance value (R-value) testing was performed on a select bulk soil sample to evaluate pavement support characteristics of the near-surface onsite soils. R-value testing was performed in accordance with Caltrans Standard Test Method 301. The test result is presented in Table B-2.

CORROSION TESTS

A series of chemical tests were performed on select near-surface soil samples to evaluate pH, resistivity, sulfate and chloride contents. The results of these tests are presented in Table B-3 below.

CONSOLIDATION TESTS

Consolidation testing was performed on a relatively undisturbed sample in accordance with ASTM Standard Test Method D2435. The test result is presented on Figure B-6.

COLLAPSE POTENTIAL TESTING

Collapse potential testing was performed on relatively undisturbed samples in accordance with ASTM Standard Test Method D2435. The test results are presented on Figures B-7 and B-8.

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Table B-1

Moisture Content and Dry Densities

Exploration Location	Depth (feet)	Moisture Content (%)	Dry Density (pcf)
B-1	5	2.1	97.8
B-1	10	1.8	104.0
B-2	5	1.7	102.7
B-2	10	2.7	108.9
B-3	10	8.7	111.9
B-4	5	3.0	96.9
B-4	10	4.5	100.2
B-5	5	2.4	118.3
B-5	10	12.3	104.9
B-6	10	14.2	95.2
B-7	5	13.1	91.2
B-7	10	10.8	89.7
B-9	5	21.0	93.8
B-9	10	12.7	95.1
B-9	20	12.4	124.0
B-9	30	14.2	112.1
B-9	40	3.8	109.3
B-9	50	6.3	125.2
B-10	5	16.5	107.4
B-10	7.5	13.4	107.4
B-10	10	7.9	100.6
B-10	20	22.1	98.0
B-10	30	18.0	105.4
B-10	40	17.0	111.3
B-10	50	18.1	110.2

Table B-2

R-Value Test Results

Exploration Location	Depth (feet)	R-Value
B-1	0-5	72
B-6	0-5	73

Table B-3

Corrosion Test Results

Boring Location	Depth (feet)	pH	Sulfate (ppm)	Chloride (ppm)	Resistivity (ohm-cm)
B-1	0-3	8.2	54	35	2138
B-7	0-5	8.1	40	35	7229
B-10	0-5	7.9	313	623	445

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APPENDIX C
GBA INSERT

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Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed*. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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Appendix G

Preliminary Design Drawings

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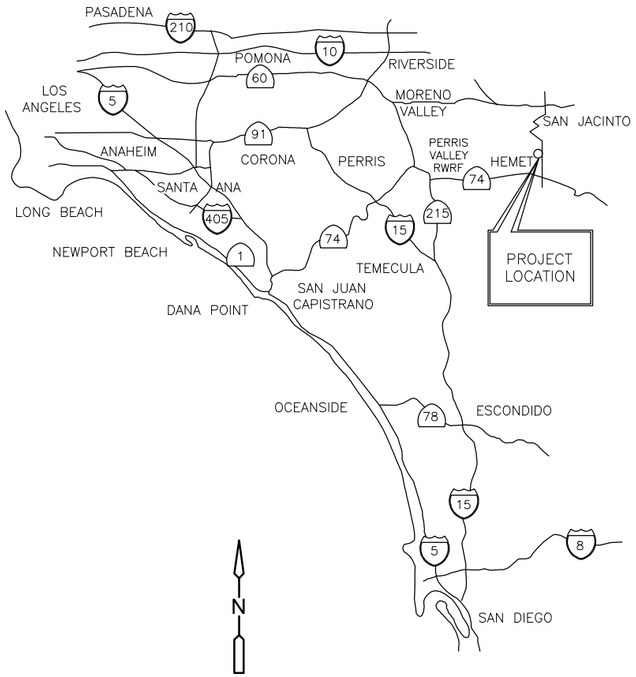
EASTERN MUNICIPAL WATER DISTRICT

SAN JACINTO, CALIFORNIA

PURIFIED WATER REPLENISHMENT PROJECT

PROJECT NO. XXXX
PRELIMINARY DESIGN DRAWINGS
MAY 2018



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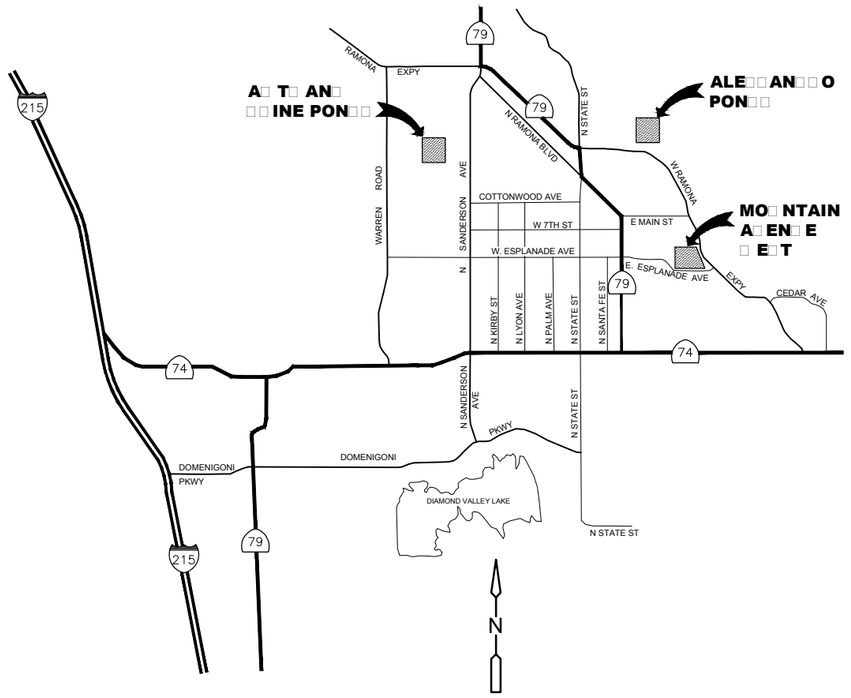

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REV. NO.	DATE	DRWN	CHKD	REMARKS

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DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

COVER SHEET

PROJECT NO. 26793-214344
FILE NAME: 00-G-001

SHEET NO.
00-G-001

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PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

□ENER□L	00-G-001	COVER SHEET
	00-G-002	SHEET INDEX
	00-G-003	GENERAL NOTES, LEGEND, ABBREVIATIONS, AND AGENCY INDEX
	00-G-004	PROCESS FLOW DIAGRAM
	00-G-005	HYDRAULIC PROFILE
□□IL	00-C-001	GENERAL CIVIL NOTES, ABBREVIATIONS AND LEGEND
	00-C-002	OVERALL SITE PLAN
	00-C-003	AWTF SITE PLAN
	00-C-004	AWTF YARD PIPING PLAN
	80-C-001	BRINE EVAPORATION POND PLAN
	80-C-002	BRINE EVAPORATION POND PROFILES
	90-C-001	CONVEYANCE PIPELINE OVERALL PLAN
	91-C-001	ROP CONVEYANCE PIPELINE KEY PLAN
	91-C-002	ROP CONVEYANCE PIPELINE PLAN AND PROFILE 1 OF □
	91-C-003	ROP CONVEYANCE PIPELINE PLAN AND PROFILE 2 OF □
	91-C-004	ROP CONVEYANCE PIPELINE PLAN AND PROFILE 3 OF □
	91-C-005	ROP CONVEYANCE PIPELINE PLAN AND PROFILE 4 OF □
	91-C-00□	ROP CONVEYANCE PIPELINE PLAN AND PROFILE 5 OF □
	91-C-007	ROP CONVEYANCE PIPELINE PLAN AND PROFILE □ OF □
	91-C-008	ROP CONVEYANCE PIPELINE ENLARGED PLAN 1 OF 2
	91-C-009	ROP CONVEYANCE PIPELINE ENLARGED PLAN 2 OF 2
	91-C-010	ROP CONVEYANCE PIPELINE DETAILS
	94-C-001	ALESSANDRO PONDS BLENDING FACILITY
	95-C-001	RECYCLED WATER CONVEYANCE PIPELINE KEY PLAN
	95-C-002	RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 1 OF 15
	95-C-003	RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 2 OF 15
	95-C-004	RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 3 OF 15
	95-C-005	RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 4 OF 15
	95-C-00□	RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 5 OF 15
	95-C-007	RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE □ OF 15
	95-C-008	RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 7 OF 15
	95-C-009	RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 8 OF 15
	95-C-010	RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 9 OF 15
	95-C-011	RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 10 OF 15
	95-C-012	RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 11 OF 15
	95-C-013	RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 12 OF 15
	95-C-014	RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 13 OF 15
	95-C-015	RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 14 OF 15
	95-C-01□	RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 15 OF 15
□R□□ITE□T□R□L	11-A-001	PROCESS AND CONTROL BUILDING PLAN
	11-A-002	PROCESS AND CONTROL BUILDING ELEVATIONS
	11-A-003	PROCESS AND CONTROL BUILDING SECTIONS
□TR□□T□R□L	N/A	
□RO□E□□	00-M-001	MECHANICAL SYMBOLS, ABBREVIATIONS AND GENERAL NOTES
	14-M-001	INFLUENT PUMP STATION PLAN AND SECTION
	1□-M-001	PROCESS AREA PLAN- MF STRAINERS
	1□-M-002	PROCESS AREA SECTION- MF STRAINERS
	17-M-001	PROCESS BUILDING PLAN
	18-M-001	PROCESS AREA PLAN - PLANT PROCESS WASTE PUMP STATION
	21-M-001	PROCESS AREA PLAN- MF SYSTEM, MF UNITS
	21-M-002	PROCESS AREA SECTION- MF SYSTEM, MF UNITS
	23-M-001	PROCESS AREA PLAN AND SECTION - MF AIR SCOUR AND COMPRESSED AIR SYSTEMS
	25-M-001	PROCESS AREA PLAN- MF CIP SYSTEM
	25-M-002	PROCESS AREA SECTION- MF CIP SYSTEM
	31-M-001	PROCESS AREA PLAN- MF BREAK TANK AND BW SUPPLY PUMP STATION
	31-M-002	PROCESS AREA SECTIONS- MF BREAK TANK AND BW SUPPLY PUMP STATION
	32-M-001	PROCESS AREA PLAN AND SECTION- RO TRANSFER PUMP STATION
	40-M-001	CHEMICAL AREA PLAN
	40-M-002	CHEMICAL AREA SECTION
	40-M-003	GENERIC CHEMICAL FEED SYSTEM PLAN - SODIUM HYDROXIDE
	40-M-004	GENERIC CHEMICAL FEED SYSTEM SECTIONS - SODIUM HYDROXIDE
	51-M-001	PROCESS AREA PLAN- PRIMARY RO SYSTEM
	51-M-002	PROCESS AREA SECTION I - PRIMARY RO SYSTEM
	51-M-003	PROCESS AREA SECTION II - PRIMARY RO SYSTEM
	52-M-001	PROCESS AREA PLAN- RO CIP SYSTEMS
	52-M-002	PROCESS AREA SECTION- RO CIP SYSTEMS
	53-M-001	PROCESS AREA PLAN AND SECTION- SECONDARY RO SYSTEM
	53-M-002	PROCESS AREA SECTION II- SECONDARY RO SYSTEM
	71-M-001	PROCESS AREA PLAN- PRODUCT WATER PUMP STATION
	71-M-002	PROCESS AREA SECTION- PRODUCT WATER PUMP STATION
	73-M-001	PROCESS AREA PLAN AND SECTION - RO PERMEATE FLUSH TANK SYSTEM
□□□□	N/A	
□IRE□□ROTE□TION	N/A	
ELE□	00-E-001	ELECTRICAL LEGENDS AND ABBREVIATIONS I
	00-E-002	ELECTRICAL LEGENDS AND ABBREVIATIONS II
	10-E-001	ELECTRICAL SITE PLAN
	10-E-002	SINGLE-LINE DIAGRAM SWGR-1
	17-E-001	SINGLE-LINE DIAGRAM MSBD-1
	17-E-002	SINGLE-LINE DIAGRAM MCC-1
	17-E-003	SINGLE-LINE DIAGRAM MCC-2
	80-E-001	SINGLE-LINE DIAGRAM MSBD-3
	80-E-002	SINGLE-LINE DIAGRAM MCC-5
	80-E-003	SINGLE-LINE DIAGRAMS MACHINE CONTROL PANELS 1, 2 AND 3
I□□	00-I-001	P□ID - LEGEND I
	00-I-002	P□ID - LEGEND II
	00-I-003	SYSTEM ARCHITECTURE
	14-I-001	P□ID - INFLUENT PUMP STATION
	1□-I-001	P□ID - MF STRAINERS
	18-I-001	P□ID - PLANT PROCESS WASTE PUMP STATION
	18-I-002	P□ID - SUMP PUMP STATION
	21-I-001	P□ID - MF UNITS - OVERALL SYSTEM
	21-I-002	P□ID - MF UNIT DETAIL - FEED END
	21-I-003	P□ID - MF UNIT DETAIL - FILTRATE END
	23-I-001	P□ID - MF COMPRESSED AIR SYSTEM
	24-I-001	P□ID - MF AIR SCOUR SYSTEM
	25-I-001	P□ID - MF ACID CIP TANK
	25-I-002	P□ID - MF CAUSTIC CIP TANK
	25-I-003	P□ID - MF CIP PUMPS
	31-I-001	P□ID - MF BREAK TANK
	32-I-001	P□ID - RO TRANSFER PUMPS
	33-I-001	P□ID - BACKWASH SUPPLY PUMPS
	37-I-001	P□ID - PRIMARY CARTRIDGE FILTERS
	41-I-001	P□ID - SODIUM HYPOCHLORITE STORAGE TANK
	41-I-002	P□ID - SODIUM HYPOCHLORITE METERING PUMPS
	41-I-003	P□ID - SODIUM HYPOCHLORITE TRANSFER PUMPS
	42-I-001	P□ID - SULFURIC ACID STORAGE TANK
	42-I-002	P□ID - SULFURIC ACID METERING PUMPS (PRIMARY RO)
	42-I-003	P□ID - SULFURIC ACID METERING PUMPS (SECONDARY RO)
	43-I-001	P□ID - THRESHOLD INHIBITOR STORAGE TOTE
	43-I-002	P□ID - THRESHOLD INHIBITOR METERING PUMPS (PRIMARY RO)
	43-I-003	P□ID - THRESHOLD INHIBITOR METERING PUMPS (SECONDARY RO)
	44-I-001	P□ID - CITRIC ACID STORAGE TOTE
	44-I-002	P□ID - CITRIC ACID TRANSFER PUMPS
	45-I-001	P□ID - SODIUM BISULFITE STORAGE TANK
	45-I-002	P□ID - SODIUM BISULFITE METERING AND TRANSFER PUMPS
	4□-I-001	P□ID - SODIUM HYDROXIDE STORAGE TANK
	4□-I-002	P□ID - SODIUM HYDROXIDE METERING PUMPS
	4□-I-003	P□ID - SODIUM HYDROXIDE TRANSFER PUMPS
	47-I-001	P□ID - CALCIUM CHLORIDE STORAGE TANK - FUTURE
	47-I-002	P□ID - CALCIUM CHLORIDE METERING PUMPS - FUTURE
	48-I-001	P□ID - HYDROGEN PEROXIDE STORAGE TANK - FUTURE
	48-I-002	P□ID - HYDROGEN PEROXIDE METERING PUMPS - FUTURE
	49-I-001	P□ID - AMMONIUM SULFATE STORAGE TANK
	49-I-002	P□ID - AMMONIUM SULFATE METERING PUMPS
	51-I-001	P□ID - PRIMARY RO FEED PANEL
	51-I-002	P□ID - PRIMARY RO FEED PUMP UNIT I
	51-I-003	P□ID - PRIMARY RO MEMBRANE
	52-I-001	P□ID - PRIMARY RO CIP SYSTEM
	53-I-001	P□ID - SECONDARY RO FEED PUMP
	53-I-002	P□ID - SECONDARY RO UNIT 1
	53-I-003	P□ID - SECONDARY RO PERMEATE AND CONCENTRATE
	54-I-001	P□ID - SECONDARY RO CIP SYSTEM
	71-I-001	P□ID - PRODUCT WATER PUMP STATION
	73-I-001	P□ID - FLUSH TRANSFER PUMPS AND FLUSH TANK
	73-I-002	P□ID - RO FLUSH PUMPS
	82-I-001	P□ID - EVAPORATION PONDS - SHEET 1
	82-I-002	P□ID - EVAPORATION PONDS - SHEET 2
	82-I-003	P□ID - EVAPORATION PONDS - SHEET 3

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

SHEET INDEX

PROJECT NO. 26793-214344
FILE NAME: 00-G-002

SHEET NO.
00-G-002

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GENERAL NOTES

1. WORKING HOURS SHALL BE BETWEEN 7:00 A.M. TO 4:00 P.M. UNLESS OTHERWISE NOTED.
2. LOCATIONS OF UNDERGROUND UTILITIES SHOWN ON THE DRAWINGS WERE OBTAINED FROM AVAILABLE RECORDS. NEITHER THE OWNER NOR ENGINEER ASSUMES ANY RESPONSIBILITY FOR UTILITIES NOT SHOWN, OR NOT IN LOCATION SHOWN. CONTRACTOR SHALL VERIFY ALL LOCATIONS AND ELEVATIONS AND SHALL TAKE ALL PRECAUTIONARY MEASURES AND ELEVATIONS AND SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT UTILITY LINES WHETHER SHOWN OR NOT SHOWN.
3. THE CONTRACTOR SHALL CONTACT "UNDERGROUND SERVICES ALERT" (U.S.A.) 1-800-422-4133 FOR FIELD LOCATION OF UTILITIES A MINIMUM OF TWO WORKING DAYS BEFORE DIGGING.
4. CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE FROM DAMAGE. ALL IMPROVEMENTS DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE EXPEDITIOUSLY REPAIRED OR RECONSTRUCTED TO THE CONSTRUCTION MANAGER'S SATISFACTION AT THE CONTRACTOR'S EXPENSE WITHOUT ADDITIONAL COMPENSATION.
5. ADJUST ALL VALVE BOXES, PULL BOXES AND MANHOLES TO FINISHED GRADE UNLESS OTHERWISE SHOWN OR DIRECTED.
6. CONTRACTOR AGREES THAT HE/SHE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY ALL PERSONS AND PROPERTY; THAT THESE REQUIREMENTS SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER, CONSTRUCTION MANAGER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF THE WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.
7. THE CONTRACTOR IS ADVISED THAT OTHER CONTRACTORS MAY BE WORKING ON OR NEAR THE JOB SITE. CONTRACTOR SHALL COORDINATE ALL CONSTRUCTION WORK WITH OTHERS WHERE APPLICABLE. SEE SPECIFICATIONS FOR A SUMMARY OF KNOWN PROJECTS.
8. FINAL RECORD LOCATIONS OF THE FACILITIES SHALL BE RECORDED BY THE CONTRACTOR AND TO THE CONSTRUCTION MANAGER WITHIN 30 DAYS OF COMPLETION OF THE PROJECT.
9. ALL STATIONING IS BASED ON CENTERLINE UNLESS OTHERWISE NOTED.
10. THE CONTRACTOR SHALL REPAIR OR REPLACE ANY UTILITIES DAMAGED DURING CONSTRUCTION AT THE CONTRACTOR'S EXPENSE AND TO THE SATISFACTION OF THE CONSTRUCTION MANAGER.
11. A SOILS REPORT FOR THE PROJECT HAS BEEN PREPARED BY KLEINFELDER AND IS AVAILABLE FOR REVIEW.
12. DIMENSIONED DISTANCE SHALL GOVERN OVER SCALED DISTANCES.
13. THE CONTRACTOR SHALL PRESERVE OR RE-ESTABLISH AND REFERENCE SURVEY MONUMENTS DESTROYED, DISTURBED OR BURIED AS A RESULT OF CONSTRUCTION SHOWN HEREON.
14. "STANDARD PLAN" CALL OUTS REFER TO THE AMERICAN PUBLIC WORKS ASSOCIATION STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION (GREEN BOOK) UNLESS OTHERWISE NOTED.
15. PROJECT ADDRESS:

    XXXXXXXXXXXXXXXXXXXX
    XXXXXXXXXXXXXXXXXXXX
    XXXXXXXXXXXXXXXXXXXX
16. THE APPROVAL OF PLANS AND SPECIFICATIONS DOES NOT PERMIT THE VIOLATION OF ANY SECTION OF THE BUILDING CODE OR OTHER CITY ORDINANCE OR STATE LAW.
17. WHEN MULTIPLE PIPE MATERIALS ARE IDENTIFIED, THE PIPE MATERIAL LISTED FIRST IS SHOWN ON THE DRAWINGS.
18. IT SHALL BE THE RESPONSIBILITY OF THE MANUFACTURER TO DETERMINE THE NUMBER, SIZE AND LOCATION OF ALL ANCHOR BOLTS TO BE SET IN CONCRETE. ANCHOR BOLTS SHALL MEET THE REQUIREMENTS OF SPECIFICATION SECTION 01172.

BASIS OF BEARINGS:

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE CALIFORNIA COORDINATE SYSTEM, ZONE 6, BASED LOCALLY ON CONTINUOUS OPERATING REFERENCE STATIONS (CORS) "MLFP","BILL" AND "P584" NAD83(2011) (EPOCH:2010.00). ALL BEARINGS AND DISTANCES SHOWN ON THIS SURVEY ARE GRID. GROUND DISTANCES MAY BE OBTAINED BY DIVIDING THE GRID DISTANCE BY THE COMBINED SCALE FACTOR OF 0.99992014. CALCULATIONS ARE MADE AT "1BASE" WITH COORDINATES N:2234982.512 E:6329948.695,

GRID DISTANCE/0.99992014= GROUND DISTANCE

BENCHMARK:

THE FOLLOWING BENCHMARK WAS OBSERVED BY COZAD & FOX, INC.:

A USGS MONUMENT DESIGNATED "3-A", PID "DX5386" BEING A 3.5IN BRASS DISK IN TOP OF CONCRETE MONUMENT

LOCATED 2.5 MILES NORTHWEST OF THE TOWN OF SAN JACINTO, AT THE SAN JACINTO RESERVOIR, 86 FEET SOUTH OF THE MOST NORTHERLY CORNER OF THE RESERVOIR CHAIN LINK FENCE, 45 FEET FROM THE NORTHWEST CHAIN LINK FENCE, 66 FEET FROM THE NORTHEAST CHAIN LINK FENCE
COORDINATES: N:2237191.77 E:6335284.67

ELEVATION = 1488.31 (NAVD 88)
PREVIOUS PLANS HELD ELEVATION 1485.08 (NGVD 29)

LEGEND

- TEMPORARY CONSTRUCTION EASEMENT LINE/ LIMITS OF WORK
- EASEMENT LINE
- RIGHT-OF-WAY
- PROPERTY LINE
- CENTERLINE
- SS — SANITARY SEWER
- W — WATER
- IRR — IRRIGATION
- G — GAS
- T — TELEPHONE LINE
- E — ELECTRIC LINE
- SD — STORM DRAIN
- W — WATER LINE
- FIRE HYDRANT
- MH — MANHOLE
- PP — POWER POLE AND OVERHEAD UTILITY LINE
- X — X — FENCE
- DIRECTION OF FLOW
- 1507.23 — SPOT ELEVATION
- 52 — CONTOUR
- 84 — PROPOSED INTERMEDIATE CONTOUR LINE AND ELEVATION DESIGNATION
- 85 — PROPOSED INDEX CONTOUR LINE AND ELEVATION DESIGNATION
- 84 — DEPRESSION CONTOUR
- EDGE OF PAVEMENT
- SIDEWALK/CONCRETE SLAB
- ASPHALT
- AGGREGATE BASE
- TREE OR SHRUB
- DEMOLISH/REMOVE
- MASONRY WALL
- CURB
- CURB AND GUTTER
- CONTROL POINT
- A / X-X — SEE DETAIL
- SEE DRAWING NO.
- 1 / X-X — SEE SECTION
- SEE DRAWING NO.

ABBREVIATIONS

ADDITIONAL ABBREVIATIONS CAN BE FOUND ON SHEETS 00-I-001

SYMBOL

∠	ANGLE
ℙ	PROPERTY LINE
℄	CENTERLINE
⌀	DIAMETER
%	PERCENT
#	NUMBER
&	AND
@	AT

A

AB	AGGREGATE BASE
ABND	ABANDONED
ABF	ALAMITOS BARRIER FEED
AC	ASPHALT CONCRETE
ACFM	ACTUAL CUBIC FEET PER MINUTE
ACP	ASBESTOS CONCRETE PIPE
ADA	AMERICANS WITH DISABILITIES ACT
ALT	ALTERNATIVE
APPROX	APPROXIMATE (LY)
ARCH	ARCHITECT (URAL) (URE)
ASPH	ASPHALT
ASSOC	ASSOCIATION
ASTM	AMERICAN SOCIETY FOR TESTING MATERIALS
AVG	AVERAGE

B

B	BLOWER
BF	BLIND FLANGE
BFV	BUTTERFLY VALVE
BLDG	BUILDING
BLK	BLOCK
BM	BENCHMARK
BOF	BOTTOM OF FOOTING
BOT	BOTTOM
BTWN	BETWEEN
BV	BALL VALVE

C

CF	CUBIC FOOT
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CIP	CLEAN-IN-PLACE
CLR	CLEARANCE
CMCLSP	CEMENT MORTAR COATED & LINED STEEL PIPE
CMU	CONCRETE MASONRY UNITS
CMLSP	CEMENT MORTAR LINED STEEL PIPE
COL	COLUMN
CONC	CONCRETE
CONT	CONTINUOUS
CONST	CONSTRUCTION
CORP	CORPORATION
CP	CONTROL POINT
CTJ	CONTROL JOINT
CTR	CENTER (ED)
CU	COPPER OR CUBIC
CY	CUBIC YARD

D

D	DRAIN
DBLE	DOUBLE
DIA	DIAMETER
DIAG	DIAGONAL
DIM	DIMENSION
DIP	DUCTILE IRON PIPE
DL	DEAD LOAD
DN	DOWN
DR	DIMENSION RATIO
DTL	DETAIL
DWG	DRAWING

E

E	EASTERLY/ELECTRICAL
EA	EACH
EF	EDGE FACE
ELEC	ELECTRIC (AL)
ELEV/EL	ELEVATION
ELSP	EPOXY LINED STEEL PIPE
EMWD	EASTERN MUNICIPAL WATER DISTRICT
ENGR	ENGINEER
EQ	EQUAL (LY)
EQUIP	EQUIPMENT
ESMT	EASEMENT
EW	EACH WAY
EWS	EYEWASH/SHOWER
EXIST/EX	EXISTING
EXT	EXTERIOR

F

FDN	FOUNDATION
FE	FLOW ELEMENT
FF	FINISHED FLOOR
FG	FINISHED GRADE
FH	FIRE HYDRANT
FIG	FIGURE
FIN	FINISH (ED)
FL	FLOW LINE
FLG	FLANGE
FLR	FLOOR
FT	FEET/FOOT
FTG	FOOTING/FITTING
FM	FORCE MAIN/FLOW METER
FRP	FIBERGLASS REINFORCED PLASTIC

G

GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GB	GRADE BREAK/GREEN BOOK
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GRTG	GRATING
GV	GATE VALVE

H

HB	HOSE BIBB
HEX	HEXAGON (AL)
HL	HEAD LOSS
HORIZ	HORIZONTAL
HP	HIGH POINT/HIGH PRESSURE
HT	HEIGHT

I

ID	INSIDE DIAMETER
IN	INCH
INS	INSIDE
INT	INTERIOR
INV	INVERT
IRR	IRRIGATION

J

JCT	JUNCTION
JT	JOINT

K

KW	KILOWATT

L

LB	POUND
LF	LINEAR FEET
LG	LONG
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LP	LOW POINT/LOW PRESSURE/LIGHT POL
LT	LEFT

M

MATL	MATERIAL
MAX	MAXIMUM
MF	MICROFILTRATION
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MSDS	MATERIAL SAFETY DATA SHEETS

N

N	NORTHERLY/NORTH
N/A	NOT APPLICABLE
NE	NORTHEAST
NO.	NUMBER
NTS	NOT TO SCALE
NW	NORTHWEST

O

O/	OVER
OC	ON CENTER
OD	OUTSIDE DIAMETER
OE	OVERHEAD ELECTRIC
OF	OVERFLOW
OH	OVERHEAD
OPER	OPERATING
OPP	OPPOSITE
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

P

PCC	PORTLAND CEMENT CONCRETE
PE	PLAIN END/POLYETHYLENE
PP	POWER POLE
PRES	PRESSURE
PSF	POUNDS PER SQUARE FOOT
PSI (G)	POUNDS PER SQUARE INCH (GAUGE)
PT	POINT
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT

R

RED	REDUCER
RCP	REINFORCED CONCRETE PIPE
REINF	REINFORCING
REQ'D	REQUIRED
RG	RUBBER GASKETED/ROUGH GRADE
RM	ROOM
RO	REVERSE OSMOSIS
RPM	REVOLUTIONS PER MINUTE
RT	RIGHT
RW	RECLAIMED WATER
R/W	RIGHT OF WAY

S

S	SEWER/SOUTHERLY/SLOPE
SCE	SOUTHERN CALIFORNIA EDISON
SCH	SCHEDULE
SD	STORM DRAIN
SDR	STANDARD DIMENSION RATIO
SE	SOUTHEAST
SEC	SECTION/SECOND
SF	SQUARE FOOT
SHT	SHEET
SIM	SIMILAR
SJVRWRF	SAN JACINTO VALLEY REGIONAL WATER RECLAMATION FACILITY
SPEC	SPECIFICATION
SQ	SQUARE
SSPWC	STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION "GREEN BOOK"
SST	STAINLESS STEEL/SANITARY SEWER
STA	STATION
STD	STANDARD
STL	STEEL
SW	STORMWATER
SYM	SYMMETRICAL

T

T	TANK/TREAD
TC	TOP OF CURB/TRUCK CONNECTION
TEMP	TEMPERATURE/TEMPORARY
TG	TOP OF GROUND
THK	THICK (NESS)
TOC	TOP OF CURB
TR	TRAIN
TYP	TYPICAL

U

UBC	UNIFORM BUILDING CODE
UE	UNDERGROUND ELECTRIC
UFC	UNIFORM FIRE CODE
UG	UNDERGROUND
UNO	UNLESS NOTED OTHERWISE

V

VAC	VACUUM
VCP	VITRIFIED CLAY PIPE
VERT	VERTICAL
VOL	VOLUME

W

W	POTABLE WATER/WESTERLY/WIDTH
W/	WITH
W/O	WITHOUT
WT	WEIGHT
WTP	WATER TREATMENT PLANT

X

X	BY
XFER	TRANSFER

FLOW STREAM ABBREVIATIONS

A

ACID	MF CIP ACID
AW	ACID WASTE

B

BA	BLOWER AIR
BP	BACKPULSE
BRC	CONCENTRATED BRINE
BRD	DILUTED BRINE
BW	MF BACKWASH LINE
BWR	BACKWASH RETURN
BWS	BACKWASH SUPPLY
BWW	BACKWASH WATER
BYP	BYPASS

C

CA	COMPRESSED AIR/MF CONTROL AIR
CAD	COMPRESSED AIR, DRIED
CF	CLEANING FLUSH
CF/CR	RO CLEANING FEED/CLEANING RETURN
CIP	CLEAN-IN-PLACE
CIT	CITRIC ACID
CLW	RO CLEANING WASTE
CNR	CONDENSATE RETURN
CNS	CONDENSATE SUPPLY
CR	CLEANING RETURN
CT	MF CHEMICAL TRANSFER
CW	POTABLE COLD WATER
CWO	CLEARWELL OVERFLOW
CWR	COOLING WATER RETURN
CWS	COOLING WATER SUPPLY

D

D	DRAIN
DW	DOMESTIC WATER

E

E	EMERGENCY WATER
EF	EXCESS FEED RECIRCULATION
EFF	EFFLUENT
EFM	ENHANCED FLUX MAINTENANCE
ELEC	ELECTRIC AND TELEMETRY
EOF	EMERGENCY OVERFLOW

F

FER	FERRIC SULFATE
FF	RO FLUSH FEED
FLW	FLUSH WASTE
FPW	FINISHED PRODUCT WATER
FR	FUEL RETURN
FS	FUEL SUPPLY
FW	FIRE WATER

G

GAS	NATURAL GAS

H

HP	HYDROGEN PEROXIDE
HPA	HIGH PRESSURE AIR
HW	POTABLE HOT WATER
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HWW	HIGH PRESSURE WASHWATER

I

IA	INSTRUMENT AIR
INST	INSTRUMENTATION
IW	INDUSTRIAL WATER
IXE	ION EXCHANGE EFFLUENT
IXSR	IX SPENT REGENERANT
IXW	IX WASTE

L

L	DRY LIME
LIM	LIME SLURRY
LS	LIME SLUDGE
LSF	LINE SATURATOR FEED

M

MC	MF MAINTENANCE CLEAN
MCF	MF CIP FEED
MCR	MF CIP WASTE
MCW	MF CIP WASTE
MEM	MF CIP MEMCLEAN
MF	MEMBRANE FILTRATION
MFE	MF EFFLUENT (FILTRATE)
MFF	MF FEED
MFF	MF FILTRATE
MFI	MF INFLUENT
MFW	MF WASTE
MMF	MF MAINTENANCE FEED
MMR	MF MAINTENANCE RETURN
MMW	MF MAINTENANCE WASTE
MR	MF RINSE

N

NW	NEUTRALIZED WASTE

O

OF	OVERFLOW

P

PA	PROCESS AIR/ PLANT AIR
PCR	PERMEATE CLEANING RETURN
PD	PERMEATE DUMP
PE	PLANT EFFLUENT
PO	POLYMER SOLUTION
PPW	PLANT PROCESS WASTE
PSW	PLANT SITE WASTE
PW	PRODUCT WATER

R

REC	RECYCLE
RF	MF REVERSE FLUSH
ROC	RO CONCENTRATE
ROF	RO FEED
ROP	RO PERMEATE
ROT	RO TRANSFER
ROW	RO WASTE
RW	RECLAIMED WATER

S

SA	SULFURIC ACID
SB	SPENT BACKWASH
SBS	SODIUM BISULFITE
SBW	STAINER BACKWASH WASTE
SD	STORM DRAIN
SE	SECONDARY EFFLUENT FEED
SFEFF	SPENT BACKWASH EFFLUENT
SH	SODIUM HYDROXIDE
SHC	SODIUM HYPOCHLORITE
SLS	SATURATED LIME SOLUTION
SPW	SPRAY WATER
SS	SANITARY SEWER
SW	SUMP WASTE

T

TA	TEST AIR
TELE	TELEPHONE
TI	THRESHOLD INHIBITOR
TRW	TOILET REUSE WATER

V

V	VACUUM
VT	VENT

U

UVE	UVAO EFFLUENT
UVI	UVAO INFLUENT

W

W	POTABLE WATER
WR	WASHWATER RECOVERY
WSH	WASHWATER
WW	PLANT WASTE WATER

AGENCY INDEX

ALL INFORMATION RELATIVE TO THE LOCATION, TYPE, AND OPERATIONAL STATUS OF UTILITIES, STRUCTURES AND/OR IMPROVEMENTS WHICH APPEAR ON THESE PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS PROVIDED BY THE FOLLOWING RESPECTIVE OWNERS OR AGENCIES. TO THE BEST OF OUR KNOWLEDGE THERE ARE NO EXISTING UTILITIES EXCEPT AS SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN ON THESE DRAWINGS. THE CONTRACTOR FURTHER ASSUMES LIABILITY AND RESPONSIBILITY FOR THESE UTILITY PIPES, CONDUITS, OR STRUCTURES, SHOWN OR NOT SHOWN ON THESE DRAWINGS.

City of San Jacinto
270 Bisseil Place
San Jacinto, CA 92582
(951) 654-3592

SC Gas-Hemet
1981 W. Lugonia Ave
Redlands, CA 92374
(909) 355-7955

Lake Hemet M.W.D
PO Box 5039
Hemet, CA 92544
(951) 658-3241

Sunesys LCC/ Crown Castle INC
2000 Corporate Drive
Canonsburg, PA 15317
(951) 278-0400

Charter/ Spectrum/ Time Warner
1500 Auto Center Drive
Ontario, CA 91761
(951) 393-3152

VERIZON/ FRONTIER
XXXXXXX
XXXXXXX

City of Hemet Utilities
3777 Industrial Ave
Hemet, CA 92545
(951) 765-3710

Eastern Municipal Water District
PO Box 8300
Perris, CA 92572
(951)928-6107

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92::17
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

GENERAL NOTES, LEGEND, ABBREVIATIONS, AND AGENCY INDEX

PROJECT NO. 26793-214344
FILE NAME: 00-G-003

SHEET NO.
00-G-003

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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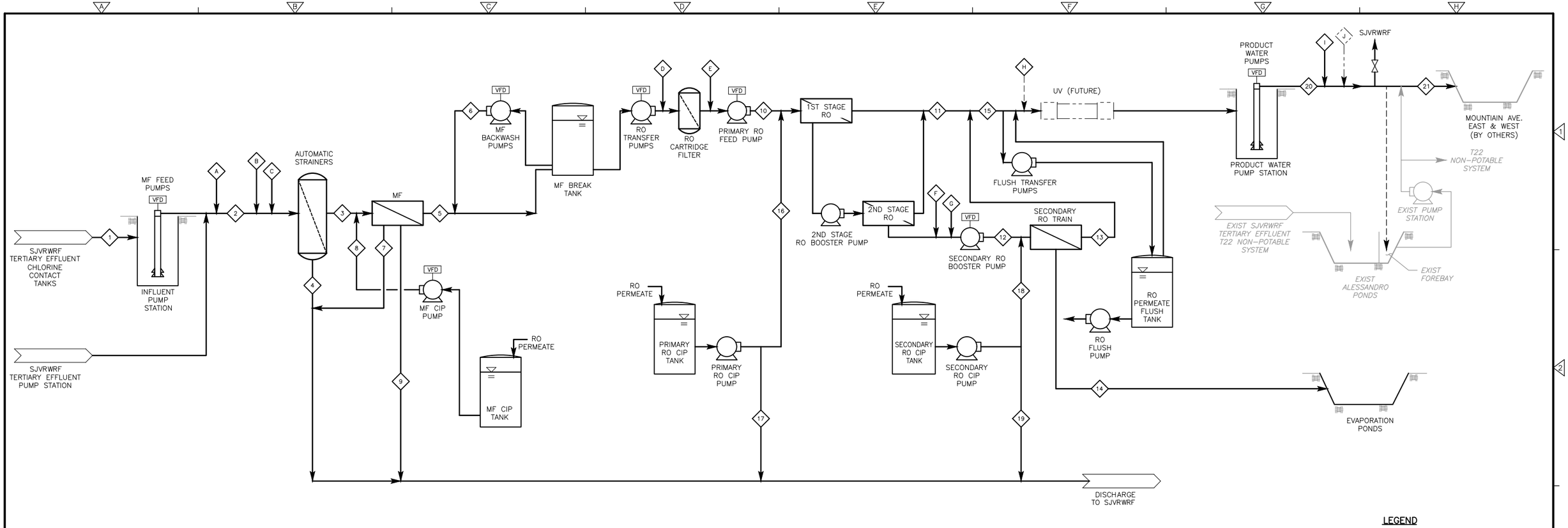

PRELIMINARY FLOW BALANCE

Automatic Strainer Recovery	98%
MF Recovery	94%
Primary RO Recovery	85%
Secondary RO Recovery	52%
Overall RO Recovery	92.8%
Online Factor	90%

FLOW STREAM (MGD)	AWTF FEED	AUTOMATIC STRAINER FEED	MF FEED	AUTOMATIC STRAINER WASTE	MF FILTRATE	MF BACKWASH FEED	MF BACKWASH WASTE	MF CIP FEED	MF CIP WASTE	PRIMARY RO FEED	PRIMARY RO PERMEATE	SECONDARY RO FEED	SECONDARY RO PERMEATE	SECONDARY RO CONCENTRATE	COMBINED RO PERMEATE	PRIMARY RO CIP FEED	PRIMARY RO CIP WASTE	SECONDARY RO CIP FEED	SECONDARY RO CIP WASTE	AWTF PRODUCT	BLENDED WATER FOR RECHARGE
PROCESS STREAM ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Design Flow-2,000 AFY (2.0 mgd)	2.3	2.3	2.3	0.05	2.3	0.15	0.15	0.01	0.01	2.155	1.8	0.323	0.17	0.1552	2.000	0.01	0.01	0.01	0.01	2.0	4.0
Design Flow-7,500 AFY (7.5 mgd)	8.7	8.7	8.6	0.17	8.6	0.55	0.55	0.02	0.02	8.052	6.844	1.208	0.628	0.5798	7.473	0.01	0.01	0.01	0.01	7.4	15.0

NOTES

1. FLOWS AND PRESSURES ARE PRELIMINARY ESTIMATION AND FOR INFORMATION ONLY. THE INFORMATION NEED TO BE UPDATED/VERIFIED DURING THE DETAILED DESIGN STAGE.

2. CHEMICAL CONCENTRATIONS AND DOSES ARE PRELIMINARY ESTIMATION AND FOR INFORMATION ONLY. THE INFORMATION NEED TO BE UPDATED/VERIFIED DURING THE DETAILED DESIGN STAGE.

CHEMICAL	SODIUM BISULFITE	AMMONIUM SULFATE	SODIUM HYPOCHLORITE	SULFURIC ACID	THRESHOLD INHIBITOR	SULFURIC ACID	THRESHOLD INHIBITOR	HYDROGEN PEROXIDE (FUTURE)	SODIUM HYDROXIDE	CALCIUM CHLORIDE
CHEMICAL STREAM ID	A	B	C	D	E	F	□	H	I	J
Bulk Chemical Concentration	50%	40%	12.5%	93%	100%	93%	100%	27%	25%	35%
Estimated Max Chemical Dose	29 mg/L	1.5 mg/L	6.0 mg/L	20 mg/L	3.0 mg/L	60 mg/L	3.0 mg/L	5 mg/L	19 mg/L	40 mg/L

LEGEND

- 15 — PROCESS STREAM ID
- C — CHEMICAL STREAM ID
- —— - - —— FUTURE
- — — — — ALTERNATE ROUTE

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92::17
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS FLOW DIAGRAM

PROJECT NO. 26793-214344
FILE NAME: 00-G-004.DWG
SHEET NO. 00-G-004

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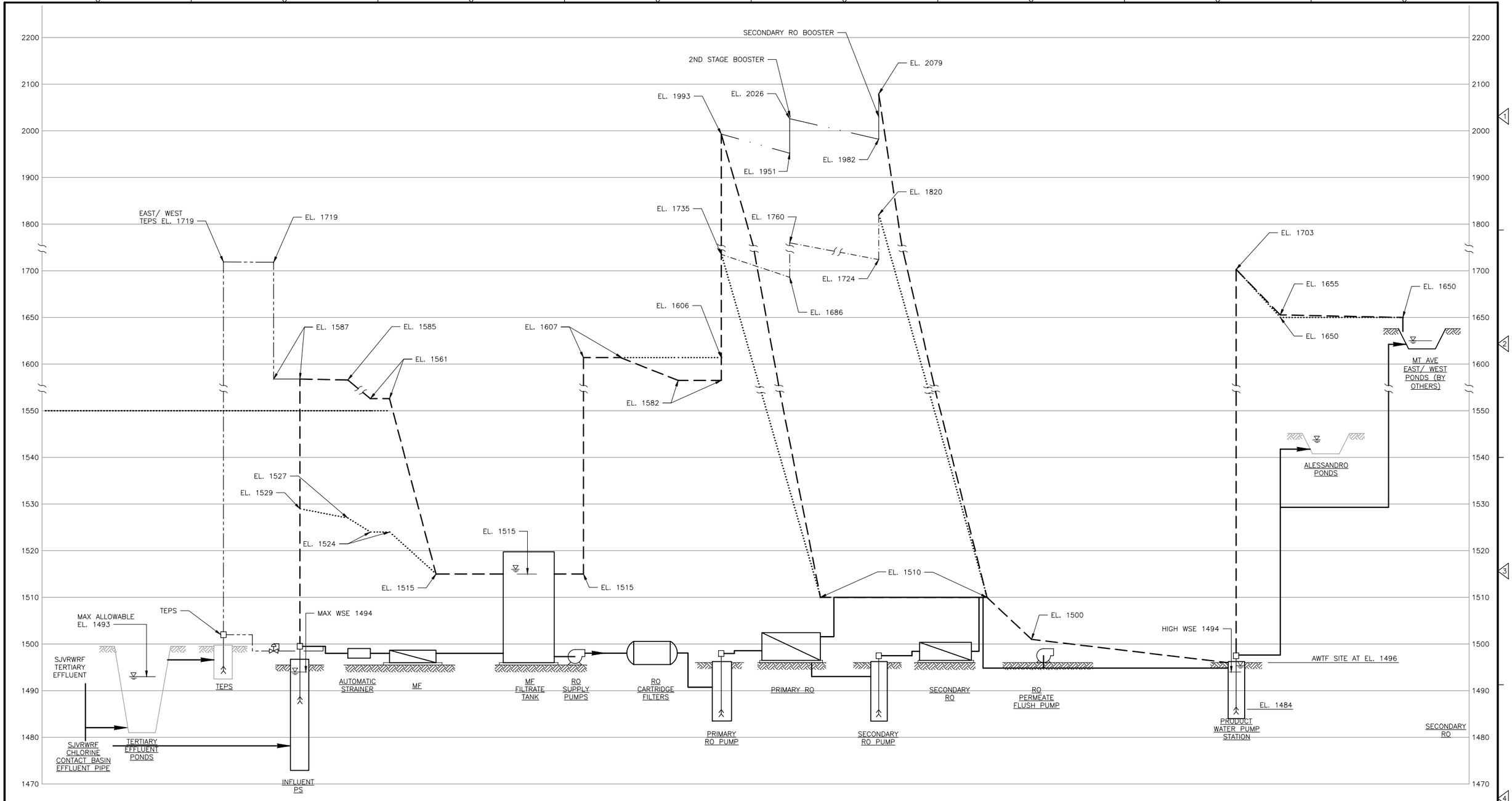

LINE TYPE LEGEND

- MAIN PROCESS FLOW, MAXIMUM CONDITION
- MAIN PROCESS FLOW, MINIMUM CONDITION
- OPTIONAL PROCESS FLOW, MAXIMUM CONDITION
- RO CONCENTRATE PROCESS FLOW, MAXIMUM CONDITION
- RO CONCENTRATE PROCESS FLOW, MINIMUM CONDITION

NOTES:

1. HYDRAULIC PROFILE BASED ON PHASE I FLOWS ONLY.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92::17
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

HYDRAULIC PROFILE

PROJECT NO. 26793-214344
FILE NAME: 00-G-005
SHEET NO. 00-G-005

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PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

ABBREVIATIONS

ASTM	AMERICAN SOCIETY OF TESTING AND MATERIALS
ABAN	ABANDONED
AC	ASPHALTIC CONCRETE OR ASPHALT
AFG	ABOVE FINISHED GRADE
AHD	AHEAD
ALT	ALTERNATE
APPROX	APPROXIMATE
AR	AIR RELEASE VALVE
ASPH	ASPHALT
AVAR, AV/AR	AIR VACUUM RELIEF/ AIR RELEASE VALVE
AVE	AVENUE
BF	BLIND FLANGE
BFV	BUTTERFLY VALVE
BG	BELOW GRADE
BK	BACK
BLVD	BOULEVARD
BM	BENCHMARK
BO	BLOW OFF
BWA	BRAZOSPORT WATER AUTHORITY
CATV	CABLE TV
C	CIVIL
℄	CENTERLINE
CB	CATCH BASIN
CL	CLASS, CENTERLINE
CLR	CLEARANCE
CML&C	CEMENT MORTAR LINED AND COATED
CML&T	CEMENT MORTAR LINED AND TAPE COATED
COMB	COMBINATION
CONC	CONCRETE
CONST	CONSTRUCTION
CONT	CONTINUOUS, CONTINUATION
COORD	COORDINATE
CP	CONTROL POINT
CPLG	COUPLING
DEF	DEFLECTION
DEMO	DEMOLISH/DEMOLITION
DEPT	DEPARTMENT
DET	DETAIL
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DR	DIMENSION RATIO/DRAIN
DWG	DRAWING
E	EAST, EASTERLY, EASTING
EA	EACH
EG	EXIST GRADE
EF	EACH FACE
ELEC	ELECTRIC, ELECTRICAL
ELEV	ELEVATION, ELEVATED
ENGR	ENGINEER
EOP	EDGE OF PAVEMENT
EQ	EQUATION
ESMT	EASEMENT
EXIST, EX	EXISTING
EW	EACH WAY
FG	FINISHED GRADE
FH	FIRE HYDRANT
FLEX	FLEXIBLE
FLG	FLANGE
FPVC	FUSIBLE POLYVINYL CHLORIDE
FT	FEET
FV	FIELD VERIFY
G	GAS
GA.	GAUGE
GALV	GALVANIZED
GPM	GALLONS PER MINUTE
GV	GATE VALVE
HDD	HORIZONTAL DIRECTIONAL DRILL
HGL	HYDRAULIC GRADE LINE
HORIZ	HORIZONTAL
HWY	HIGHWAY
IBC	INTERNATIONAL BUILDING CODE
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IN	INCHES
INT	INTERSECTION
INV	INVERT
L	LENGTH/LEFT
LB	POUND
LF	LINEAR FEET
LT	LEFT
MAX	MAXIMUM
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MJ	MECHANICAL JOINT
MSL	MEAN SEA LEVEL
N	NORTH, NORTHERLY, NORTHING
NAD83	NORTH AMERICAN DATUM 1983

NIC	NOT IN CONTRACT
NO	NUMBER
NPDES	NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
NTS	NOT TO SCALE
OD	OUTSIDE DIAMETER
O/C	ON CENTER
OFF	OFFSET
OH	OVERHEAD
OHE	OVERHEAD ELECTRIC
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
OT	OVERHEAD TELEPHONE
OTV	OVERHEAD TV
PB	PULL BOX
PC	POINT OF CURVATURE
PE	POLYETHYLENE, PLAIN END
PH	POT HOLE
PI	POINT OF INTERSECTION
PL	PROPERTY LINE
PP	POWER POLE
PSI	POUNDS PER SQUARE INCH
PT	POINT OF TANGENCY
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
PW	PUMP WELL
R	RADIUS
RD	ROAD
R/RT	RIGHT
R/W	RIGHT OF WAY
R&R	REMOVE AND RECONSTRUCT
REF	REFERENCE
REQ'D	REQUIRED
REST'D	RESTRAINED
RJ	RESTRAINED JOINT
RR	RAILROAD
RT	RIGHT
S	SLOPE OR SOUTH
SCP	SURVEY CONTROL POINT
SCH	SCHEDULE
SD	STORM DRAIN
SF	SQUARE FEET
SHT	SHEET
SIM	SIMILAR
SPECS	SPECIFICATIONS
SQ	SQUARE
SS	STAINLESS STEEL, SANITARY SEWER
SSPWC	STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION
ST	STREET
STD	STANDARD
STA	STATION
STL	STEEL
T&B	TOP AND BOTTOM
TEL	TELEPHONE
TEMP	TEMPORARY
TOB	TOP OF BERM/BANK
TOC	TOP OF CONCRETE
TOW	TOP OF WALL
TXDOT	TEXAS DEPARTMENT OF TRANSPORTATION
TYP	TYPICAL
UGND	UNDERGROUND
UNK	UNKNOWN
US/USA	UNITED STATES/ UNITED STATES OF AMERICA, UNDERGROUND SERVICES ALERT
USC&GS	UNITED STATES COAST AND GEODETIC SURVEY
UTIL	UTILITY
VERT	VERTICAL
W	WATER/WEST/WIDE
W/	WITH
WATCH	WORK AREA TRAFFIC CONTROL HANDBOOK
WM	WATER MAIN
WS	WELDED STEEL
WT	WEIGHT
WTR	WATER
WV	WATER VALVE
ø	DIAMETER
@	AT
Δ	DELTA

LEGEND

- EXIST UNDERGROUND GAS MAIN
- EXIST UNDERGROUND GAS MAIN (HIGH PRESSURE)
- EXIST CABLE
- EXIST OVERHEAD ELECTRIC
- EXIST UNDERGROUND ELECTRIC
- EXIST IRRIGATION WATER
- EXIST FIBER OPTIC
- EXIST UNDERGROUND TELEPHONE
- EXIST UNDERGROUND STORM DRAIN
- EXIST UNDERGROUND SANITARY SEWER
- EXIST UNDERGROUND WATER
- EXIST UNKNOWN UTILITY
- TEMPORARY EASEMENT
- EASEMENT LINE
- EXISTING EASEMENT
- PROPERTY LINE
- EXIST ROAD CENTERLINE
- EDGE OF EXIST ASPHALT PAVEMENT
- LANE STRIPING
- EXIST 1' CONTOUR
- EXIST 5' CONTOUR
- EXIST TREE
- EXIST BARBWIRE FENCE
- EXIST CHAINLINK FENCE
- EXIST WOODRAIL FENCE
- EXIST WROUGHT IRON FENCE
- EXIST WALL
- EXIST STREET LIGHT
- EXIST TRAFFIC LIGHT
- EXIST CABLE TV, ELECTRIC TELEPHONE OR GAS VAULT
- EXIST UTILITY PULL BOX
- EXIST TRAFFIC SIGNAL CONTROL BOX
- EXIST DRAIN INLET (SD) / EXIST MANHOLE, SEWER (S) OR STORM DRAIN (D)
- EXIST GAS LINE INDICATOR
- EXIST WATER METER
- EXIST GAS METER
- EXIST GAS VALVE
- EXIST WATER VALVE
- EXIST FIRE HYDRANT
- EXIST BOLLARD
- EXIST BUILDING
- EXIST POWER POLE
- PIPELINE WITH STATION
- COORDINATE GRID
- BLOW OFF VALVE
- AVAR
- SURVEY CONTROL POINT
- UTILITY LOCATION UNCERTAIN. CONTRACTOR SHALL POTHOLE PRIOR TO SUBMITTING PIPE SHOP DRAWINGS.
- GEOTECHNICAL BORING LOCATION. SEE GEOTECHNICAL INVESTIGATION REPORT HTS,INC. DATED 2016
- EXISTING PRODUCTION WELL
- EXISTING MONITORING WELL
- BENCHMARK
- EXISTING SPOT ELEVATION
- NEW SPOT ELEVATION

GENERAL CONSTRUCTION NOTES

1. WORK TO BE DONE CONSISTS OF THE IMPROVEMENTS IN CONFORMANCE WITH THESE PLANS AND THE CONTRACT DOCUMENTS AND SPECIFICATIONS TOGETHER WITH ANY SUPPLEMENTAL INFORMATION REFERENCED HEREON.
2. APPROVAL BY EMWD IMPLIES NO PERMISSION OTHER THAN THAT WITHIN THE DISTRICT'S JURISDICTION. ALL PERMITS REQUIRED BY LAW AND NOT ALREADY OBTAINED BY THE DISTRICT SHALL BE ACQUIRED BY CONTRACTOR. REQUIREMENTS OF EMWD SHALL TAKE PRECEDENCE OVER REQUIREMENTS OF OTHER AGENCIES ONLY WHERE EMWD REQUIREMENTS ARE MORE STRINGENT.
3. THE PROPOSED WORK SHALL BE SUBORDINATE TO ANY OPERATIONS EMWD MAY CONDUCT AND SHALL BE COORDINATED WITH SUCH OPERATIONS AS DIRECTED BY EMWD.
4. CONTRACTOR SHALL PROTECT ALL EXISTING IMPROVEMENTS IN PLACE. SAID EXISTING IMPROVEMENTS SHALL INCLUDE BUT SHALL NOT BE LIMITED TO PIPES, BERMS, DITCHES, ROADWAYS, FENCES, AND PLANTS. ANY REMOVAL OR DAMAGE TO EXISTING IMPROVEMENTS SHALL BE REPLACED OR REPAIRED BY THE CONTRACTOR AND SHALL BE APPROVED BY THE OWNER AND EMWD.
5. THE CONTRACTOR SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY. THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY AND HOLD DESIGN PROFESSIONAL AND OWNER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT.
6. LINEAR FEET OF PIPE SHOWN ON THE DRAWINGS ARE HORIZONTAL MEASUREMENTS AND EXTEND THROUGH VALVES, BENDS, AND OTHER APPURTENANCES.
7. ALL MATERIALS TESTING AND INSPECTION OF PIPE SHALL BE IN CONFORMITY WITH THE REQUIREMENTS OF AWWA STANDARDS AND EMWD. FAILURE TO MEET SAID REQUIREMENTS WILL BE CAUSE FOR REJECTION.
8. THE CONTRACTOR SHALL SUBMIT THE SHORING PLANS FOR TRENCHES AND PITS PREPARED AND SIGNED BY A CALIFORNIA REGISTERED CIVIL ENGINEER TO THE DISTRICT FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
9. THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITIES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THE CONTRACTOR SHALL TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN, AND ANY OTHER LINES OR STRUCTURES NOT SHOWN ON THESE PLANS, AND IS RESPONSIBLE FOR THE PROTECTION OF, AND ANY DAMAGE TO THESE LINES OR STRUCTURES.
10. ALL EXISTING UNDERGROUND UTILITY LOCATIONS SHOWN HEREON ARE FROM PL.ANS FURNISHED BY THE RESPECTIVE UTILITY COMPANIES. CONTRACTOR SHALL CONTACT "UNDERGROUND SERVICE ALERT" (USA, 800–227–2600) TO VERIFY EXISTING UTILITY LOCATIONS ON SITE BEFORE COMMENCING CONSTRUCTION.
11. THE CONTRACTOR SHALL BE RESPONSIBLE TO REPORT DISCREPANCIES IN PLANS AND/OR CONDITIONS IMMEDIATELY TO THE DESIGN ENGINEER FOR RESOLUTION PRIOR TO CONSTRUCTION, AND SHALL BE RESPONSIBLE FOR DISCREPANCIES NOT SO REPORTED AND RESOLVED.

BASIS OF BEARINGS

THE BASIS OF BEARINGS IS THE CALIFORNIA COORDINATE SYSTEM, ZONE 6, BASED LOCALLY ON CONTINUOUS OPERATING REFERENCE STATIONS (CORS) "MLFP", "BILL", AND "P584" NAD83 (2011) (EPOCH: 2010.00). ALL BEARINGS AND DISTANCES SHOWN ON ARE GRID. GROUND DISTANCES MAY BE OBTAINED BY DIVIDING THE GRID DISTANCES BY THE COMBINED SCALE FACTOR OF 0.99992013. CALCULATIONS ARE MADE AT "1BASE" WITH COORDINATES N: 2234982.512 E: 6529948.695.

GRID DISTANCE/0.99992014 = GROUND DISTANCE

BENCHMARK

A USGS MONUMENT DESIGNATED "3–A", PID "DX5386" BEING A 3.5IN BRASS DISK ON TOP OF CONCRETE MONUMENT LOCATED 2.5 MILES NORTHWEST OF THE TOWN OF SAN JACINTO, AT THE SAN JACINTO RESERVOIR, 86 FEET SOUTH OF THE MOST NORTHERLY CORNER OF THE RESERVOIR CHAIN LINK FENCE, 45 FEET FROM THE NORTHWEST CHAIN LINK FENCE, 66 FEET FROM THE NORTHEAST CHAIN LINK FENCE.

COORDINATES: N 2237191.77 E: 6335284.67

RECYCLED WATER NOTES

1. RECYCLED WATERLINE AND APPURTENANT CONSTRUCTION SHALL BE IN ACCORDANCE WITH EMWD STANDARDS, SPECIFICATIONS AND GUIDELINES FOR RECYCLED WATER SYSTEMS.
2. PRIOR TO CONSTRUCTION OF PIPELINE, CONTRACTOR SHALL EXPOSE THE EXISTING RECYCLED WATER SYSTEM AND VERIFY ITS EXISTING ELEVATION AND LOCATION.
3. PERMANENT AND TEMPORARY BLOW–OFF ASSEMBLIES SHALL BE INSTALLED IN ACCORDANCE WITH STD. DWG. PA–1. ALL PIPING JOINTS SHALL BE RESTRAINED FROM THE MAIN LINE TO THE BLOW–OFF ASSEMBLY. INSTALL GUARD AND MARKER POSTS PER EMWD STD. DWG. 8–665.
4. 2" AIR VALVE ASSEMBLIES SHALL BE INSTALLED IN ACCORDANCE WITH STD. DWG. PB–9, TYPE A. ALL PIPING JOINTS SHALL BE RESTRAINED FROM THE MAIN LINE TO THE AIR VALVE ASSEMBLY. INSTALL GUARD AND MARKER POSTS PER EMWD STD. DWG. B–665.
5. INSTALL LOCATOR WIRE OVER RECYCLED WATER MAIN PER STD. DWG. B–656.
6. STATIONING SHOWN IS BASED ON PIPE CENTERLINE STATIONS.
7. ALL CONSTRUCTION SHOULD OBEY THE FOLLOWING SEPARATION STANDARDS:
   a. PARALLEL CONSTRUCTION:
      THE HORIZONTAL DISTANCE BETWEEN POTABLE WATER MAINS AND RECYCLED WATER MAINS SHALL BE AT LEAST 10 FEET (OUTSIDE OF PIPE TO OUTSIDE OF PIPE).
      THE HORIZONTAL DISTANCE BETWEEN GAS PIPELINES AND RECYCLED WATER MAINS SHALL BE AT LEAST 2 FEET (OUTSIDE OF PIPE TO OUTSIDE OF PIPE).
   b. PERPENDICULAR CONSTRUCTION (CROSSING):
      POTABLE WATER MAINS SHALL BE AT LEAST ONE–FOOT ABOVE SEWER OR RECYCLED WATER MAINS WHERE THESE LINES MUST CROSS.
   ANY DEVIATION FROM THESE STANDARDS WILL REQUIRE SPECIAL PROVISIONS AS REQUIRED ON THE PLANS.
8. ALL RECYCLED WATER FACILITIES SHALL BE MARKED IN ACCORDANCE WITH EMWD REGULATIONS FOR PIPING CARRYING RECYCLED WATER. WARNING TAPE SHALL BE A MINIMUM OF 3 INCHES WIDE AND SHALL RUN CONTINUOUSLY FOR THE ENTIRE LENGTH OF ALL RECYCLED WATER MAIN LINE PIPING. THE TAPE SHALL BE LAID 6 INCHES ABOVE THE TOP OF THE PIPE. THE TAPE SHALL READ "CAUTION: NON POTABLE WATER" PER STD. DWG. PB–6. TAPE COLOR SHALL BE PURPLE.
9. ALL VALVE CAPS AND RISERS SHALL BE TRIANGULAR IN SHAPE AND CONSTRUCTED PER EMWD STD. DWG. PB–2.
10. AFTER THE PIPELINE IS BACKFILLED, BUT BEFORE THE CONSTRUCTION CONTRACT IS COMPLETED, THE PIPELINE SHALL BE TESTED BY EMWD AT THE CONTRACTOR'S EXPENSE TO INSURE THAT THE JOINT BONDS, INSULATED JOINTS AND TEST STATIONS ARE INTACT AND PROPERLY INSTALLED. ALSO, NATIVE PIPE–TO–SOIL POTENTIALS SHALL BE MEASURED AND RECORDED AND A REPORT SHALL BE SUBMITTED INCLUDING THIS DATA. CATHODIC PROTECTION SYSTEM SHALL BE TESTED AS WELL.
11. WHERE SEWERS HAVE BEEN CONSTRUCTED BY AGENCIES OTHER THAN EMWD, CONTRACTOR SHALL VERIFY SEWER LATERAL LOCATIONS PRIOR TO EXCAVATION FOR RECYCLED WATER PIPELINE. IN THE EVENT SEWER LATERALS ARE FOUND TO BE AT A DEPTH LESS THAN IN ACCORDANCE WITH EMWD SEWER STANDARDS (INSIDE CITY OF SAN JACINTO, REFER TO CITY OF SAN JACINTO STANDARD NO. S600), RECYCLED WATER PIPELINE CONTRACTOR SHALL ADJUST RECYCLED WATER PIPELINE DEPTH AS DIRECTED BY THE DESIGN ENGINEER TO CROSS OVER THE SEWER LATERAL IF POSSIBLE TO PROVIDE 36–INCH MINIMUM COVER TO FINISH ROAD GRADE; OTHERWISE CROSS UNDER LATERAL.
12. ALL NEW BURIED CONSTANT PRESSURE TRANSMISSION/DISTRIBUTION PIPING IN THE RECYCLED WATER SYSTEM, INCLUDING SERVICE LINES, VALVES, AND OTHER APPURTENANCES SHOULD EITHER BE COLORED PURPLE, DANATONE 522C, AND EMBOSSED OR BE INTEGRALLY STAMPED/MARKED "CAUTION: RECYCLED WATER DO NOT DRINK", OR BE INSTALLED WITH A PURPLE IDENTIFICATION TAPE, OR A PURPLE POLYETHYLENE VINYL WRAP, COLOR TO BE PANATONE 512C.

CITY OF SAN JACINTO GENERAL NOTES

1. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE SPECIFICATIONS FOR THE IMPROVEMENTS OF DEVELOPMENTS WITHIN THE CITY OF SAN JACINTO, IN ACCORDANCE WITH THE COUNTY OF RIVERSIDE ORDINANCES AND STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION 1997 EDITION.
2. THE CONTRACTOR SHALL SECURE ALL PERMITS REQUIRED BY THE CITY OF SAN JACINTO AND COUNTY OF RIVERSIDE, PRIOR TO COMMENCEMENT OF ANY WORK.
3. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE PUBLIC WORKS DEPARTMENT 24 HOURS IN ADVANCE, PRIOR TO THE CONCLUSION OF EACH PHASE OF WORK, SO THAT THE CONSTRUCTION INSPECTOR CAN INSPECT THE WORK BEING DONE.
4. ASPHALT CONCRETE PAVING SHALL COMPLY WITH THE RIVERSIDE COUNTY SPECIFICATIONS FOR 1/2–INCH MAXIMUM AGGREGATE. THE MIX SHALL CONTAIN NOT LESS THAN 5% BY GROSS BATCH WEIGHT OF AR 8000 ASPHALT AS DEFINED IN SECTION 92 – BITUMINOUS MATERIAL OF THE STANDARD SPECIFICATION OF THE STATE OF CALIFORNIA DATED, JULY 1999.
5. CURBS, GUTTERS, SIDEWALKS AND STREET SIGNS SHALL BE INSTALLED, AS PER COUNTY OF RIVERSIDE STANDARDS, EXCEPT AS NOTED.
6. ANY RELOCATION OR UNDER GROUNDING OF EXISTING FACILITIES SHALL BE THE RESPONSIBILITY AND AT THE EXPENSE OF THE CONTRACTOR.
7. THE TOP 5 FEET OF THE TRENCH BACKFILL AND ALL BEDDING SHALL BE COMPACTED TO 90% MINIMUM RELATIVE COMPACTION EXCEPT THAT THE TOP 12–INCHES OF SUBGRADE MATERIAL SHALL BE COMPACTED TO 95% MINIMUM RELATIVE COMPACTION ACCORDING TO ASTM D698. BACKFILL BELOW 5 FEET SHALL BE COMPACTED TO 85% MINIMUM RELATIVE COMPACTION.
8. ALL STORM RELATED FACILITIES (ABOVE OR BELOW GROUND) SHALL BE MAINTAINED BY THE CONTRACTOR UNTIL INSTALLATION OF ULTIMATE FACILITIES AS APPROVED BY THE CITY OF SAN JACINTO.
9. THE FINAL PAVING COURSE FOR ROAD MIX AND A.C. SURFACE STREETS SHALL BE 0.15 FEET THICK AND A MINIMUM OF 10 FEET WIDE OR AS WIDE AS NECESSARY TO COVER ALL BREAK–OUTS AND OVERLAP EXISTING PAVEMENT 2 FEET ON EITHER SIDE OF THE TRENCH, WHICHEVER IS THE GREATER. THE FINAL PAVING COURSE SHALL BE LAID WITH A SELF PROPELLED MECHANICAL SPREADING AND FISHING MACHINE EQUIPPED WITH TAMPER BARS AND AUTOMATIC SCREED. (BARBER GREENE OR AN APPROVED EQUAL PAVING MACHINE).
10. ALL STREET SUBGRADE MATERIAL AND A.B. MATERIAL SHALL BE COMPACTED TO 95% DENSITY FOR THE TOP 12–INCHES. BASE R VALUES SHALL BE OBTAINED PRIOR TO THE PLACEMENT OF ANY BASE MATERIAL.
11. ALL STREETS SHALL BE FOG SEALED. (0.05 GAL. SQ. YD. MINIMUM)
12. PROVIDE RAMPS FOR THE HANDICAPPED AT ALL SIDEWALKS INTERSECTIONS, PER A.D.A STANDARDS. THE CITY OF SAN JACINTO INSPECTOR WILL LOCATE RAMPS AT THE TIME OF CONSTRUCTION. SCORE MARKS FOR BLIND PERSONS SHALL BE PROVIDED AT ALL HANDICAPPED RAMPS IN ACCORDANCE WITH A.D.A STANDARDS.
13. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO TEMPORARILY PATCH ALL UTILITY TRENCHES WITHIN EXISTING PAVED STREETS. THE TEMPORARY PATCH SHALL BE REMOVED AND REPLACED WITH A PERMANENT PATCH AT THE TIME OF THE A.C. SURFACING, AND THE CONTRACTOR SHALL BE RESPONSIBLE FOR A MINIMUM OF ONE YEAR FOR ANY AND ALL FAILURES.
14. THE CONTRACTOR WILL HOLD HARMLESS, INDEMNIFY AND DEFEND THE CITY OF SAN JACINTO, THE OWNER, THE ARCHITECT, THE ENGINEER AND HIS CONSULTANTS, EACH OF THEIR OFFICERS, EMPLOYEES AND AGENTS, FROM ANY AND ALL LIABILITY CLAIMS, LOSSES OR DAMAGE ARISING OR ALLEGED TO ARISE FROM THE PERFORMANCE OF WORK DESCRIBED HEREIN, BUT NOT INCLUDING THE SOLE NEGLIGENCE OF THE CITY OF SAN JACINTO, THE OWNER, THE ARCHITECT, THE ENGINEER AND HIS CONSULTANTS AND EACH OF THEIR OFFICERS, EMPLOYEES AND AGENTS.
15. A 24–HOUR NOTICE IS REQUIRED PRIOR TO THE PUBLIC WORKS INSPECTION.
16. ALL CONCRETE SHALL BE A MINIMUM OF 2,500 PSI, PER SECTION 201.1.2. THE MIX DESIGN SHALL BE 520–C–2500 (5–1/2 SACK).
17. SURVEY MONUMENTS SHALL BE INSTALLED, PER RIVERSIDE COUNTY STANDARD 901 AND 903. MONUMENTS SHALL BE INSTALLED WITHIN 30 DAYS AFTER COMPLETION OF SUBDIVISION IMPROVEMENTS.
18. ANY IMPROVEMENTS NOT IN COMPLIANCE WITH FEDERAL ADA STANDARDS SHALL BE REMOVED AND REPLACED AT THE DEVELOPERS COST.
19. THE CONTRACTOR SHALL TREAT THE DEWATERED GROUNDWATER IN COMPLIANCE WITH REGIONAL WATER QUALITY DISCHARGE. THE CONTRACTOR SHALL PREPARE AND SUBMIT A WATER QUALITY MANAGEMENT PLAN (WQMP) TO THE CITY OF SAN JACINTO FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
20. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEWATERING OF PITS AND TRENCHES DURING CONSTRUCTION PER GEOTECHNICAL REPORT DATED NOVEMBER 10, 2009.
21. THE CONTRACTOR SHALL BACKFILL THE TRENCHES DURING WORKING HOURS IF THE CONTRACTOR DOES NOT BACKFILL THE TRENCH, HE SHALL COVER ALL THE OPEN TRENCHES WITH APPROVED STEEL PLATES.

UTILITY NOTIFICATIONS

CONTRACTOR SHALL NOTIFY THE FOLLOWING ENTITIES AT LEAST 48 HOURS IN ADVANCE OF STARTING CONSTRUCTION:

EASTERN MUNICIPAL WATER DISTRICT FIELD ENGINEERING DEPARTMENT	(951) 928–3777 EXT. 4830
CITY OF SAN JACINTO	(951) 654–3592
UNDERGROUND SERVICE ALERT	(800) 227–2600

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

GENERAL CIVIL NOTES, ABBREVIATIONS AND LEGEND

PROJECT NO. 26793–214344
FILE NAME: 00–C–001
SHEET NO. 00-C-001

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

XREFs: [CDMS_2234] Images: [811 DigMert]
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PLAN
1" = 40'

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. LIN
DRAWN BY: C. ANDERSON
SHEET CHK'D BY: XX
CROSS CHK'D BY: XX
APPROVED BY: XX
DATE: MAY 2018

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111 Academy Way, Suite 150
Irvine, California 92□17
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

OVERALL SITE PLAN

PROJECT NO. 26793-214344
FILE NAME: 00-C-002
SHEET NO. 00-C-002

XREFs: [CSTPL001, CDMS_2234, CSTPL004, CWP000ST-REV4, MWP000PB] Images: [image352]
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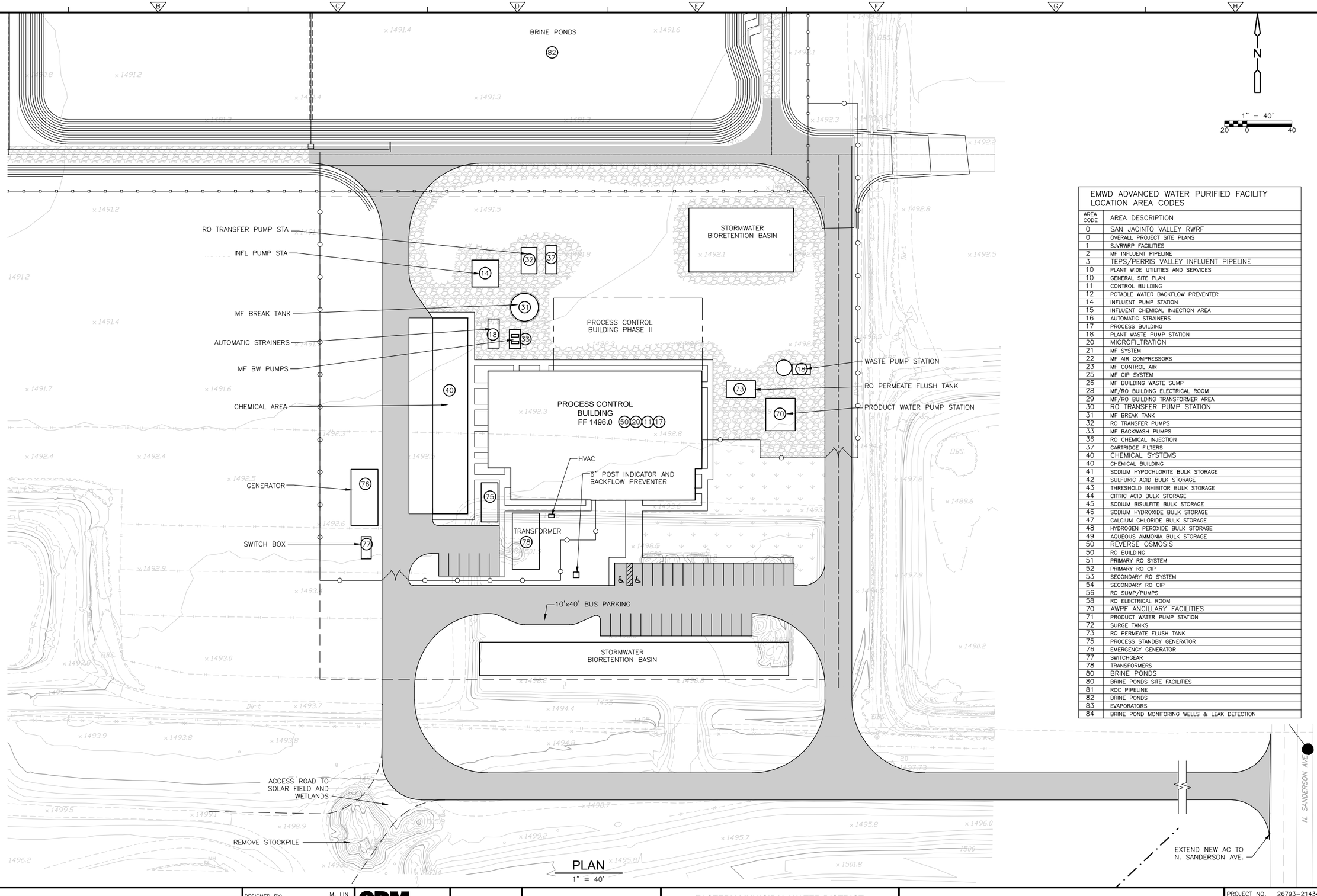

PLAN
1" = 40'

EMWD ADVANCED WATER PURIFIED FACILITY LOCATION AREA CODES	
AREA CODE	AREA DESCRIPTION
0	SAN JACINTO VALLEY RWRF
0	OVERALL PROJECT SITE PLANS
1	SJVRWRP FACILITIES
2	MF INFLUENT PIPELINE
3	TEPS/PERRIS VALLEY INFLUENT PIPELINE
10	PLANT WIDE UTILITIES AND SERVICES
10	GENERAL SITE PLAN
11	CONTROL BUILDING
12	POTABLE WATER BACKFLOW PREVENTER
14	INFLUENT PUMP STATION
15	INFLUENT CHEMICAL INJECTION AREA
16	AUTOMATIC STRAINERS
17	PROCESS BUILDING
18	PLANT WASTE PUMP STATION
20	MICROFILTRATION
21	MF SYSTEM
22	MF AIR COMPRESSORS
23	MF CONTROL AIR
25	MF CIP SYSTEM
26	MF BUILDING WASTE SUMP
28	MF/RO BUILDING ELECTRICAL ROOM
29	MF/RO BUILDING TRANSFORMER AREA
30	RO TRANSFER PUMP STATION
31	MF BREAK TANK
32	RO TRANSFER PUMPS
33	MF BACKWASH PUMPS
36	RO CHEMICAL INJECTION
37	CARTRIDGE FILTERS
40	CHEMICAL SYSTEMS
40	CHEMICAL BUILDING
41	SODIUM HYPOCHLORITE BULK STORAGE
42	SULFURIC ACID BULK STORAGE
43	THRESHOLD INHIBITOR BULK STORAGE
44	CITRIC ACID BULK STORAGE
45	SODIUM BISULFITE BULK STORAGE
46	SODIUM HYDROXIDE BULK STORAGE
47	CALCIUM CHLORIDE BULK STORAGE
48	HYDROGEN PEROXIDE BULK STORAGE
49	AQUEOUS AMMONIA BULK STORAGE
50	REVERSE OSMOSIS
50	RO BUILDING
51	PRIMARY RO SYSTEM
52	PRIMARY RO CIP
53	SECONDARY RO SYSTEM
54	SECONDARY RO CIP
56	RO SUMP/PUMPS
58	RO ELECTRICAL ROOM
70	AWPF ANCILLARY FACILITIES
71	PRODUCT WATER PUMP STATION
72	SURGE TANKS
73	RO PERMEATE FLUSH TANK
75	PROCESS STANDBY GENERATOR
76	EMERGENCY GENERATOR
77	SWITCHGEAR
78	TRANSFORMERS
80	BRINE PONDS
80	BRINE PONDS SITE FACILITIES
81	ROC PIPELINE
82	BRINE PONDS
83	EVAPORATORS
84	BRINE POND MONITORING WELLS & LEAK DETECTION

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. LIN
DRAWN BY: C. ANDERSON
SHEET CHK'D BY: XX
CROSS CHK'D BY: XX
APPROVED BY: XX
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

AWTF SITE PLAN

PROJECT NO. 26793-214344
FILE NAME: 00-C-003

SHEET NO.
00-C-003

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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4"–ROC–SST SEE 80–C–001 FOR CONTINUATION

RO TRANSFER PUMP STA

MF BREAK TANK

INFL PUMP STA

STORMWATER BIORETENTION BASIN

24"–ROF–SST

24"–MFF–ELSP

24"–MFI–ELSP

4"–ROC–SST

24"–MFF–ELSP

24"–MFF–ELSP

3"–D–PVC

AUTOMATIC STRAINERS

PROCESS CONTROL BUILDING PHASE II

WASTE PUMP STATION

MF BW PUMPS

12"–BWS–ELSP

RO PERMEATE FLUSH TANK

CHEMICAL AREA

24"–MFI–ELSP

PRODUCT WATER PUMP STATION

PROCESS CONTROL BUILDING FF 1496.0

ELECTRICAL ROOM CONDENSING UNITS

14"–ROP–PVC

14"–ROP–PVC

GENERATOR

HVAC

6" POST INDICATOR AND BACKFLOW PREVENTER

12"–PW/OF–PVC

TRANSFORMER

SWITCH BOX

10'x40' BUS PARKING

8"–UW–PVC

STORMWATER BIORETENTION BASIN

8"–PW–PVC SEE 00–C–002 FOR CONTINUATION

8"–UW–PVC SEE 00–C–002 FOR CONTINUATION

6"–CW–PVC SEE 00–C–002 FOR CONTINUATION

24"–MFF–ELSP SEE 00–C–002 FOR CONTINUATION

CONNECT TO EXISTING 42" TE

N

1" = 40'

20 0 40

NOTES:
ONLY MAJOR PIPING SHOWN.
FINAL DESIGN SHOULD INVESTIGAE WHETHER THERE IS ADEQUATE FLOWS IN THE UA LINE FOR FIRE WATER.

PLAN
1" = 40'

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. LIN
DRAWN BY: C. ANDERSON
SHEET CHK'D BY: XX
CROSS CHK'D BY: XX
APPROVED BY: XX
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92::17
Tel: (949) 752-5452

emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

AWTF YARD PIPING PLAN

PROJECT NO. 26793–214344
FILE NAME: 00–C–004

SHEET NO.
00-C-004

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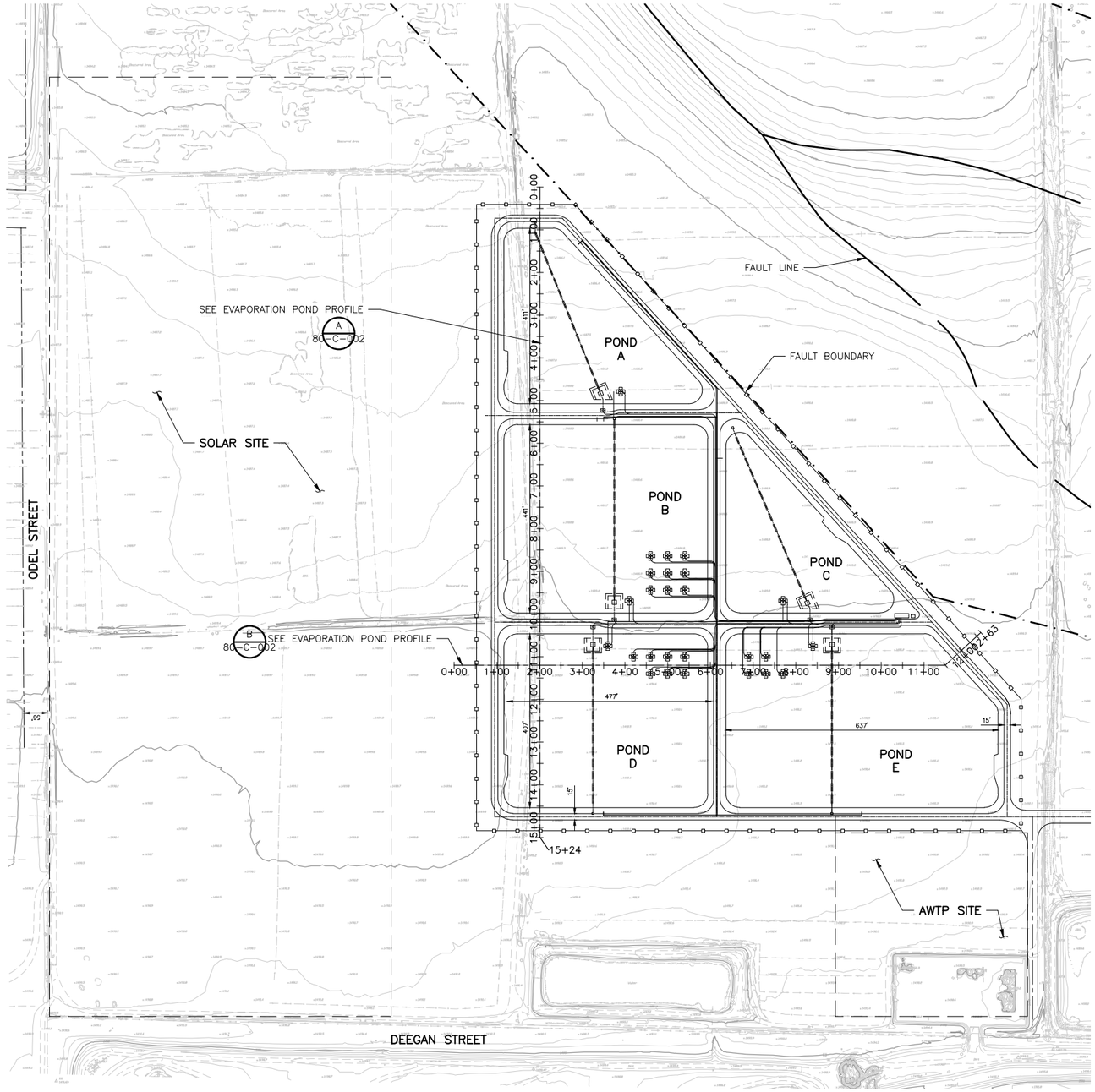
PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION



PLAN
1" = 150'

1" = 150'
125 0 150

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: E. CHANG
DRAWN BY: C. ANDERSON
SHEET CHK'D BY: XX
CROSS CHK'D BY: XX
APPROVED BY: XX
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92::17
Tel: (949) 752-5452

emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

BRINE EVAPORATION POND PLAN

PROJECT NO. 26793-214344
FILE NAME: 80-C-001

SHEET NO.
80-C-001

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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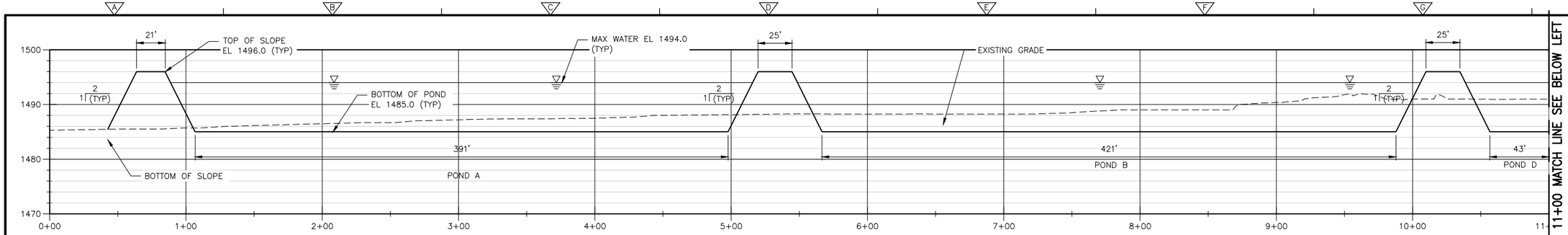
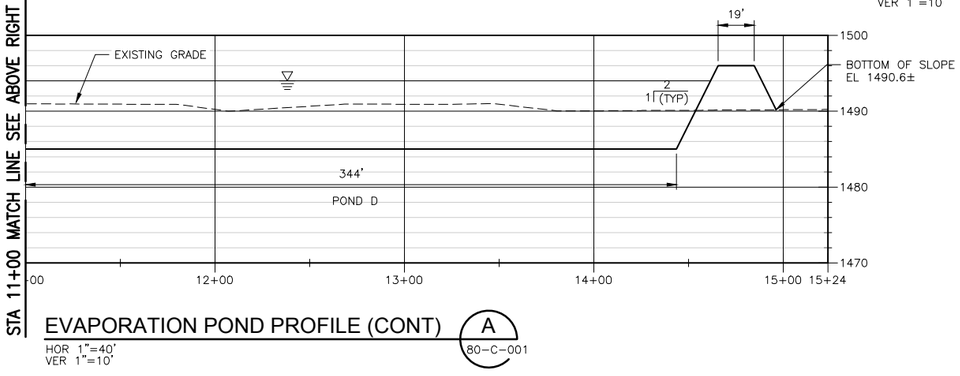


EVAPORATION POND PROFILE A

HOR 1"=40'
VER 1"=10'

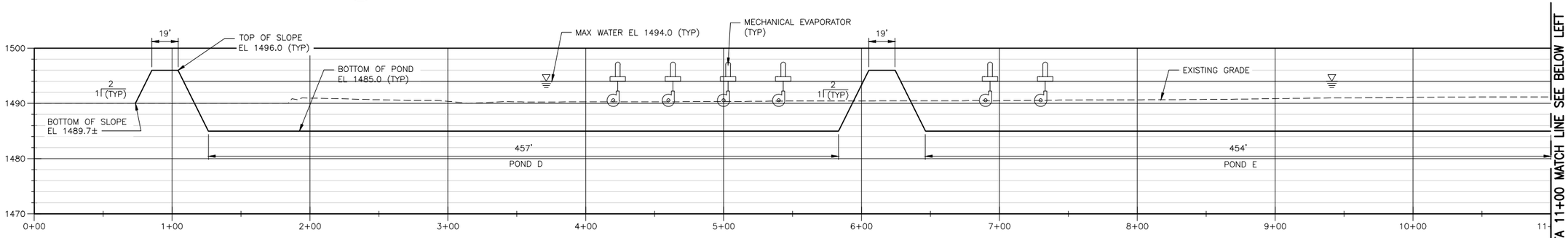
80-C-001



EVAPORATION POND PROFILE (CONT) A

HOR 1"=40'
VER 1"=10'

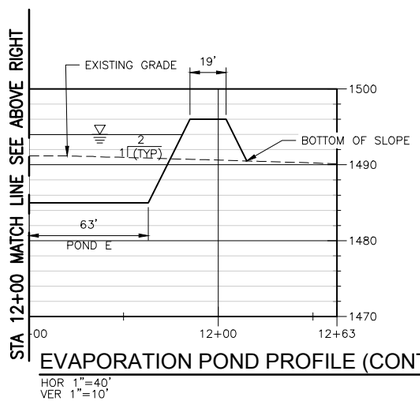
80-C-001



EVAPORATION POND PROFILE B

HOR 1"=40'
VER 1"=10'

80-C-001



EVAPORATION POND PROFILE (CONT) A

HOR 1"=40'
VER 1"=10'

80-C-001

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: E. CHANG
DRAWN BY: C. ANDERSON
SHEET CHK'D BY: XX
CROSS CHK'D BY: XX
APPROVED BY: XX
DATE: MAY 2018

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111 Academy Way, Suite 150
Irvine, California 92::17
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

BRINE EVAPORATION POND PROFILES

PROJECT NO. 26793-214344
FILE NAME: 80-C-002

SHEET NO.
80-C-002

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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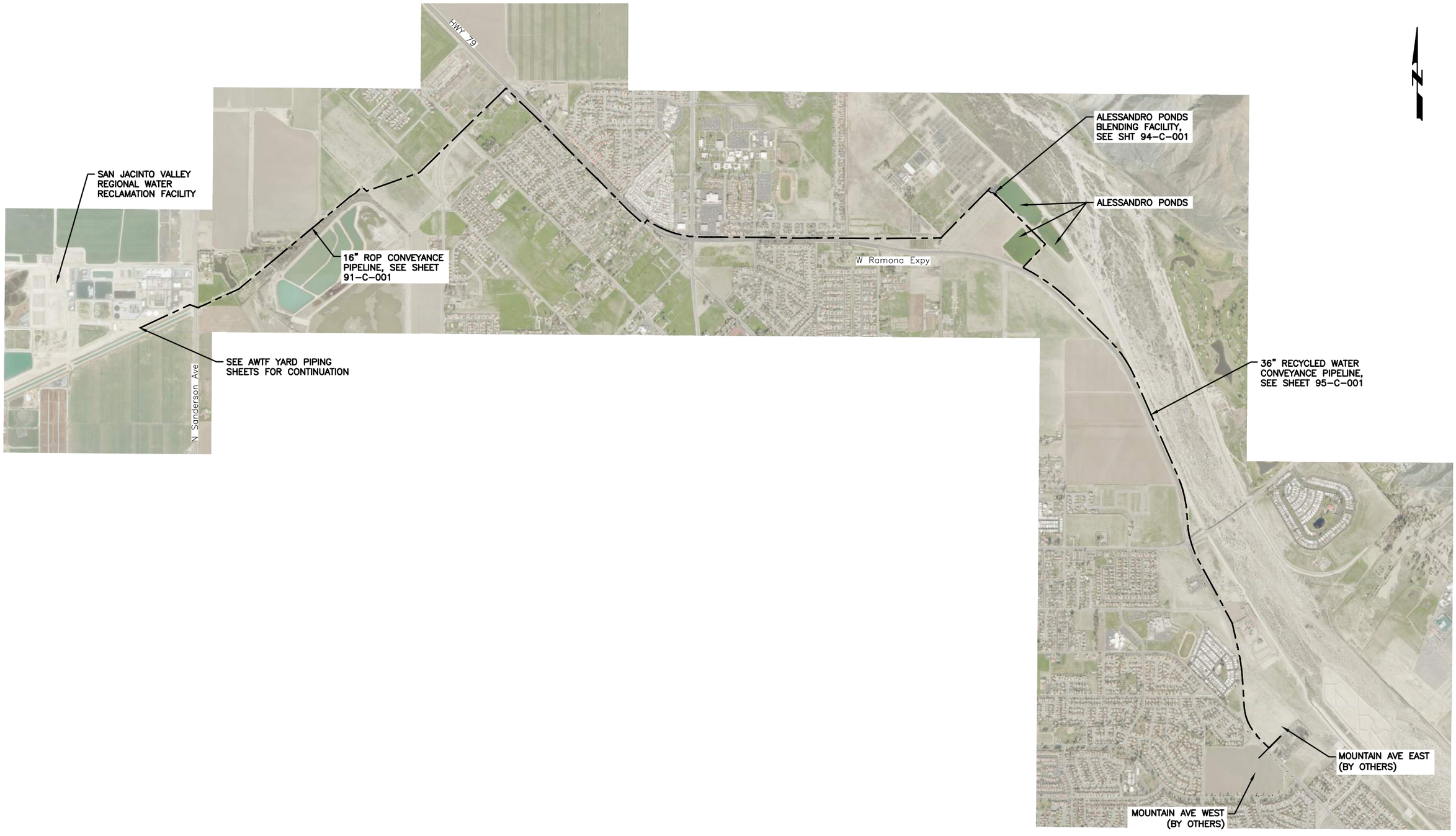

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A.GOH
DRAWN BY: O.NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92□17
Tel: (949) 752-5452

emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

CONVEYANCE PIPELINE OVERALL PLAN

PROJECT NO. 26793-214344
FILE NAME: 90-C-001

SHEET NO.
90-C-001

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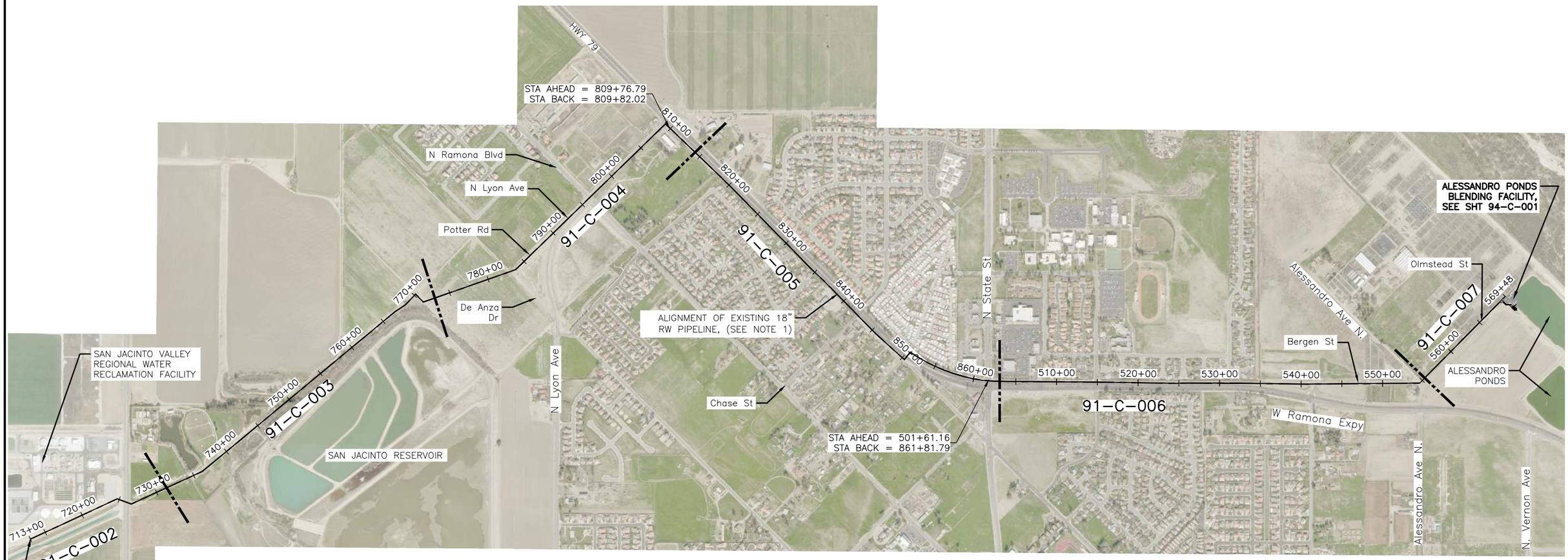
PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION



NOTES:

1. ALIGNMENT AND STATIONS OF EXISTING 18" RW STEEL PIPELINE ARE APPROXIMATE PER SD-1767, SD-1768,SD-1769,SD-1770, SD-1771, AND SD-1771.

N

1" = 600'

300 0 600

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

ROP CONVEYANCE PIPELINE
KEY PLAN

PROJECT NO. 26793-214344
FILE NAME: 91-C-001

SHEET NO.
91-C-001

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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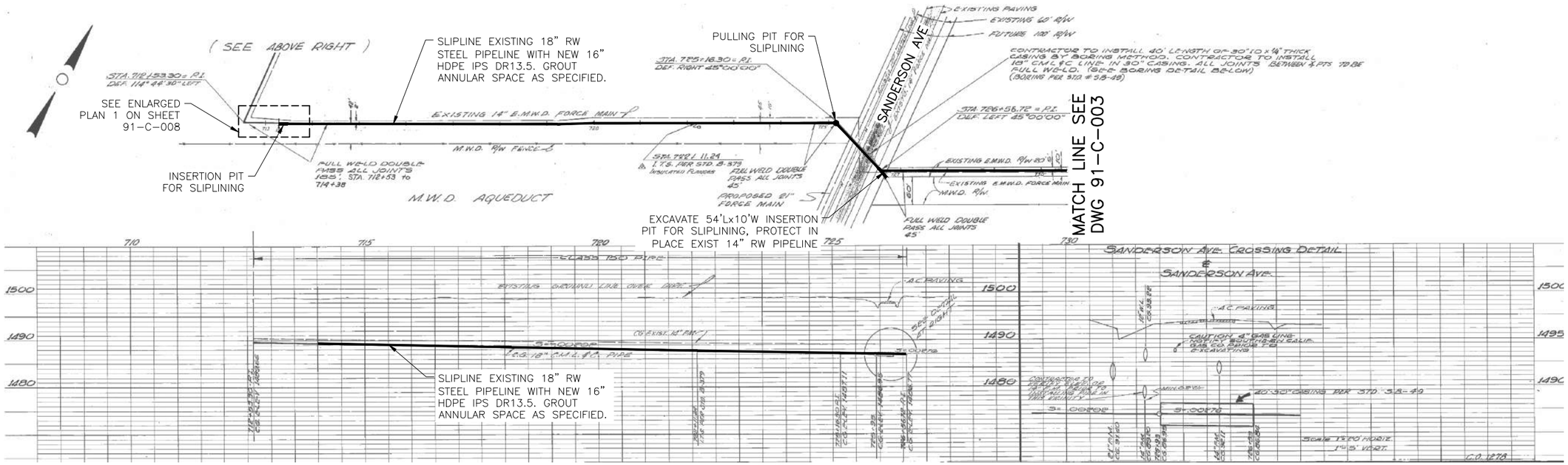

NOTES:

1. SCREENED INFORMATION (GRAYED OUT) ON THIS SHEET REPRESENT AS-BUILT CONDITIONS AS SHOWN ON SD-1767.
2. PLAN AND PROFILE SHOWN ON THIS SHEET ARE BASED ON THE NGVD 29 DATUM. BENCHMARK CONVERSION FROM NGVD 29 TO NAVD 88: NAVD 88 = NGVD 29 + 2.31 FEET.
3. CONTRACTOR TO VERIFY EXISTING ELEVATIONS IN THE FIELD PRIOR TO ANY CONSTRUCTION AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES.

1" = 120'
60 0 120
APPROXIMATE

811 CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

ROP CONVEYANCE PIPELINE
PLAN AND PROFILE 1 OF □

PROJECT NO. 26793-214344
FILE NAME: 91-C-002

SHEET NO.
91-C-002

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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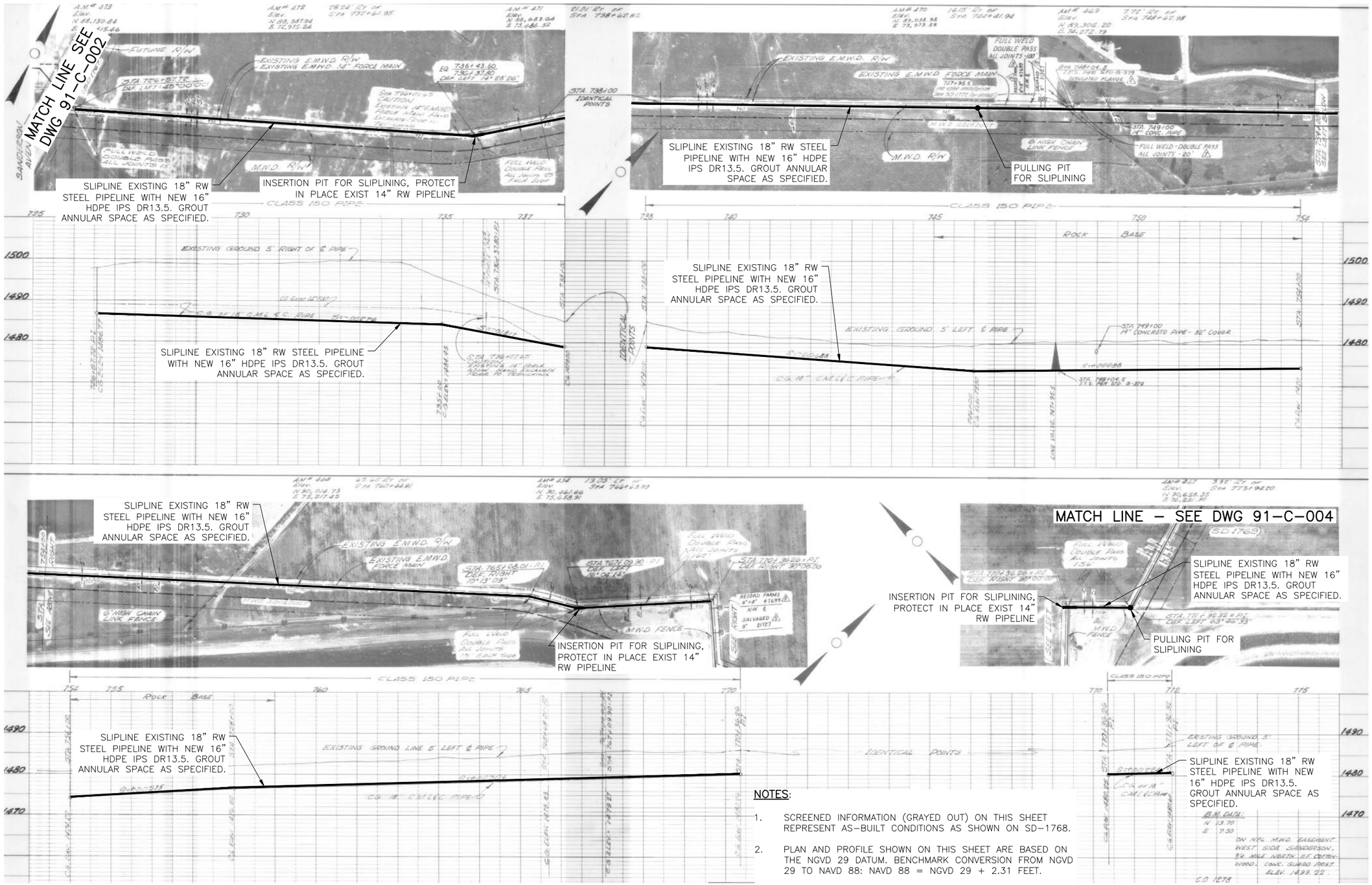

NOTES:

1. SCREENED INFORMATION (GRAYED OUT) ON THIS SHEET REPRESENT AS-BUILT CONDITIONS AS SHOWN ON SD-1768.
2. PLAN AND PROFILE SHOWN ON THIS SHEET ARE BASED ON THE NGVD 29 DATUM. BENCHMARK CONVERSION FROM NGVD 29 TO NAVD 88: NAVD 88 = NGVD 29 + 2.31 FEET.
3. CONTRACTOR TO VERIFY EXISTING ELEVATIONS IN THE FIELD PRIOR TO ANY CONSTRUCTION AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES.

1" = 120'
60 0 120
APPROXIMATE

CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92::17
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

ROP CONVEYANCE PIPELINE
PLAN AND PROFILE 2 OF □

PROJECT NO. 26793-214344
FILE NAME: 91-C-003
SHEET NO. 91-C-003

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PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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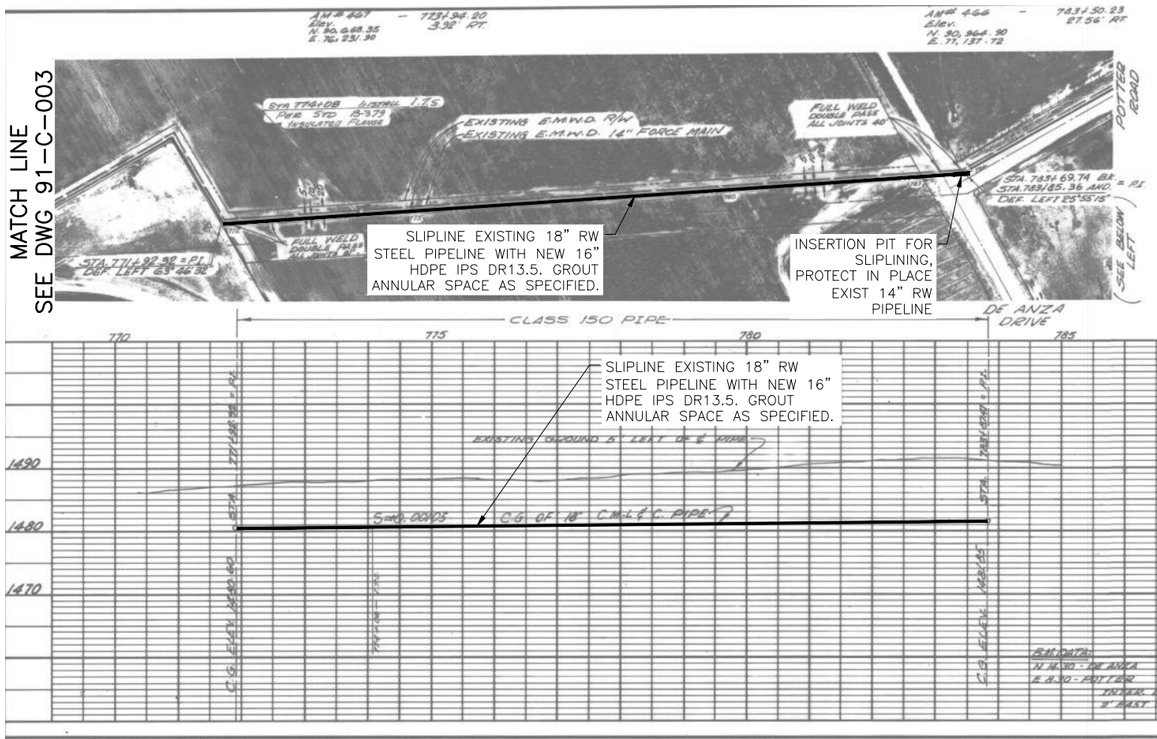

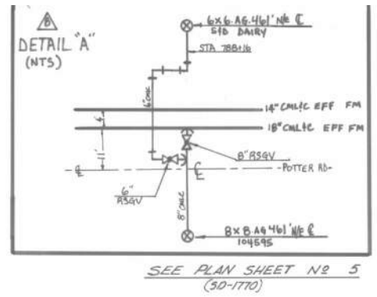

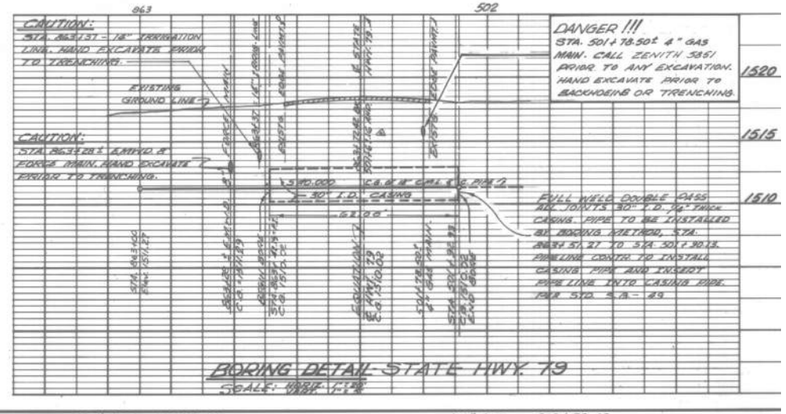

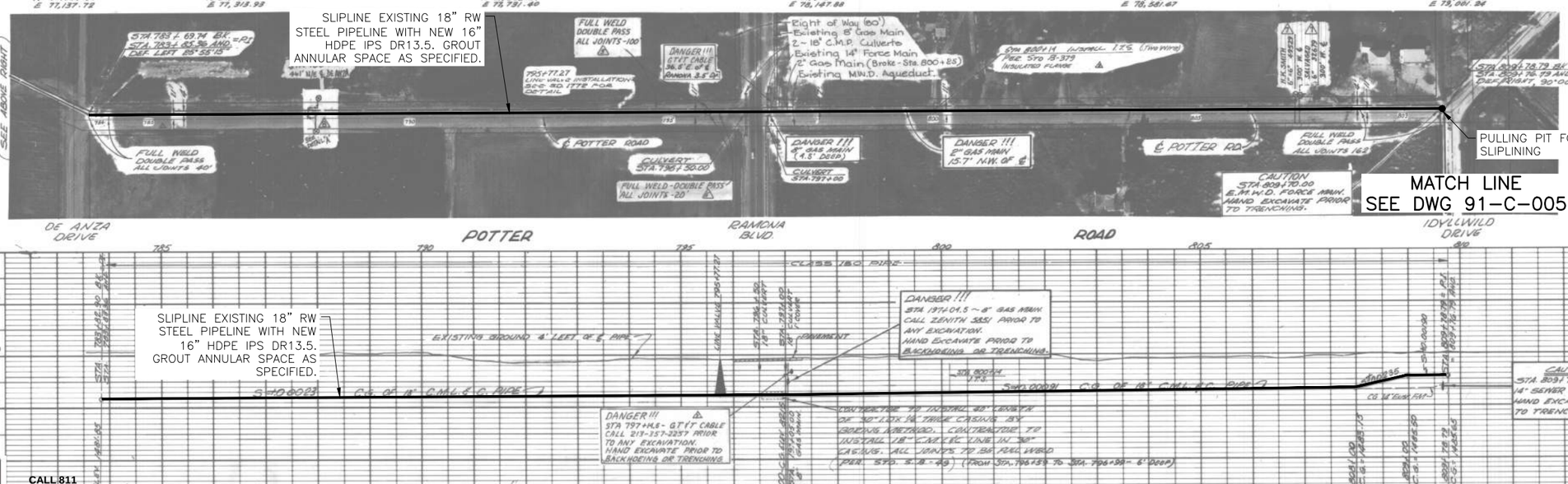

NOTES:

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2. PLAN AND PROFILE SHOWN ON THIS SHEET ARE BASED ON THE NGVD 29 DATUM. BENCHMARK CONVERSION FROM NGVD 29 TO NAVD 88: NAVD 88 = NGVD 29 + 2.31 FEET.
3. CONTRACTOR TO VERIFY EXISTING ELEVATIONS IN THE FIELD PRIOR TO ANY CONSTRUCTION AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES.

CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

1" = 120'
60 0 120
APPROXIMATE

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

ROP CONVEYANCE PIPELINE
PLAN AND PROFILE 3 OF □

PROJECT NO. 26793-214344
FILE NAME: 91-C-004

SHEET NO.
91-C-004

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PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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MATCH LINE – SEE DWG 91-C-004

SEE ENLARGED PLAN AND PROFILE ON SHEET 91-C-009

PULLING PIT

FULL WELD DOUBLE-PASS ALL JOINTS 18"

CAUTION STA. 8102+08.00 W.M.D. 13.5' AQUEDUCT. HAND EXCAVATE PRIOR TO TRENCHING.

CAUTION STA. 8197+93, SAN VICENTE 8' AQUEDUCT. HAND EXCAVATE PRIOR TO TRENCHING

Existing 14" C.M.L.&C. Force Main
Existing 13.5' M.W.D. Aqueduct
Right of Way Lines (60')

POTTER ROAD

SLIPLINE EXISTING 18" RW STEEL PIPELINE WITH NEW 16" HDPE IPS DR13.5. GROUT ANNULAR SPACE AS SPECIFIED.

INSERTION PIT FOR SLIPLINING, PROTECT IN PLACE EXIST 14" RW PIPELINE

Existing 8' San Vicente Aqueduct

EXISTING EMWD FORCE MAIN

EMWD METER

STA. 8199+23 INSTALL 1.75 FBE STD. B-37 INSULATED FLANGES

FUTURE RAMONA EXPRESSWAY

℄ IDYLLWILD DRIVE

INSERTION PIT FOR SLIPLINING, PROTECT IN PLACE EXIST 14" RW PIPELINE

STA. 8361+93.26 = P.I. DEF. RIGHT 2°34'36"

STA. 8361+93.26 = P.I. DEF. LEFT 2°34'36"

STA. 8381+50.00

SEE LOWER LEFT

IDYLLWILD DRIVE

SLIPLINE EXISTING 18" RW STEEL PIPELINE WITH NEW 16" HDPE IPS DR13.5. GROUT ANNULAR SPACE AS SPECIFIED.

SLIPLINE EXISTING 18" RW STEEL PIPELINE WITH NEW 16" HDPE IPS DR13.5. GROUT ANNULAR SPACE AS SPECIFIED.

SEE ENLARGED PLAN AND PROFILE ON SHEET 91-C-009

CLASS 150 PIPE

STA. 8378+03.83 = P.I. & B.C. DEFLECTION ANGLE 70° RADIAL BEARING DEF. LEFT 19°51'14"

SLIPLINE EXISTING 18" RW STEEL PIPELINE WITH NEW 16" HDPE IPS DR13.5. GROUT ANNULAR SPACE AS SPECIFIED.

INSERTION PIT FOR SLIPLINING, PROTECT IN PLACE EXIST 14" RW PIPELINE

CAUTION !!! 8" WATER LINE HAND EXCAVATE PRIOR TO TRENCHING (44' N. of ℄ IDYLLWILD)

CAUTION !!! 2" GAS MAIN—3' DEEP HAND EXCAVATE PRIOR TO TRENCHING (40' N. of ℄ IDYLLWILD)

PULLING PIT FOR SLIPLINING

STA. 857+03.43 LINE VALVE INSTALLATION SEE SD 1772 FOR DETAIL

Right of Way Lines (60')
Existing 14" Water Line
Existing EMWD 8" Force Main
Existing 4" Gas Main

FULL WELD DOUBLE PASS ALL JOINTS 18"

FUTURE RAMONA EXPRESSWAY

STA. 8543+42.19 = P.I. DEF. RIGHT 0°51'35"

STA. 8544+66.94 DEF. LEFT 90°00'00"

EQUATION STA. 8563+78.42 BK. EQ. = STA. 8563+61.16 AHD. DEF. RIGHT 90°00'00"

DANGER!!! G.T.F.T. CABLE

Existing 14" C.M.L.&C. Force Main
Right of Way Lines (66')

STATE HWY 79

MATCH LINE – SEE DWG 91-C-006

SEE UPPER RIGHT

STA. 8381+50

STA. 8441+98.37 = P.I. DEF. RIGHT 2°34'36"

STA. 8441+98.37 = P.I. DEF. LEFT 2°34'36"

SLIPLINE EXISTING 18" RW STEEL PIPELINE WITH NEW 16" HDPE IPS DR13.5. GROUT ANNULAR SPACE AS SPECIFIED.

INSERTION PIT FOR SLIPLINING, PROTECT IN PLACE EXIST 14" RW PIPELINE

EXISTING EMWD FORCE MAIN

CAUTION STA. 8526+18 48" PARLINE See Note Below

STA. 8561+66.91 = P.I. DEF. LEFT 90°00'00"

Existing EMWD 48" Water Line

Right of Way Lines (60')
Existing 20" EMWD Water Line
Existing 2" Gas Main
Existing EMWD 14" Force Main

CHASE STREET

IDYLLWILD DRIVE

SLIPLINE EXISTING 18" RW STEEL PIPELINE WITH NEW 16" HDPE IPS DR13.5. GROUT ANNULAR SPACE AS SPECIFIED.

A.C. PAVING

CAUTION STA. 8526+18 48" EMWD PIPELINE NOTIFY E.M.W.D. (208-3155 PRIOR TO ANY EXCAVATION, HAND EXCAVATE WITHIN 24" BACKFILLING OR TRENCHING

CONTRACTOR TO VERIFY EXISTING PIPELINE IN THIS VICINITY

SLIPLINE EXISTING 18" RW STEEL PIPELINE WITH NEW 16" HDPE IPS DR13.5. GROUT ANNULAR SPACE AS SPECIFIED.

CAUTION 2" WATER LINE HAND EXCAVATE PRIOR TO TRENCHING (150' N. of ℄ DRIVE)

INSERTION PIT FOR SLIPLINING, PROTECT IN PLACE EXIST 14" RW PIPELINE

IDYLLWILD DRIVE

SLIPLINE EXISTING 18" RW STEEL PIPELINE WITH NEW 16" HDPE IPS DR13.5. GROUT ANNULAR SPACE AS SPECIFIED.

NATURAL GROUND OVER PIPE

SEE SHEET SD 1769 FOR BORING DETAIL AND PROFILE UNDER STATE HIGHWAY

DANGER !!! STA 5024+05 - G.T.FT. CABLE CALL 213-357-2357 PRIOR TO ANY EXCAVATION. HAND EXCAVATE PRIOR TO BACKHOEING OR TRENCHING

CLASS 150 PIPE

C.D. 1278

811 CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

NOTES:

1. SCREENED INFORMATION (GRAYED OUT) ON THIS SHEET REPRESENT AS-BUILT CONDITIONS AS SHOWN ON SD-1770.
2. PLAN AND PROFILE SHOWN ON THIS SHEET ARE BASED ON THE NGVD 29 DATUM. BENCHMARK CONVERSION FROM NGVD 29 TO NAVD 88: NAVD 88 = NGVD 29 + 2.31 FEET.
3. CONTRACTOR TO VERIFY EXISTING ELEVATIONS IN THE FIELD PRIOR TO ANY CONSTRUCTION AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES.

1" = 120'
60 0 120
APPROXIMATE

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

ROP CONVEYANCE PIPELINE
PLAN AND PROFILE 4 OF □

PROJECT NO. 26793-214344
FILE NAME: 91-C-005
SHEET NO. 91-C-005

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PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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MATCH LINE - SEE DWG 91-C-005 (SD 1770)

INSERTION PIT FOR SLIPLINING, PROTECT IN PLACE EXIST 14" RW PIPELINE

INSERTION PIT FOR SLIPLINING, PROTECT IN PLACE EXIST 14" RW PIPELINE

SLIPLINE EXISTING 18" RW STEEL PIPELINE WITH NEW 16" HDPE IPS DR13.5. GROUT ANNULAR SPACE AS SPECIFIED.

SLIPLINE EXISTING 18" RW STEEL PIPELINE WITH NEW 16" HDPE IPS DR13.5. GROUT ANNULAR SPACE AS SPECIFIED.

SLIPLINE EXISTING 18" RW STEEL PIPELINE WITH NEW 16" HDPE IPS DR13.5. GROUT ANNULAR SPACE AS SPECIFIED.

EXCAVATE 50'Lx6'W INSERTION PIT FOR SLIPLINING, PROTECT IN PLACE EXIST 14" RW PIPELINE

EXCAVATE 50'Lx6'W INSERTION PIT FOR SLIPLINING, PROTECT IN PLACE EXIST 14" RW PIPELINE

SEE MATCH LINE DWG 91-C-007

NOTES:

1. SCREENED INFORMATION (GRAYED OUT) ON THIS SHEET REPRESENT AS-BUILT CONDITIONS AS SHOWN ON SD-1771.
2. PLAN AND PROFILE SHOWN ON THIS SHEET ARE BASED ON THE NGVD 29 DATUM. BENCHMARK CONVERSION FROM NGVD 29 TO NAVD 88: NAVD 88 = NGVD 29 + 2.31 FEET.
3. CONTRACTOR TO VERIFY EXISTING ELEVATIONS IN THE FIELD PRIOR TO ANY CONSTRUCTION AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES.

1" = 120'
60 0 120
APPROXIMATE

CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

ROP CONVEYANCE PIPELINE
PLAN AND PROFILE 5 OF □

PROJECT NO. 26793-214344
FILE NAME: 91-C-006
SHEET NO. 91-C-00□

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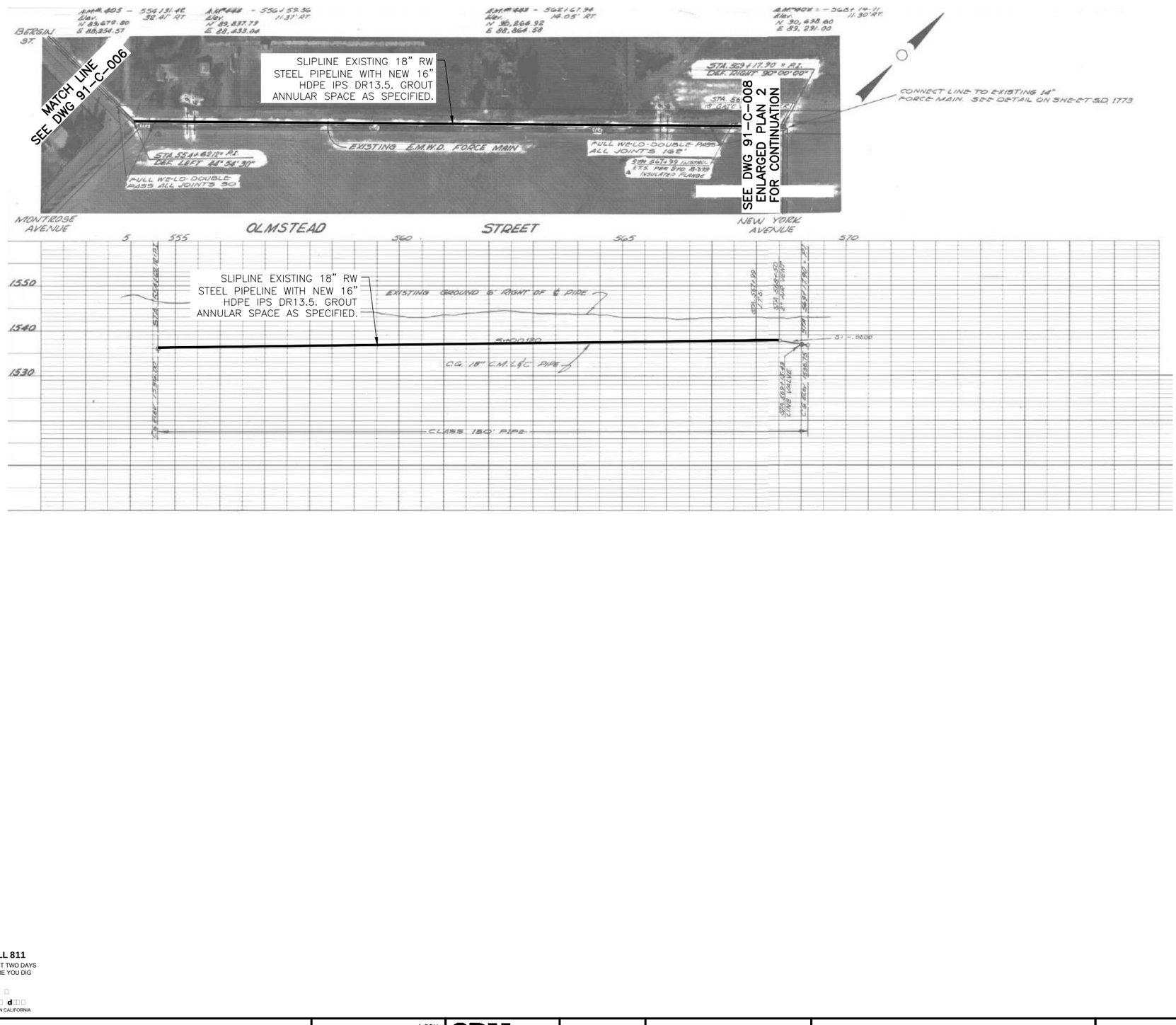

NOTES:

1. SCREENED INFORMATION (GRAYED OUT) ON THIS SHEET REPRESENT AS-BUILT CONDITIONS AS SHOWN ON SD-1772.
2. PLAN AND PROFILE SHOWN ON THIS SHEET ARE BASED ON THE NGVD 29 DATUM. BENCHMARK CONVERSION FROM NGVD 29 TO NAVD 88: NAVD 88 = NGVD 29 + 2.31 FEET.
3. CONTRACTOR TO VERIFY EXISTING ELEVATIONS IN THE FIELD PRIOR TO ANY CONSTRUCTION AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES.

1" = 120'
60 0 120
APPROXIMATE

CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A.GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92□17
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

ROP CONVEYANCE PIPELINE
PLAN AND PROFILE □ OF □

PROJECT NO. 26793-214344
FILE NAME: 91-C-007

SHEET NO.
91-C-007

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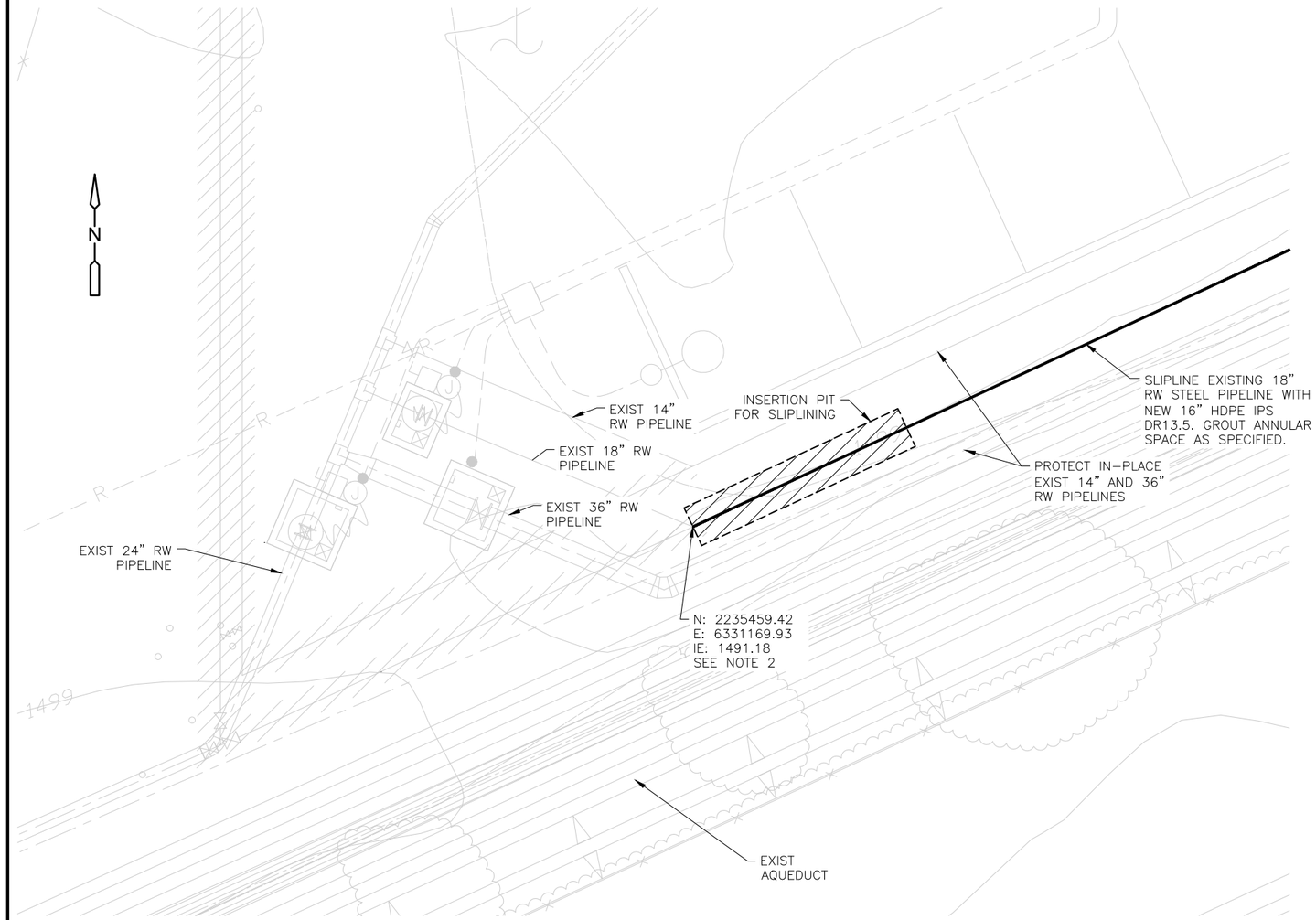


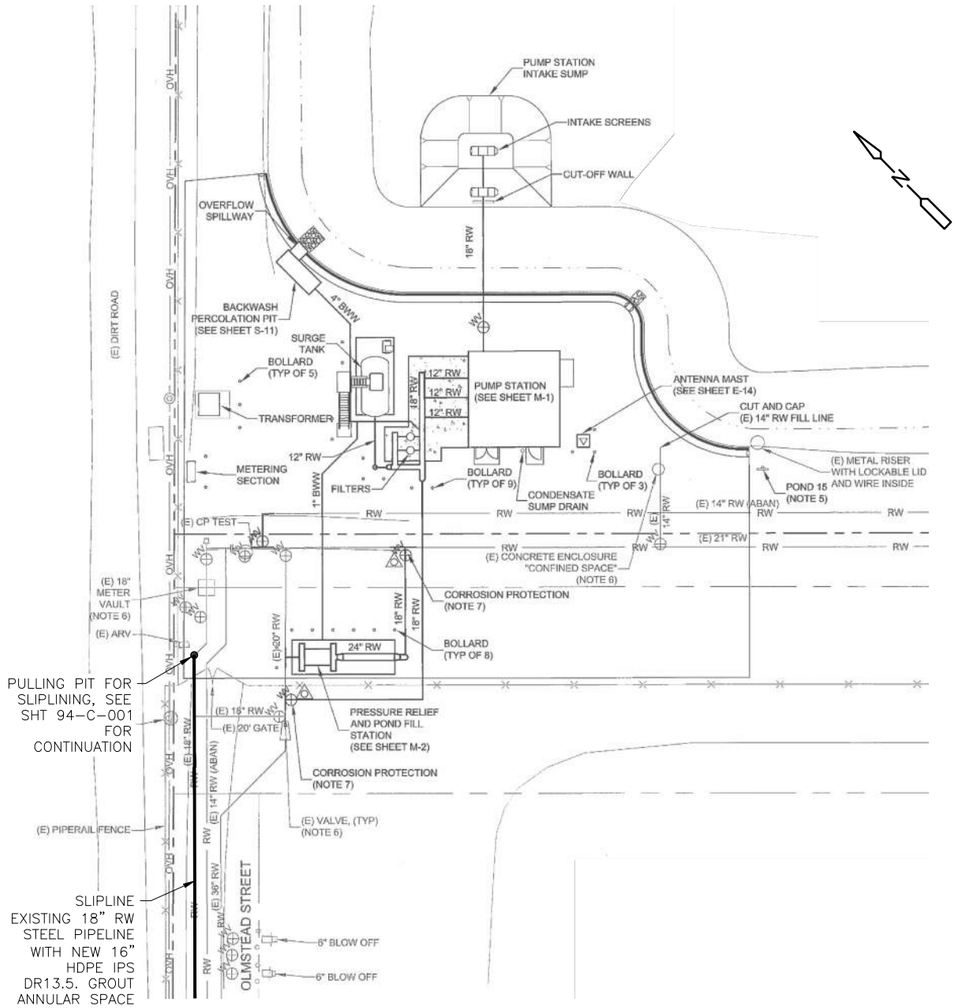
ENLARGED PLAN 1

1" = 10'

1" = 10'
5 0 10

NOTES:

1. SCREENED INFORMATION (GRAYED OUT) ON ENLARGED PLAN 1 REPRESENT AS-BUILT CONDITIONS AS SHOWN ON D-39056 (SHT 7109B10-02Y14).
2. CONNECT TO EXISTING 18" RW WITH 16X18 REDUCER, 45 BEND, AND HDPE FLANGE ADAPTER. SEE AWTF YARD PIPING FOR CONTINUATION.



ENLARGED PLAN 2

NTS

NOTES:

1. SCREENED INFORMATION (GRAYED OUT) ON ENLARGED PLAN 2 REPRESENT AS-BUILT CONDITIONS AS SHOWN ON D-43204 (SHT C-4).

CALL 811
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UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A.GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

ROP CONVEYANCE PIPELINE
ENLARGED PLAN 1 OF 2

PROJECT NO. 26793-214344
FILE NAME: 91-C-008
SHEET NO. 91-C-008

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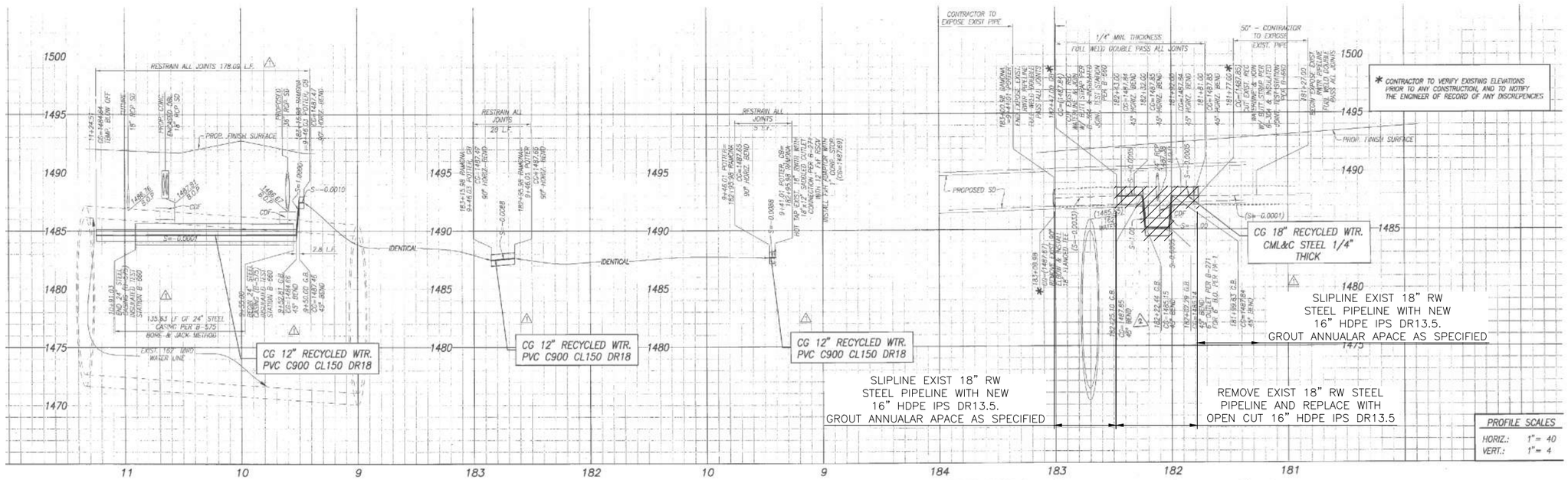
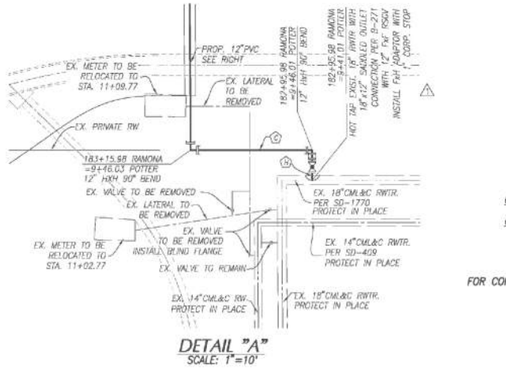
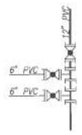




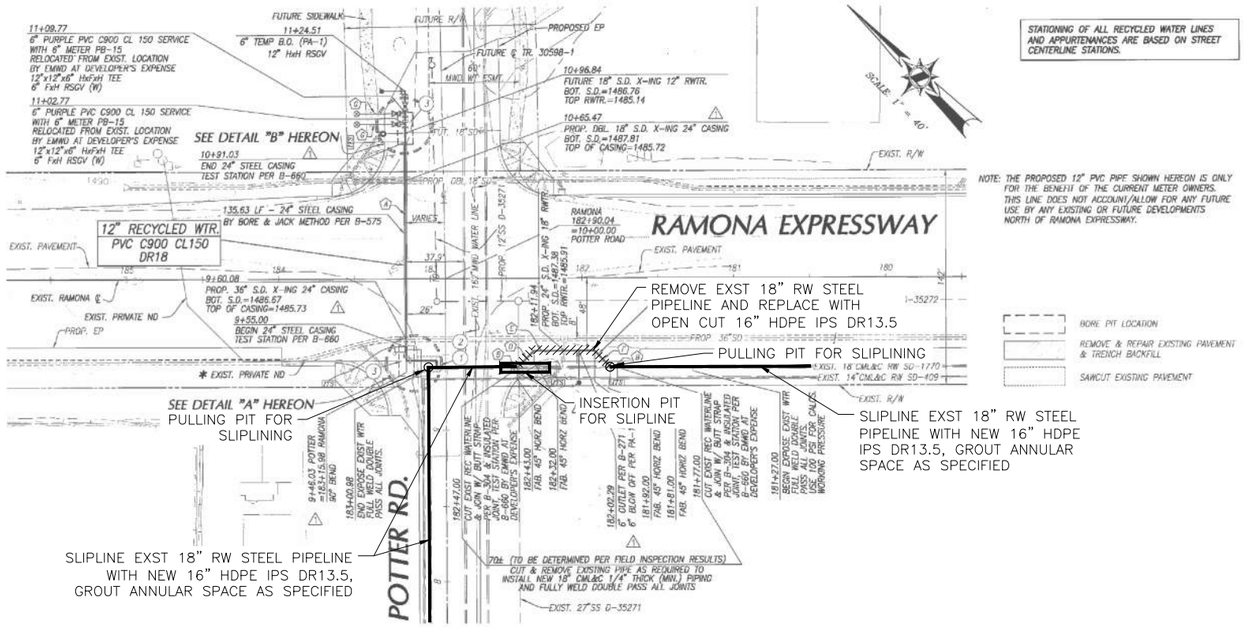
DETAIL "A"
SCALE: 1"=10'



FOR CONSTRUCTION NOTES SEE RIGHT

DETAIL "B"
NTS

1. REMOVE & REPAIR EXISTING PAVEMENT & TRENCH BACKFILL PER COUNTY OF RIVERSIDE STD. PLAN NO. 818
2. SAWCUT EXISTING PAVEMENT
3. 20'x10' BORE PIT



CALL 811
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UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

NOTES:

1. SCREENED INFORMATION (GRAYED OUT) ON THIS SHEET REPRESENT AS-BUILT CONDITIONS AS SHOWN ON D-38127.

1" = 50'
25 0 50
APPROXIMATE

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92::17
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

ROP CONVEYANCE PIPELINE ENLARGED PLAN 2 OF 2

PROJECT NO. 26793-214344
FILE NAME: 91-C-009

SHEET NO.
91-C-009

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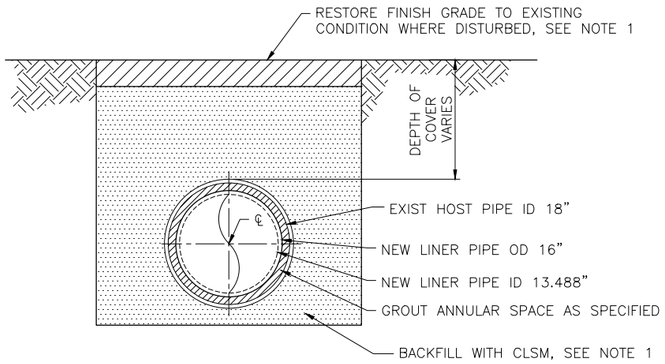

NOTE:

1. BACKFILL AND SURFACE RESTORATION ARE APPLICABLE AT INSERTION AND PULLING PITS ONLY.

TYPICAL SLIPLINING CROSS–SECTION

DETAIL A
NTS –

CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

ROP CONVEYANCE PIPELINE DETAILS

PROJECT NO. 26793–214344
FILE NAME: 91–C–010

SHEET NO.
91-C-010

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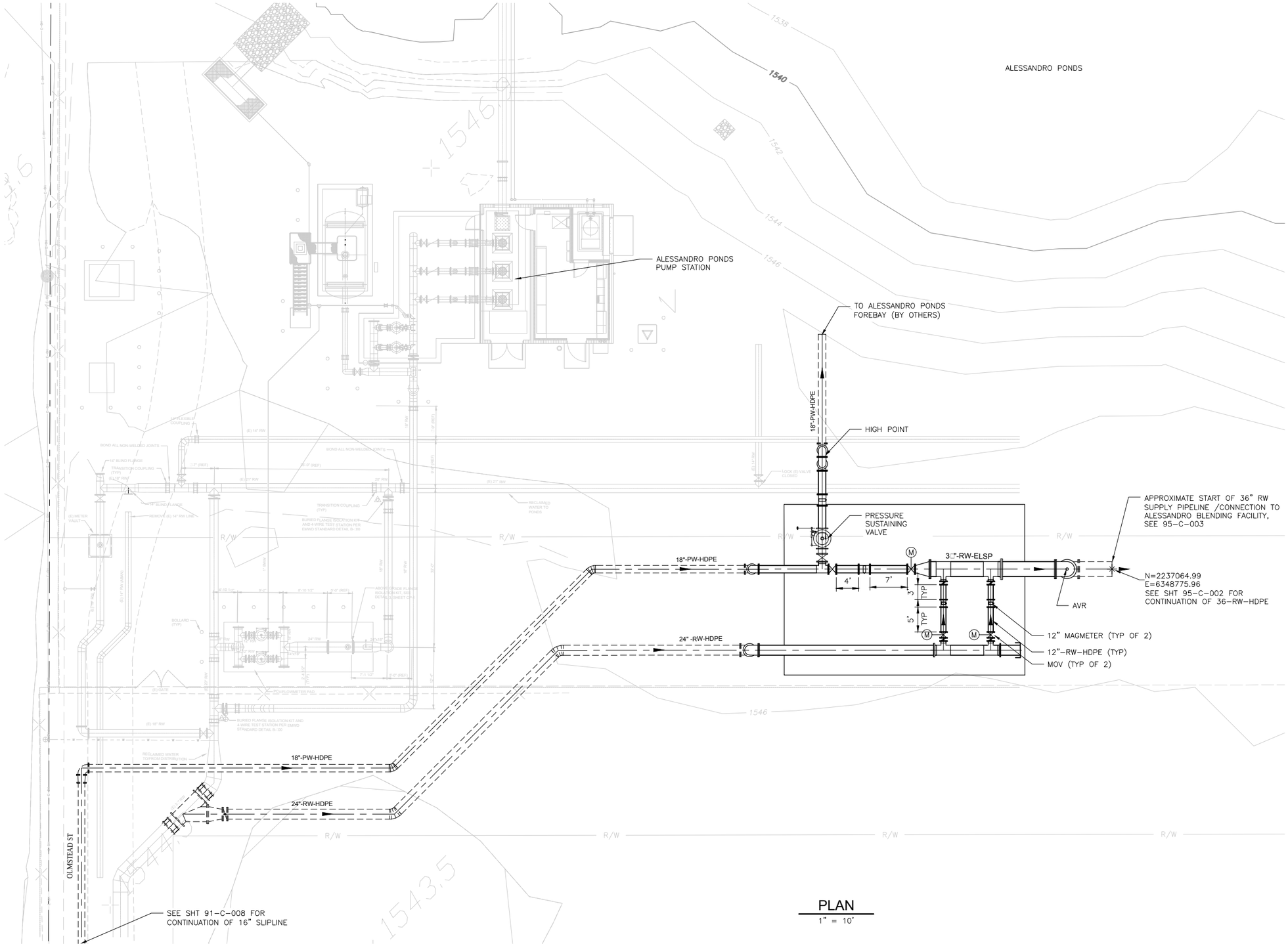

PLAN
1" = 10'

1" = 10'
5 0 10

CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

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EASTERN MUNICIPAL WATER DISTRICT
PURIFIED WATER REPLENISHMENT PROJECT

ALESSANDRO PONDS BLENDING FACILITY

PROJECT NO. 26793-214344
FILE NAME: 94-C-001
SHEET NO.
94-C-001

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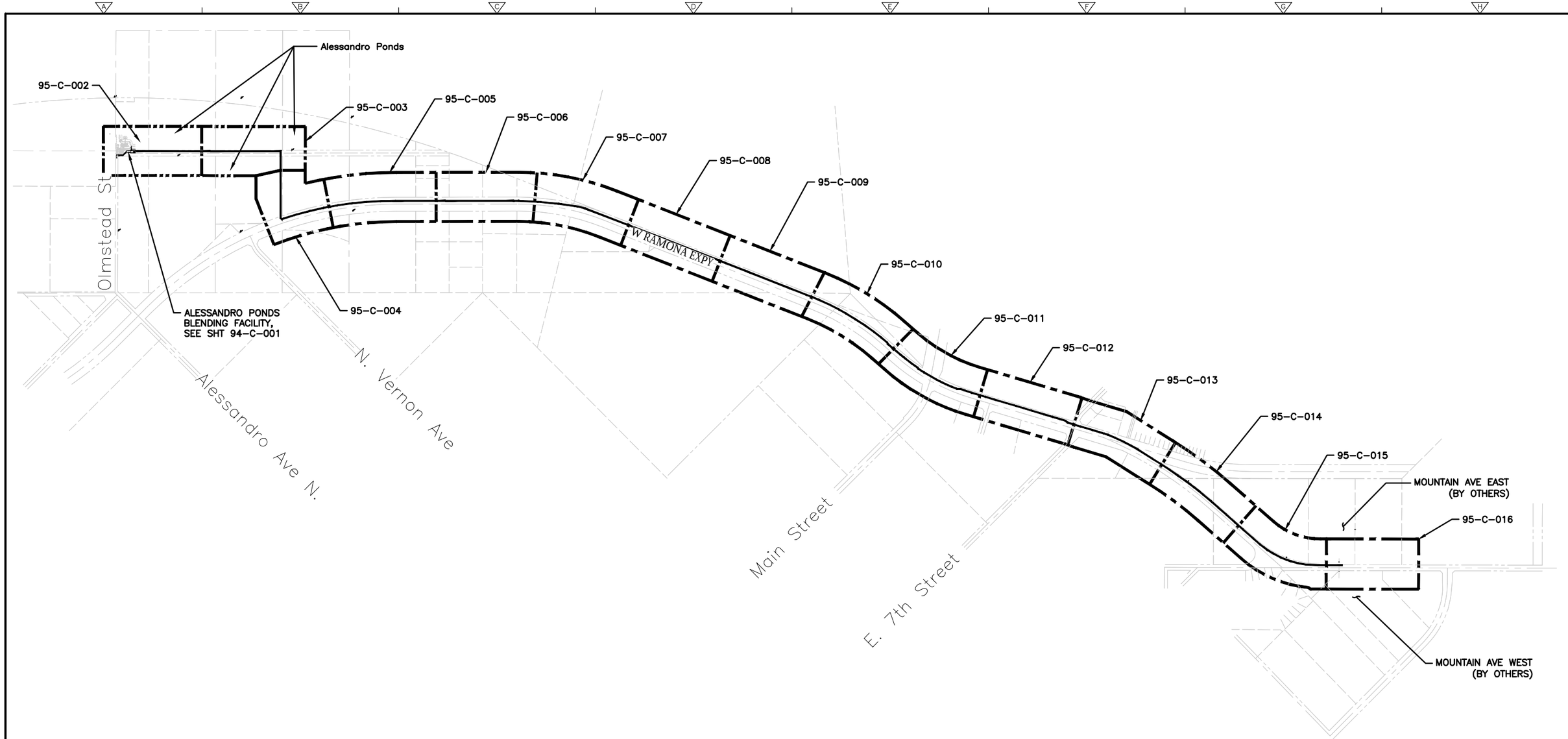

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92□17
Tel: (949) 752-5452

emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

RECYCLED WATER CONVEYANCE PIPELINE KEY PLAN

PROJECT NO. 26793-214344
FILE NAME: 95-C-001

SHEET NO.
95-C-001

1" = 500'
250 0 500

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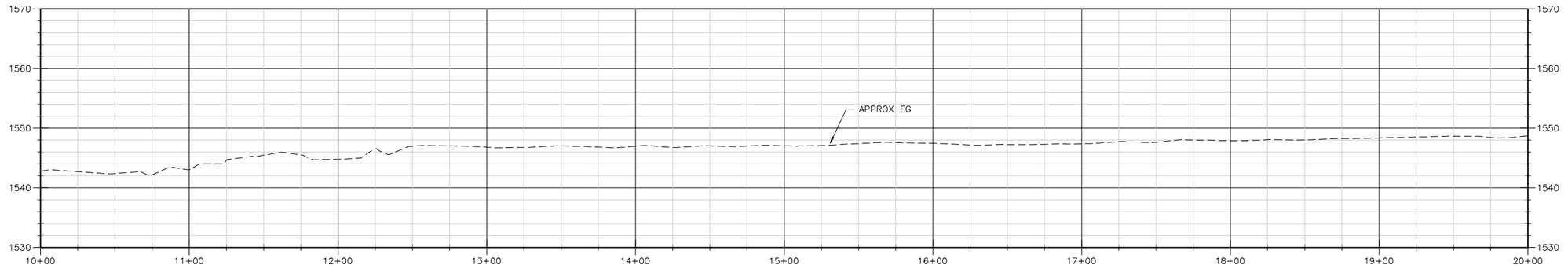
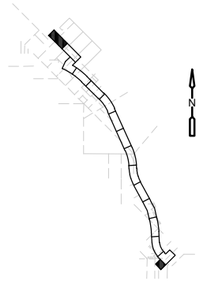
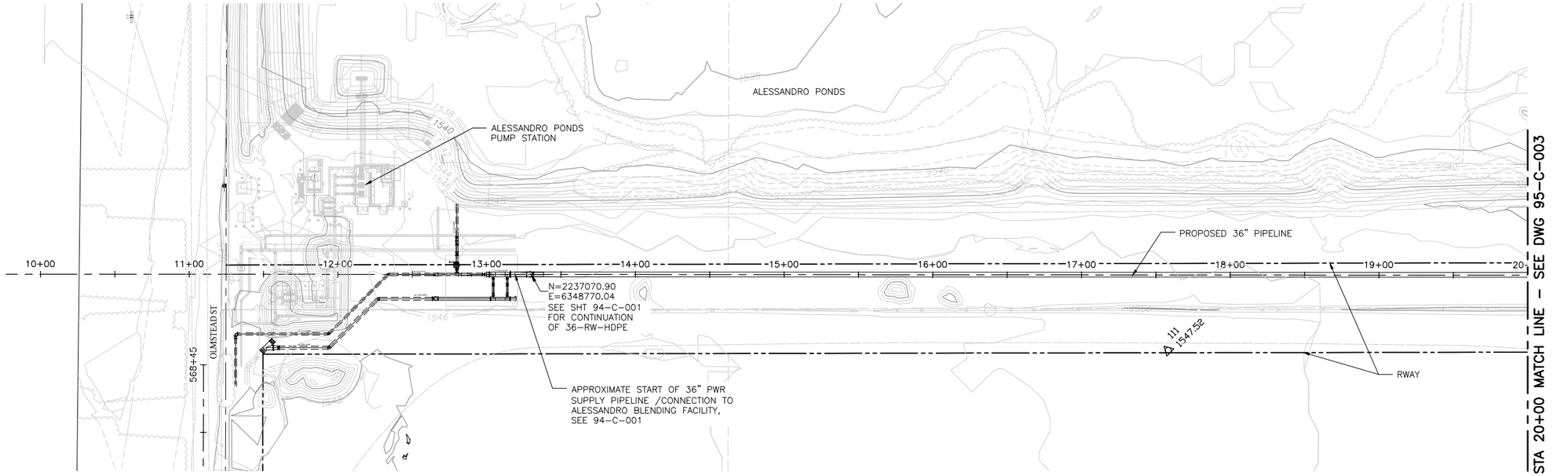


PROFILE
V: 1"=10', H: 1"=40'



KEY MAP
NTS



PLAN
1" = 40'

1" = 40'
20 0 40

1" = 10'
5 0 10

CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92::17
Tel: (949) 752-5452

emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

RECYCLED WATER CONVEYANCE PIPELINE
PLAN / PROFILE 1 OF 15

PROJECT NO. 26793-214344
FILE NAME: 95-C-002
SHEET NO.
95-C-002

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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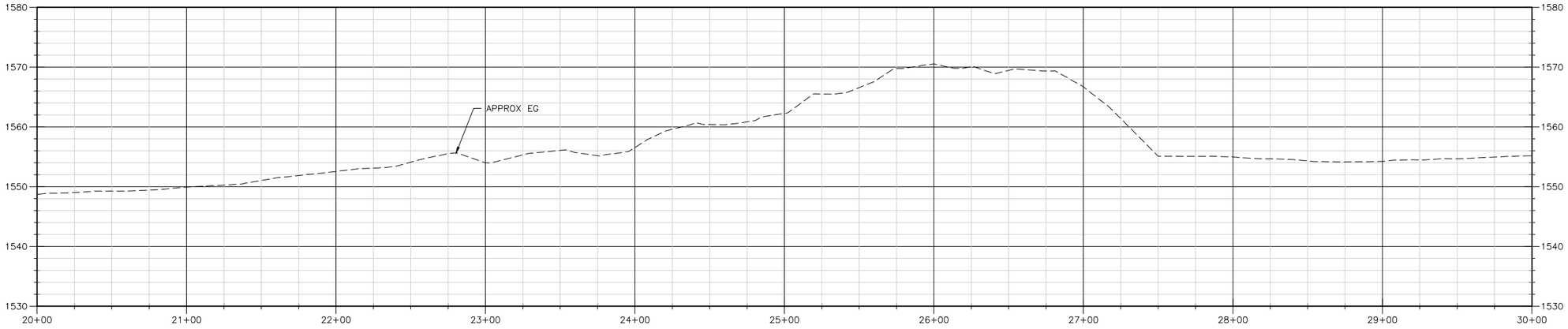
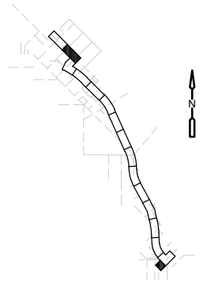
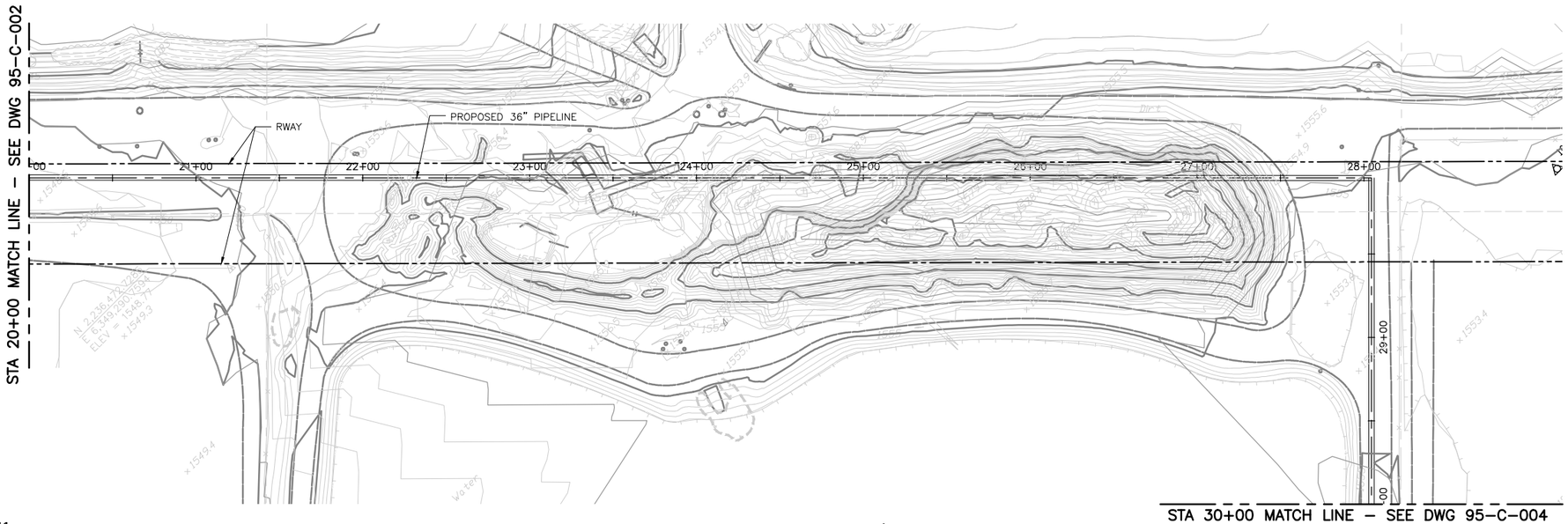


PROFILE
V: 1"=10', H: 1"=40'



KEY MAP
NTS



PLAN
1" = 40'

1" = 40'
20 0 40
1" = 10'
5 0 10

CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 2 OF 15

PROJECT NO. 26793-214344
FILE NAME: 95-C-003

SHEET NO.
95-C-003

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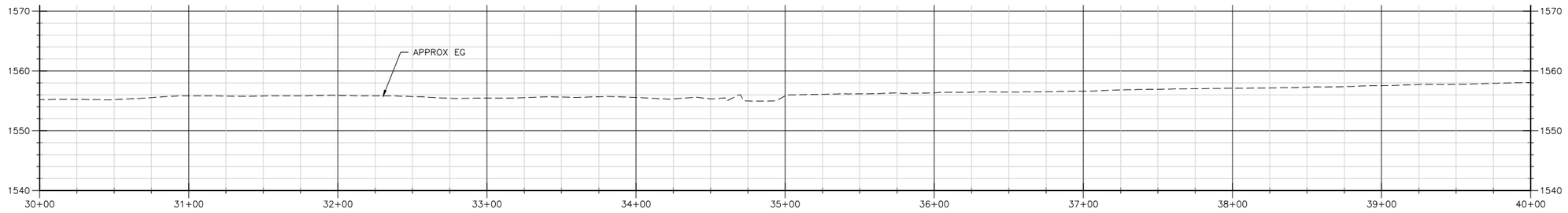
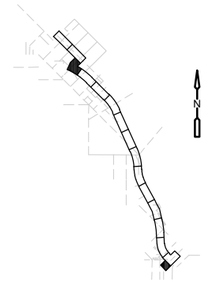
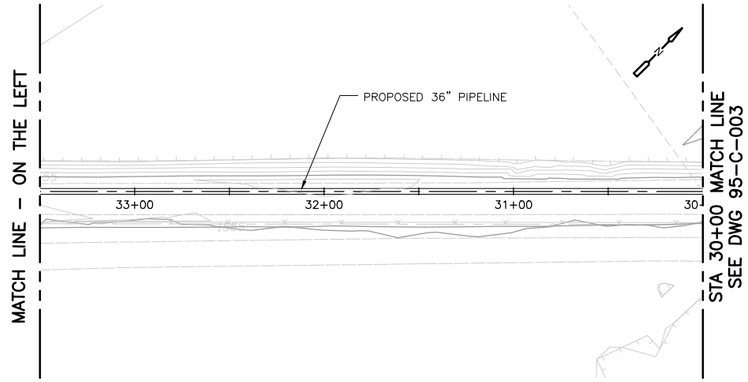
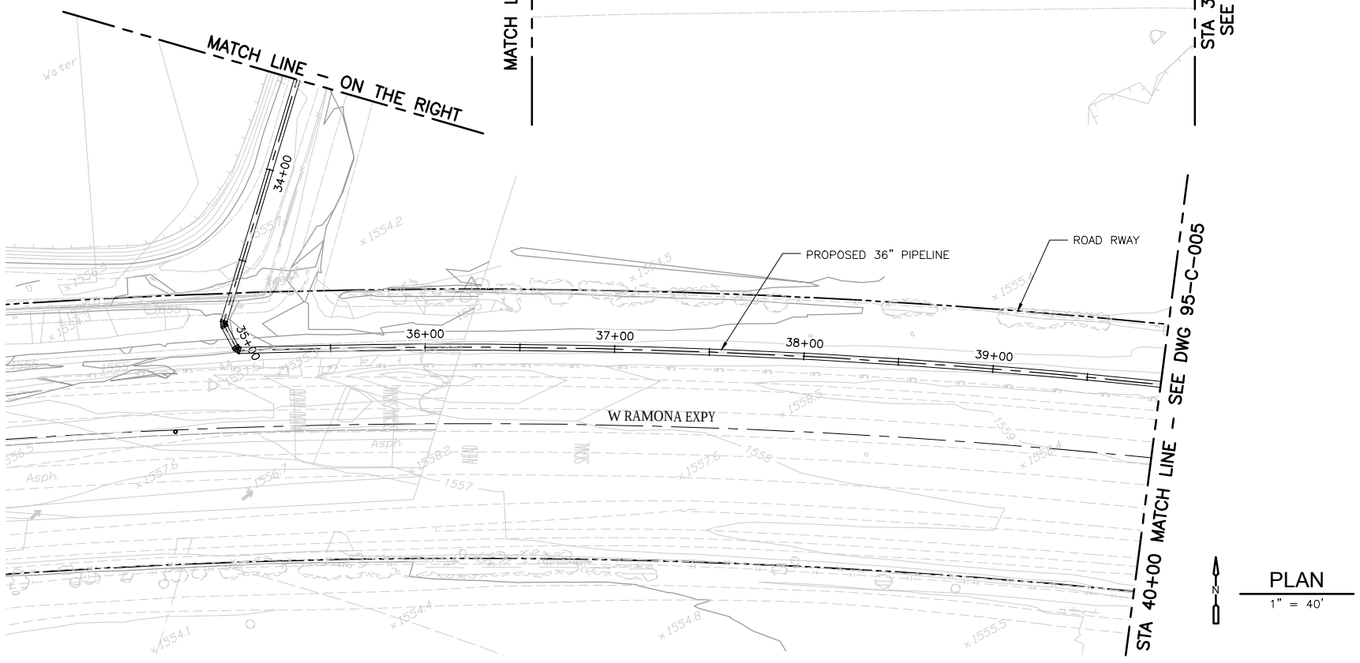


PROFILE
V: 1"=10', H: 1"=40'



KEY MAP
NTS





PLAN
1" = 40'

1" = 40'
20 0 40
1" = 10'
5 0 10

CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92::17
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 3 OF 15

PROJECT NO. 26793-214344
FILE NAME: 95-C-004
SHEET NO.
95-C-004

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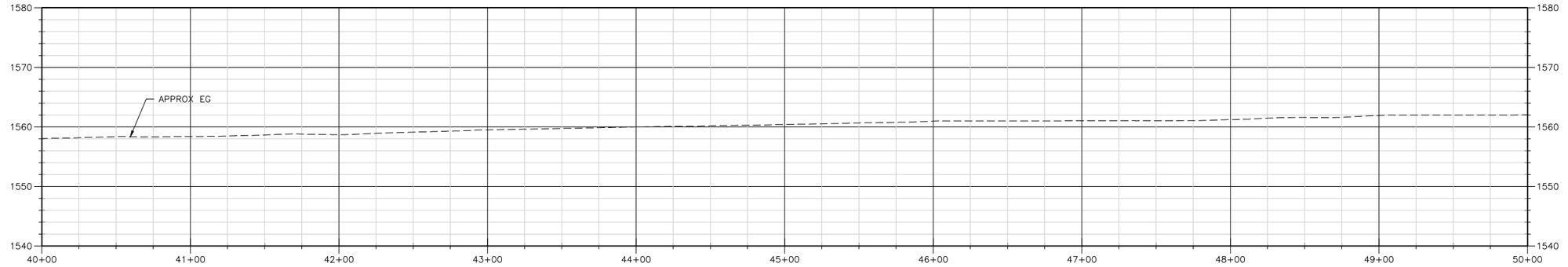
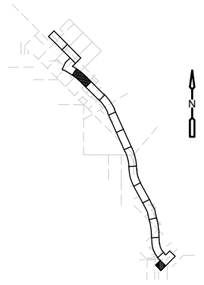
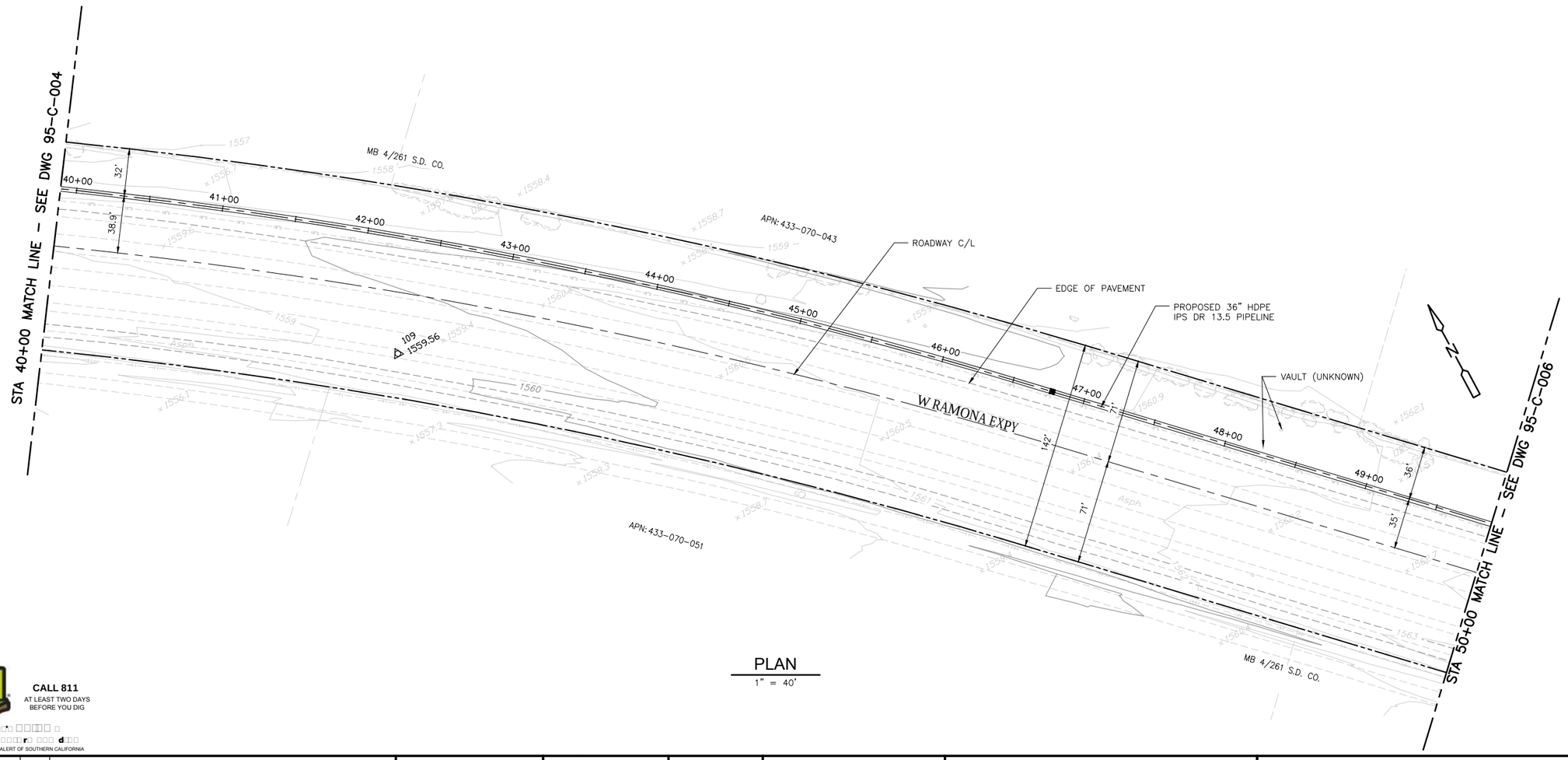


PROFILE
V: 1"=10', H: 1"=40'



KEY MAP
NTS



PLAN
1" = 40'

1" = 40'
20 0 40

1" = 10'
5 0 10

CALL 811
AT LEAST TWO DAYS
BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A.GOH
DRAWN BY: O.NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

RECYCLED WATER CONVEYANCE PIPELINE
PLAN / PROFILE 4 OF 15

PROJECT NO. 26793-214344
FILE NAME: 95-C-005

SHEET NO.
95-C-005

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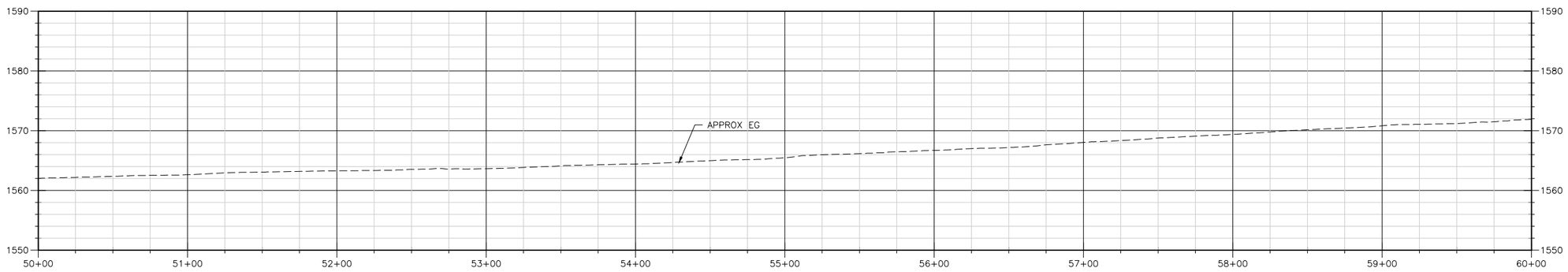
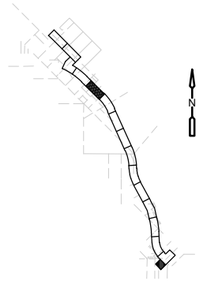
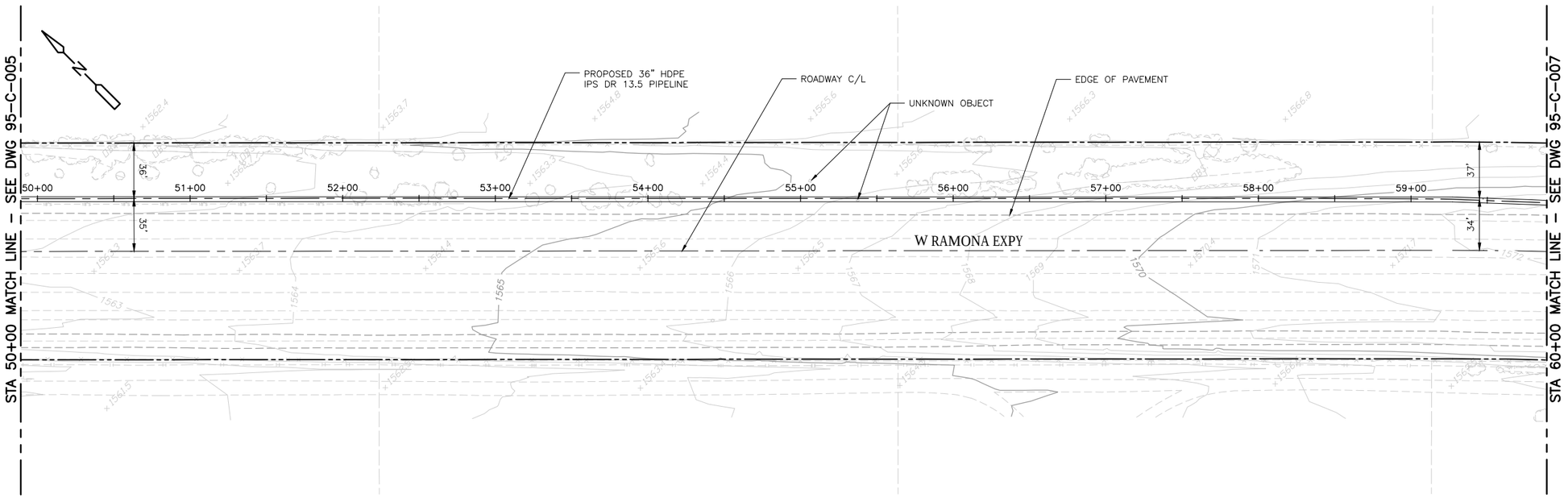


PROFILE
V: 1"=10', H: 1"=40'



KEY MAP
NTS



PLAN
1" = 40'

1" = 40'
20 0 40
1" = 10'
5 0 10

CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

RECYCLED WATER CONVEYANCE PIPELINE
PLAN / PROFILE 5 OF 15

PROJECT NO. 26793-214344
FILE NAME: 95-C-006
SHEET NO.
95-C-00□

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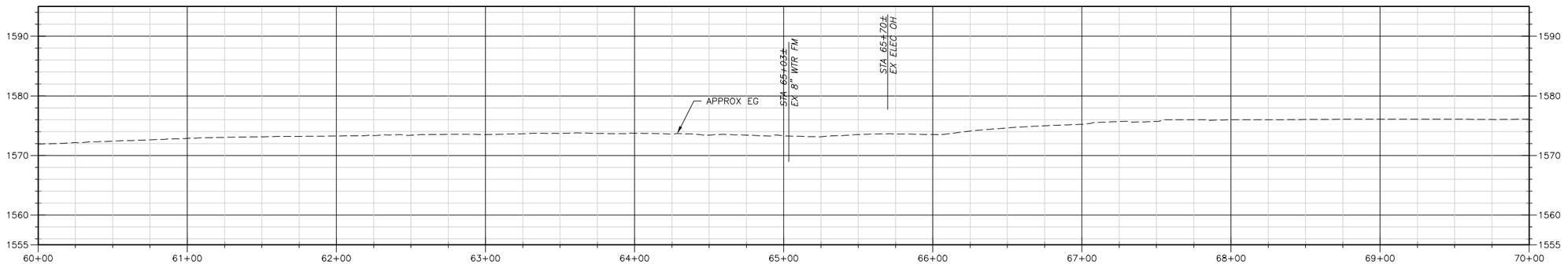
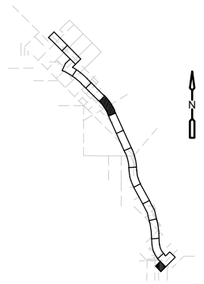


PROFILE
V: 1"=10', H: 1"=40'



KEY MAP
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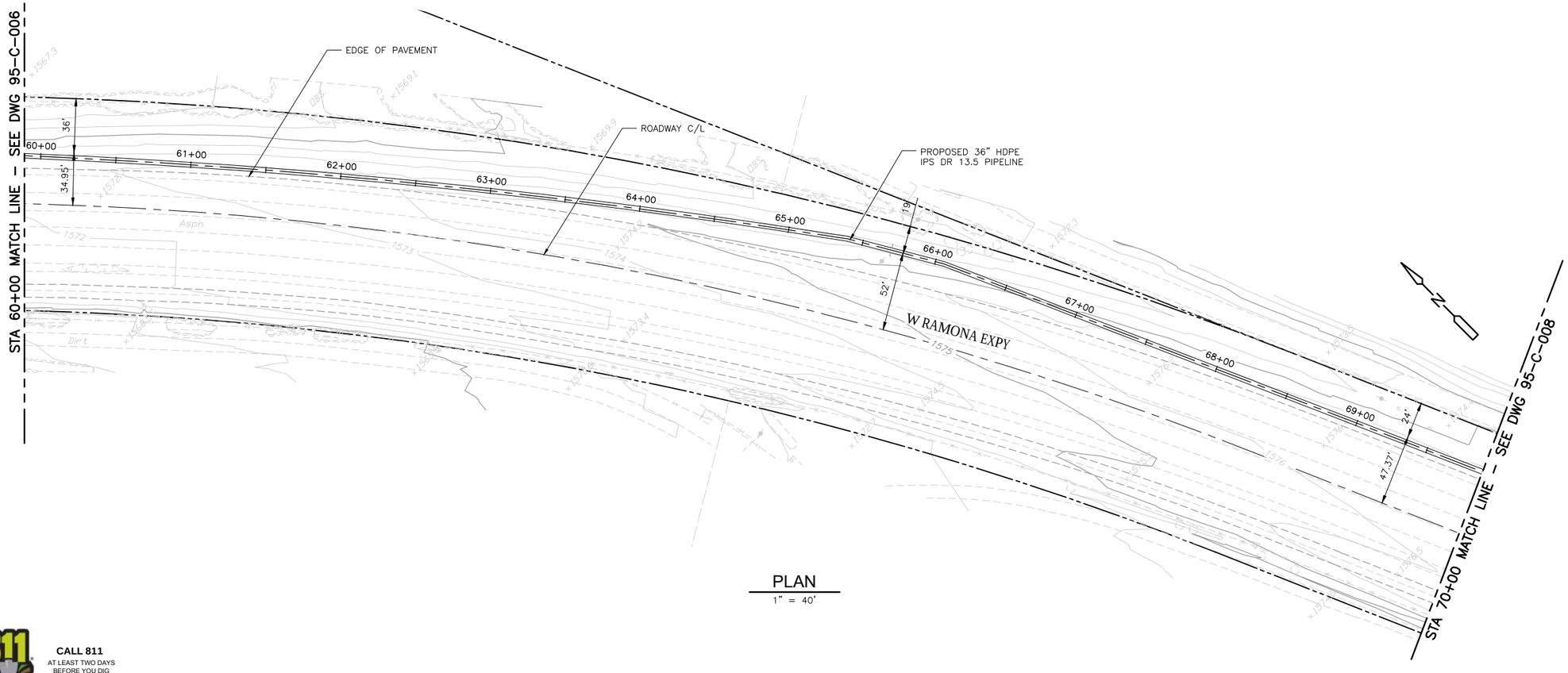

PLAN
1" = 40'

1" = 40'
20 0 40

1" = 10'
5 0 10

CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92□17
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

RECYCLED WATER CONVEYANCE PIPELINE
PLAN / PROFILE □ OF 15

PROJECT NO. 26793-214344
FILE NAME: 95-C-007

SHEET NO.
95-C-007

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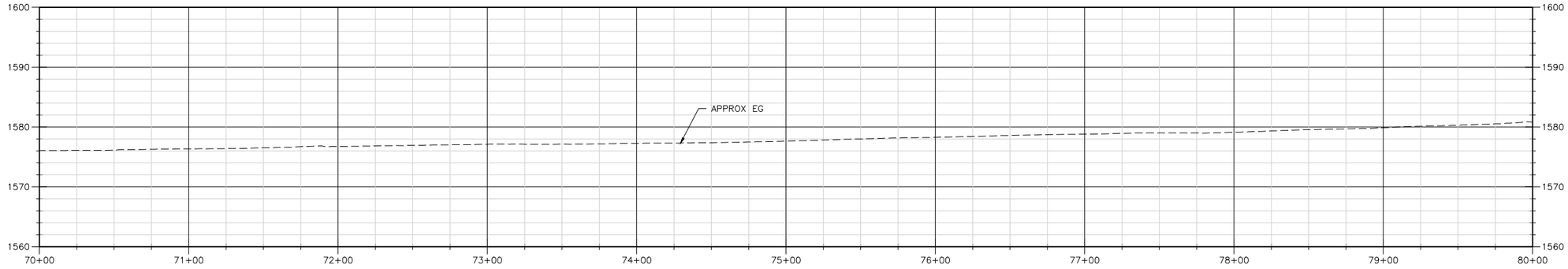
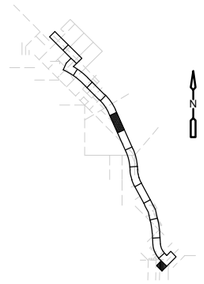
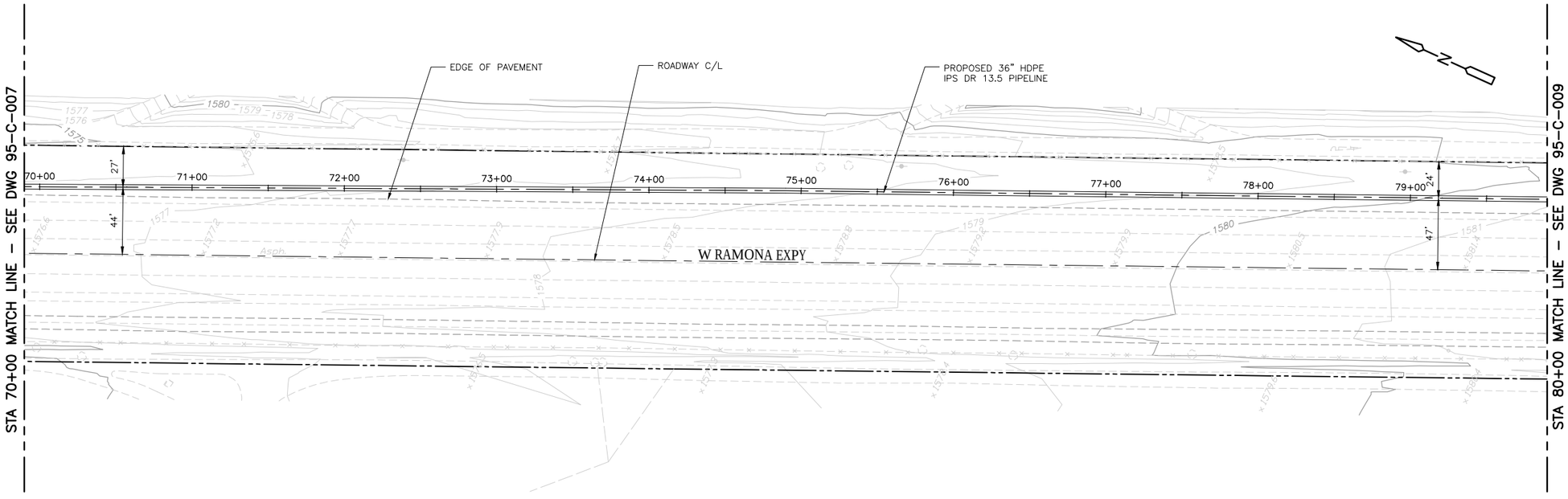


PROFILE
V: 1"=10', H: 1"=40'



KEY MAP
NTS



PLAN
1" = 40'

1" = 40'
20 0 40

1" = 10'
5 0 10

CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A.GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

RECYCLED WATER CONVEYANCE PIPELINE
PLAN / PROFILE 7 OF 15

PROJECT NO. 26793-214344
FILE NAME: 95-C-008

SHEET NO.
95-C-008

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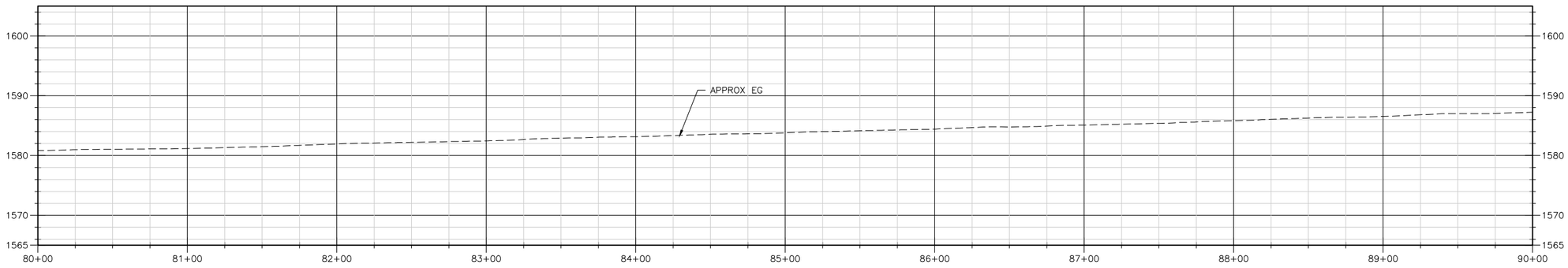
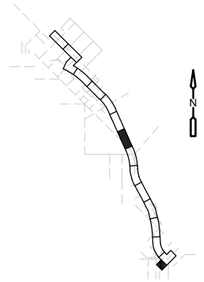


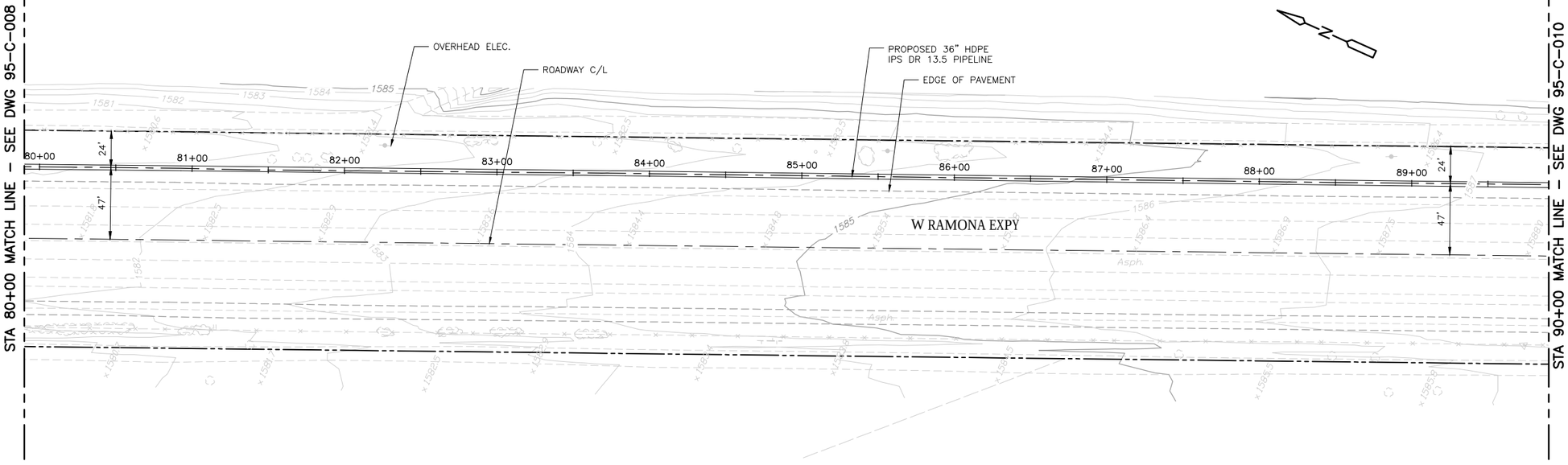
PROFILE
V: 1"=10', H: 1"=40'



KEY MAP
NTS

STA 80+00 MATCH LINE – SEE DWG 95-C-008

STA 90+00 MATCH LINE – SEE DWG 95-C-010



PLAN
1" = 40'

CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

1" = 40'
20 0 40
1" = 10'
5 0 10

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

RECYCLED WATER CONVEYANCE PIPELINE
PLAN / PROFILE 8 OF 15

PROJECT NO. 26793-214344
FILE NAME: 95-C-009

SHEET NO.
95-C-009

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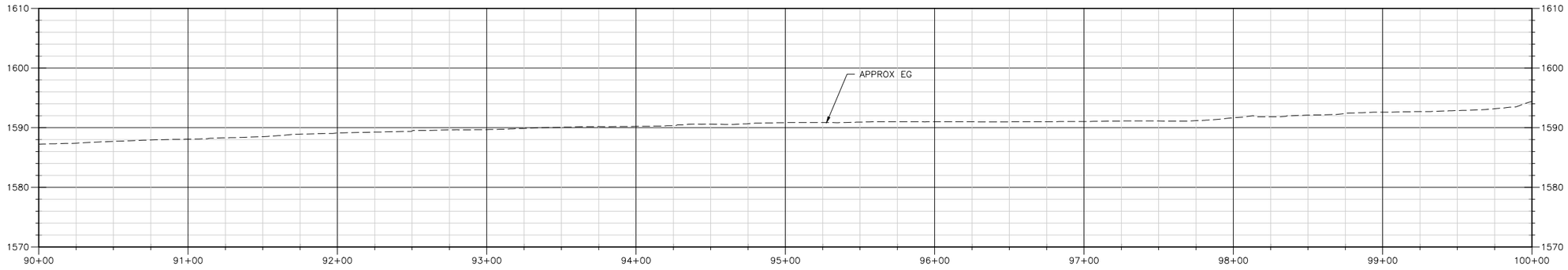
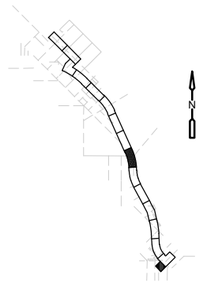
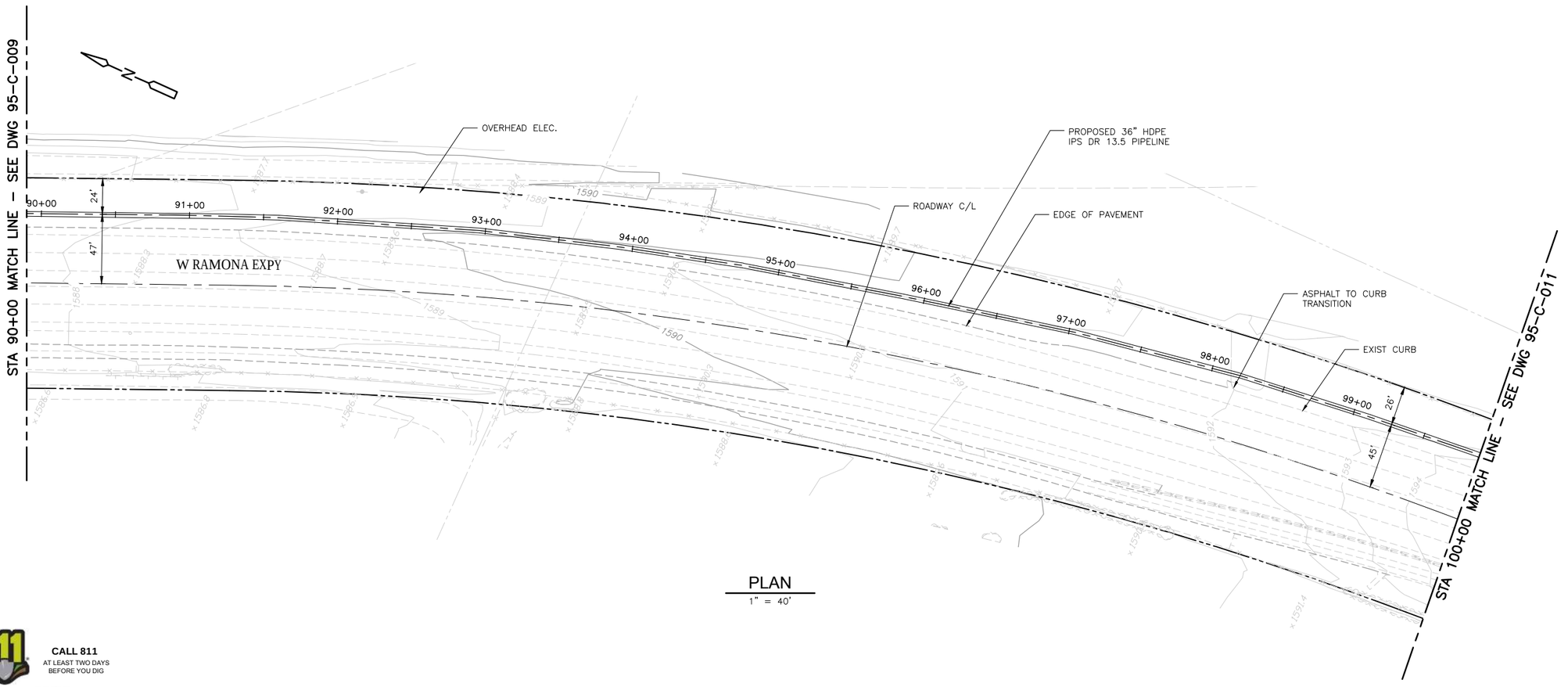


PROFILE
V: 1"=10', H: 1"=40'



KEY MAP
NTS



PLAN
1" = 40'

CALL 811
AT LEAST TWO DAYS
BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

1" = 40'
20 0 40
1" = 10'
5 0 10

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A.GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

RECYCLED WATER CONVEYANCE PIPELINE
PLAN / PROFILE 9 OF 15

PROJECT NO. 26793-214344
FILE NAME: 95-C-010
SHEET NO.
95-C-010

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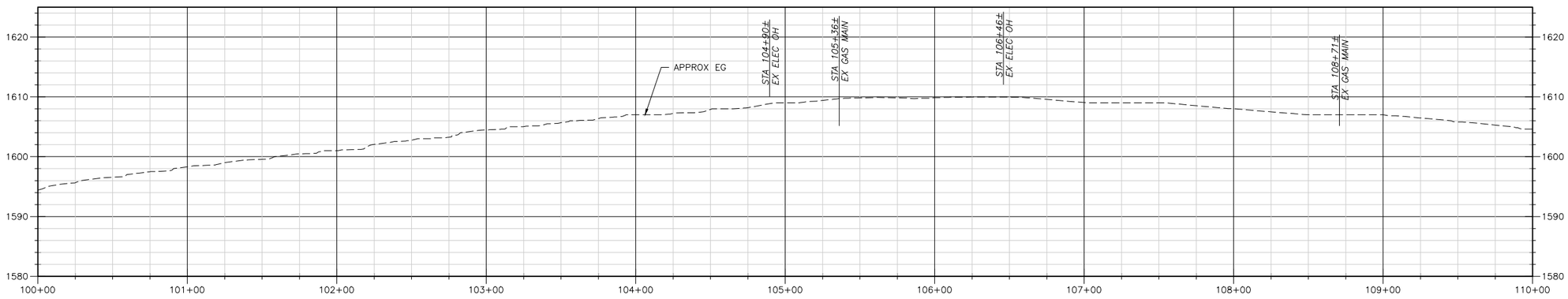
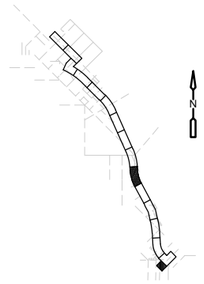


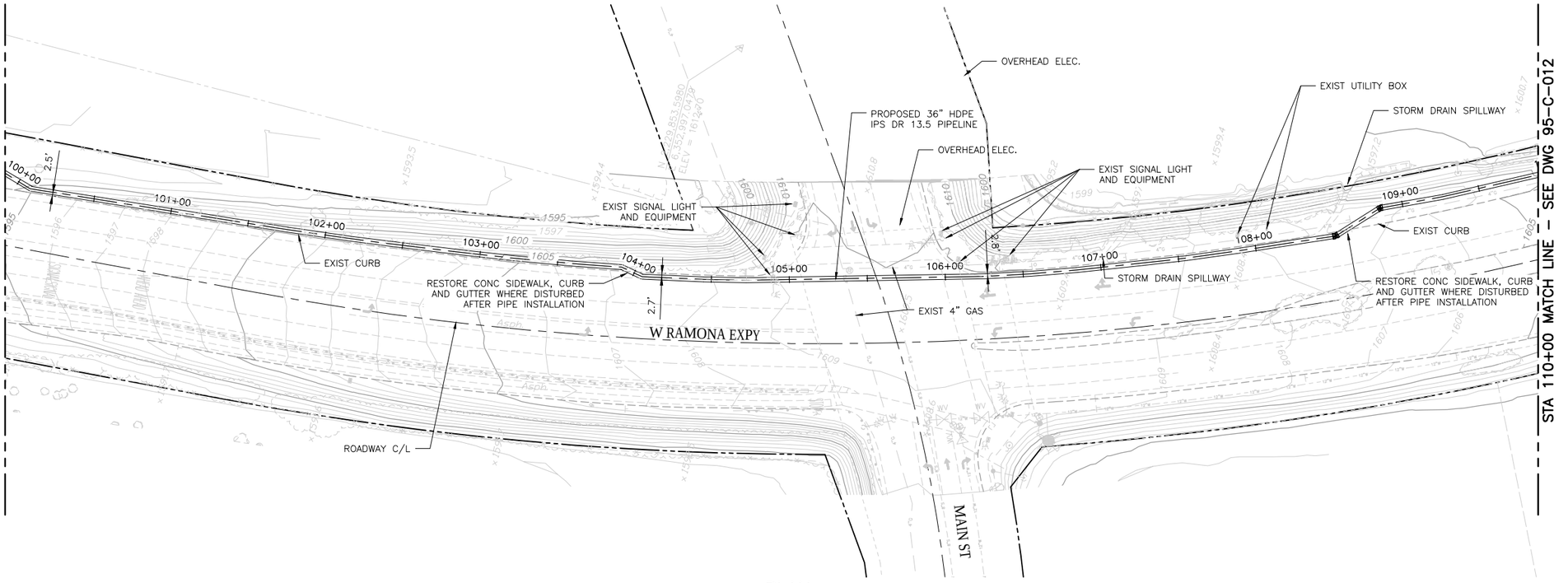
PROFILE

V: 1"=10', H: 1"=40'



KEY MAP

NTS



PLAN

1" = 40'

1" = 40'
20 0 40

1" = 10'
5 0 10

CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

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111 Academy Way, Suite 150
Irvine, California 92:17
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 10 OF 15

PROJECT NO. 26793-214344
FILE NAME: 95-C-011

SHEET NO.
95-C-011

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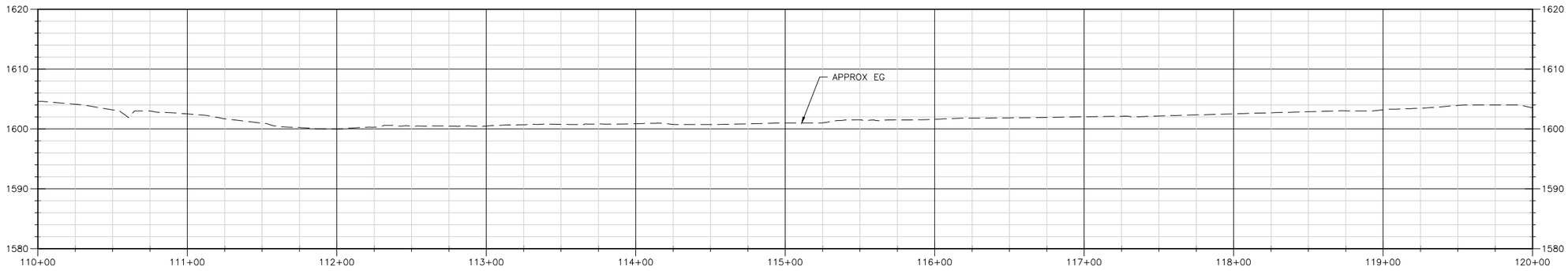
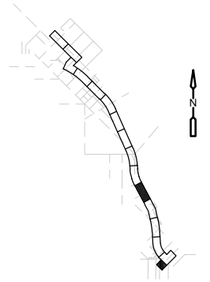


PROFILE
V: 1"=10', H: 1"=40'



KEY MAP
NTS

STA 110+00 MATCH LINE – SEE DWG 95-C-011

STA 120+00 MATCH LINE – SEE DWG 95-C-013

STORM DRAIN SPILLWAY

ROAD RW

EXIST CURB

PROPOSED 36" HDPE
IPS DR 13.5 PIPELINE

OVERHEAD ELEC.

EXIST GAS

EDGE OF
PAVEMENT

ROADWAY C/L

W RAMONA EXPY

10+00
111+00
112+00
113+00
114+00
115+00
116+00
117+00
118+00
119+00

19'

52'

PLAN
1" = 40'

1" = 40'
20 0 40

1" = 10'
5 0 10

CALL 811
AT LEAST TWO DAYS
BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

RECYCLED WATER CONVEYANCE PIPELINE
PLAN / PROFILE 11 OF 15

PROJECT NO. 26793-214344
FILE NAME: 95-C-012

SHEET NO.
95-C-012

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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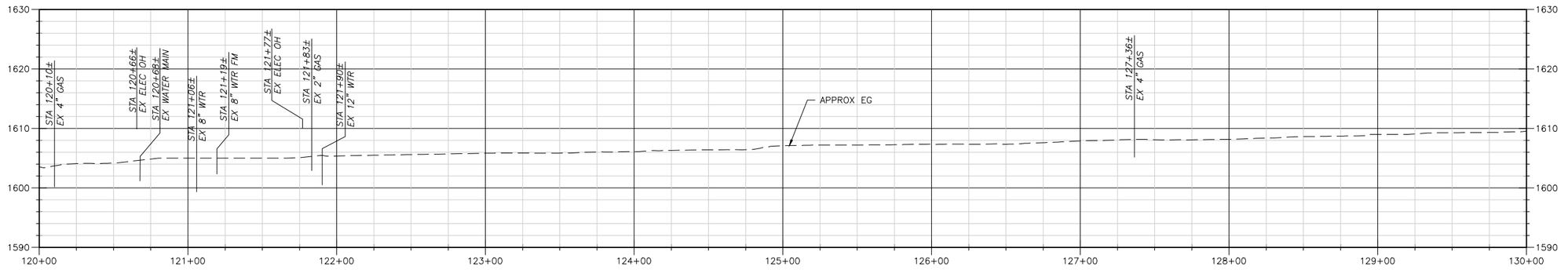
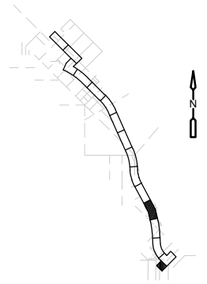
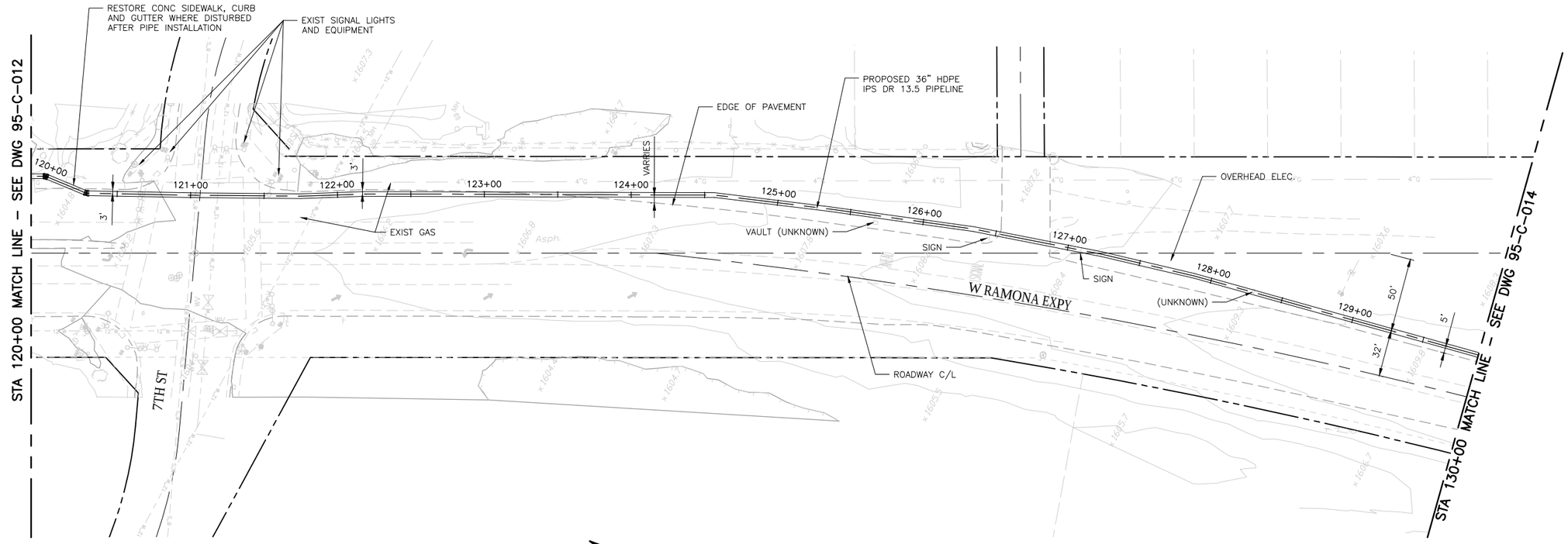


PROFILE
V: 1"=10', H: 1"=40'



KEY MAP
NTS



PLAN
1" = 40'

1" = 40'
20 0 40
1" = 10'
5 0 10

CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

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emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT
PURIFIED WATER REPLENISHMENT PROJECT

RECYCLED WATER CONVEYANCE PIPELINE
PLAN / PROFILE 12 OF 15

PROJECT NO. 26793-214344
FILE NAME: 95-C-013
SHEET NO.
95-C-013

XREFs: [CDMS_2234, 1702200_BS, PIPE ALIGN 36 inch, 1702200_UT, 1702200_TP, Key_Plan_BS] Images: [811 DigAlert]
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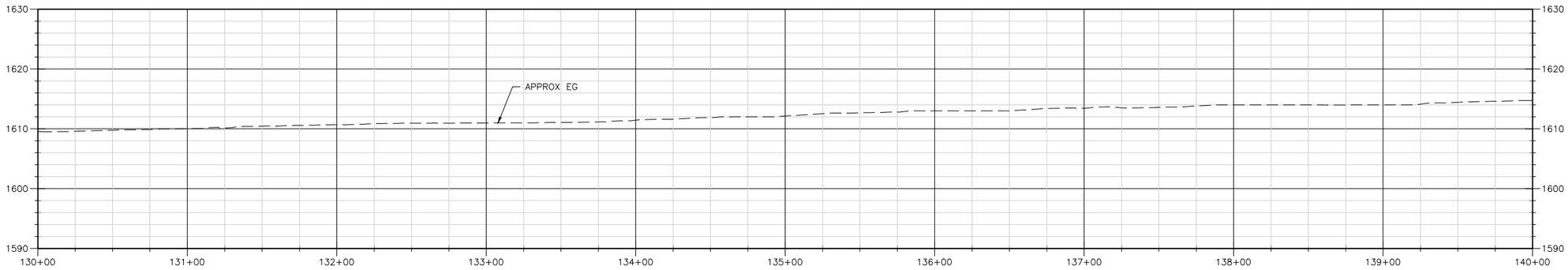
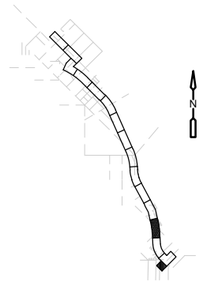
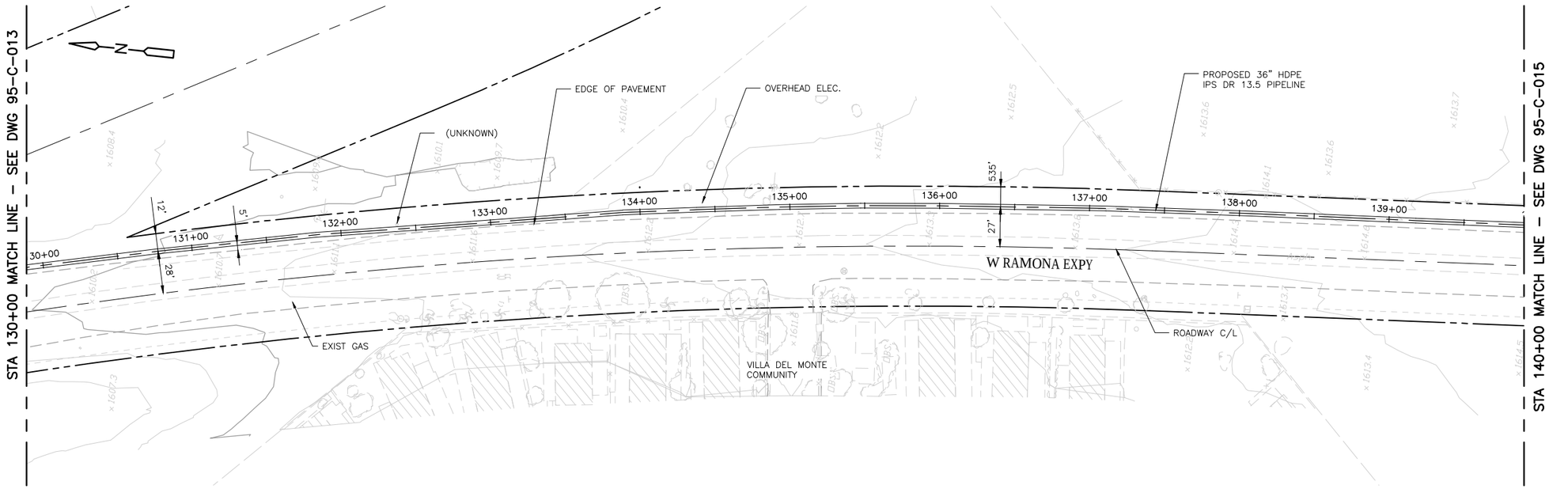


PROFILE
V: 1"=10', H: 1"=40'



KEY MAP
NTS



PLAN
1" = 40'

CALL 811
AT LEAST TWO DAYS
BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

1" = 40'
20 0 40
1" = 10'
5 0 10

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

RECYCLED WATER CONVEYANCE PIPELINE
PLAN / PROFILE 13 OF 15

PROJECT NO. 26793-214344
FILE NAME: 95-C-014

SHEET NO.
95-C-014

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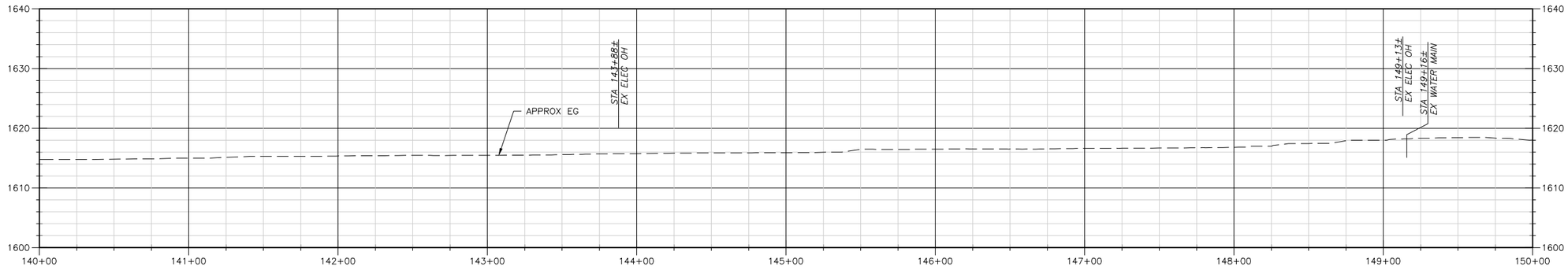
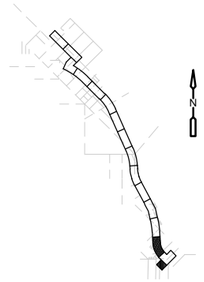


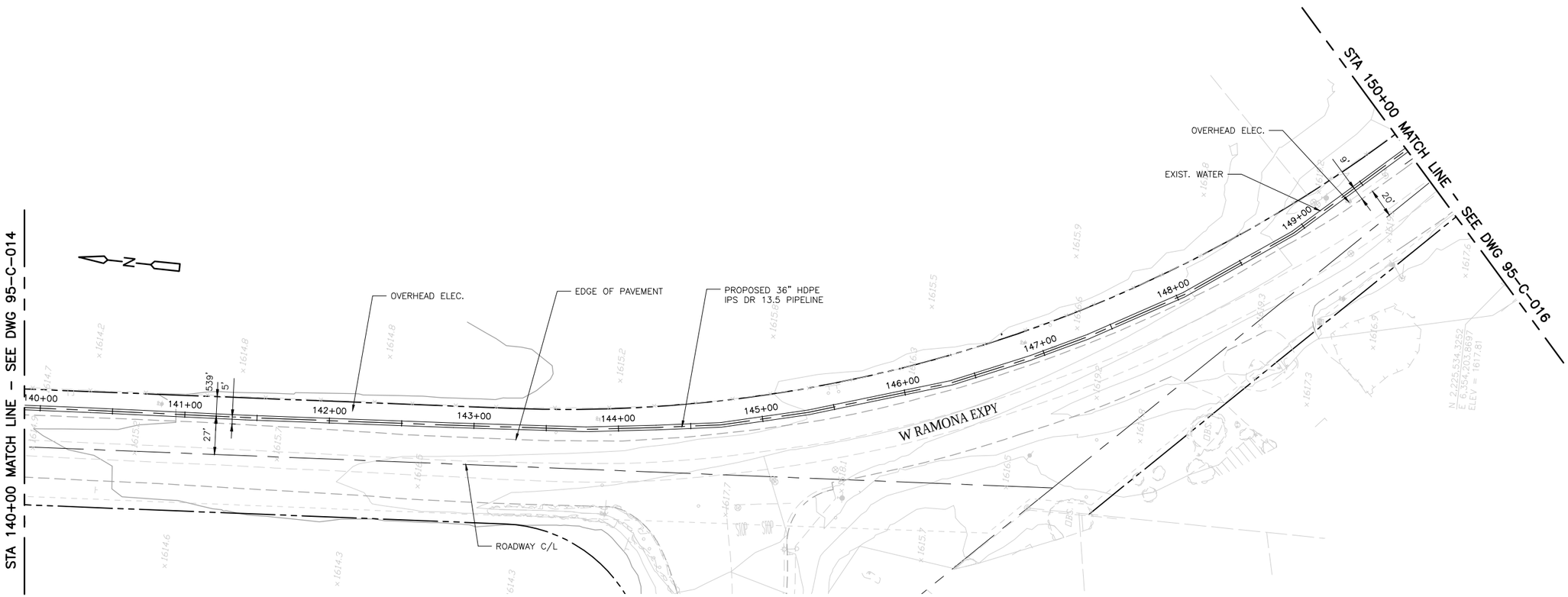
PROFILE

V: 1"=10', H: 1"=40'



KEY MAP

NTS



PLAN

1" = 40'

1" = 40'

1" = 10'

CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A.GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

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111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

RECYCLED WATER CONVEYANCE PIPELINE
PLAN / PROFILE 14 OF 15

PROJECT NO. 26793-214344
FILE NAME: 95-C-015

SHEET NO.
95-C-015

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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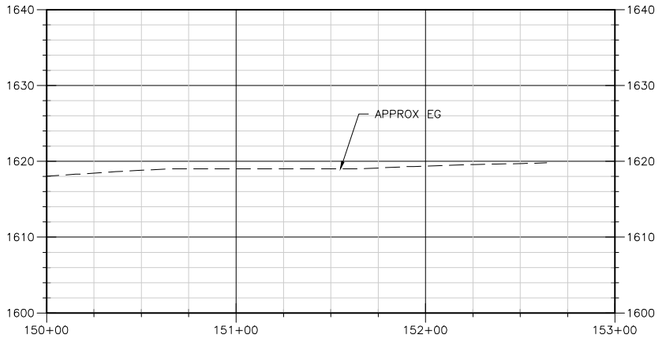
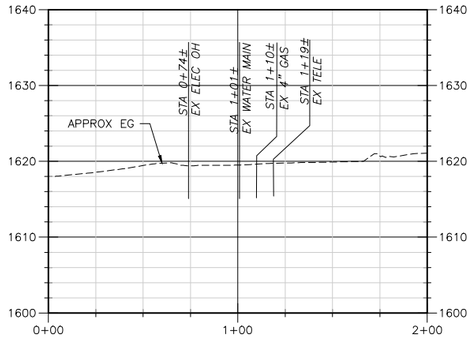
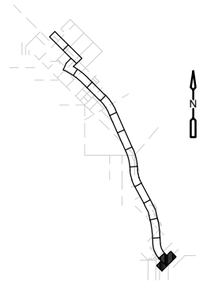




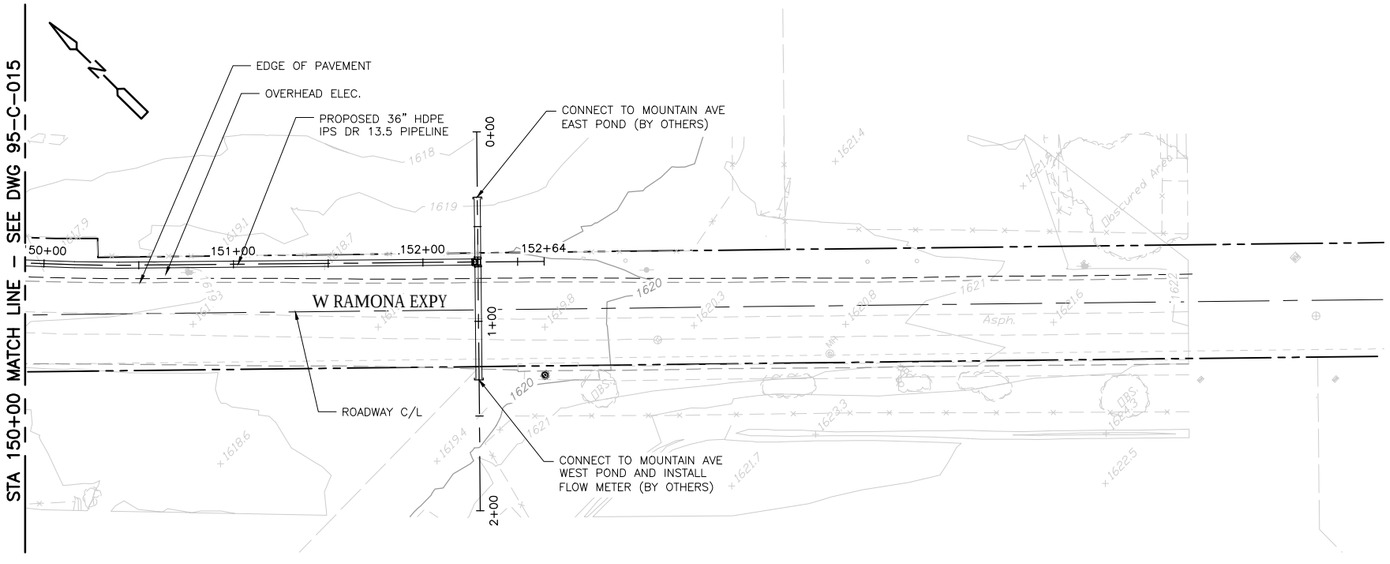
PROFILE

V: 1"=10', H: 1"=40'



KEY MAP

NTS



PLAN

1" = 40'

1" = 40'
20 0 40

1" = 10'
5 0 10

811 CALL 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. GOH
DRAWN BY: O. NAHHAS
SHEET CHK'D BY: ---
CROSS CHK'D BY: ---
APPROVED BY: ---
DATE: MAY 2018

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111 Academy Way, Suite 150
Irvine, California 92::17
Tel: (949) 752-5452

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

RECYCLED WATER CONVEYANCE PIPELINE PLAN / PROFILE 15 OF 15

PROJECT NO. 26793-214344
FILE NAME: 95-C-016

SHEET NO.
95-C-01□

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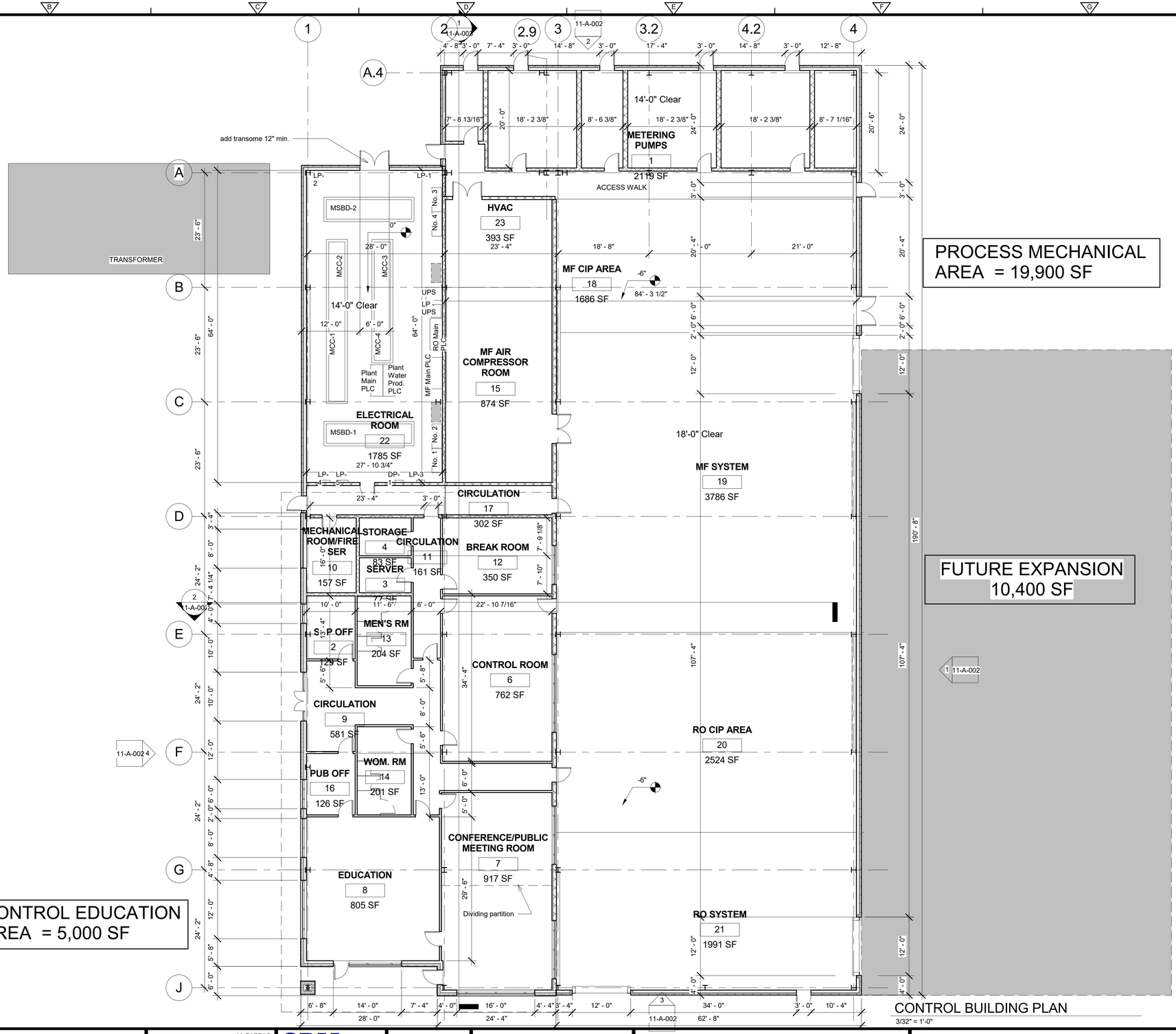

CONTROL BUILDING PLAN

3/32" = 1'-0"

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REV. NO.	DATE	DRWN	REMARKS

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DESIGNED BY: M. PAPPAS
DRAWN BY: M. PAPPAS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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111 Academy Way Suite 150
Irvine, CA 92617
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND CONTROL BUILDING PLAN

PROJECT NO. 26793-214344
FILE NAME: AWZ001BM.RVT

11-A-001

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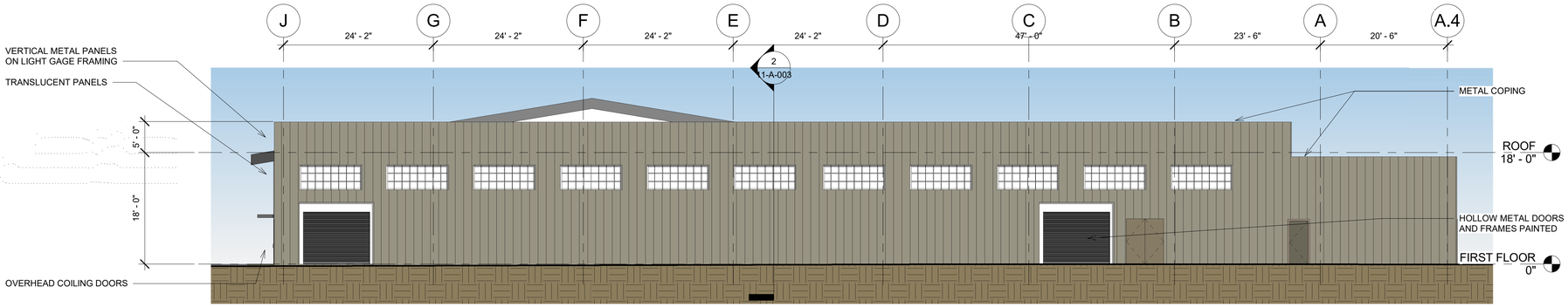
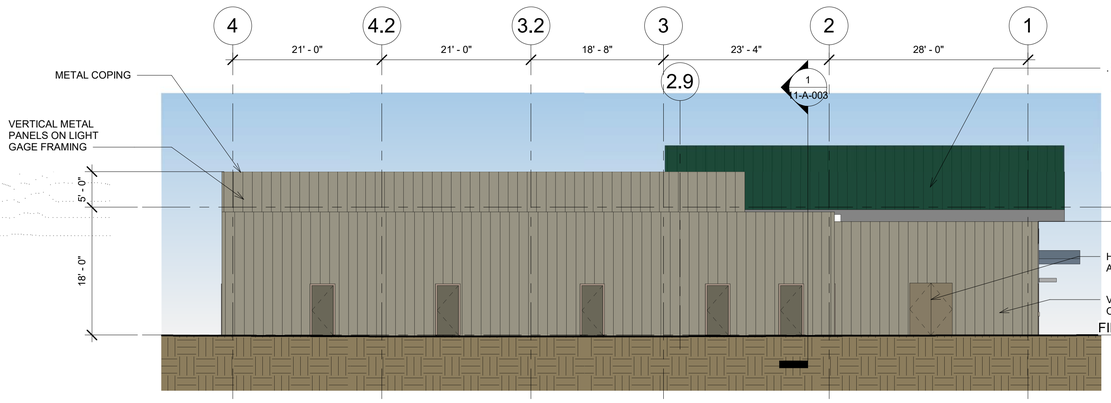
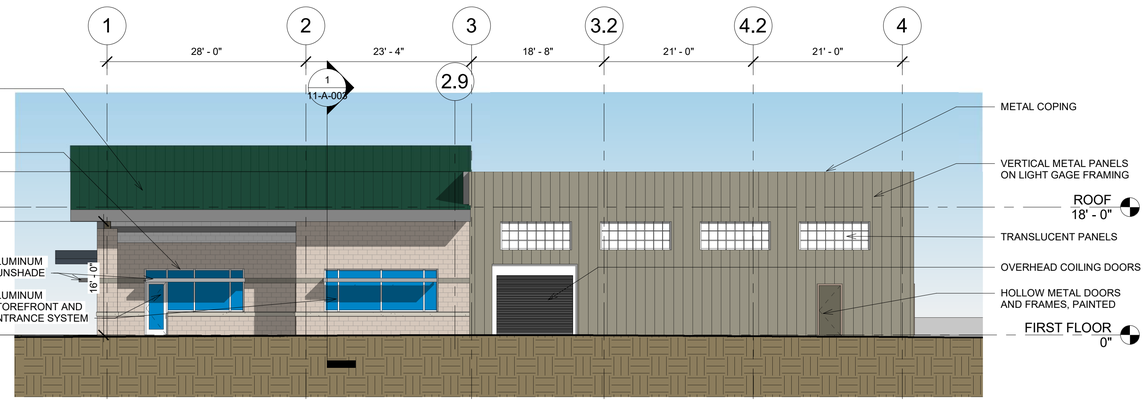


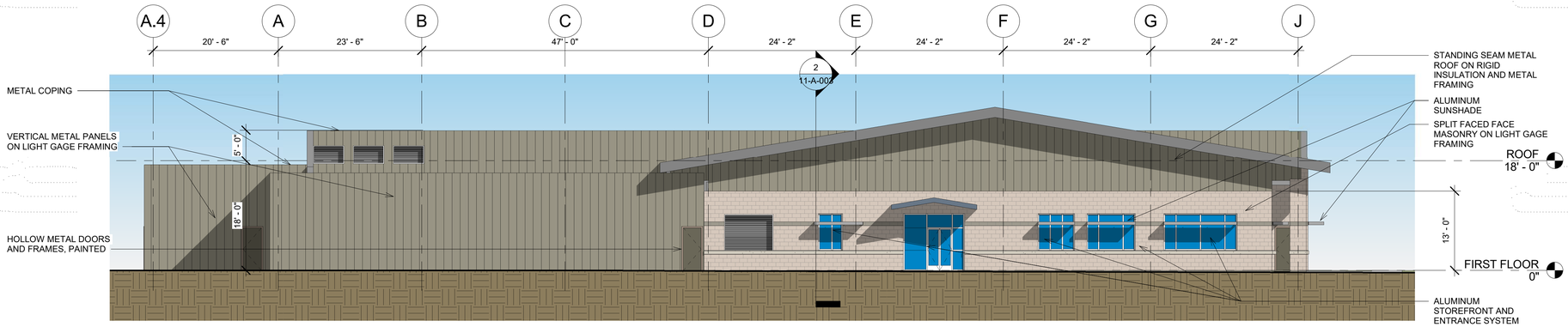
1 EAST ELEVATION
3/32" = 1'-0"



2 NORTH ELEVATION
3/32" = 1'-0"



3 SOUTH ELEVATION
3/32" = 1'-0"



4 WEST ELEVATION
3/32" = 1'-0"

REV. NO.	DATE	DRWN	REMARKS

DESIGNED BY: M. PAPPAS
DRAWN BY: M. PAPPAS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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111 Academy Way Suite 150
Irvine, CA 92617
Tel: (949) 752-5452

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND CONTROL BUILDING ELEVATIONS

PROJECT NO. 26793-214344
FILE NAME: AWZ001BM.RVT

11-A-002

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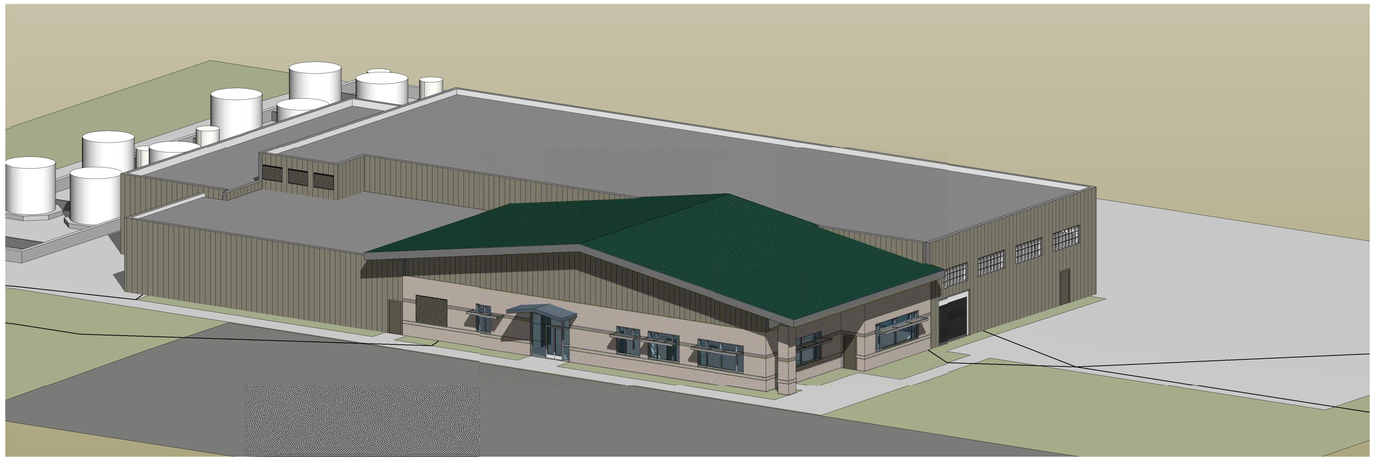
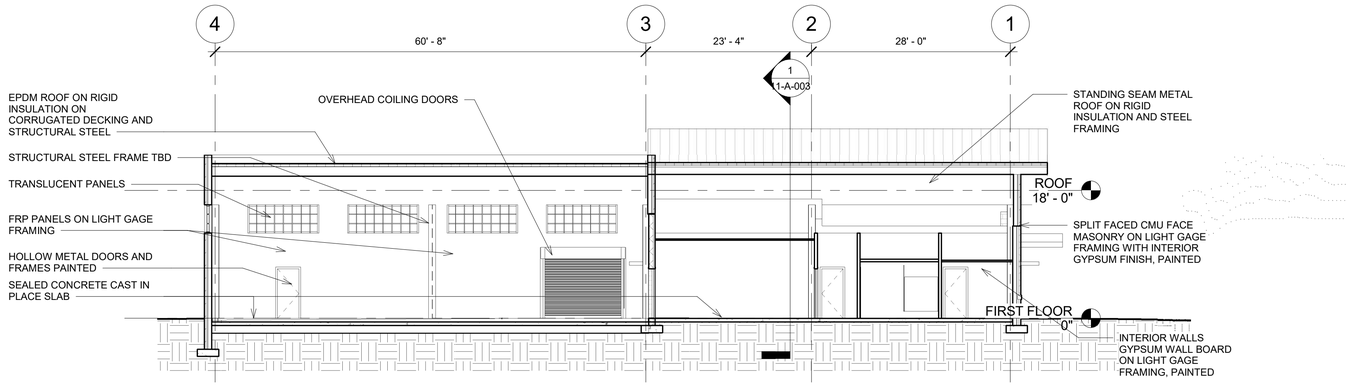
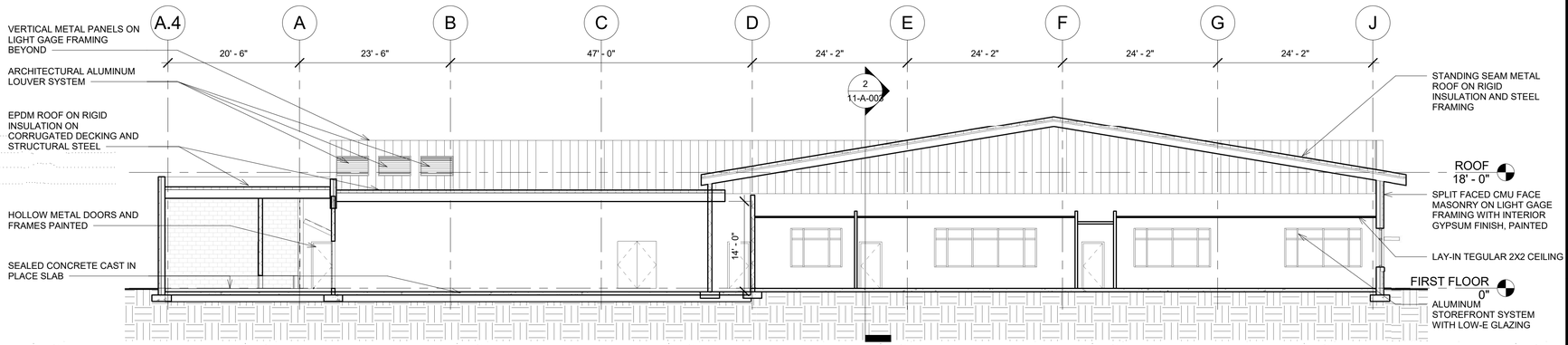


AXONOMETRIC VIEW



2 **SECTION - TRANSVERSE**
3/32" = 1'-0"



1 **SECTION - LONGITUDINAL**
3/32" = 1'-0"

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REV. NO.	DATE	DRWN	REMAR

DESIGNED BY: M. PAPPAS
DRAWN BY: M. PAPPAS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

CDM Smith
111 Academy Way Suite 150
Irvine, CA 92617
Tel: (949) 752-5452

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EASTERN MUNICIPAL WATER DISTRICT
PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND CONTROL BUILDING SECTIONS

PROJECT NO. 26793-214344
FILE NAME: AWZ001BM.RVT

11-A-003

5/22/2018 4:35:39 PM

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

PIPE AND FITTING SYMBOLS

DOUBLE LINE PIPING SINGLE LINE PIPING

3" PIPE & SMALLER	PROCESS PIPING:
	EXISTING PROCESS PIPING
	FUTURE PROCESS PIPING
	WELDED JOINT
	FLANGED JOINT, SIMPLIFIED REPRESENTATION (SEE NOTE 1)
	FLANGED JOINT (SEE NOTE 1)
(F) OR (R)	COUPLING FOR GROOVED END JOINTS: (F) FLEXIBLE (R) RIGID
	GROOVED END/FLANGED JOINT
	MECHANICAL JOINT (SEE NOTE 1)
	PUSH ON JOINT OR CAULKED BELL & SPIGOT JOINT (SEE NOTE 1)
	FLANGE x PLAIN END PIPE COUPLING (FLANGE ADAPTOR)
	PIPE COUPLING (SLEEVE-TYPE)
(A) (B) ONE OR TWO LETTERS IDENTIFYING THE TYPE REFER TO SPECIFICATIONS	PIPE COUPLING (SLEEVE-TYPE)
(B)	FLEXIBLE COUPLING OR EXPANSION JOINT (BELLOWS TYPE)

PIPE AND FITTING SYMBOLS NOTES:

1. GENERIC JOINT SYMBOL IS USED FOR ALL SINGLE LINE PIPING SHOWN ON THE INTERIOR AND EXTERIOR MECHANICAL DRAWINGS.
2. BOTH, DETAILED AND SIMPLIFIED FLANGE REPRESENTATION SYMBOLS MAY BE SHOWN ON THE DRAWINGS.
3. UNLESS MODIFIED BY THE GENERAL PROJECT NOTES OR DETAILED ON THE LAYOUT AND SCHEMATIC DRAWINGS PIPE AND FITTING JOINT REQUIREMENTS FOR THE VARIOUS PIPE MATERIALS ARE DEFINED IN THE SPECIFICATIONS AND ARE INDICATED ON THE PROCESS PIPE SCHEDULES

VALVE SYMBOLS

DOUBLE LINE VALVE SINGLE LINE VALVE

UNCLASSIFIED. TYPE AS SHOWN ON THE DRAWINGS ADJACENT TO SYMBOL	
GATE VALVE	(GV)
KNIFE GATE VALVE	(KG)
GLOBE VALVE	(GLV)
BALL VALVE	(BV)
RECYCLE CONTROL VALVE	(RCV)
CONE VALVE	(CNV)
NEEDLE VALVE	(NV)
PINCH VALVE	(PV)
DIAPHRAGM VALVE	(DPV)
BUTTERFLY VALVE	(BFV)
PLUG VALVE	(PV)
3-WAY PLUG VALVE	(PV3)
4-WAY PLUG VALVE	(PV4)
CHECK VALVE, GENERAL SYMBOL	(CKV)
BALL CHECK VALVE	(BCV)
DOUBLE DOOR CHECK VALVE	(DDCV)
S SOLENOID VALVE	(SV)
M MOTOR OPERATED VALVE	(MOV)
S 3-WAY SOLENOID VALVE	(SV3)
S 4-WAY SOLENOID VALVE	(SV4)
ANGLE VALVE	(AV)
QUICK CONNECT COUPLING	(QCC)
RESTRAINED FLANGED COUPLING ADAPTER	(FCA)
BULKHEAD GATE	(BHG)
SLIDE GATE	(SG)
SLUICE GATE	(SLG)
PCV XX-XXXX PRESSURE REDUCING REGULATOR SELF CONTAINED	(PCV)
PCV XX-XXXX PRESSURE REDUCING REGULATOR WITH EXTERNAL PRESSURE TAP	(PCV)
POCV XX-XXXX DIFFERENTIAL PRESSURE REDUCING REGULATOR WITH INTERNAL AND EXTERNAL PRESSURE TAPS	(PDCV)

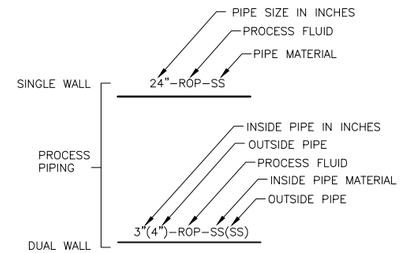
GENERAL MECHANICAL NOTES

1. STRUCTURAL BACKGROUND AND DIMENSIONAL DATA ON MECHANICAL DRAWINGS ARE FOR REFERENCE (REF) ONLY. SEE APPLICABLE STRUCTURAL DRAWINGS FOR ACTUAL DESIGN INFORMATION.
2. ALL BURIED PIPING SHOWN AND LOCATED ON CIVIL DRAWINGS, SHALL AGREE WITH MECHANICAL PIPING LOCATING DIMENSIONS. UNLESS INDICATED OTHERWISE OR NOT SHOWN, MECHANICAL LOCATION SHALL TAKE PRECEDENCE.
3. FOR THE SAKE OF CLARITY MECHANICAL PIPING DRAWINGS MAY NOT SHOW ALL VALVES, GAUGES, SWITCHES, OPERATORS, DRAINS, VENTS, ETC. REQUIRED FOR THE COMPLETE SYSTEM.
4. CERTAIN SMALL DIAMETER PIPING RUNS (ESPECIALLY CONTROL/ SAMPLING/ PLUMBING/ CHEMICAL PIPES) MAY NOT BE SHOWN IN THEIR ENTIRETY. IN SOME CASES PIPING IS SHOWN APPROXIMATELY TO SCALE BUT NOT EVERY FITTING, VALVE, OFFSET OR APPURTENANCES MAY BE SHOWN. SOME VALVES AND APPURTENANCES MAY BE OMITTED FOR THE SAKE OF CLARITY.
5. FOR DATA NOT SHOWN ON MECHANICAL DRAWINGS, THE APPROPRIATE P&ID'S SHALL GOVERN.
6. FOR THE PIPE FITTINGS OR APPURTENANCES THAT ARE NOT SHOWN OR CALLED OUT, THE CONTRACTOR SHALL PROVIDE TO COMPLETE THE PIPING SYSTEM.
7. EQUIPMENT ANCHORAGE SHALL BE DESIGNED BY THE EQUIPMENT SUPPLIER WITH SET AND LEVELING DONE BY THE CONTRACTOR. AFTER SETTING ALL BASE PLATES SHALL BE GROUTED PER MANUFACTURERS RECOMMENDATIONS.
8. UNLESS SHOWN OTHERWISE, USE ECCENTRIC TYPE REDUCER (FLAT ON TOP) ON ALL PIPING SYSTEMS TO MINIMIZE POCKETS, EXCEPT AIR LINES.
9. ANCHOR BOLTS OR EXPANSION TYPE ANCHORS SHOWN ON DWGS ARE FOR REFERENCE ONLY.
10. ALL PRESSURE PIPE JOINTS SHALL BE FULLY RESTRAINED UNLESS NOTED OTHERWISE.
11. CONNECTIONS BETWEEN DIFFERENT PIPE CLASSES SHALL BE MADE WITH A CONNECTION RATED FOR THE HIGHER PRESSURE CLASS.
12. P&ID'S SHALL GOVERN PIPE CONNECTIONS AND PIPE APPURTENANCES, AND SHALL TAKE PRECEDENCE OVER MECHANICAL DRAWINGS, UNLESS SPECIFICALLY NOTED OTHERWISE.
13. DIELECTRIC COUPLINGS, INSULATING FLANGES AND FLANGE KITS, OR UNIONS SHALL BE INSTALLED AT ALL CONNECTIONS OF ALL DISSIMILAR TYPES OF PIPES AND MATERIALS.
14. ALL EQUIPMENT BASES AND PIPING HAVING DRAIN OUTLETS SHALL BE PIPED TO THE NEAREST FLOOR DRAIN OR SUMP USING PVC PIPE OF APPROPRIATE DIAMETER AS INDICATED ON THE DRAWINGS OR AS RECOMMENDED BY THE EQUIPMENT MANUFACTURER.
15. EXCEPT AT EQUIPMENT AND VALVES, OR IF OTHERWISE NOTED, RIGID SPLIT RING ("VICTAULIC" TYPE) COUPLINGS MAY BE UTILIZED IN PLACE OF FLANGED CONNECTIONS, AS ACCEPTABLE TO THE ENGINEER. IF MINIMUM PIPE WALL THICKNESS REQUIREMENTS CANNOT BE MET, UTILIZE SHOULDERED ENDS.
16. PIPES SHALL SLOPE UNIFORMLY (OR BE STRAIGHT) BETWEEN CENTERLINES AND/ OR INVERT ELEVATIONS SHOWN.
17. ALL WALL OR FLOOR PENETRATIONS SHALL BE SEALED.
18. EXCEPT FOR THREADED AND 1 1/2" AND SMALLER VALVES, PROVIDE CHAIN OPERATOR OR EXTENSION STEMS TO ALL OPERATING VALVES WHICH ARE GREATER THAN 6 FEET ABOVE ANY OPERATING LEVEL. CHAINS SHALL BE EXTENDED TO A CLEAR AREA AND TO AN ELEVATION OF MAXIMUM 3 FEET ABOVE THE OPERATING LEVEL.

PIPE SUPPORTS

19. BALL VALVES FOR SODIUM HYPOCHLORITE AND HYDROGEN PEROXIDE SYSTEMS SHALL BE VENTED.
20. PRVs SHALL BE INSTALLED AT ALL HIGH POINTS ON THE SODIUM HYPOCHLORITE AND HYDROGEN PEROXIDE SYSTEM PIPING. ALSO, PRVs SHALL BE INSTALLED ON ALL ISOLATED VALVE SEGMENTS ON SODIUM HYPOCHLORITE SYSTEM PIPING.
21. THE NUMBER AND LOCATION OF UNIONS AND OTHER COUPLINGS SHOWN IS APPROXIMATE AND ALL ARE NOT SHOWN. THE CONTRACTOR SHALL PROVIDE UNIONS OR DISMANTLING COUPLINGS (WHETHER THEY ARE SHOWN ON THE DRAWINGS OR NOT) ON ALL PIPELINES AT: ALL EQUIPMENT CONNECTIONS AND BRANCH LINES.
22. ALL EXPOSED PVC PIPING AND VALVES SHALL BE PAINTED WITH UV RESISTANT COATING.
23. PIPE SUPPORTS SHOWN IF SHOWN, ON THE DRAWINGS ARE MINIMUM REQUIREMENTS AND ARE USED TO SHOW DESIGN INTENT TO THE CONTRACTOR.
24. CONTRACTOR SHALL DESIGN AND TRANSMIT SUBMITTALS ON ALL PIPE SUPPORTS THAT ARE REQUIRED FOR A COMPLETE SYSTEM, BUT MAY NOT BE SHOWN ON DRAWINGS. SUPPORTS SHALL BE BRACED AS REQUIRED FOR SEISMIC RESTRAINT. TRANSMIT SUBMITTALS ON PIPE SUPPORT DETAILS AND DESIGN CALCULATIONS PERFORMED BY A CALIFORNIA PE TO CDM SMITH FOR REVIEW AND APPROVAL.
25. ALL PIPING ADJACENT TO EQUIPMENT, FITTINGS, VALVES, COUPLINGS, INSTRUMENT DEVICES AND OTHER APPURTENANCES SHALL BE PROPERLY SUPPORTED AND/OR ANCHORED ACCORDING TO ALL MANUFACTURERS' RECOMMENDATIONS.
26. SIZE OF SUPPORT COMPONENTS AND THEIR CONNECTIONS SHOWN FOR PIPE, DUCT, HVAC, AND EQUIPMENT ANCHORAGE SYSTEM (ALL ITEMS INCLUDING ANCHOR BOLT SIZE, SPACING, AND EMBEDMENT LENGTH) ARE MINIMUM REQUIREMENTS. CONTRACTOR SHALL DESIGN ALL SUPPORT COMPONENTS AND THEIR CONNECTIONS PER SPECIFICATIONS AND INCREASE SIZES AS REQUIRED BY DESIGN CALCULATIONS.
27. CONTRACTOR SHALL COORDINATE SUPPORT CONFIGURATION AND INSTALLATION WITH WORK OF ALL OTHER TRADES PRIOR TO ANY FABRICATION OR INSTALLATION.
28. WHEN PIPE SUPPORTS ARE NOT PLASTIC COATED, SHIELDED OR LINED, ALL PVC, COPPER AND SST PIPING SHALL BE WRAPPED AT SUPPORT POINTS WITH 70 MILS TEFLON OR PVC TAPE.

PIPE LINE TAGGING



NOTES:

1. REFER TO 00-G-003 FOR PIPING AND FLOW STREAM ABBREVIATIONS

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REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92::17
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

MECHANICAL SYMBOLS, ABBREVIATIONS AND GENERAL NOTES

PROJECT NO. 26793-214344
FILE NAME: 00-M-001.DWG
SHEET NO.
00-M-001

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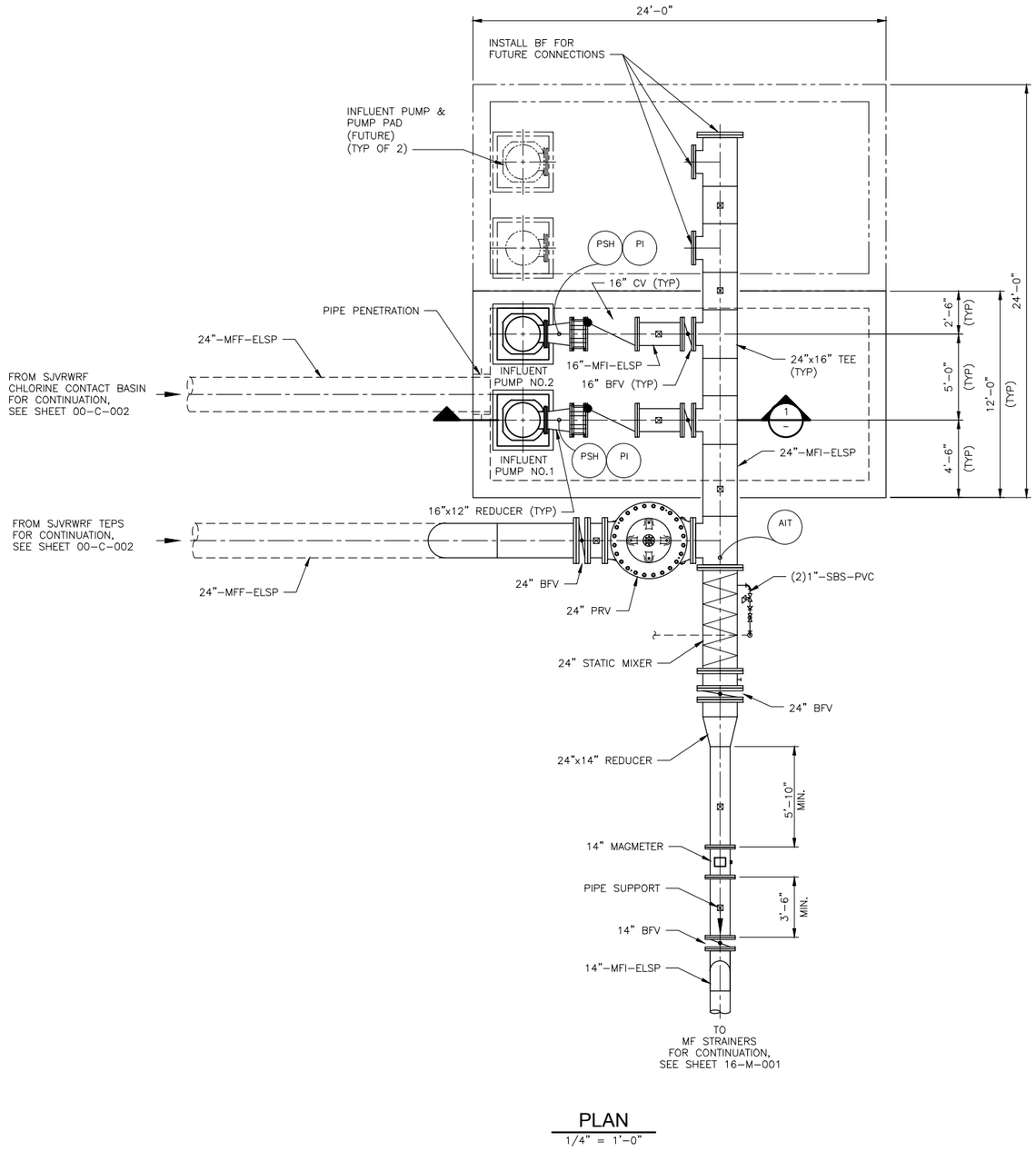
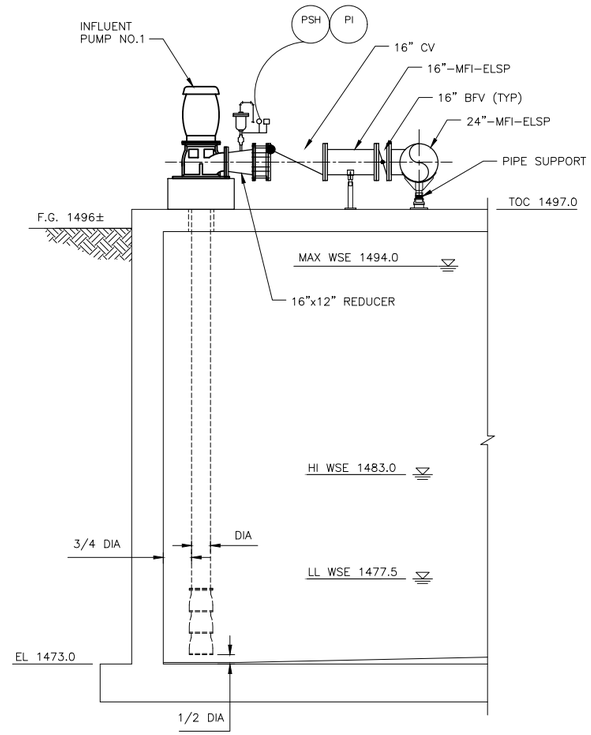
PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION



PLAN
1/4" = 1'-0"



SECTION 1
1/4" = 1'-0"

1/4" = 1'- 0"
2 1 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

INFLUENT PUMP STATION PLAN AND SECTION

PROJECT NO. 26793-214344
FILE NAME: 14-M-001.DWG
SHEET NO. 14-M-001

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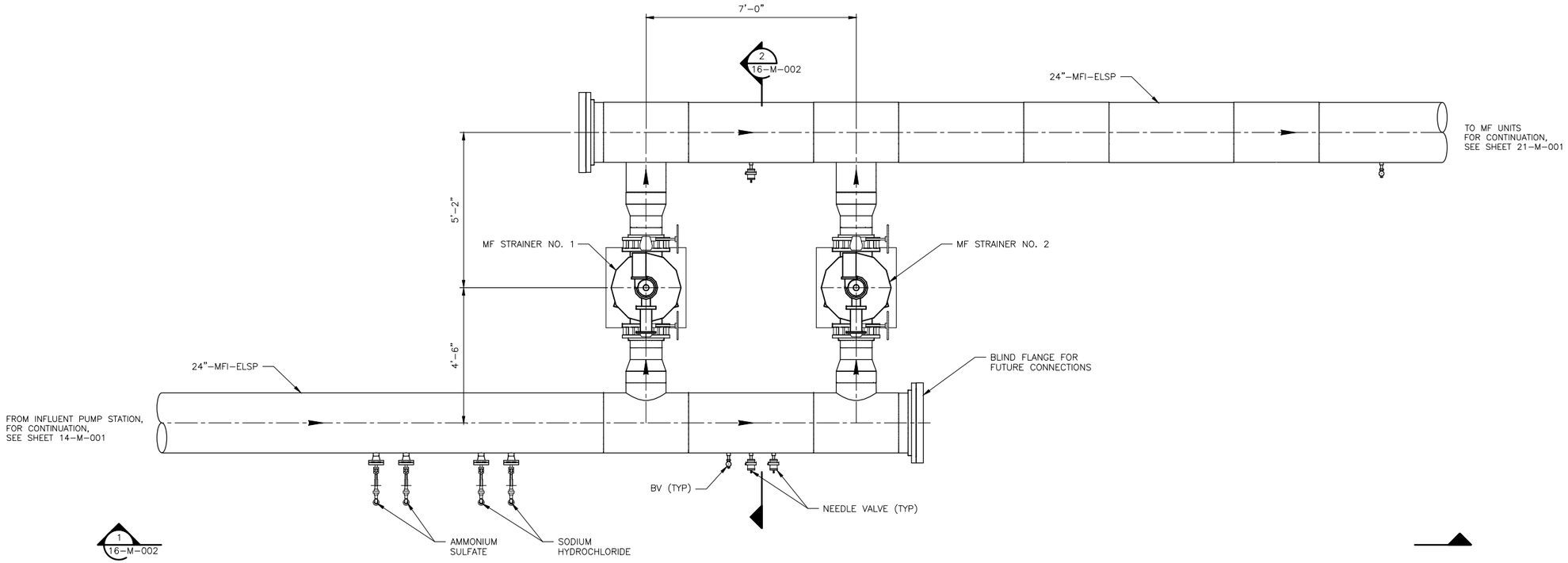

MF AUTOSTRAINERS

□L□N

1/2" = 1'-0"

1/2" = 1'- 0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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CARLSBAD, CA 92010
TEL: 760-400-3660 FAX: 760-400-3661

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

□RO□E□□□RE□□L□N
M□□TR□INER□

PROJECT NO. 26793-214344
FILE NAME: 16-M-001.dwg

SHEET NO.
□□M□□□

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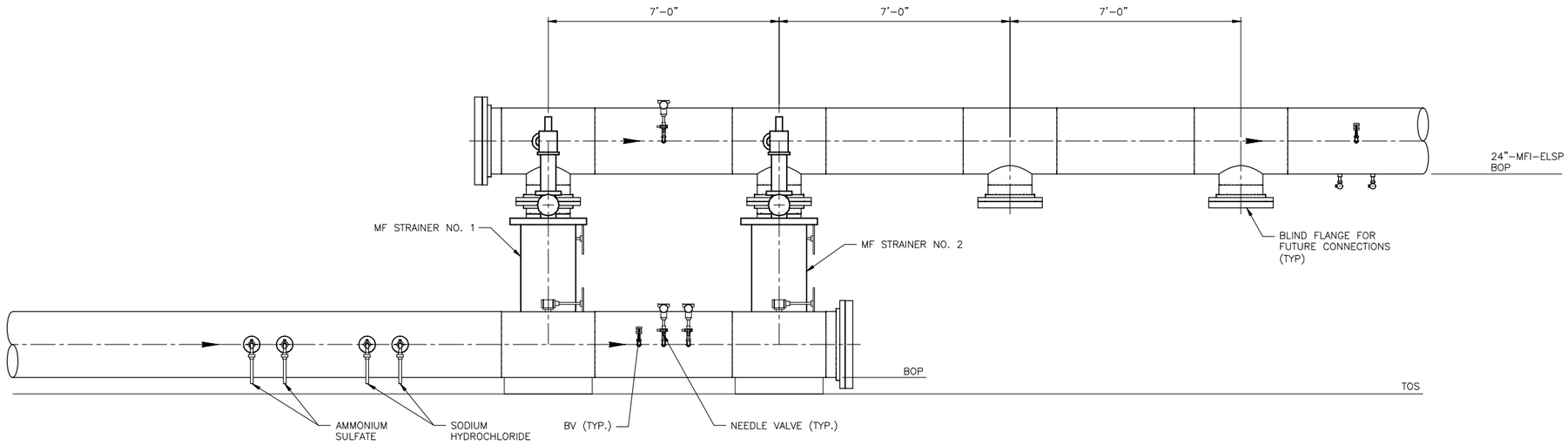

MF AUTOSTRAINERS

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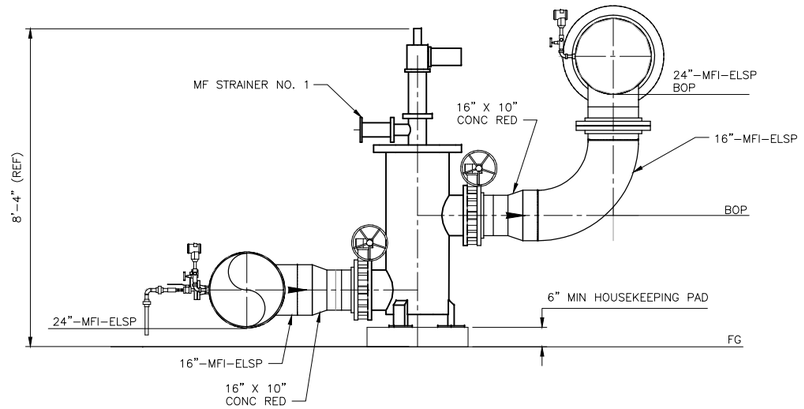
1/2" = 1'-0" 16-M-001



MF AUTOSTRAINERS

□E□TION □

1/2" = 1'-0" 16-M-001

1/2" = 1'- 0"

1 0 1 2

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

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M□□TR□INER□

PROJECT NO. 26793-214344
FILE NAME: 16-M-002.dwg

SHEET NO.
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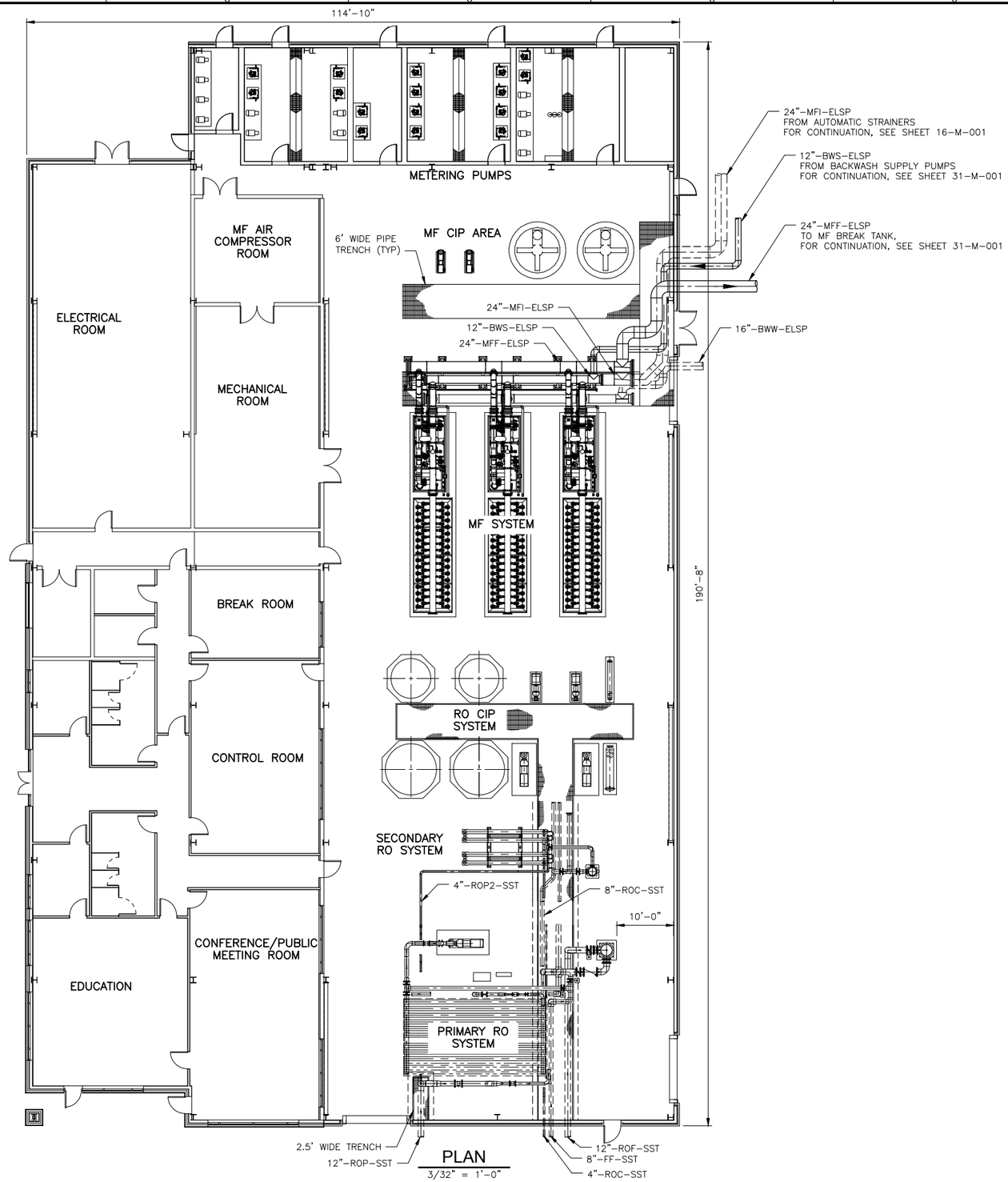

PLAN
3/32" = 1'-0"

3/32" = 1'- 0"
8 0 8 16

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS BUILDING PLAN

PROJECT NO. 26793-214344
FILE NAME: 17-M-001.DWG
SHEET NO. 17-M-001

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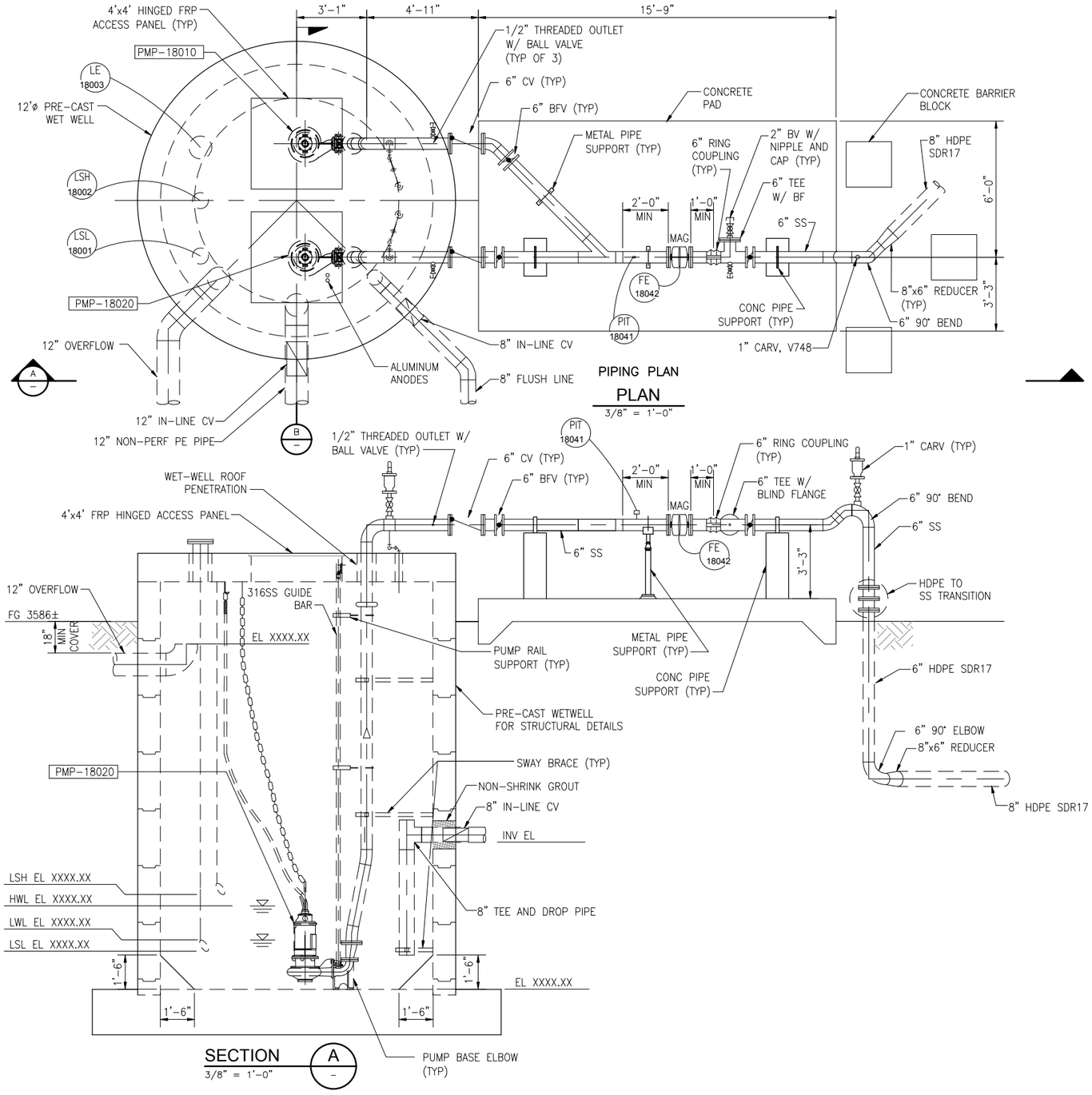
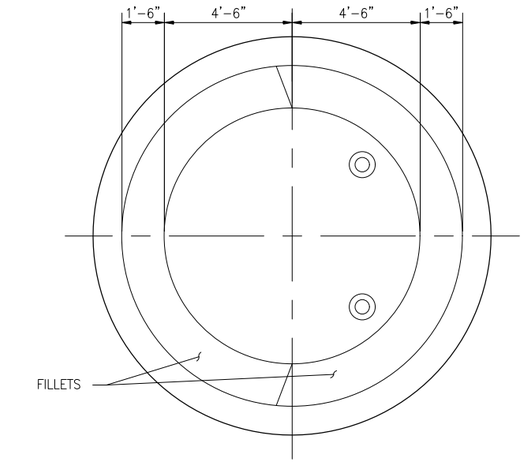


PIPING PLAN

PLAN

3/8" = 1'-0"



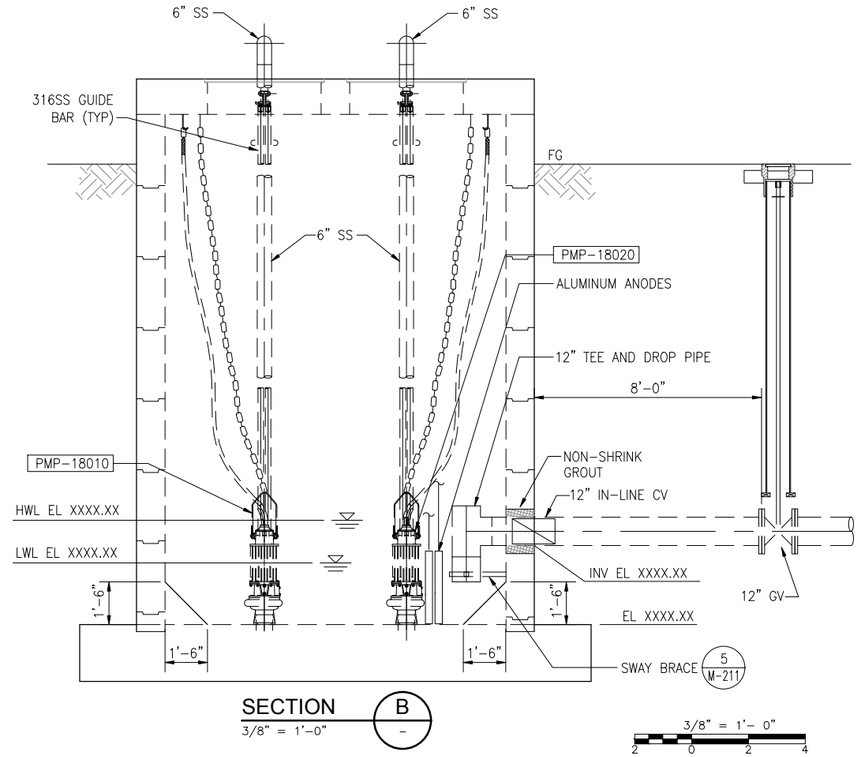
LOWER LEVEL WET WELL PLAN

PLAN

3/8" = 1'-0"

SECTION A

3/8" = 1'-0"



SECTION B

3/8" = 1'-0"

3/8" = 1'- 0"

2 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AREA PLAN
PLANT PROCESS WASTE PUMP STATION

PROJECT NO. 26793-214344
FILE NAME: 18-M-001.dwg
SHEET NO. 18-M-001

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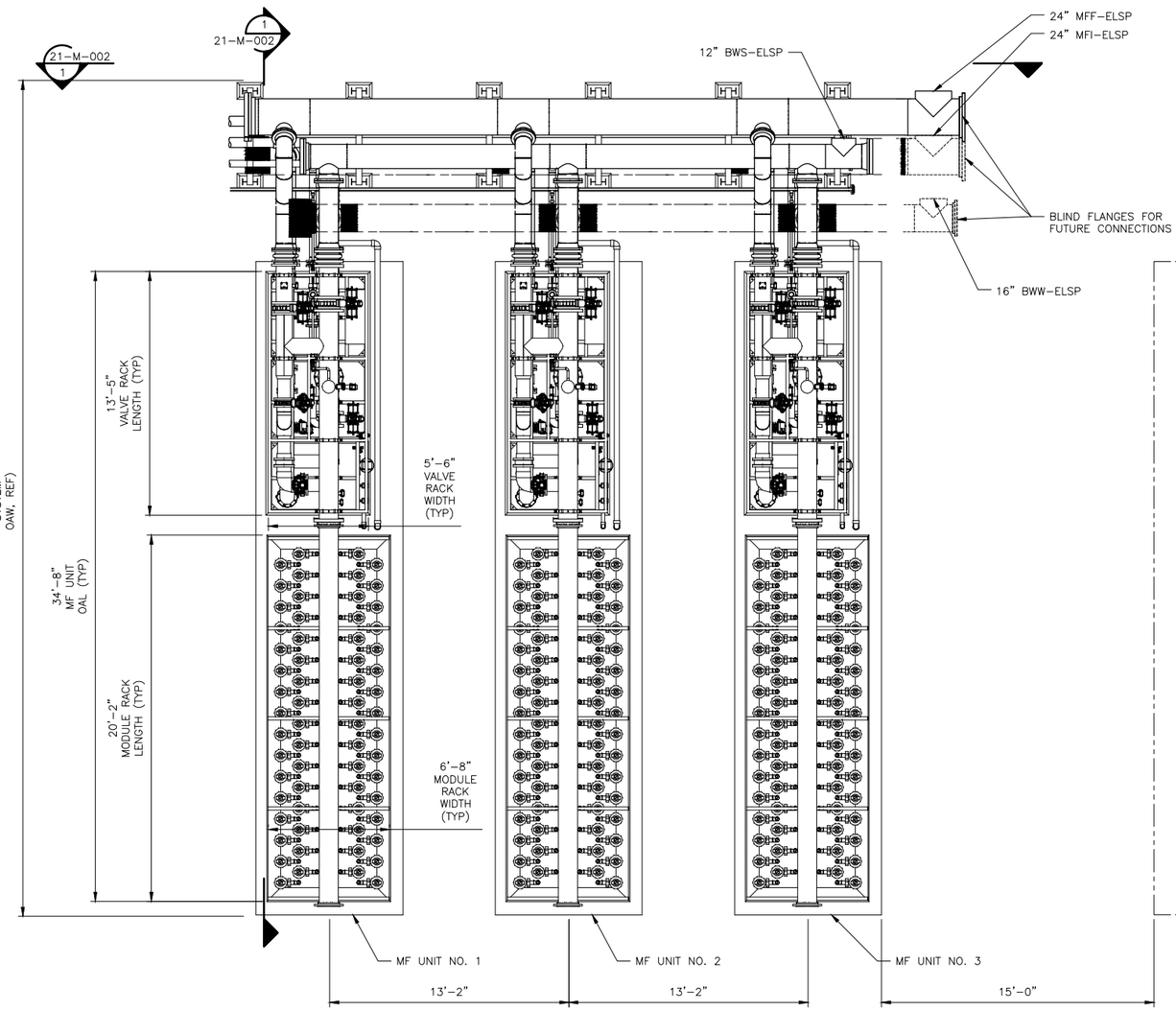

MF UNITS

□L□N

1/4" = 1'-0"

1/4" = 1'- 0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

□RO□E□□□RE□□L□N
M□□□□TEM□M□□NIT□

PROJECT NO. 26793-214344
FILE NAME: 21-M-001.dwg
SHEET NO.
□□M□□□

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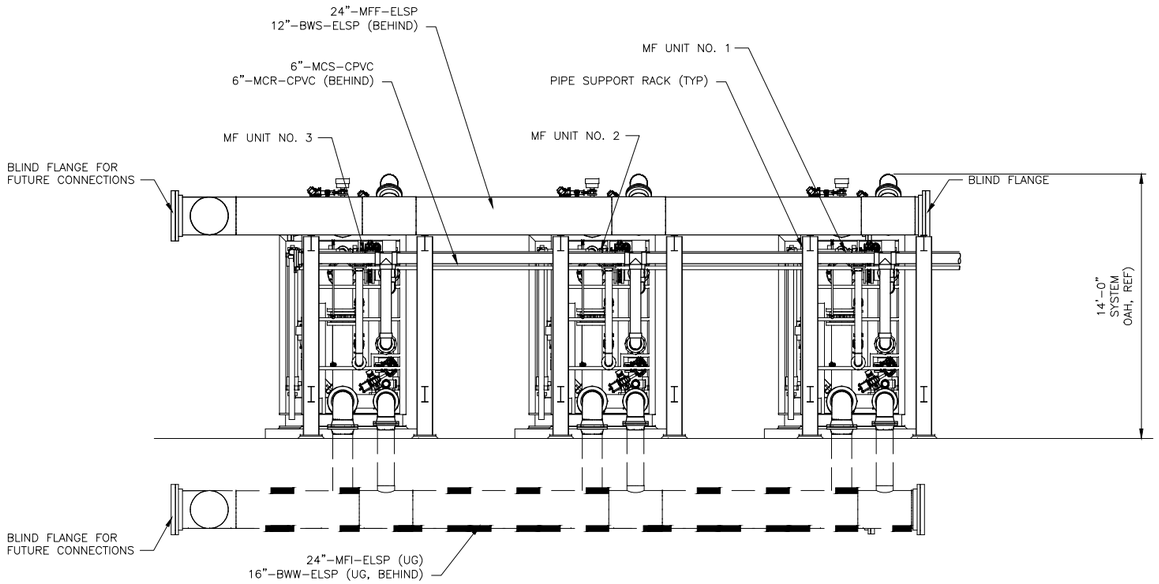

MF UNITS

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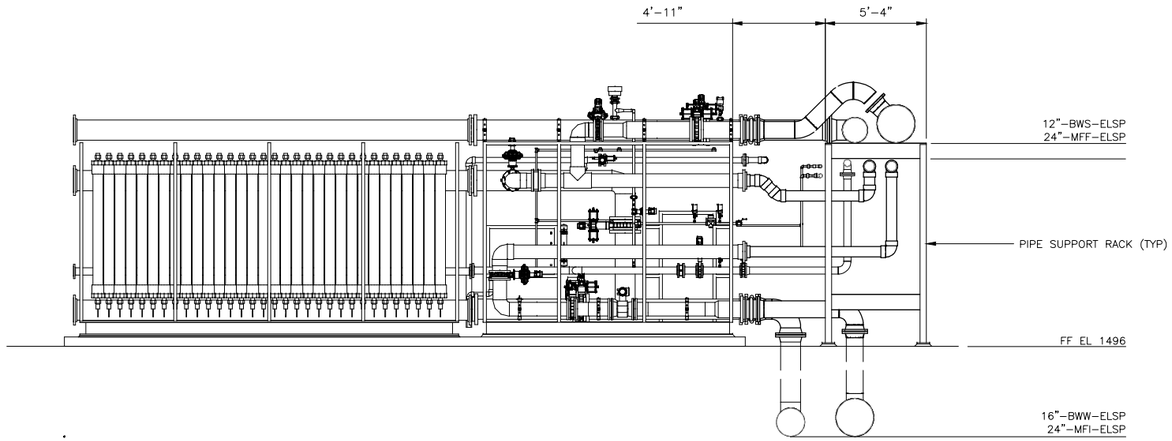
1/4" = 1'–0"

21–M–001



MF UNITS

□E□TION

1/4" = 1'–0"

21–M–001

1/4" = 1'– 0"

2 1 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

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M□□□TEM□M□□NIT□

PROJECT NO. 26793–214344
FILE NAME: 21–M–002.dwg

SHEET NO.

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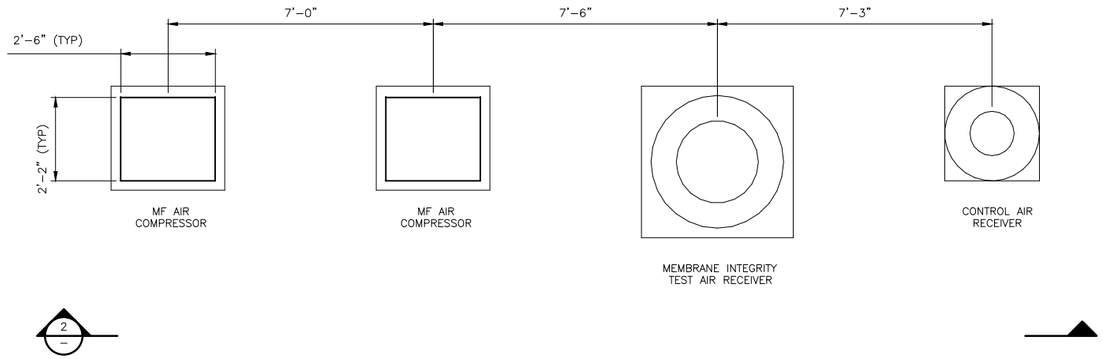

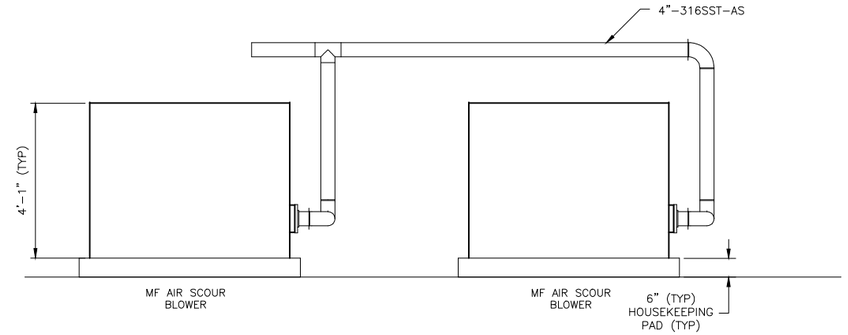

MF AIR SCOUR BLOWERS

□E□TION

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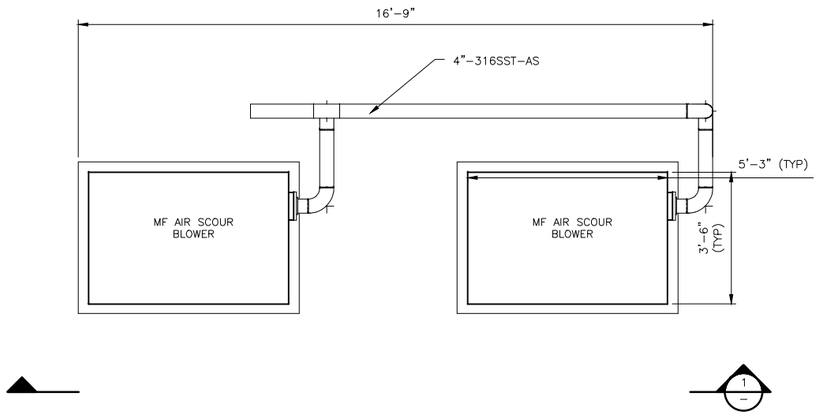

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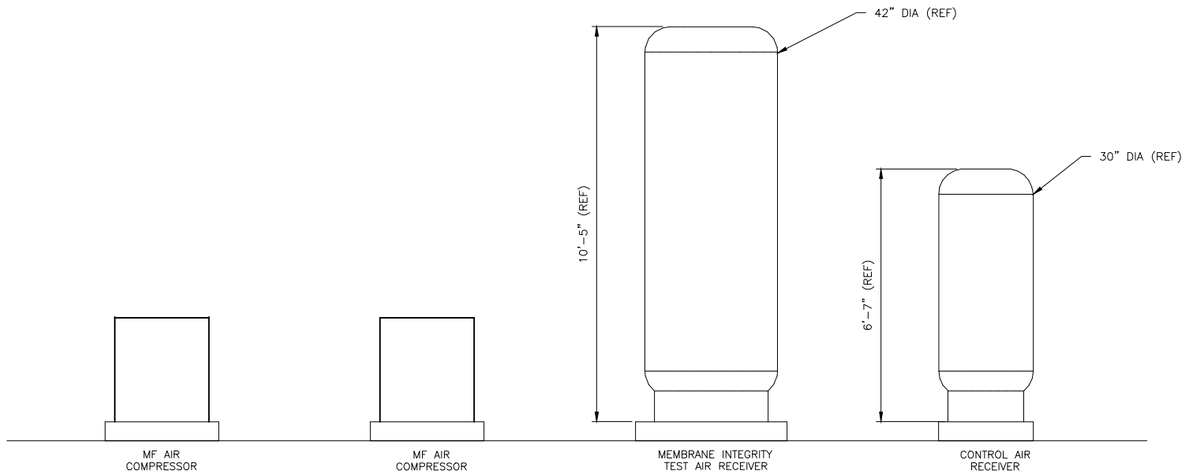
1/2" = 1'-0"



MF AIR COMPRESSOR

□E□TION

1/2" = 1'-0"

1/2" = 1'- 0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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CARLSBAD, CA 92010
TEL: 760-400-3660 FAX: 760-400-3661

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

□RO□E□□□RE□□L□N□ND□E□TION M□□IR□□O□R□ND□OM□RE□□ED□IR□□□TEM□

PROJECT NO. 26793-214344
FILE NAME: 23-M-001.dwg

SHEET NO.

□□M□□□

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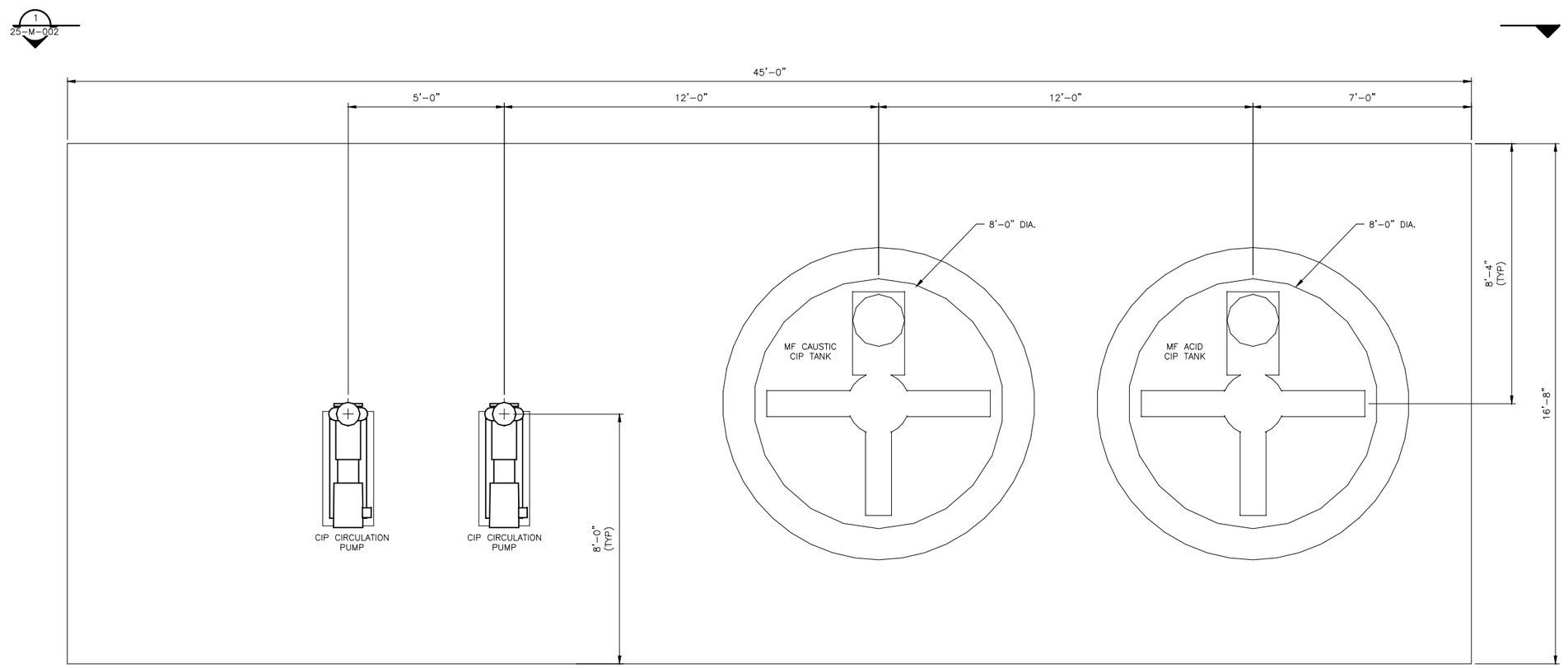

MF CIP SYSTEM

□L□N

1/2" = 1'-0"

1/2" = 1'- 0"
1 0 1 2

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

SEPARATION PROCESSES, INC.
3156 LIONSHEAD AVE., SUITE 2,
CARLSBAD, CA 92010
TEL: 760-400-3660 FAX: 760-400-3661

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

□RO□E□□□RE□□L□N M□□I□□□TEM

PROJECT NO. 26793-214344
FILE NAME: 25-M-001.dwg

SHEET NO.
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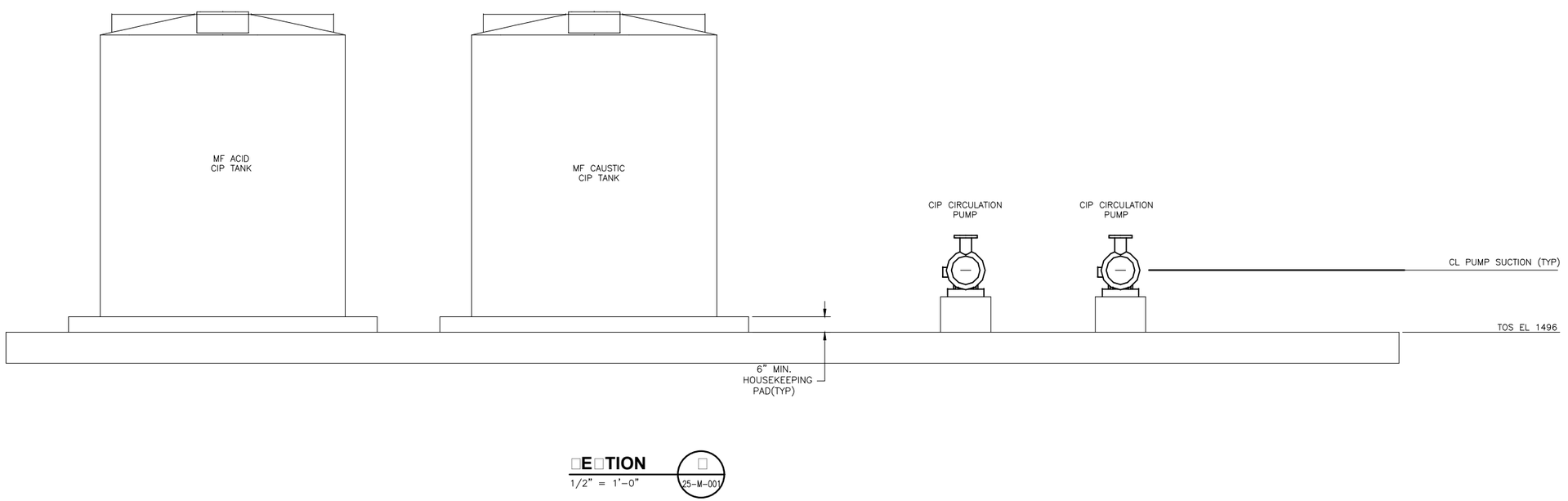

□E□TION □
1/2" = 1'-0" 25-M-001

1/2" = 1'- 0"
1 0 1 2

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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3156 LIONSHEAD AVE., SUITE 2,
CARLSBAD, CA 92010
TEL: 760-400-3660 FAX: 760-400-3661

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

□RO□E□□□RE□□E□TION
M□□I□□□TEM

PROJECT NO. 26793-214344
FILE NAME: 25-M-002.dwg
SHEET NO.
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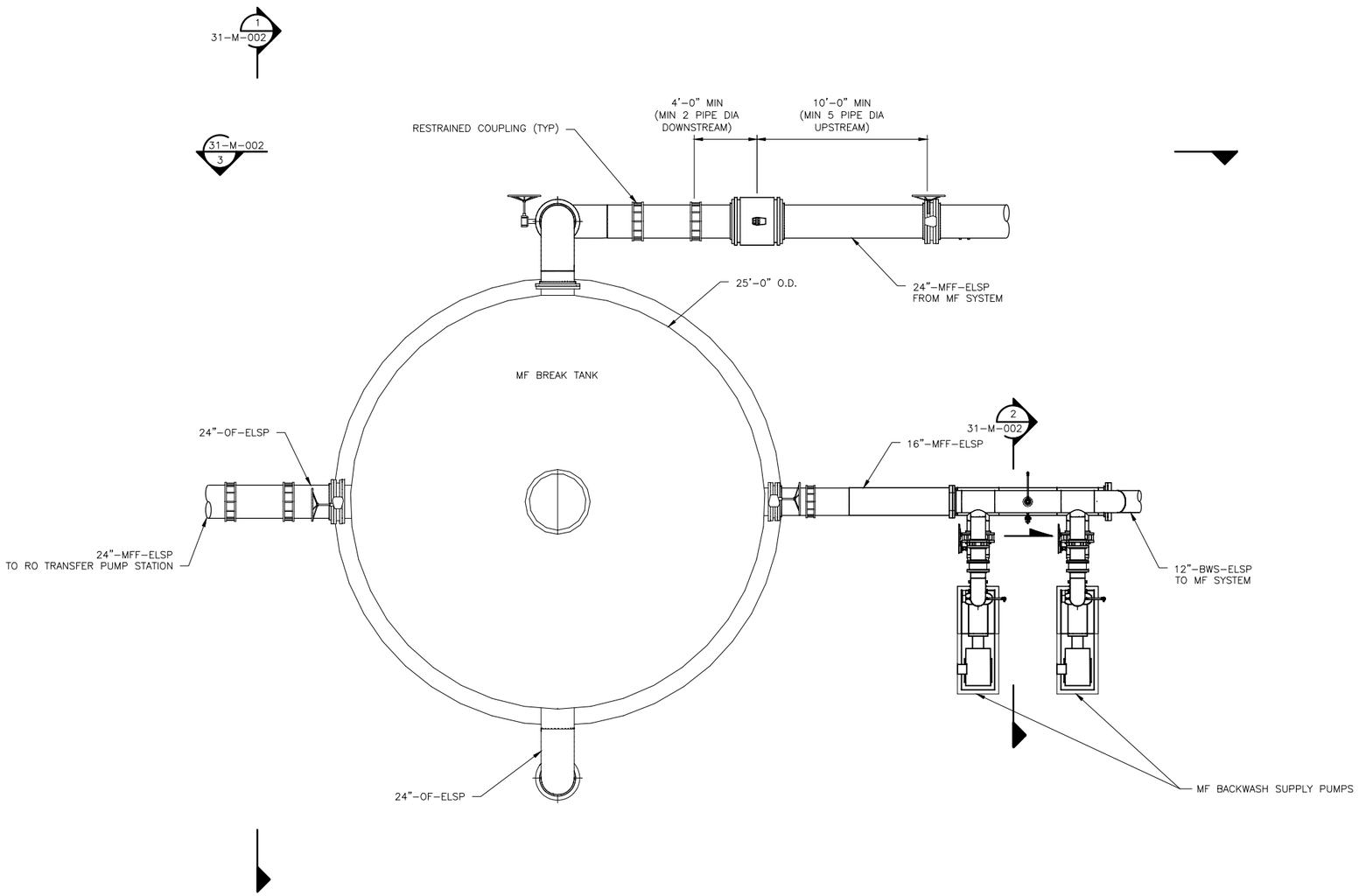

MF BREAK TANK AND BACKWASH SUPPLY PUMP STATION

□L□N

1/4" = 1'-0"

N

1/4" = 1'- 0"

2 1 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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3156 LIONSHEAD AVE., SUITE 2,
CARLSBAD, CA 92010
TEL: 760-400-3660 FAX: 760-400-3661

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

□RO□E□□□□RE□□L□N
M□□□RE□□T□N□□
□ND□□ □□□□L□□□M□□T□TION

PROJECT NO. 26793-214344
FILE NAME: 31-M-001.dwg

SHEET NO.
□□M□□□

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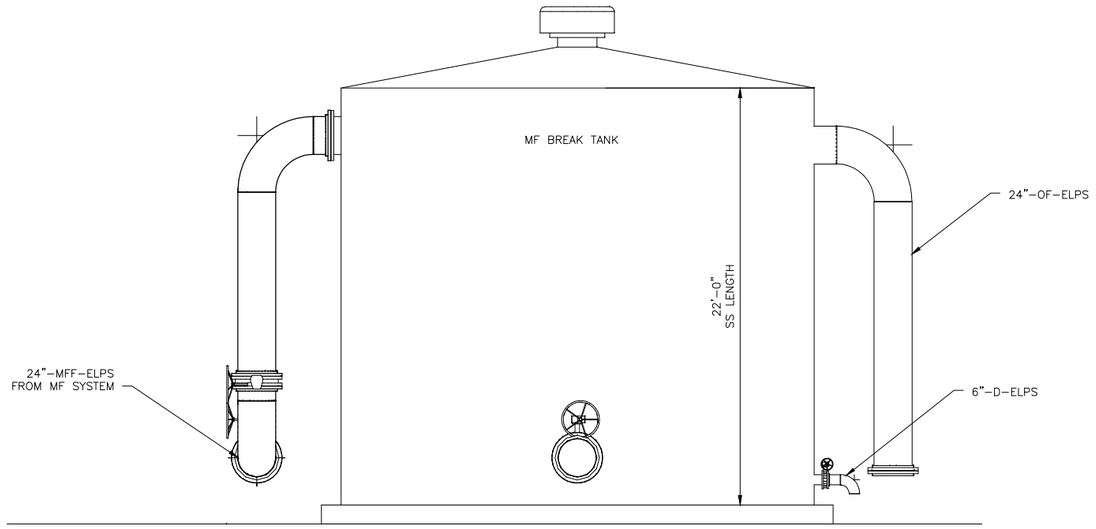
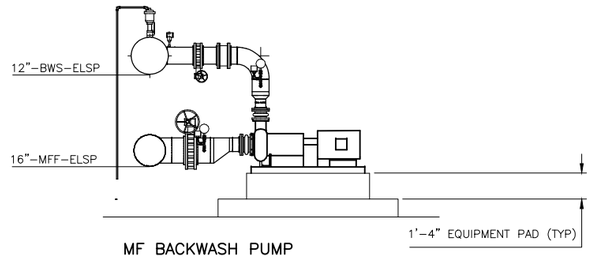
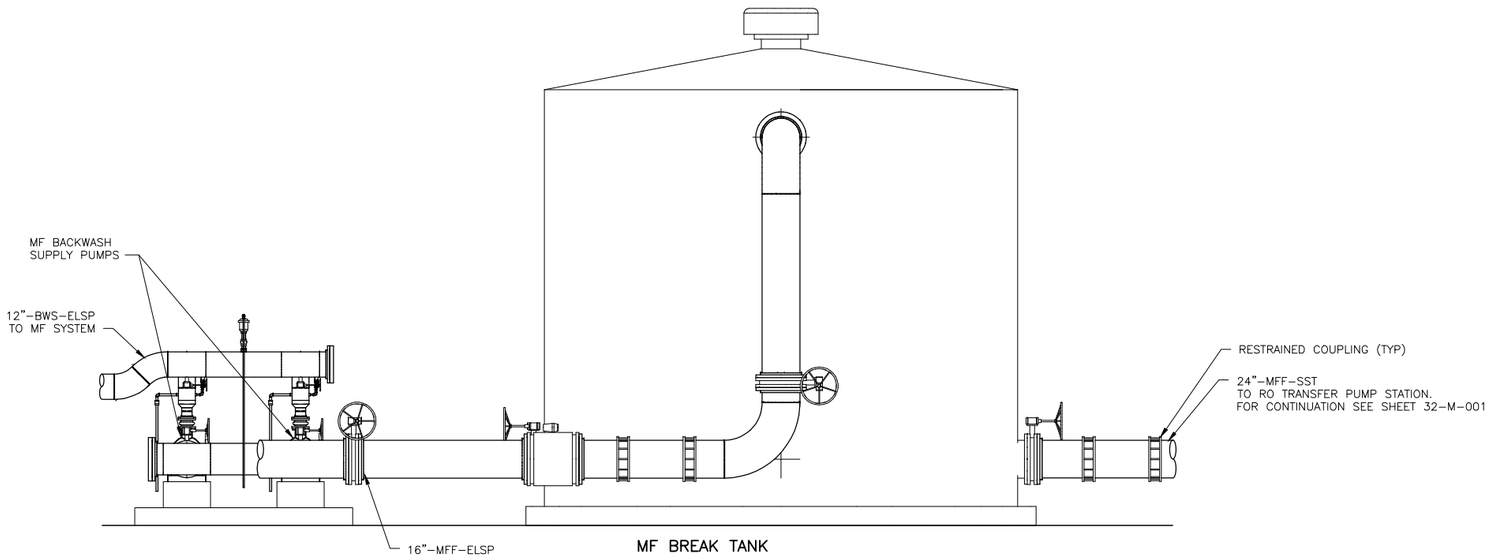


□E□TION
1/4" = 1'-0"
31-M-001



MF BACKWASH PUMP
□E□TION
1/4" = 1'-0"
31-M-001



MF BREAK TANK
□E□TION
1/4" = 1'-0"
31-M-001

1/4" = 1'- 0"
2 1 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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3156 LIONSHEAD AVE., SUITE 2,
CARLSBAD, CA 92010
TEL: 760-400-3660 FAX: 760-400-3661

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

□RO□E□□□□RE□□□E□TION□
M□□RE□□T□N□□ND□
□□ □□□□L□□□M□□T□TION

PROJECT NO. 26793-214344
FILE NAME: 31-M-002.dwg

SHEET NO.
□□M□□□

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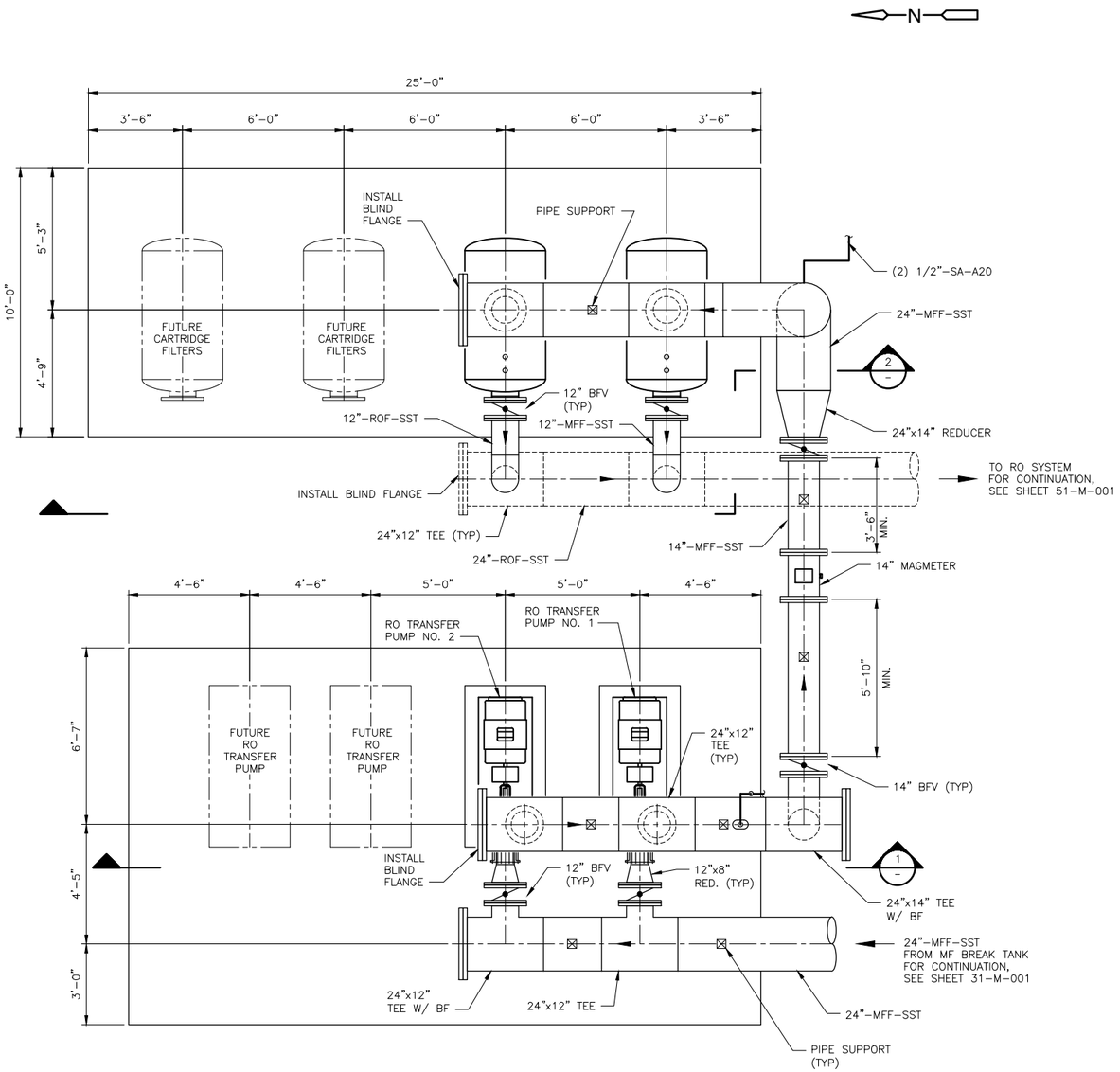
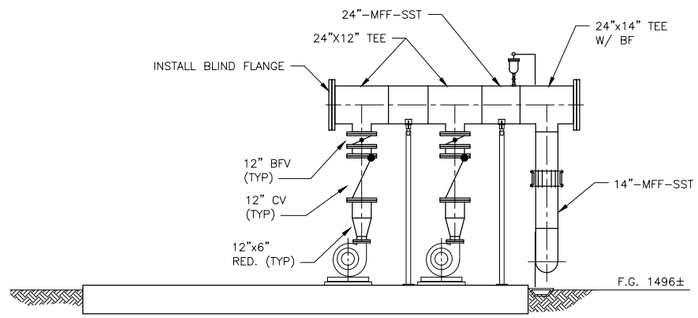


RO TRANSFER PUMPS AND CARTRIDGE FILTERS

PLAN

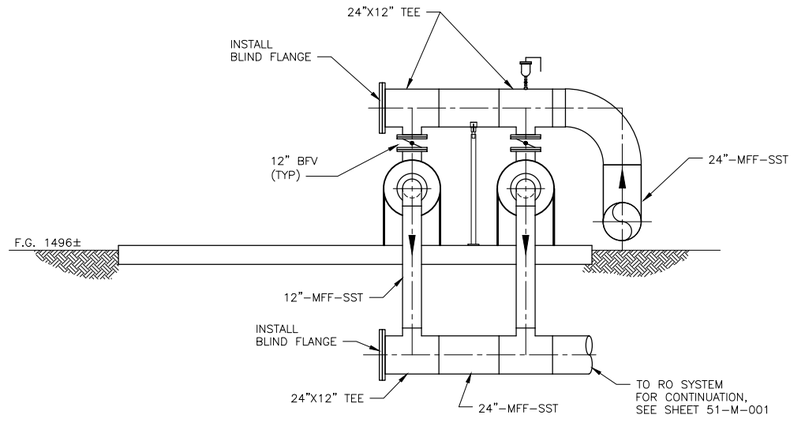
3/8" = 1'-0"



RO TRANSFER PUMPS

SECTION 1

1/4" = 1'-0"



CARTRIDGE FILTERS

SECTION 2

1/4" = 1'-0"

1/4" = 1'- 0"

3/8" = 1'- 0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AREA PLAN AND SECTION RO TRANSFER PUMP STATION

PROJECT NO. 26793-214344
FILE NAME: 32-M-001.DWG
SHEET NO. 32-M-001

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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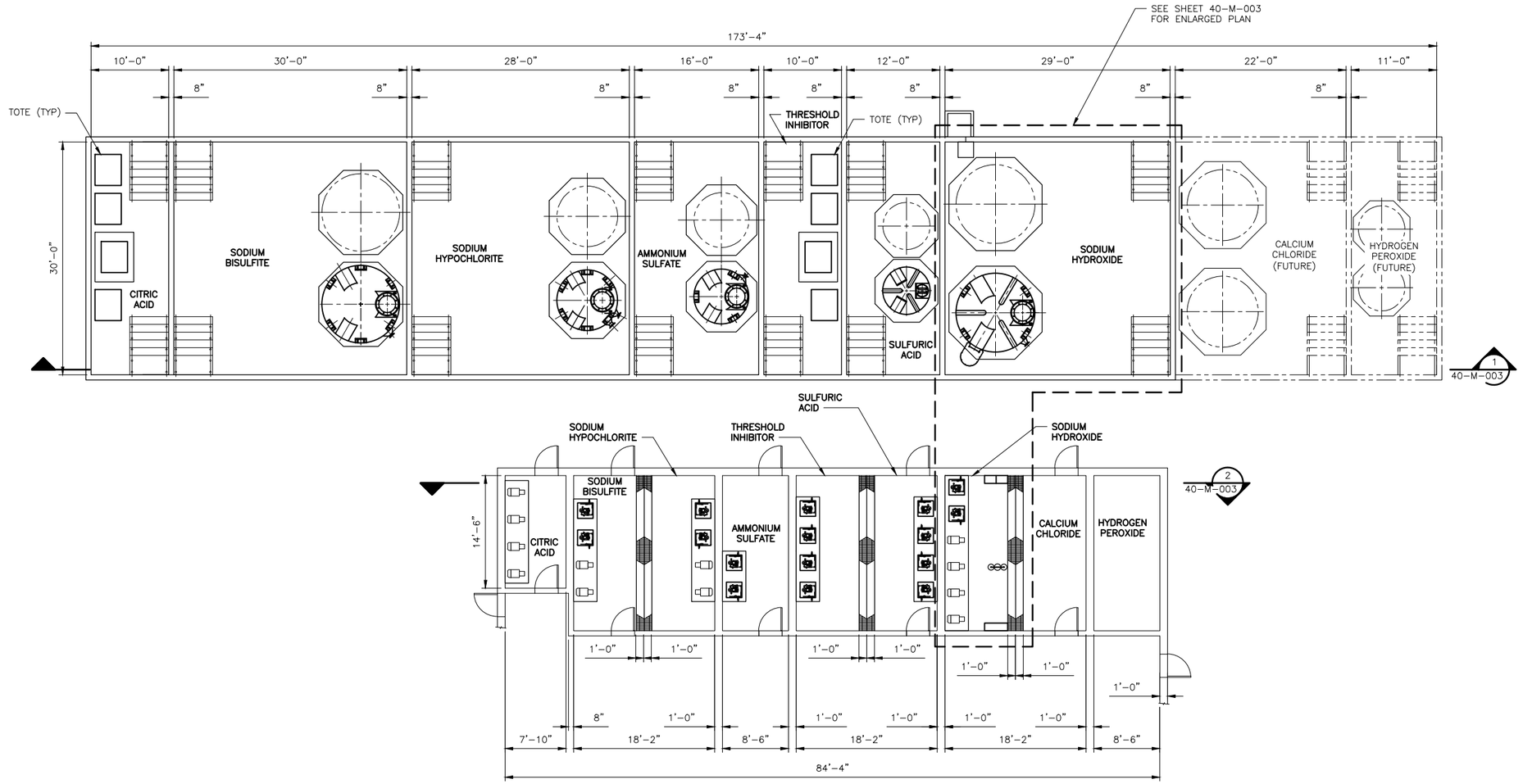

PLAN
1/8" = 1'-0"

1/8" = 1'- 0"
4 2 0 4 8

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

CHEMICAL AREA PLAN

PROJECT NO. 26793-214344
FILE NAME: 40-M-001.DWG

SHEET NO.
40-M-001

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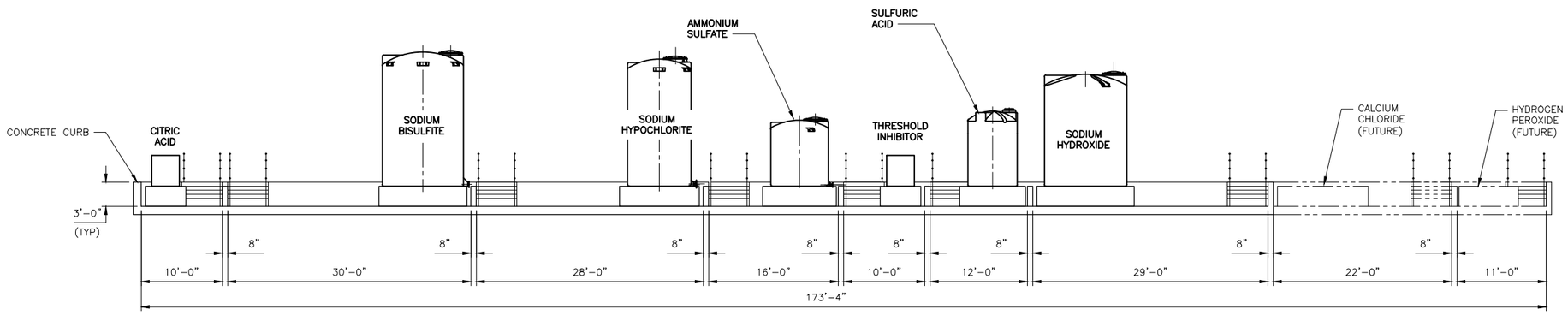
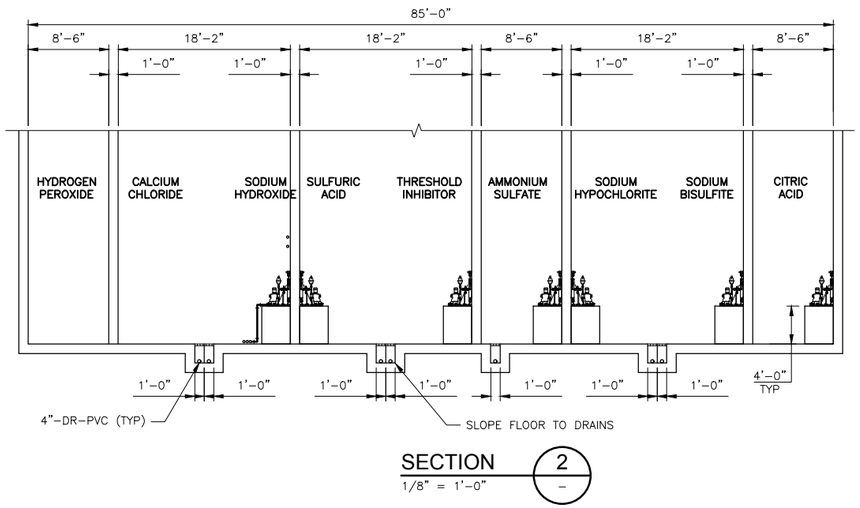


SECTION 1
1/8" = 1'-0"



SECTION 2
1/8" = 1'-0"

1/8" = 1'- 0"
4 2 0 4 8

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

CHEMICAL AREA SECTION

PROJECT NO. 26793-214344
FILE NAME: 40-M-002.DWG

SHEET NO.
40-M-002

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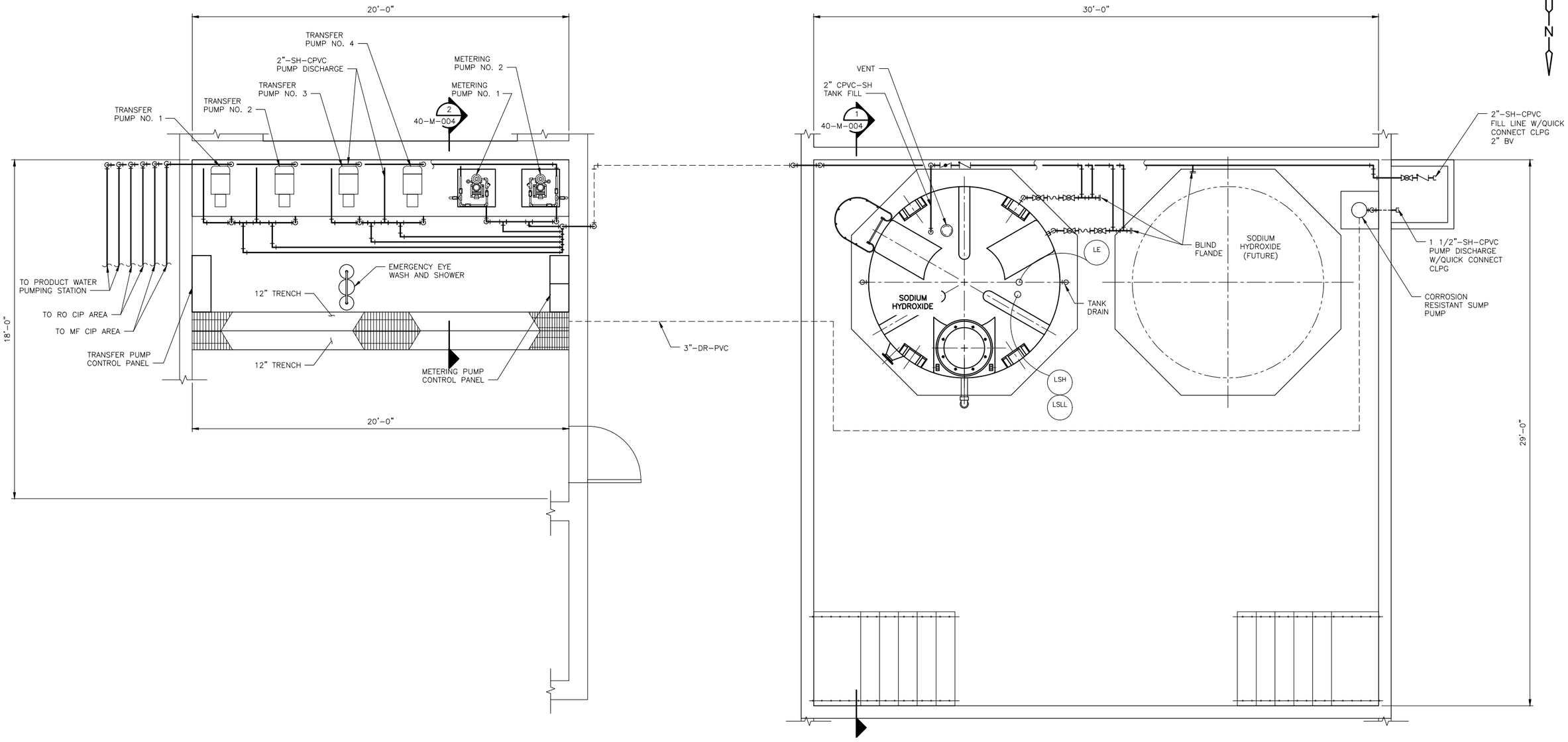

PLAN

3/8" = 1'-0"

3/8" = 1'- 0"

2 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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111 Academy Way, Suite 150
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Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

GENERIC CHEMICAL FEED SYSTEM PLAN SODIUM HYDROXIDE

PROJECT NO. 26793-214344
FILE NAME: 40-M-003.DWG
SHEET NO.
40-M-003

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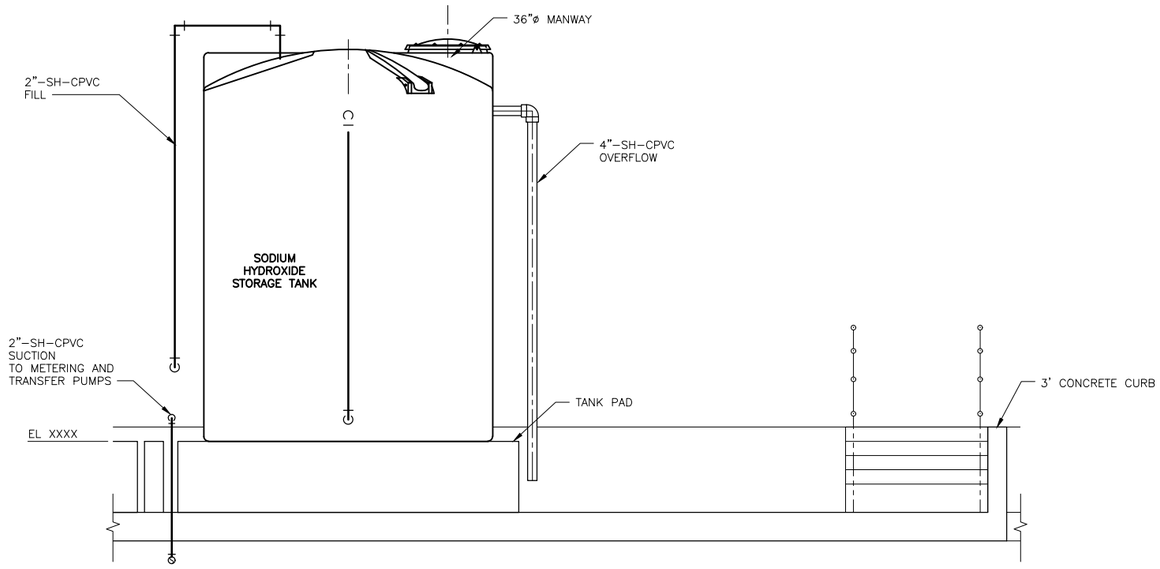
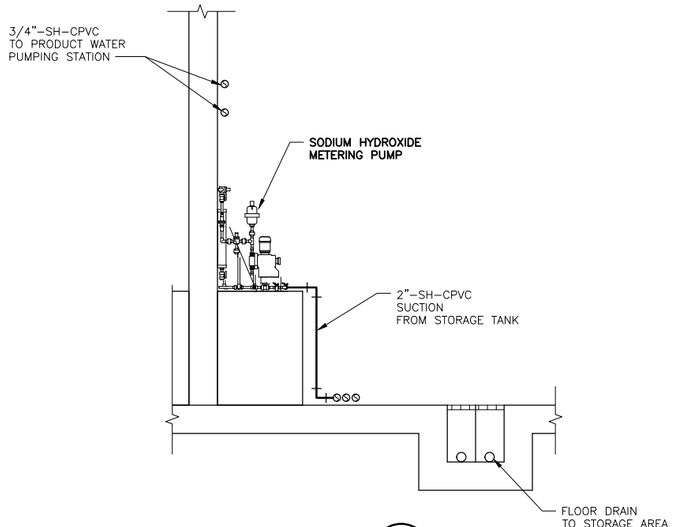


SECTION 1
1/8" = 1'–0"



SECTION 2
1/8" = 1'–0"

1/8" = 1'– 0"
4 2 0 4 8

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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Tel: (949) 752-5452

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

GENERIC CHEMICAL FEED SYSTEM SECTIONS SODIUM HYDROXIDE

PROJECT NO. 26793–214344
FILE NAME: 40–M–004.DWG

SHEET NO.
40-M-004

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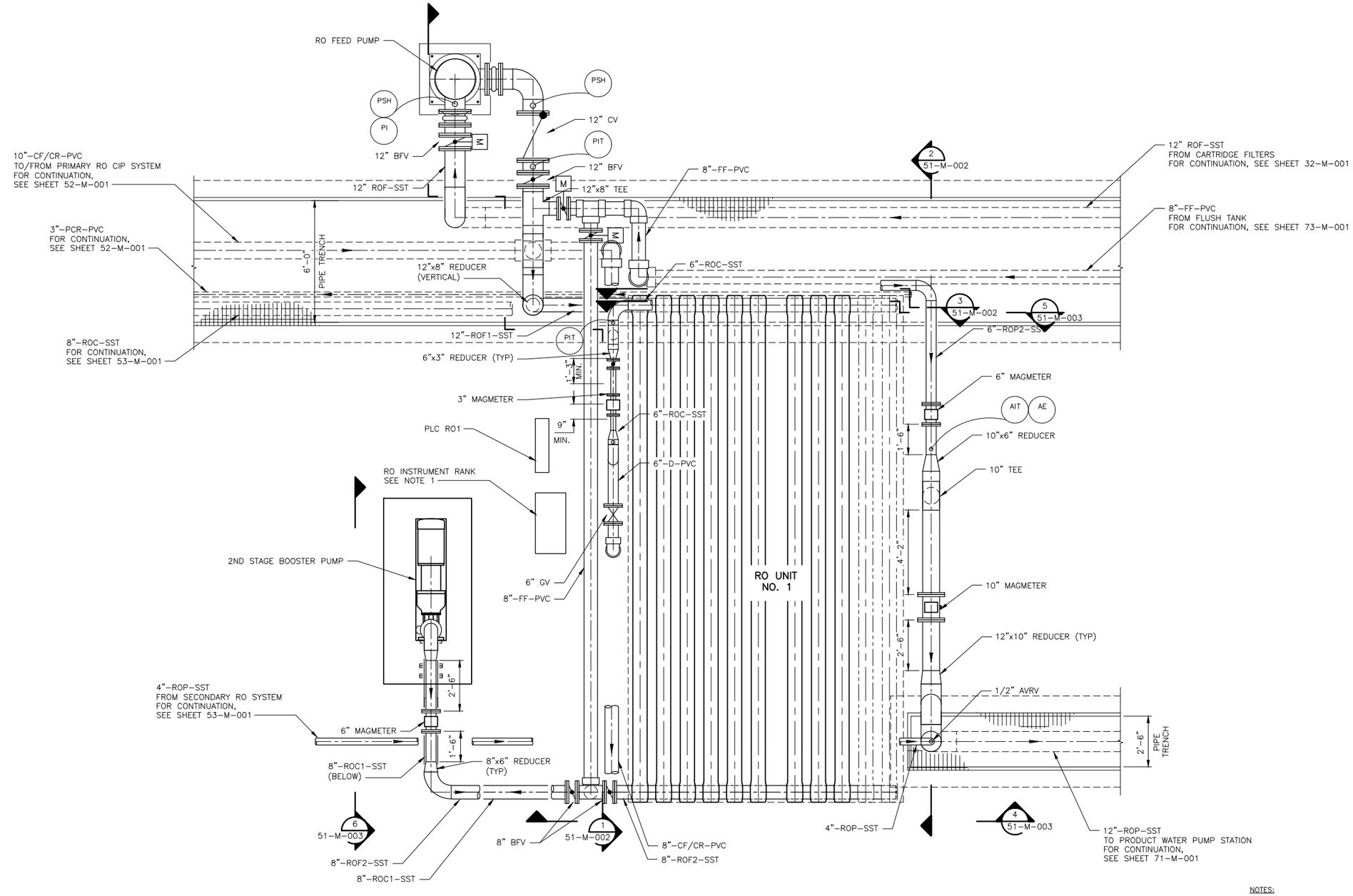

PLAN
3/8" = 1'-0"

NOTES:

1. CONTRACTOR TO PROVIDE SUPPORTS STRUCTURE FROM RO EQUIPMENT FRAME FOR MOUNTING.
2. USE 6" SCH 80 PVC PIPE SLEEVE TO CONTAIN SAMPLE LINES FOR SLAB PENETRATION USE LINK SEALS AND MIN OF 2" SPACE GROUT TO SEAL ANNULAR SPACE.
3. ALL ANALYZERS TO BE SUPPORTED BY UNISTRUT FRAME.
4. CONTRACTOR TO FIELD VERIFY PLATFORM COMPARABILITY WITH INSTALLED PIPING AND EQUIPMENT.

3/8" = 1'- 0"
2 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY: G. WETTERAU
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

PROCESS AREA PLAN
PRIMARY RO SYSTEM

PROJECT NO. 26793-214344
FILE NAME: 51-M-001.DWG
SHEET NO.
51-M-001

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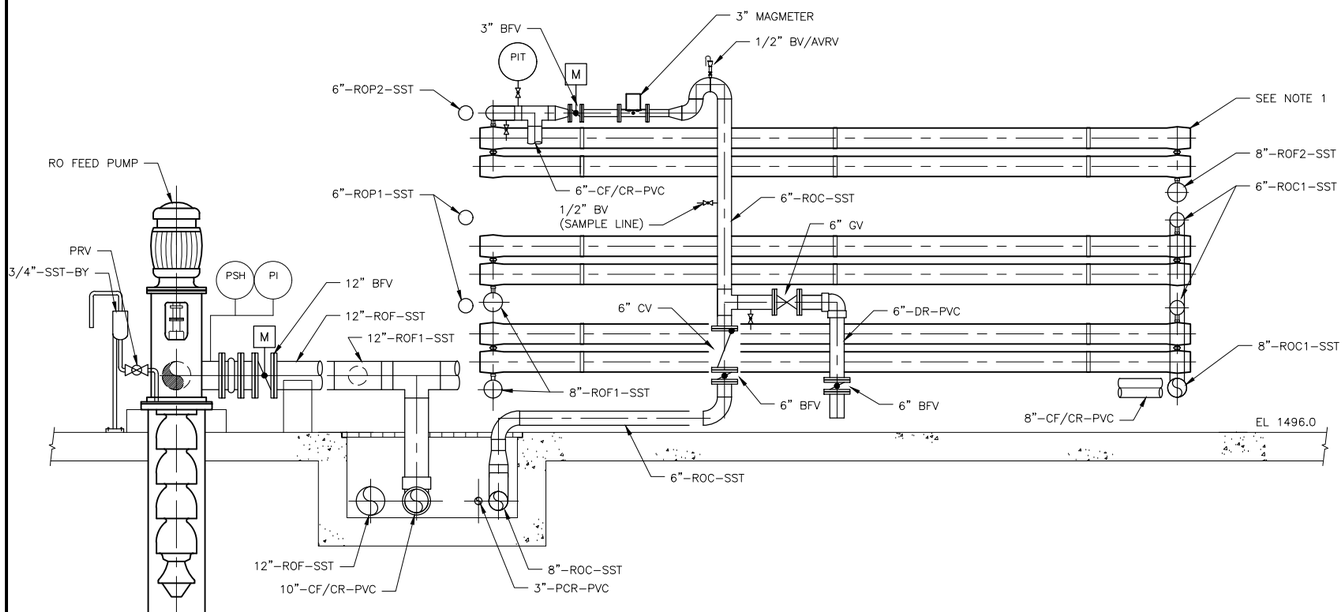
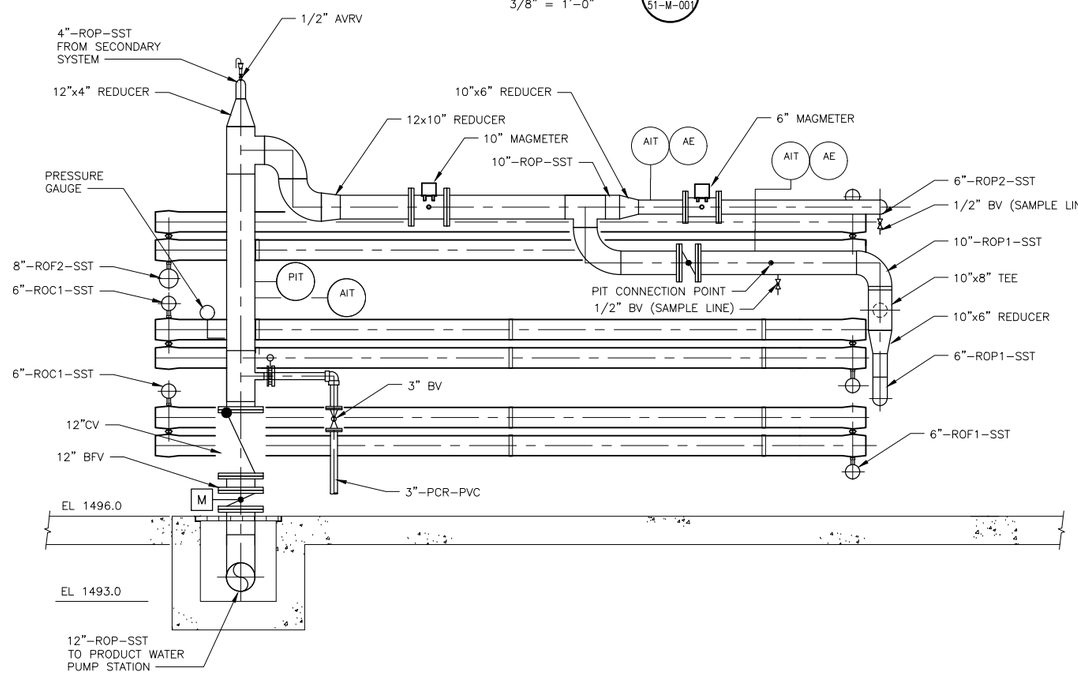
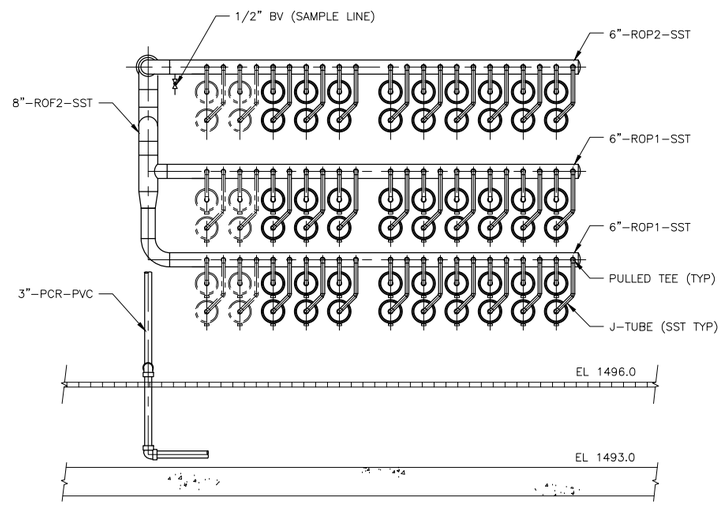


SECTION 1
3/8" = 1'-0"
51-M-001



SECTION 2
3/8" = 1'-0"
51-M-001



SECTION 3
3/8" = 1'-0"
51-M-001

NOTES:

1. NOMINAL LENGTH OF PRESSURE VESSEL IS 298 INCHES AND NOMINAL O.D. IS 8.5".
2. REFER TO THE P & ID DRAWINGS FOR ADDITIONAL PIPING REQUIREMENTS AS WELL AS INSTRUMENTATION REQUIREMENTS.
3. PLC, WQ RACK AND INSTRUMENT PANEL NOT SHOWN FOR CLARITY.

3/8" = 1'- 0"
2 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY: G. WETTERAU
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

PROCESS AREA SECTION I
PRIMARY RO SYSTEM

PROJECT NO. 26793-214344
FILE NAME: 51-M-002.DWG

SHEET NO.
51-M-002

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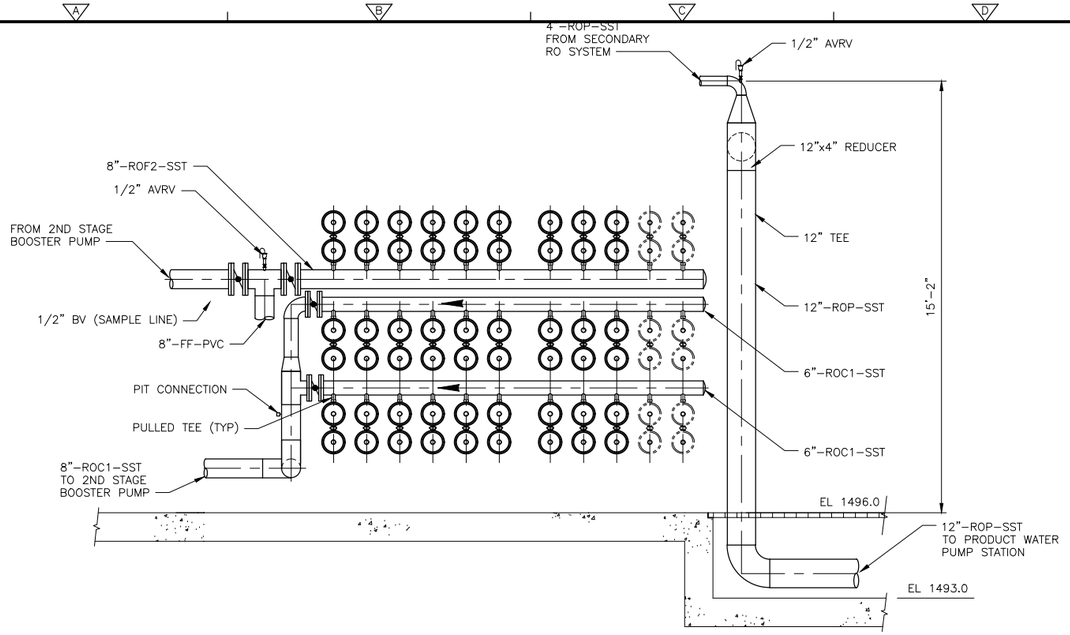
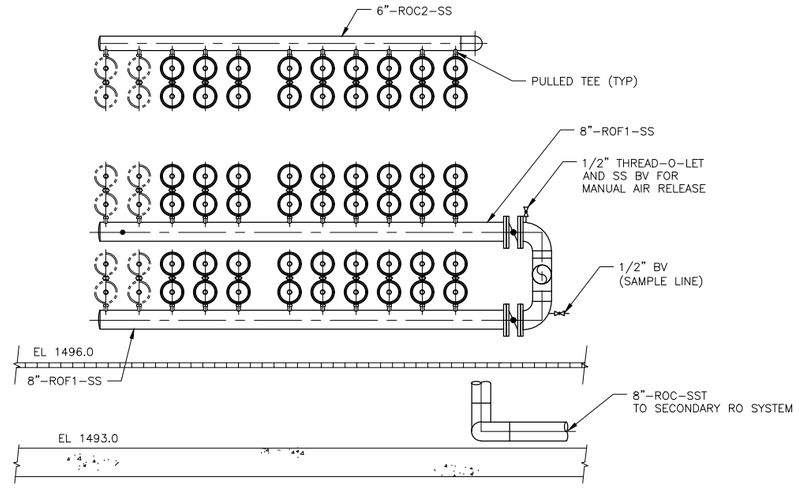
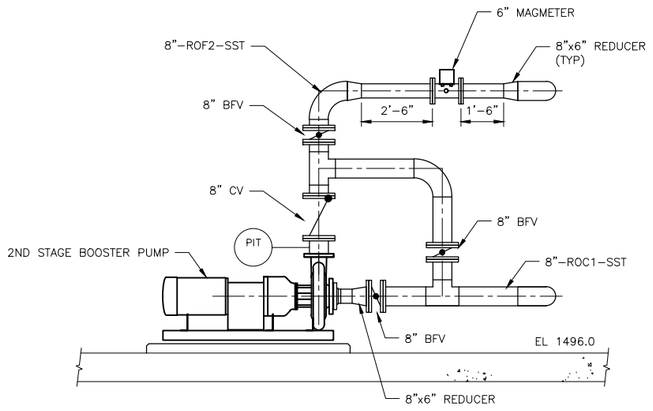


SECTION 4
3/8" = 1'-0" 51-M-001



SECTION 5
3/8" = 1'-0" 51-M-001



SECTION □
3/8" = 1'-0" 51-M-001

NOTES:

1. NOMINAL LENGTH OF PRESSURE VESSEL IS 298 INCHES AND NOMINAL O.D. IS 8.5".
2. ERT AND CONNECTIONS NOT SHOWN AND TO BE COORDINATED WITH ROEM (ALL SHEETS).
3. REFER TO THE P&ID DRAWINGS FOR ADDITIONAL PIPING REQUIREMENTS AS WELL AS INSTRUMENTATION REQUIREMENTS.
4. PLC, WQ RACK AND INSTRUMENT PANEL NOT SHOWN FOR CLARITY.

3/8" = 1'- 0"
2 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY: G. WETTERAU
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

PROCESS AREA SECTION II
PRIMARY RO SYSTEM

PROJECT NO. 26793-214344
FILE NAME: 51-M-003.DWG
SHEET NO.
51-M-003

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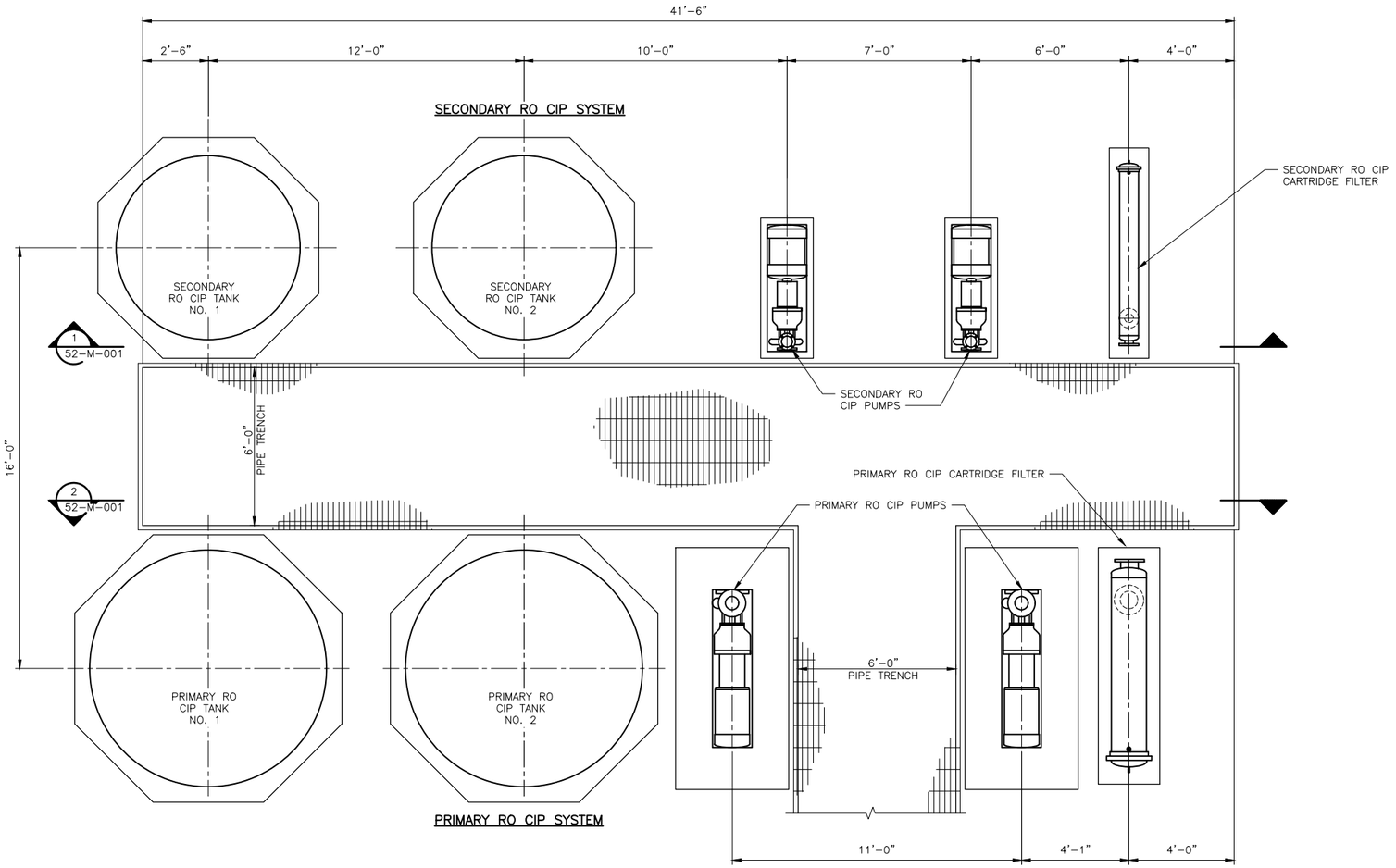

PLAN
3/8" = 1'-0"

3/8" = 1'- 0"
2 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AREA PLAN
RO CIP SYSTEMS

PROJECT NO. 26793-214344
FILE NAME: 52-M-001.DWG
SHEET NO.
52-M-001

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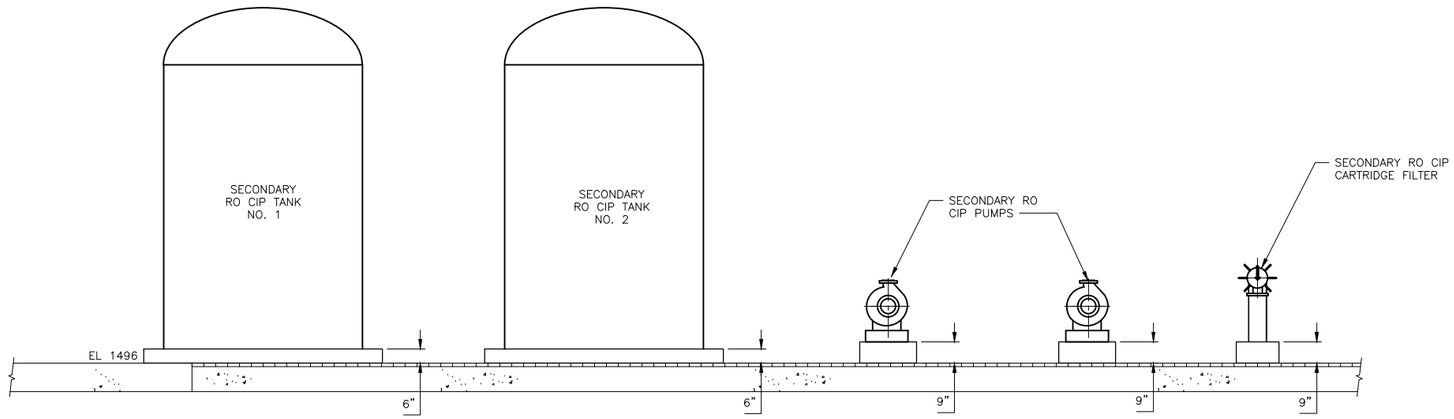
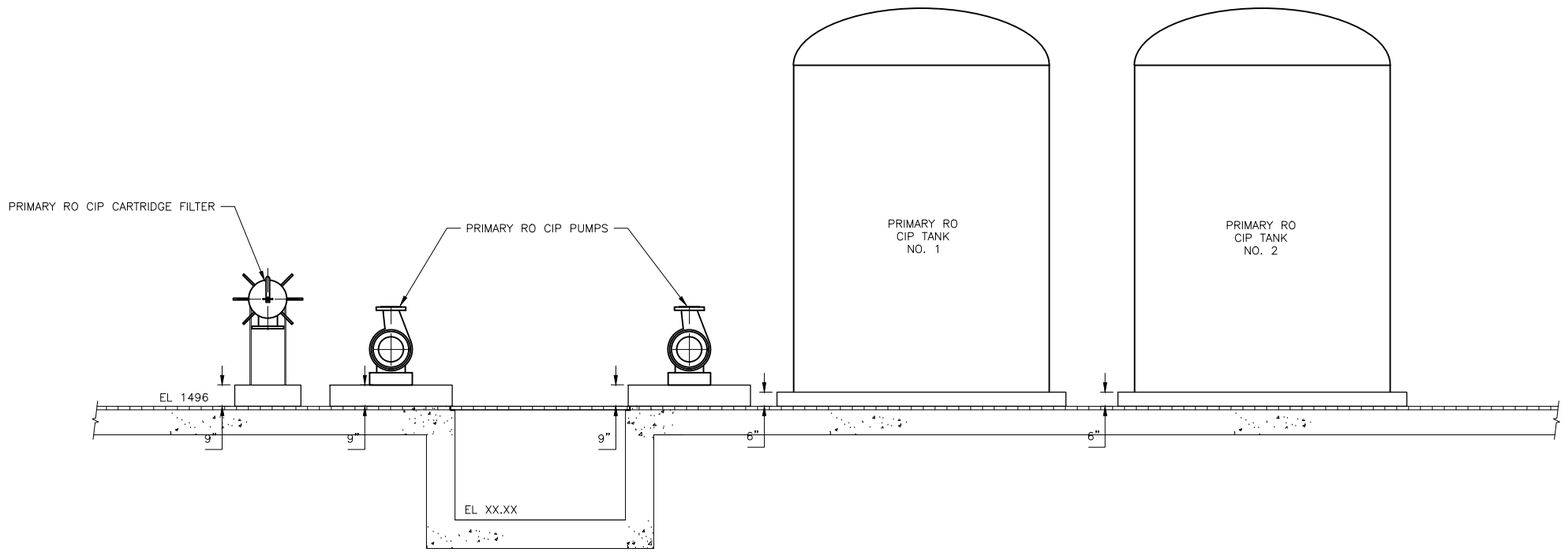


SECONDARY RO CIP SYSTEM

SECTION 1 / –

3/8" = 1'–0"



PRIMARY RO CIP SYSTEM

SECTION 2 / –

3/8" = 1'–0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

PROCESS AREA SECTION
RO CIP SYSTEMS

PROJECT NO. 26793-214344
FILE NAME: 52-M-002.DWG

SHEET NO.
52-M-002

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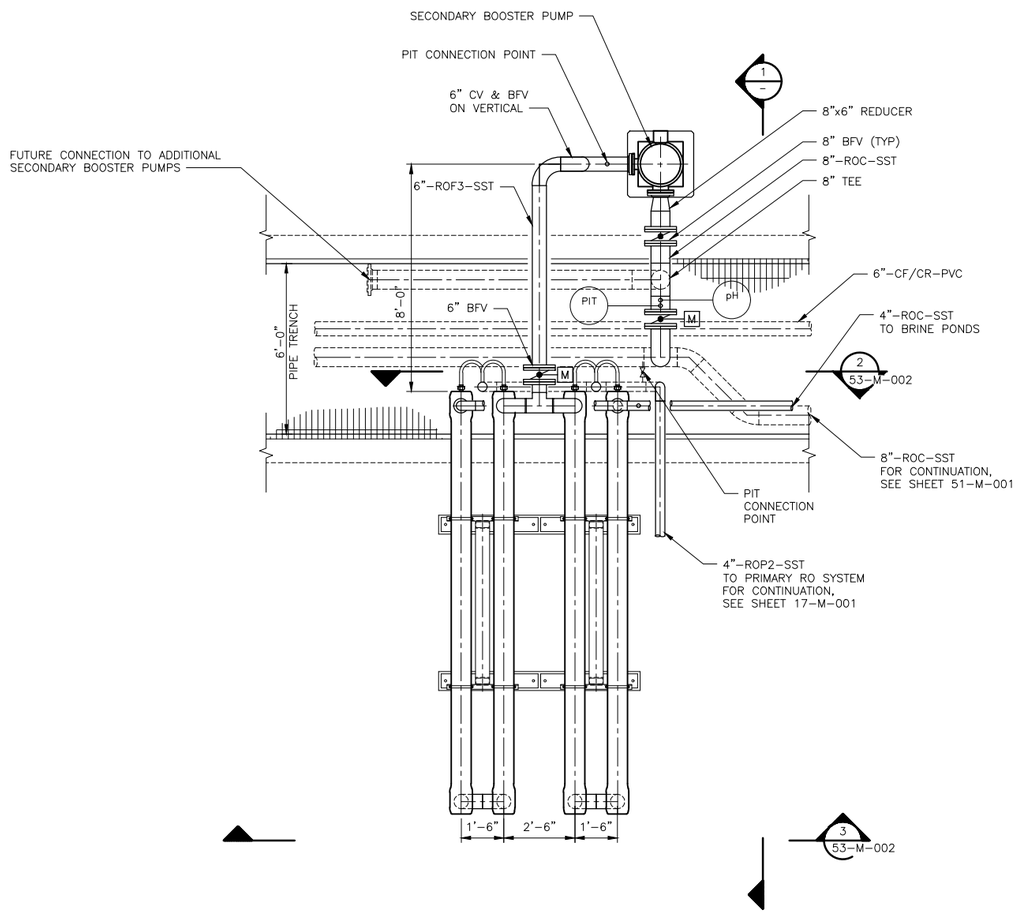
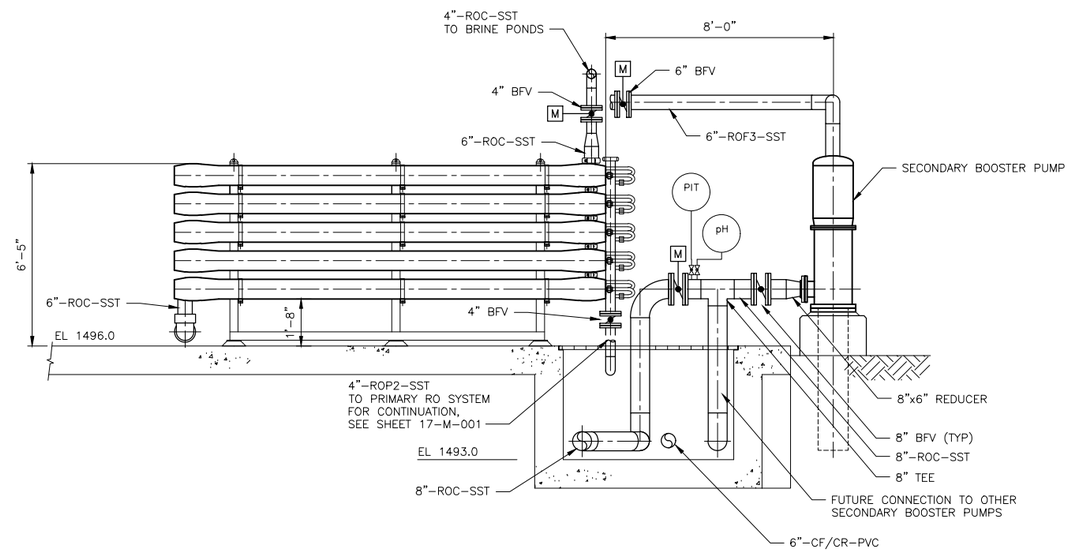


PLAN
3/8" = 1'-0"



SECTION 1
3/8" = 1'-0"

3/8" = 1'- 0"
2 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AREA PLAN AND SECTION SECONDARY RO SYSTEM

PROJECT NO. 26793-214344
FILE NAME: 53-M-001.DWG
SHEET NO.
53-M-001

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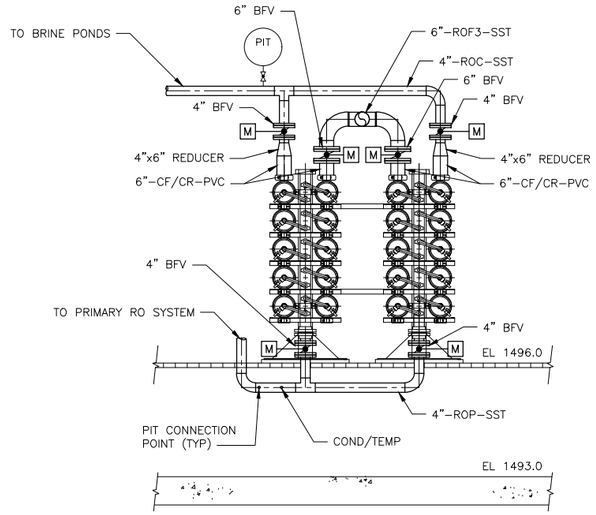
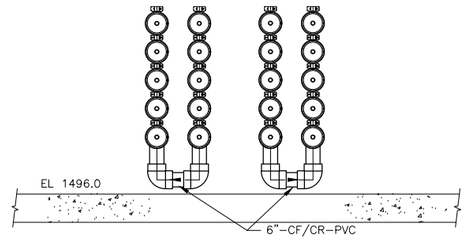


SECTION 2
3/8" = 1'-0"
M-5



SECTION 3
3/8" = 1'-0"
M-5

3/8" = 1'- 0"
2 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AREA SECTION II
SECONDARY RO SYSTEM

PROJECT NO. 26793-214344
FILE NAME: 53-M-002.DWG

SHEET NO.
53-M-002

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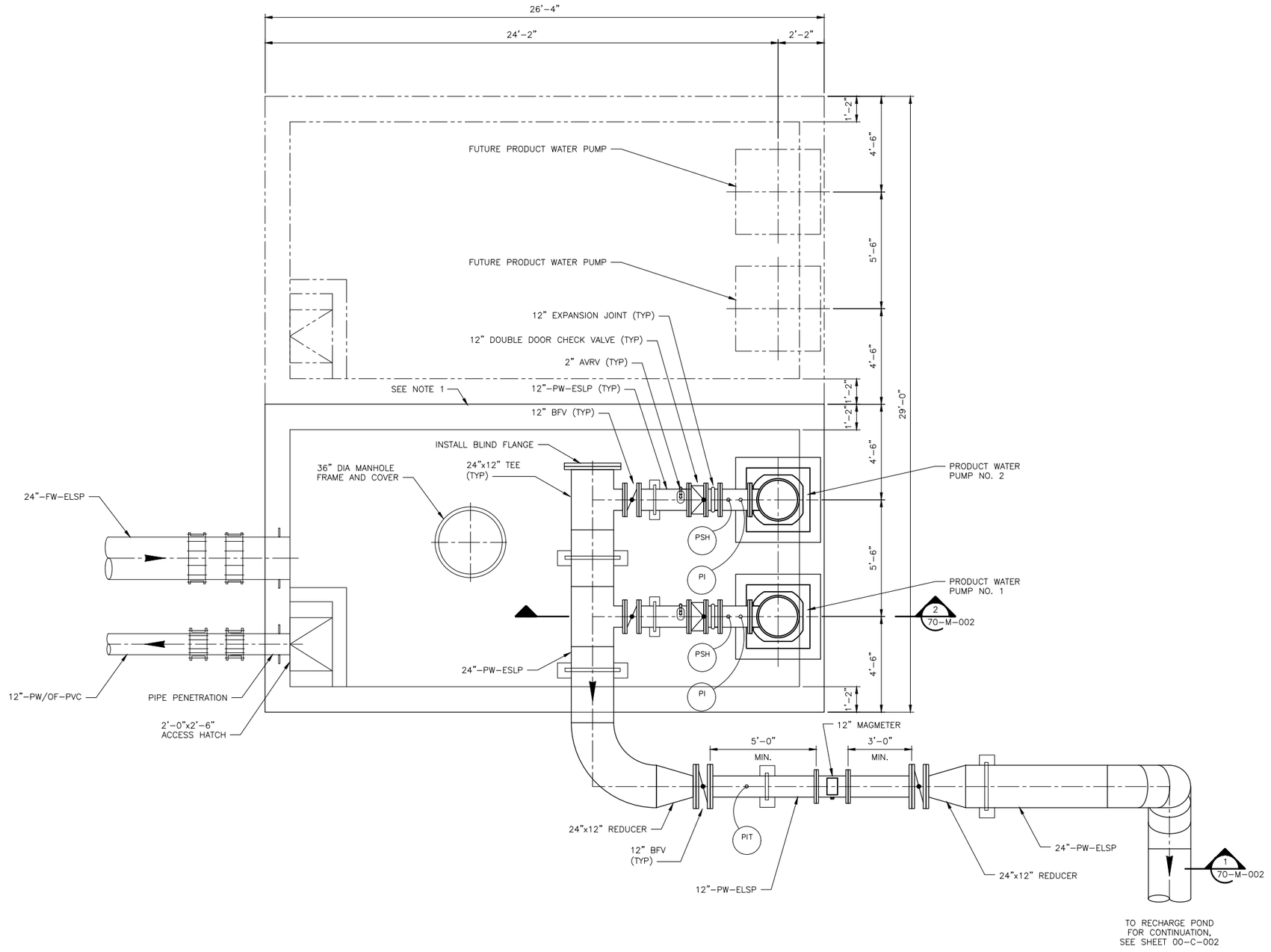

N

NOTES:

1. TANK DIVIDED FOR PHASE I WITH THE ABILITY TO REMOVE THE WALL FOR PHASE II.

PLAN
3/8" = 1'-0"

3/8" = 1'- 0"
2 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AREA PLAN
PRODUCT WATER PUMP STATION

PROJECT NO. 26793-214344
FILE NAME: 71-M-001.DWG

SHEET NO.
71-M-001

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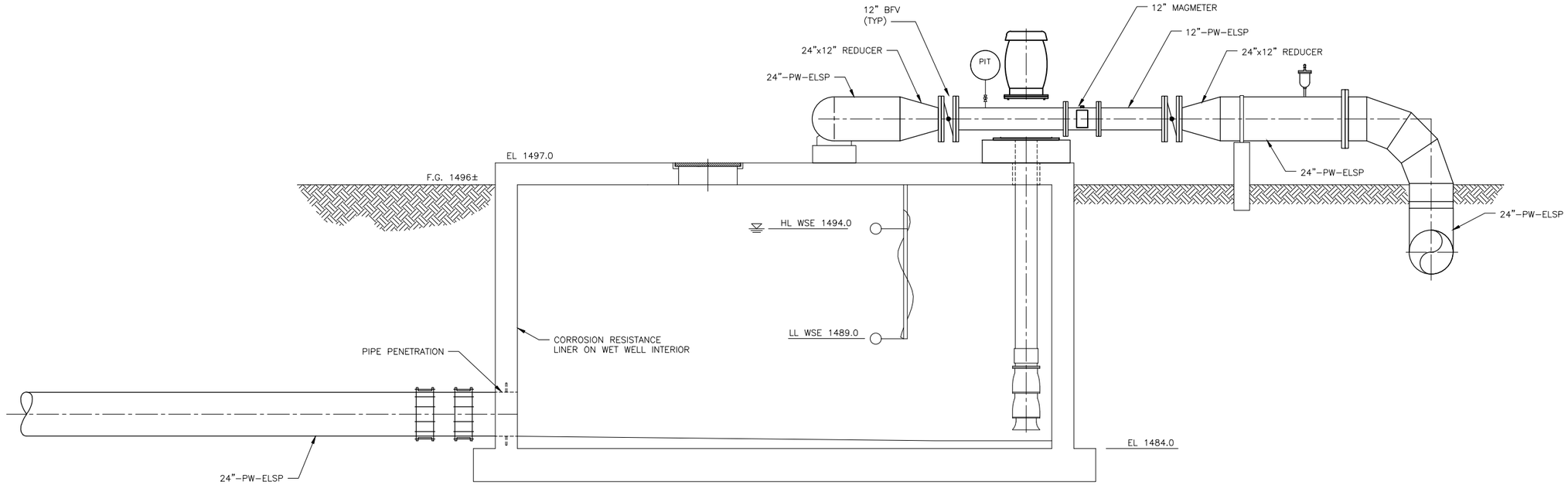
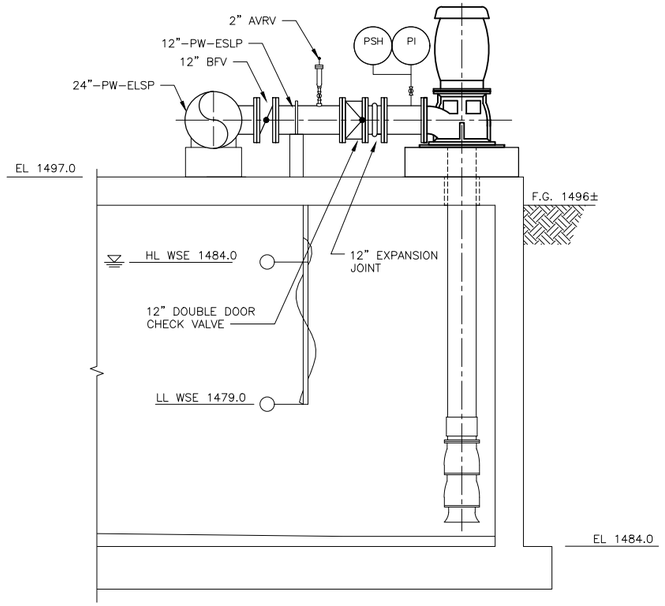


SECTION 1
3/8" = 1'-0"
71-M-001



SECTION 2
3/8" = 1'-0"
71-M-001

3/8" = 1'- 0"
2 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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Irvine, California 92::17
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

PROCESS AREA SECTION
PRODUCT WATER PUMP STATION

PROJECT NO. 26793-214344
FILE NAME: 71-M-002.DWG
SHEET NO.
71-M-002

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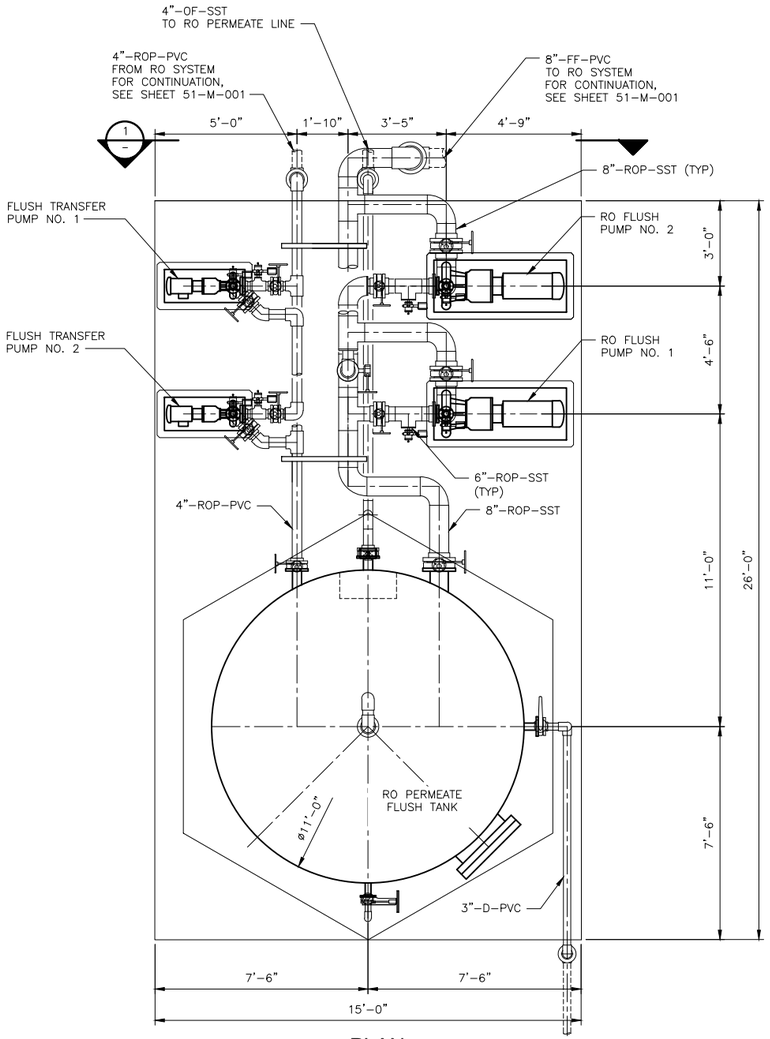
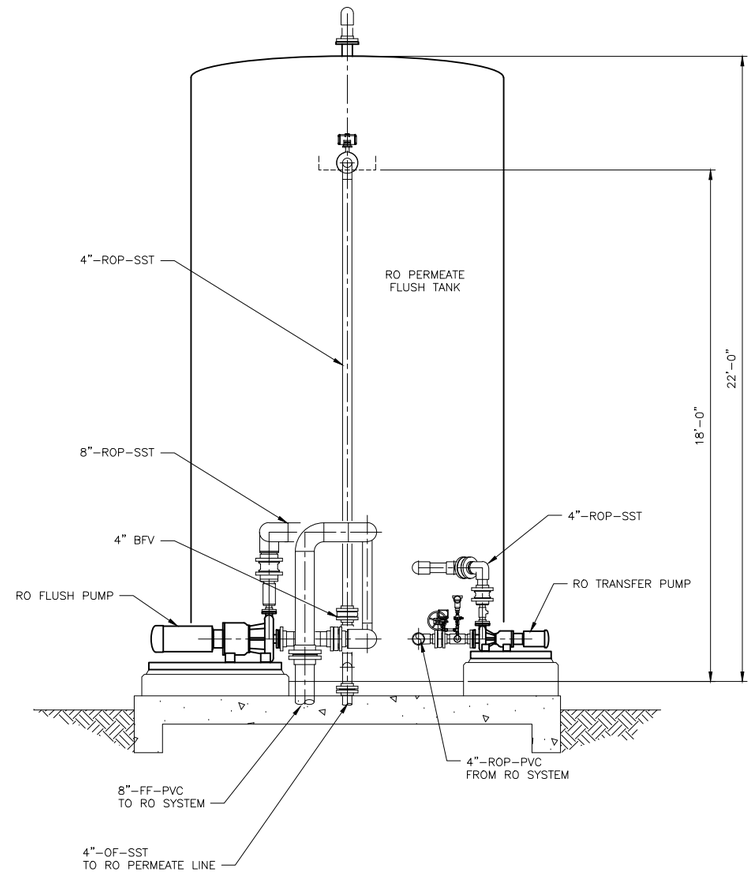


PLAN
3/8" = 1'-0"



SECTION 1
3/8" = 1'-0"

3/8" = 1'- 0"
2 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KOOP
DRAWN BY: M. PEREZ
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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Irvine, California 92617
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

PROCESS AREA PLAN AND SECTION
RO PERMEATE FLUSH TANK SYSTEM

PROJECT NO. 26793-214344
FILE NAME: 73-M-001.DWG
SHEET NO.
73-M-001

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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ONE LINE OR CONTROL DIAGRAM	PLAN	DESCRIPTION
52 CS	——	MEDIUM VOLTAGE DRAWOUT TYPE POWER CIRCUIT BREAKER CS=CONTROL SWITCH
FRAME TRIP	CB	LOW VOLTAGE AIR OR MOLDED CASE CIRCUIT BREAKER, 3 POLE UNLESS OTHERWISE NOTED.
*		COMBINATION MOTOR CIRCUIT PROTECTOR AND MAGNETIC MOTOR STARTER, FULL VOLTAGE NON-REVERSING UNLESS OTHERWISE NOTED: * FVR – FULL VOLTAGE REVERSING RVNR – REDUCED VOLTAGE NON-REVERSING RVAT – REDUCED VOLTAGE AUTOTRANSFORMER RVSS – REDUCED VOLTAGE SOLID STATE 2S1W – TWO SPEED, ONE WINDING 2S2W – TWO SPEED, TWO WINDING (DIAGRAMATICALLY SHOWN, CONTRACTOR SHALL FIELD LOCATE)
*		NON-FUSIBLE DISCONNECT SWITCH, 600 VOLT, 3 POLE * AMPERE RATING NOTED IF OTHER THAN 30A (DIAGRAMATICALLY SHOWN, CONTRACTOR SHALL FIELD LOCATE)
* *	F	FUSIBLE DISCONNECT SWITCH, 600 VOLT, 3 POLE, * AMPERE RATING AND FUSE SIZE AS NOTED * AMPERE RATING NOTED IF OTHER THAN 30A FUSE RATING (DIAGRAMATICALLY SHOWN, CONTRACTOR SHALL FIELD LOCATE)
	P 2	MANUAL MOTOR STARTER WITH THERMAL OVERLOAD HEATER, 1 POLE UNLESS OTHERWISE NOTED "P" INDICATES WITH PILOT LIGHT "2" INDICATES TWO POLE (DIAGRAMATICALLY SHOWN, CONTRACTOR SHALL FIELD LOCATE)
	——	DRAWOUT TYPE EQUIPMENT OR DEVICE
	——	MEDIUM VOLTAGE CABLE TERMINATION
	——	MEDIUM VOLTAGE AIR INTERRUPTER SWITCH
*	——	MEDIUM VOLTAGE FUSED AIR INTERRUPTER SWITCH * FUSE RATING
	——	MEDIUM VOLTAGE FUSED MOTOR CONTROLLER
480V KVA 120/208V 3P, 4W	T	TRANSFORMER, RATINGS AND CONNECTIONS AS NOTED. UNLESS OTHERWISE NOTED ON THE SINGLE LINE DIAGRAMS, ALL DRY TYPE TRANSFORMERS SERVICING ADMINISTRATIVE AND LABORATORY SPACES SHALL HAVE A K FACTOR OF 4. ISOLATION TRANSFORMERS SHALL HAVE A K-20 RATING
* A TO 5	——	CURRENT TRANSFORMER * QUANTITY A = PRIMARY AMPERES
* V TO 120	——	POTENTIAL TRANSFORMER * QUANTITY V = PRIMARY VOLTAGE
	G	GENERATOR, RATINGS AND CONNECTIONS AS NOTED
ATS N S 100A	——	AUTOMATIC OR MANUAL TRANSFER SWITCH NO.1 (ATS-1), (MTS-1) "N" INDICATES NORMAL OR PREFERRED SOURCE "S" INDICATES STANDBY OR ALTERNATE SOURCE 100A INDICATES CONTINUOUS CURRENT RATING
*	*	VARIABLE SPEED DRIVE CONTROLLER * D.C. = D.C. DRIVE CONTROLLER SCR = SILICON CONTROLLED RECTIFIER VFD = VARIABLE FREQUENCY DRIVE
#KW	E	UNIT HEATER – ELECTRIC HEATING COIL AND FAN # – RATING
——	U	UNIT HEATER – GAS FIRED, STEAM OR WATER HEATING COIL AND FAN
5	M	MOTOR, NUMERAL INDICATES HORSEPOWER
VS VM *	——	VOLTMETER WITH SWITCH, 3 PHASE
AS AM *	——	AMMETER WITH SWITCH, 3 PHASE

ONE LINE OR CONTROL DIAGRAM	PLAN	DESCRIPTION
*	——	METER * WM – WATTMETER WHM – WATTHOUR METER WHDM – WATTHOUR DEMAND METER WHDR – WATTHOUR DEMAND RECORDER PF – POWER FACTOR METER DMU – DIGITAL METERING UNIT TRANSDUCER AX – CURRENT TRANSDUCER WX – WATT TRANSDUCER WHX – WATTHOUR TRANSDUCER
*	*	RELAY, NO. AS INDICATED 25 – SYNCHRONISM CHECK RELAY 27 – UNDERVOLTAGE RELAY 32 – DIRECTIONAL POWER RELAY 38 – BEARING PROTECTIVE DEVICE 40 – LOSS OF EXCITATION RELAY 42 – RUNNING CONTACTOR/PILOT RELAY 46 – REVERSE PHASE/PHASE BALANCE/CURRENT RELAY 47 – PHASE SEQUENCE VOLTAGE RELAY 49 – MACHINE OR TRANSFORMER THERMAL RELAY 50/51 – INSTANTANEOUS/TIME OVERCURRENT RELAY 50G – INSTANTANEOUS GROUND 51 – TIME OVERCURRENT RELAY 51G – TIME OVERCURRENT RELAY, GROUNDING RESISTOR TYPE 51N – TIME OVERCURRENT RELAY, RESIDUAL TYPE 51V – TIME OVERCURRENT RELAY WITH VOLTAGE RESTRAINT 51X – AUXILIARY RELAY (TRIPS CB AND ALARMS) 59 – OVERVOLTAGE RELAY 60 – NEGATIVE SEQUENCE VOLTAGE RELAY 62 – TIME DELAY RELAY 63 – OVERPRESSURE RELAY 64 – GENERATOR FIELD GROUND RELAY 67 – AC DIRECTIONAL OVERCURRENT RELAY 74 – ALARM LATCHING RELAY 83 – AUTOMATIC SELECTIVE CONTROL OR TRANSFER RELAY 86 – LOCKING-OUT RELAY 87 – DIFFERENTIAL PROTECTIVE RELAY B – SUFFIX INDICATES "BUS" G – SUFFIX INDICATES "GENERATOR" GF – GROUND FAULT ST – SHUNT TRIP T – SUFFIX INDICATES "TRANSFORMER" X – SUFFIX INDICATES "AUXILIARY"
*	——	SPECIAL CAPACITOR * SC – SURGE CAPACITOR PF – POWER FACTOR CORRECTION CAPACITOR
*	——	TUNED POWER FACTOR CORRECTION CAPACITOR
	——	PUSHBUTTON, MOMENTARY CONTACT, SPRING RETURN, NORMALLY CLOSED
	——	PUSHBUTTON, MOMENTARY CONTACT, SPRING RETURN, NORMALLY OPEN
	ES	EMERGENCY STOP PUSHBUTTON WITH RED MUSHROOM HEAD OPERATOR (MAINTAINED CONTACT)
STOP START	PBL	START-STOP PUSHBUTTON CONTROL STATION (MOMENTARY CONTACT) WITH LOCKOUT DEVICE ON STOP
	PBM	START-STOP PUSHBUTTON CONTROL STATION, MAINTAINED CONTACT WITH LOCKOUT DEVICE ON STOP
OFF ON	S/S	OFF/ON SELECTOR SWITCH
L R (XO) (OX)	LR	LOCAL/REMOTE SELECTOR SWITCH
A B C* (XOO) (OXO) (OOX)	*	3 POSITION SELECTOR SWITCH, MAINTAINED CONTACT O–OPEN X–CLOSED POSITION / TOP CONTACT / MIDDLE CONTACT / BOTTOM CONTACT A / X / O / O B / O / X / O C / O / O / X NAMEPLATE (A/B/C) * HOA – HAND/OFF/AUTO HOR – HAND/OFF/REMOTE LOR – LOCAL/OFF/REMOTE RSL – RAISE/STOP/LOWER TOA – TEST/OFF/AUTO

GD/VF #	GD/VF #	GAS DETECTOR / VENTILATION FAILURE ALARM
		# INDICATES TYPE OF UNIT
		1=MASTER, 2=REMOTE

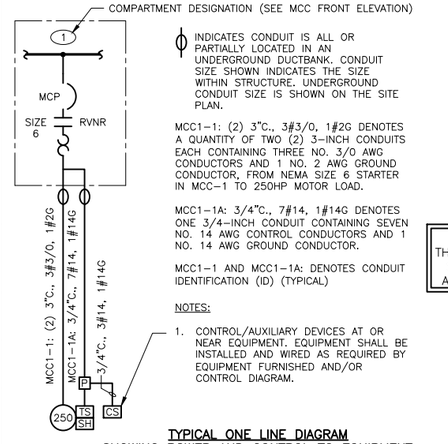
42 #	——	MOTOR STARTER COIL, NUMBER AS INDICATED TO DENOTE INTERLOCKING ONLY
CR #	——	CONTROL RELAY COIL, NUMBER AS INDICATED

ONE LINE OR CONTROL DIAGRAM	PLAN	DESCRIPTION
*	——	PILOT LIGHT, COLOR AS NOTED * R – RED G – GREEN B – BLUE W – WHITE A – AMBER
*	——	PILOT LIGHT, PUSH-TO-TEST TYPE, COLOR AS NOTED ABOVE.
* # RANGE SETPOINT		TIME DELAY RELAY RANGE AS NOTED SETPOINT AS NOTED # NUMBER AS INDICATED * TDE – TIME DELAY AFTER ENERGIZATION ON DELAY TDD – TIME DELAY AFTER DE-ENERGIZATION OFF DELAY NOTC – NORMALLY OPEN, TIMED CLOSING WHEN ENERGIZED NCTO – NORMALLY CLOSED, TIMED OPENING WHEN ENERGIZED NOTO – NORMALLY OPEN, TIMED OPENING WHEN DE-ENERGIZED NCTC – NORMALLY CLOSED, TIMED CLOSING WHEN DE-ENERGIZED
NOTC		
NCTO		
NOTO		
NCTC		
——	* - ##	FIELD INSTRUMENT, TAG NO. AS INDICATED * INDICATES INSTRUMENT TYPE DEFINED ON LOOP SHEETS OR P & ID ## INDICATES LOOP NO.
	LS OR ■	LIQUID LEVEL (FLOAT) SWITCH NORMALLY OPEN, CLOSES ON RISING LEVEL NORMALLY CLOSED, OPENS ON RISING LEVEL
	PS OR ■	PRESSURE OR VACUUM SWITCH NORMALLY OPEN, CLOSES ON RISING PRESSURE NORMALLY OPEN, CLOSES ON DROPPING PRESSURE NORMALLY CLOSED, OPENS ON RISING PRESSURE NORMALLY CLOSED, OPENS ON DROPPING PRESSURE
	TS OR T OR ■	TEMPERATURE SWITCH OR THERMOSTAT NORMALLY OPEN, CLOSES ON RISING TEMPERATURE NORMALLY OPEN, CLOSES ON DROPPING TEMPERATURE NORMALLY CLOSED, OPENS ON RISING TEMPERATURE NORMALLY CLOSED, OPENS ON DROPPING TEMPERATURE
	FS OR ■	FLOW SWITCH (AIR, WATER, ETC.) NORMALLY OPEN, CLOSES ON INCREASED FLOW NORMALLY CLOSED, OPENS ON INCREASED FLOW
	ZS OR ■	POSITION (LIMIT) SWITCH NORMALLY OPEN NORMALLY OPEN – HELD CLOSED NORMALLY CLOSED NORMALLY CLOSED – HELD OPEN
	WS OR ■	TORQUE SWITCH NORMALLY OPEN, CLOSES ON HIGH TORQUE NORMALLY CLOSED, OPENS ON HIGH TORQUE
#	——	UTILIZED IN CONJUNCTION WITH OTHER CONTROL SCHEMATIC SYMBOLS TO DEPICT THE PHYSICAL LOCATION OF THE DEVICE # REPRESENTS LOCATION SEE LOCATION LEGEND ON DRAWING
	——	CONDUCTORS OR CONDUITS CROSSING PATHS BUT NOT CONNECTED
	——	CONDUCTORS ELECTRICALLY CONNECTED
	S	SOLENOID VALVE

ONE LINE OR CONTROL DIAGRAM	PLAN	DESCRIPTION
LA	——	LIGHTNING ARRESTER
		GROUND OR GROUND ROD
30A	——	FUSE, AMPERE RATING AS NOTED
	HTR	STRIP HEATER OR HEATING ELEMENT
	——	INDUCTOR
TG	TG	TACHOMETER GENERATOR
	——	CONTACT, NORMALLY OPEN (NO)
	——	CONTACT, NORMALLY CLOSED (NC)
	——	OVERLOAD RELAY HEATER
*	——	* K = KEY INTERLOCK E = ELECTRICAL INTERLOCK
TB	——	TERMINAL OR TEST BLOCK
RTD	——	RESISTANCE TEMPERATURE DETECTOR
VE OR VE	——	VIBRATION DETECTOR
DM	DM	DAMPER MOTOR
ETM	——	ELAPSED TIME METER
M	M	MOTOR OPERATED VALVE OR GATE
	——	INDICATES LIMITS OF ELECTRICAL EQUIPMENT OR WIRING ENCLOSURE

EXISTING WORK | NEW WORK | FUTURE EXPANSION

EXISTING, NEW OR FUTURE CONDITION DESIGNATION



INDICATES CONDUIT IS ALL OR PARTIALLY LOCATED IN AN UNDERGROUND DUCTBANK. CONDUIT SIZE SHOWN INDICATES THE SIZE WITHIN STRUCTURE. UNDERGROUND CONDUIT SIZE IS SHOWN ON THE SITE PLAN.

MCC1-1: (2) 3"C., 3#3/0, 1#2G DENOTES A QUANTITY OF TWO (2) 3-INCH CONDUITS EACH CONTAINING THREE NO. 3/0 AWG CONDUCTORS AND 1 NO. 2 AWG GROUND CONDUCTOR, FROM NEMA SIZE 6 STARTER IN MCC-1 TO 250HP MOTOR LOAD.

MCC1-1A: 3/4"C., 7#14, 1#14G DENOTES ONE 3/4-INCH CONDUIT CONTAINING SEVEN NO. 14 AWG CONTROL CONDUCTORS AND 1 NO. 14 AWG GROUND CONDUCTOR.

MCC1-1 AND MCC1-1A: DENOTES CONDUIT IDENTIFICATION (ID) (TYPICAL)

NOTES:

1. CONTROL/AUXILIARY DEVICES AT OR NEAR EQUIPMENT. EQUIPMENT SHALL BE INSTALLED AND WIRED AS REQUIRED BY EQUIPMENT FURNISHED AND/OR CONTROL DIAGRAM.

TYPICAL ONE LINE DIAGRAM SHOWING POWER AND CONTROL TO EQUIPMENT

NOTES:

1. IN GENERAL CONDUIT ROUTING FOR EQUIPMENT AND DEVICES IS NOT SHOWN ON THE PLANS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ROUTING ALL CONDUITS WHICH SHALL INCLUDE CONDUITS SHOWN ON ONE-LINE AND RISER DIAGRAMS AND HOME-RUNS SHOWN ON PLAN DRAWINGS. REFER TO SPECIFICATIONS FOR MATERIALS AND INSTALLATION REQUIREMENTS.

2. THE WIRING DIAGRAMS, QUANTITY AND SIZE OF WIRES AND CONDUITS REPRESENT A SUGGESTED ARRANGEMENT BASED UPON SELECTED STANDARD COMPONENTS OF ELECTRICAL EQUIPMENT. MODIFICATIONS ACCEPTABLE TO THE ENGINEER MAY BE MADE BY THE CONTRACTOR TO ACCOMMODATE EQUIPMENT ACTUALLY PURCHASED. THE BASIC SEQUENCE AND METHOD OF CONTROL MUST BE MAINTAINED AS INDICATED ON THE DRAWINGS AND/OR SPECIFICATIONS.

3. SWITCHGEAR AND MOTOR CONTROL CENTER COMPARTMENT DESIGNATIONS AS INDICATED BELOW:
   - BLANK: NOT INTENDED FOR USE. PLATE ONLY
   - SPACE: EQUIPPED WITH REQUIRED BUS AND HARDWARE FOR THE FUTURE ADDITION OF BREAKERS AND/OR STARTERS WITHIN THE SIZE AND RANGE SHOWN
   - SPARE: CONTAINS A COMPLETELY INSTALLED BREAKER AND/OR STARTER OF SIZE AND TYPE INDICATED FOR FUTURE USE.

4. INTERPRETATION OF ELECTRICAL DRAWINGS: CIRCUIT IDENTIFICATION, ROUTING, AND SIZES OF CONDUITS AND WIRES ARE SHOWN ON THE FOLLOWING DRAWINGS:

A. POWER ONE LINE DIAGRAMS: POWER, CONTROL AND SIGNAL WIRING REQUIREMENTS FOR ELECTRICAL DISTRIBUTION EQUIPMENT AND UTILIZATION EQUIPMENT POWERED FROM SWITCHGEAR, SWITCHBOARDS, MOTOR CONTROL CENTERS AND MAJOR POWER DISTRIBUTION PANELBOARDS ARE TYPICALLY SHOWN ON THE ONE LINE DIAGRAMS. THE PARAMETERS IDENTIFIED ON THE ONE LINE DIAGRAMS ARE: CIRCUIT IDENTIFICATION, CIRCUIT ORIGIN AND DESTINATION, CONDUIT SIZE, WIRE SIZE AND QUANTITY FOR COMPLETE CIRCUIT LENGTH, AND AUXILIARY DEVICES ASSOCIATED WITH THE CONTROL/PROTECTION OF THE POWERED EQUIPMENT, AND SIZE OF THE GROUNDING ELECTRODE CONDUCTORS.

B. INSTRUMENTATION AND CONTROL RISER DIAGRAMS: POWER, CONTROL, SIGNAL AND DATA HIGHWAY WIRING REQUIREMENTS FOR INSTRUMENTS AND CONTROL DEVICES CONTROLLED/MONITORED FROM INSTRUMENTATION AND CONTROL PANELS SUCH AS RTUS, PLCS, TERMINAL CABINETS, AND REMOTE I/O PANELS ARE TYPICALLY SHOWN ON THE INSTRUMENTATION AND CONTROL ONE LINE DIAGRAMS. THE PARAMETERS IDENTIFIED ON THE ONE LINE DIAGRAMS ARE: CIRCUIT IDENTIFICATION, CIRCUIT ORIGIN AND DESTINATION, CONDUIT SIZE, WIRE SIZE, QUANTITY AND TYPE FOR COMPLETE CIRCUIT LENGTH, AND AUXILIARY DEVICES ASSOCIATED WITH THE CONTROL/PROTECTION OF THE POWERED EQUIPMENT.

C. FLOOR PLANS: FOR DETERMINING THE LENGTH OF CIRCUITS LOCATED WITHIN STRUCTURES, FLOOR PLANS SHOW THE LOCATION OF ELECTRICAL DISTRIBUTION EQUIPMENT, CONTROL PANELS, UTILIZATION EQUIPMENT, INSTRUMENTS, ANCILLARY EQUIPMENT AND DEVICES AND THE ANTICIPATED PENETRATION LOCATIONS WHERE CONDUITS EXIT/ENTER THE STRUCTURE. HOMERUNS MAY ALSO BE SHOWN FROM MISCELLANEOUS EQUIPMENT NOT SHOWN ON A ONE LINE OR RISER DIAGRAM.

D. SITE PLANS: FOR DETERMINING THE LENGTH OF CIRCUITS EXTERIOR TO STRUCTURES AND TO IDENTIFY THE SPECIFIC REQUIREMENTS OF THE UNDERGROUND CONDUITS OR DUCT BANKS, SITE PLANS SHOW THE GENERAL ROUTING OF UNDERGROUND CONDUITS AND DUCT BANKS WITH SECTIONS INDICATING THE CONDUIT SIZE, ARRANGEMENT AND CIRCUIT ROUTING.

E. NOTE THAT CONDUIT SIZE WITHIN STRUCTURE IS INDICATED ON ONE-LINE DIAGRAM AND UNDERGROUND SIZE IS INDICATED ON DUCT BANK SECTIONS.

GENERAL NOTE
THIS IS A STANDARD LEGEND. SOME SYMBOLS MAY NOT APPEAR ON THE DRAWINGS.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: T. ADAMS
DRAWN BY: T. ADAMS
SHEET CHK'D BY: –
CROSS CHK'D BY: –
APPROVED BY: –
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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

ELECTRICAL LEGENDS AND ABBREVIATIONS I

PROJECT NO. 26793-214344
FILE NAME: 00-E-001.DWG
SHEET NO. 00-E-001

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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SYMBOL	DESCRIPTION
A 3 b	LIGHTING FIXTURE "A" – FIXTURE TYPE (SEE LIGHTING FIXTURE SCHEDULE) "b" – CONTROLLED BY SWITCH "b" "3" – CIRCUIT NUMBER
A 3 b	LIGHTING FIXTURE, NOTATIONS SAME AS ABOVE
A 3 b	WALL MOUNTED TYPE LIGHTING FIXTURE, NOTATIONS SAME AS ABOVE
A 3 OR A 3	CROSS HATCH INDICATES LIGHTING FIXTURE THAT IS UNSWITCHED AND SHALL REMAIN ON AT ALL TIMES. NOTATIONS SAME AS ABOVE.
A 3 b OR A 3 b	SHADED AREA INDICATES LIGHTING FIXTURE THAT IS EQUIPPED WITH EMERGENCY BACKUP POWER SOURCE. NOTATIONS SAME AS ABOVE.
A 3	POLE MOUNTED AREA TYPE LIGHTING FIXTURE, NOTATIONS SAME AS ABOVE
A 3	POLE MOUNTED ROADWAY TYPE LIGHTING FIXTURE, NOTATIONS SAME AS ABOVE
EM 3 (*)	EMERGENCY LIGHTING BATTERY UNIT WITH TWO LAMP HEADS "EM" – FIXTURE TYPE (SEE LIGHTING FIXTURE SCHEDULE) "3" – SUPERVISORY CIRCUIT * – FIXTURE TAG #
R–2 BU–1(*)	REMOTE EMERGENCY ADJUSTABLE WALL LIGHTING FIXTURE WITH TWO LAMP HEADS "R–2" – FIXTURE TYPE (SEE LIGHTING FIXTURE SCHEDULE) * – HOME RUN TO BATTERY UNIT INDICATED. CONDUIT SHALL BE 3/4" AND CONTAIN (2) NO. 12 AWG BRANCH CIRCUIT CONDUCTORS AND (1) NO. 12 AWG GROUND CONDUCTOR UNLESS OTHERWISE INDICATED.
A 3	COMBINATION BATTERY UNIT AND EXIT SIGN. FILLED QUADRANT REPRESENTS FACE SIDE OF SIGN.
A 3	CEILING MOUNTED EXIT SIGN, NOTATIONS SAME AS ABOVE. WHEN USED, ARROW INDICATES DIRECTION OF EGRESS. FILLED QUADRANT REPRESENTS FACE SIDE OF SIGN. (DOUBLE FACE DOUBLE CHEVRONS SHOWN)
A 3	WALL MOUNTED EXIT SIGN, NOTATIONS SAME AS ABOVE. WHEN USED, ARROW INDICATES DIRECTION OF EGRESS. FILLED QUADRANT REPRESENTS FACE SIDE OF SIGN.
RH–3 E 3 BU–1(*)	REMOTE EMERGENCY CEILING LIGHTING FIXTURE. "RH–3" – FIXTURE TYPE (SEE LIGHTING FIXTURE SCHEDULE) "3" – SUPERVISORY CIRCUIT * – HOME RUN TO BATTERY UNIT INDICATED. CONDUIT SHALL BE 3/4" AND CONTAIN 2 NO. 12 AWG BRANCH CIRCUIT CONDUCTORS AND 1 NO. 12 AWG GROUND CONDUCTOR UNLESS OTHERWISE INDICATED.
	HOME RUN TO DESIGNATED EQUIPMENT. BRANCH CIRCUIT CONDUIT WITH 2 NO. 12 AWG BRANCH CIRCUIT CONDUCTORS AND 1 NO. 12 AWG GROUND CONDUCTOR UNLESS OTHERWISE NOTED. NUMBER OF ARROWS INDICATE NUMBER OF CIRCUITS. FOR MINIMUM SIZE CONDUIT PERMITTED REFER TO THE SPECIFICATIONS.
	CONDUIT CONCEALED IN WALL, IN SLAB ABOVE, OR ABOVE CEILING.
	CONDUIT CONCEALED IN OR BELOW FLOOR OR UNDERGROUND.
	CONDUIT RUN EXPOSED. RUN PARALLEL OR PERPENDICULAR TO STRUCTURE OR WALL.
	'x' INDICATES EXPLOSION PROOF CONDUIT SEAL FITTING.
	CONCRETE ENCASED DUCTBANK. WIDTH VARIES, SEE DUCTBANK SECTION/DETAILS FOR REQUIREMENTS AND WIDTH
	CONDUIT STUBBED OUT AND CAPPED
(2) 3"C., 3#3/0, 1#2G	DENOTES A QUANTITY OF TWO (2) 3–INCH CONDUITS EACH CONTAINING THREE NO. 3/0 AWG CONDUCTORS AND 1 NO. 2 AWG GROUND CONDUCTOR.
2–2/C#16 SH	DENOTES A QUANTITY OF TWO INSTRUMENT CABLES. EACH CABLE TO CONSIST OF TWO NO. 16 AWG CONDUCTORS TWISTED TOGETHER AND COVERED WITH A METALLIC SHIELD AND AN OVERALL PROTECTIVE JACKET. REFER TO THE SPECIFICATIONS FOR THE EXACT CABLE TO BE PROVIDED.
2–3/C#16 SH	SAME AS ABOVE EXCEPT CABLE TO CONSIST OF THREE NO. 16 AWG CONDUCTORS TWISTED, SHIELDED AND COVERED WITH AN OVERALL PROTECTIVE JACKET. REFER TO THE SPECIFICATIONS FOR THE EXACT CABLE TO BE PROVIDED.
(3) 4"C.	THREE 4–INCH CONDUITS
	FLEXIBLE METAL CONDUIT "WHIP" (3/4"C., 2#12, 1#12G UNLESS OTHERWISE NOTED) FOR LIQUID TIGHT MOTOR CONNECTIONS
	'X' INDICATES CONDUIT SEAL FITTING IN OTHER THAN CODE REQUIRED LOCATIONS.
	INDICATES MOTOR STARTER AND/OR MOTOR CONTROL EQUIPMENT WITHIN THE ENCLOSURE.

SYMBOL	DESCRIPTION
$a	SINGLE POLE SWITCH "a" INDICATES FIXTURES CONTROLLED.
$a 2	DOUBLE POLE SWITCH "a" INDICATES FIXTURES CONTROLLED.
$c 3	THREE WAY SWITCH "c" INDICATES FIXTURES CONTROLLED.
$a 4	FOUR WAY SWITCH "a" INDICATES FIXTURES CONTROLLED.
$a D	DIMMER SWITCH "a" INDICATES FIXTURES CONTROLLED
$OS	SINGLE POLE SWITCH "OS" INDICATES A PASSIVE INFRARED OCCUPANCY SENSOR
$OS 2	DOUBLE POLE SWITCH "OS" INDICATES PROGRAMMABLE OCCUPANCY SENSOR CAPABLE OF INBOARD/OUTBOARD SWITCHING
$DT	SINGLE POLE SWITCH "DT" INDICATES DUAL TECHNOLOGY PROGRAMMABLE OCCUPANCY SENSOR CAPABLE OF SENSING MOTION AND SOUND
C 3	LIGHTING CONTACTOR WITH NUMBER OF POLES AS INDICATED
TM	TIME SWITCH
	PUSH BUTTON STATION
TYPE A	INDICATES ALL LIGHTING FIXTURES WITHIN THE ROOM OR AREA IN WHICH THIS NOTATION APPEARS SHALL BE TYPE "A" UNLESS OTHERWISE NOTED. SEE LIGHTING FIXTURE SCHEDULE FOR TYPES
	LIGHTING PANELBOARD (LP–#) SHOWN ON PLAN PER ACTUAL PANEL DIMENSIONS
	POWER PANELBOARD (PP–#) OR DISTRIBUTION PANELBOARD (DP–#) SHOWN ON PLAN PER ACTUAL PANEL DIMENSIONS
	LIGHTING CONTACTOR PANELBOARD (LCP–#) SHOWN ON PLAN PER ACTUAL PANEL DIMENSIONS
* 4	DUPLEX RECEPTACLE, 20A, 120V, 2P, 3W * GFCI – GROUND FAULT CIRCUIT INTERRUPTER TYPE WP – WEATHERPROOF XP – EXPLOSION PROOF T – TRANSIENT VOLTAGE SURGE SUPPRESSOR IC – ISOLATED GROUND 4 – CIRCUIT NUMBER
* 4	DUPLEX RECEPTACLE, 20A, 120V, 2P, 3W MOUNTED ABOVE COUNTER–TOP OR 42" AFF * NOTATIONS SAME AS ABOVE
* 60 3 4W	SPECIAL PURPOSE RECEPTACLE * – VOLT RATING "3" – NUMBER OF POLES "60" – AMPERE RATING "4W" – 4 WIRES IN ADDITION TO GROUND
	MULTI–OUTLET ASSEMBLY, SYMBOL DENOTES RECEPTACLE TYPE
	FLUSH FLOOR OUTLET BOX WITH TYPE OUTLET INDICATED
	UNDER FLOOR DUCT SYSTEM WITH TYPE OUTLETS INDICATED
	THREE CELL UNDER FLOOR DUCT SYSTEM JUNCTION BOX
J OR J	JUNCTION BOX
P	PULL BOX
TC	TERMINAL CABINET
OS	OCCUPANCY SENSOR
PC	PHOTOCELL
ESA	EMERGENCY EYEWASH/SHOWER ALARM STATION WITH FLOW SWITCH(ES)
	INDICATED EQUIPMENT AND MATERIALS TO BE DEMOLISHED
DUST	INDICATES THAT ALL ELECTRICAL EQUIPMENT AND MATERIALS INSTALLED WITHIN THE ROOM OR AREA IN WHICH THIS NOTATION APPEARS SHALL BE OF NEMA 12 CONSTRUCTION (OR GASKETED AND SUITABLE FOR USE IN A WET LOCATION WHERE NEMA STANDARDS DO NOT APPLY) UNLESS OTHERWISE NOTED.
DAMP OR WET	INDICATES THAT ALL ELECTRICAL EQUIPMENT AND MATERIALS INSTALLED WITHIN THE ROOM OR AREA IN WHICH THIS NOTATION APPEARS SHALL BE OF NEMA 4X CONSTRUCTION (OR GASKETED AND SUITABLE FOR USE IN A WET LOCATION WHERE NEMA STANDARDS DO NOT APPLY) UNLESS OTHERWISE NOTED.
CORROSIVE	INDICATES THAT ALL ELECTRICAL EQUIPMENT AND MATERIALS INSTALLED WITHIN THE ROOM OR AREA IN WHICH THIS NOTATION APPEARS SHALL BE OF NEMA 4X CONSTRUCTION (OR CORROSION RESISTANT CONSTRUCTION SUITABLE FOR USE IN A WET LOCATION WHERE NEMA STANDARDS DO NOT APPLY) UNLESS OTHERWISE NOTED.
CLASS I, DIV. 1 GROUP D	INDICATES THAT ALL ELECTRICAL EQUIPMENT AND MATERIALS INSTALLED WITHIN THE ROOM OR AREA IN WHICH THIS NOTATION APPEARS SHALL CONFORM TO N.E.C. REQUIREMENTS FOR THE HAZARDOUS AREA CLASSIFICATION SHOWN.

SYMBOL	DESCRIPTION
	GROUND SYSTEM GRID OR LOOP, 36" BELOW FINISHED GRADE UNLESS OTHERWISE NOTED.
	EXOTHERMIC WELD CONNECTION
	3/4" x 10'–0" GROUND ROD. UNLESS SPECIFIED OTHERWISE.
	GROUND ROD TEST WELL STATION (SEE DETAIL SHEET FOR REQUIREMENTS)
COMMUNICATION SYSTEMS	
K	TELEPHONE OUTLET FOR DESK TYPE HANDSET K = KEY SYSTEM
K	TELEPHONE OUTLET FOR WALL TYPE HANDSET (MOUNT UP 4'–6") K = KEY SYSTEM
	PAGE/PARTY TELEPHONE OUTLET FOR DESK TYPE HANDSET
	PAGE/PARTY TELEPHONE OUTLET FOR WALL TYPE HANDSET, MOUNT UP 4'–6"
S H W	PAGING SPEAKER, WALL MOUNTED H = HORN TYPE W = WIDE ANGLE TYPE
S H W	PAGING SPEAKER, WALL MOUNTED, BI–DIRECTIONAL, HORN TYPE W = WIDE ANGLE TYPE
S	PAGING SPEAKER, FLUSH MOUNTED CEILING TYPE
S	PAGING SPEAKER, SURFACE MOUNTED CEILING TYPE
VC	REMOTE WALL MOUNTED VOLUME CONTROL FOR CEILING SPEAKER, MOUNT UP 5'–0"
A	PAGING SPEAKER AMPLIFIER ASSEMBLY
TM	TELEPHONE CABINET OR BACKBOARD AS NOTED
P OR C	"C" – DATA INPUT/OUTPUT CABLE OUTLET "P" – PROCESS COMPUTER SYSTEM (CAT6 RJ–45 JACK)

GD/VF #	GAS DETECTOR/VENTILATION FAILURE ALARM,
	# INDICATES TYPE OF UNIT.
	1 = MASTER, 2 = REMOTE

GB	GAS DETECTION/VENTILATION FAILURE WEATHERPROOF DUAL–LITE BEACON MOUNT TOP OF DEVICE UP 6'–8" A.F.F.
15 G	GAS DETECTION/VENTILATION FAILURE HORN/STROBE MOUNT TOP OF DEVICE UP 6'–8" A.F.F.
G	GAS DETECTION/VENTILATION FAILURE HORN, MOUNT TOP OF DEVICE UP 6'–8" A.F.F.
G	GAS DETECTION/VENTILATION FAILURE STROBE, MOUNT TOP OF DEVICE UP 6'–8" A.F.F.
SECURITY SYSTEMS	
SACP	SECURITY ALARM CONTROL PANEL
DS	SECURITY ALARM DOOR SWITCH
K	SECURITY ALARM KEY PAD
R	SECURITY SYSTEM CARD ACCESS READER
WS	SECURITY ALARM WINDOW SWITCH
	SECURITY ALARM MOTION DETECTOR
CCTV	CLOSED CIRCUIT TV CAMERA
PTZ	PAN, TILT, ZOOM CAMERA LENS CONTROLS
GB	GLASS BREAK DETECTOR
FIRE ALARM SYSTEMS	
H 200 R	FIRE ALARM HEAT DETECTOR 135 FIXED TEMPERATURE UNLESS OTHERWISE NOTED. "200" – 200 FIXED TEMPERATURE "R" – FIXED TEMPERATURE RATE–OF–RISE TYPE
I	FIRE ALARM SMOKE DETECTOR PHOTOELECTRIC TYPE UNLESS OTHERWISE NOTED. "I" – IONIZATION TYPE.
D	FIRE ALARM DUCT SMOKE DETECTOR
FACP	FIRE ALARM CONTROL PANEL
FV	FIRE ALARM VENTILATION PANEL WITH GRAPHIC PANEL
FA	REMOTE FIRE ALARM ANNUNCIATOR PANEL

SYMBOL	DESCRIPTION
F	FIRE ALARM MASTER BOX
F	FIRE ALARM HORN, MOUNT UP 7'–6"
15 F	FIRE ALARM STROBE, MOUNT UP 6'–8" 15 = CANDELA RATING
15 F	FIRE ALARM HORN AND STROBE LIGHT COMBINATION, MOUNT UP 6'–8" 15 = CANDELA RATING
F	FIRE ALARM MANUAL PULL STATION, MOUNT UP 4'–0"
VSS	SPRINKLER VALVE SUPERVISORY SWITCH
SFS	SPRINKLER FLOW ALARM SWITCH
F	FIRE ALARM BELL
FB	WEATHERPROOF HI–INTENSITY FIRE ALARM STROBE LIGHT WITH HORN
PIR	PASSIVE INFRARED DETECTOR
R	SMOKE BEAM DETECTOR (RECEIVER)
T	SMOKE BEAM DETECTOR (TRANSMITTER)
	FIRE ALARM SMOKE DETECTOR REMOTE INDICATOR AND TEST SWITCH

ABBREVIATIONS	
A	AMPS
AC	ALTERNATING CURRENT
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AL	ALUMINUM
AIC	AMPERE INTERRUPTING CAPACITY
AMP	AMPERE
ATS	AUTOMATIC TRANSFER SWITCH
AUTO	AUTOMATIC
AUX	AUXILIARY
AWG	AMERICAN WIRE GAUGE
BKR	BREAKER
BLDG	BUILDING
C	CONDUIT
CB	CIRCUIT BREAKER
CGD	COMBUSTIBLE GAS DETECTOR
CKT	CIRCUIT
CLB	CURRENT LIMITING BREAKER
CLF	CURRENT LIMITING FUSE
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
CS	CONTROL SWITCH/CONTROL STATION
CT	CURRENT TRANSFORMER
CU	COPPER
CWS	CONDUIT WALL SEAL
DC	DIRECT CURRENT
DIA	DIAMETER
DMU	DIGITAL METERING UNIT
DN	DOWN
EC	EMPTY CONDUIT
ELEC	ELECTRICAL

ABBREVIATIONS (CONTINUED)	
ELEV	ELEVATION
EM	EMERGENCY
ENCL	ENCLOSURE OR ENCLOSED
EQUIP	EQUIPMENT
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EX	EXISTING
FO	FIBER OPTIC
FU	FUSE
GCP	GENERATOR CONTROL PANEL
GEN	GENERATOR
G, GND	GROUND
GFI	GROUND FAULT INTERRUPTER
GRS	GALVANIZED RIGID STEEL
HACR	HEATING & AIR CONDITIONING RATED
HH	HANDHOLE
HT	HEIGHT
HID	HIGH INTENSITY DISCHARGE
HP	HORSEPOWER
HZ	HERTZ
ID	IDENTIFICATION
INSTR	INSTRUMENT
K	KILO (PREFIX)
kcmil	1000 CIRCULAR MILS
KVA	KILOVOLT AMPERES
KW	KILOWATTS
LA	LIGHTING ARRESTER
LTG	LIGHTING
LP	LIGHTING PANEL
LV	LOW VOLTAGE
MAX	MAXIMUM
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MDP	MAIN DISTRIBUTION PANEL
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MLO	MAIN LUGS ONLY
MTD	MOUNTED
MTS	MANUAL TRANSFER SWITCH
MV	MEDIUM VOLTAGE
N	NEUTRAL
NC	NORMALLY CLOSED
NO	NORMALLY OPEN OR NUMBER
NTS	NOT TO SCALE
OH	OVERHEAD
OL	OVERLOAD
PB	PULL BOX
PCP	PUMP CONTROL PANEL
PH	PHASE
PMH	POWER MANHOLE
PNL	PANEL OR PANELBOARD
PR	PAIR
PRI	PRIMARY
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE
RECPT	RECEPTACLE
REQD	REQUIRED
QTY	QUANTITY
SA	SURGE ARRESTER
SEC	SECONDS OR SECONDARY
SH	SHIELDED OR SPACE HEATER
SHH	SIGNAL HANDHOLE
SPD	SURGE PROTECTIVE DEVICE
SS	STAINLESS STEEL
SV	SOLENOID VALVE
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
TC	TIME TO CLOSE OR TRAY CABLE
TEL	TELEPHONE
TO	TIME TO OPEN
TS	TWISTED SHIELDED OR THERMAL SWITCH
TYP	TYPICAL
UG	UNDERGROUND
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLTS
VA	VOLT AMPS
VFD	VARIABLE FREQUENCY DRIVE
W	WATTS, WIDTH, WITH, WIRE
WP	WEATHERPROOF
XP	EXPLOSION PROOF
XFMR	TRANSFORMER

A / E–4 — SHEET NO. WHERE DETAIL IS DRAWN

SYMBOL WHERE THERE IS A DETAIL

DETAIL 1/4" = 1'–0" — A / E–3 — SHEET NO. WHERE THERE IS A DETAIL

SYMBOL WHERE DETAIL IS DRAWN

DETAIL SYMBOL

1 / E–4 — SHEET NO. WHERE SECTION IS DRAWN

SYMBOL WHERE THERE IS A SECTION

SECTION 1/4" = 1'–0" — 1 / E–3 — SHEET NO. WHERE SECTION IS TAKEN

SYMBOL WHERE SECTION IS DRAWN

SECTION SYMBOL

GENERAL NOTE
THIS IS A STANDARD LEGEND. SOME SYMBOLS MAY NOT APPEAR ON THE DRAWINGS.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: T. ADAMS
DRAWN BY: T. ADAMS
SHEET CHK'D BY: –
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APPROVED BY: –
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emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT
PURIFIED WATER REPLENISHMENT PROJECT

ELECTRICAL
LEGENDS AND ABBREVIATIONS II

PROJECT NO. 26793–214344
FILE NAME: 00–E–002.DWG
SHEET NO.
00-E-002

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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REV. NO.	DATE	DRWN	CHKD	REMARKS

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DRAWN BY: T. ADAMS
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CROSS CHK'D BY: –
APPROVED BY: –
DATE: MAY 2018

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emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

ELECTRICAL SITE PLAN

PROJECT NO. 26793–214344
FILE NAME: 10–E–001.DWG

SHEET NO.
10-E-001

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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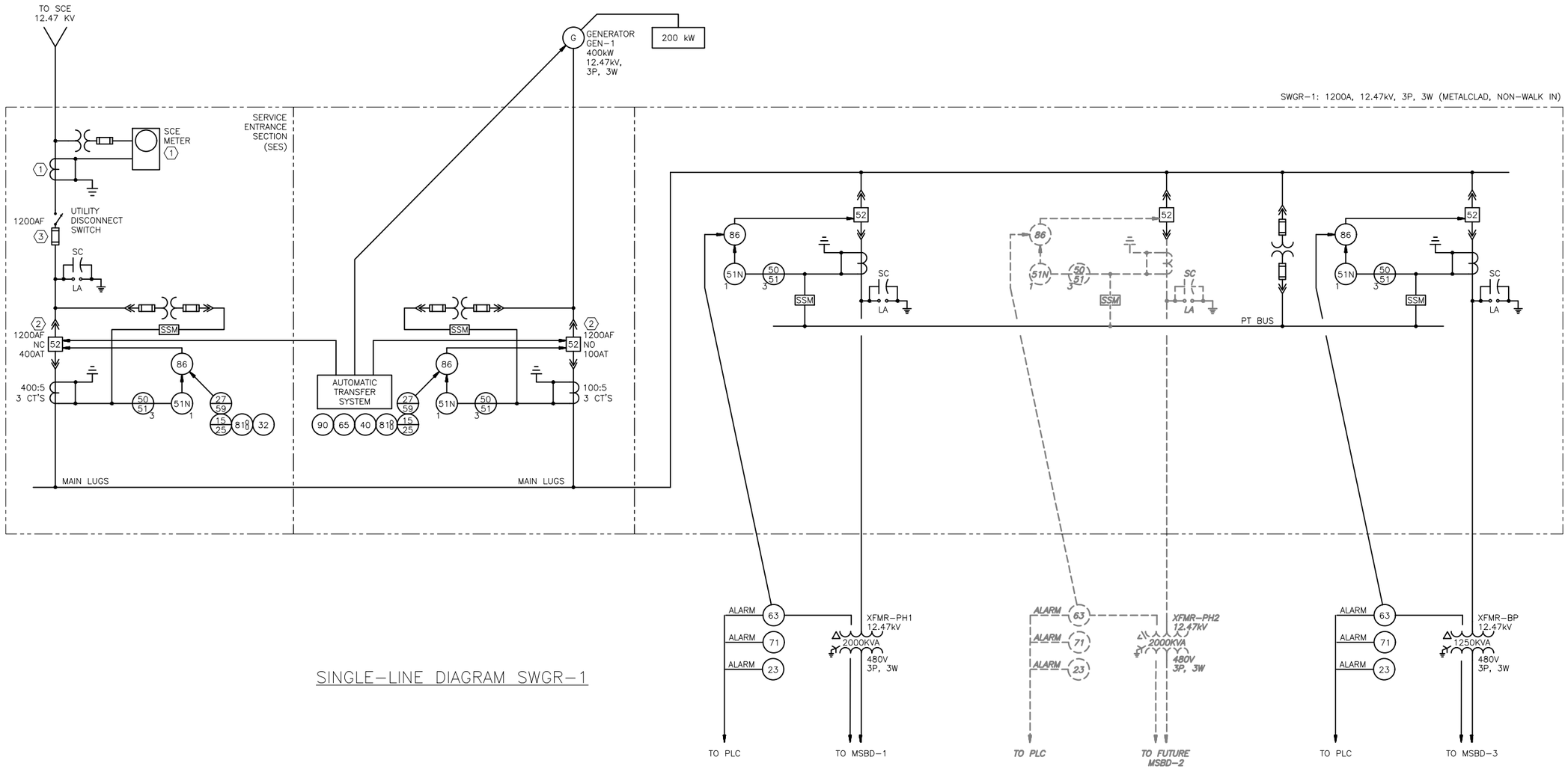
15	AUTOMATIC SYNCHRONIZER
23	HIGH TEMPERATURE
25	MANUAL SYNCH CHECK
27	UNDER VOLTAGE
32	REVERSE POWER
40	LOSS OF FIELD
50	INSTANTANEOUS OVER CURRENT
51	TIMED OVER CURRENT
51N	TIMED GROUND FAULT
59	OVER VOLTAGE
63	SUDDEN PRESSURE RELAY
65	LOAD SHARING/SOFT LOADING
71	LOW LIQUID LEVEL
81O	OVER FREQUENCY
81U	UNDER FREQUENCY
86	LOCKOUT
90	VAR/POWER FACTOR CONTROLLER

KEYED NOTES:

1. PROVIDED BY SCE.
2. STATUS AND CONTROL TO/FROM AUTOMATIC TRANSFER SYSTEM.
3. STATUS TO AUTOMATIC TRANSFER SYSTEM.



SINGLE-LINE DIAGRAM SWGR-1

REV. NO.	DATE	DRWN	CHKD	REMARKS

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

ELECTRICAL
SINGLE-LINE DIAGRAM
SWGR-1

PROJECT NO. 26793-214344
FILE NAME: 10-E-002.DWG
SHEET NO. 10-E-002

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

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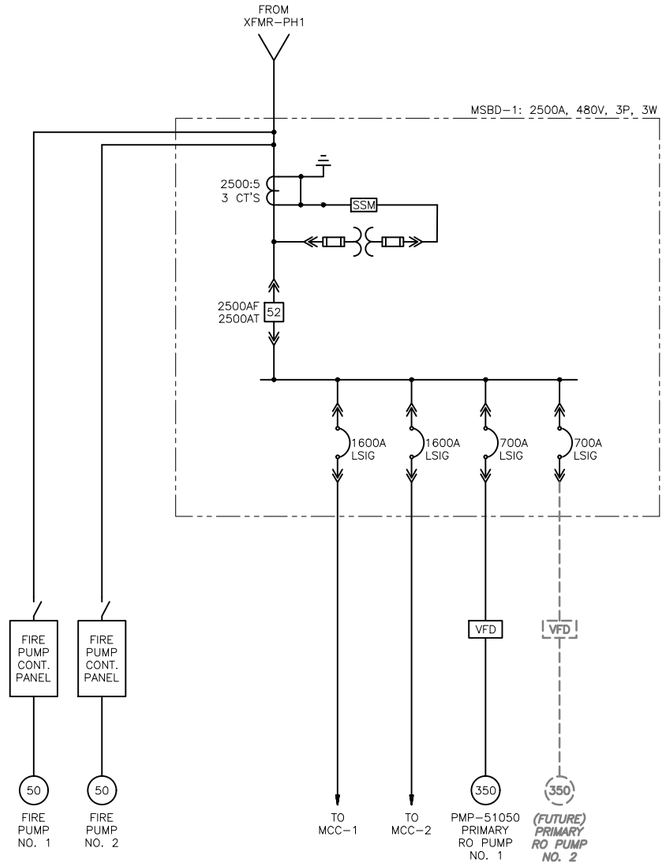

SINGLE–LINE DIAGRAM MSBD–1

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: T. ADAMS
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APPROVED BY: –
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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

ELECTRICAL
SINGLE-LINE DIAGRAM
MSBD-1

PROJECT NO. 26793–214344
FILE NAME: 17–E–001.DWG

SHEET NO.
17-E-001

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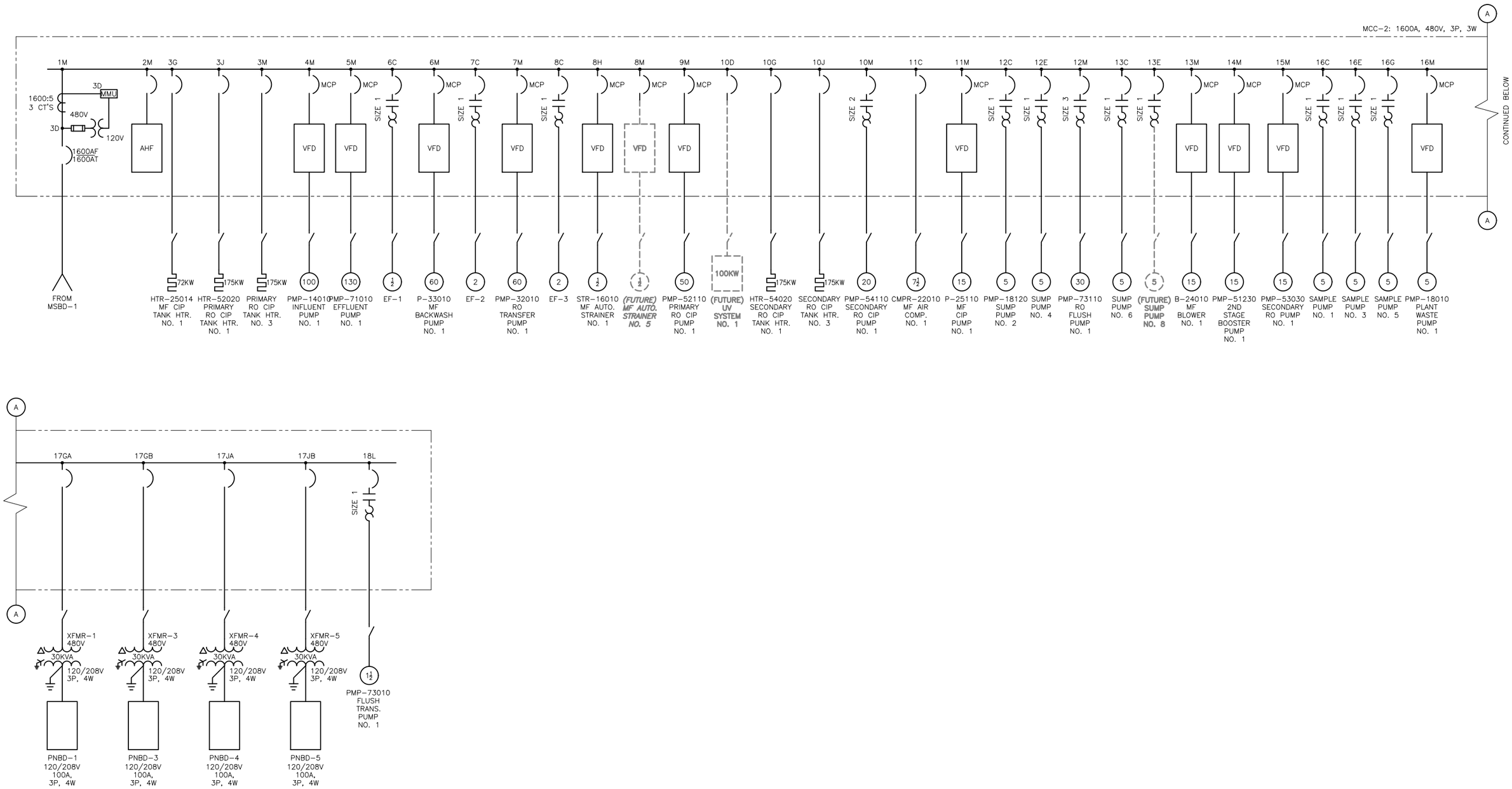

SINGLE-LINE DIAGRAM MCC-1

REV. NO.	DATE	DRWN	CHKD	REMARKS

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PURIFIED WATER REPLENISHMENT PROJECT

ELECTRICAL
SINGLE-LINE DIAGRAM
MCC-1

PROJECT NO. 26793-214344
FILE NAME: 17-E-002.DWG
SHEET NO. 17-E-002

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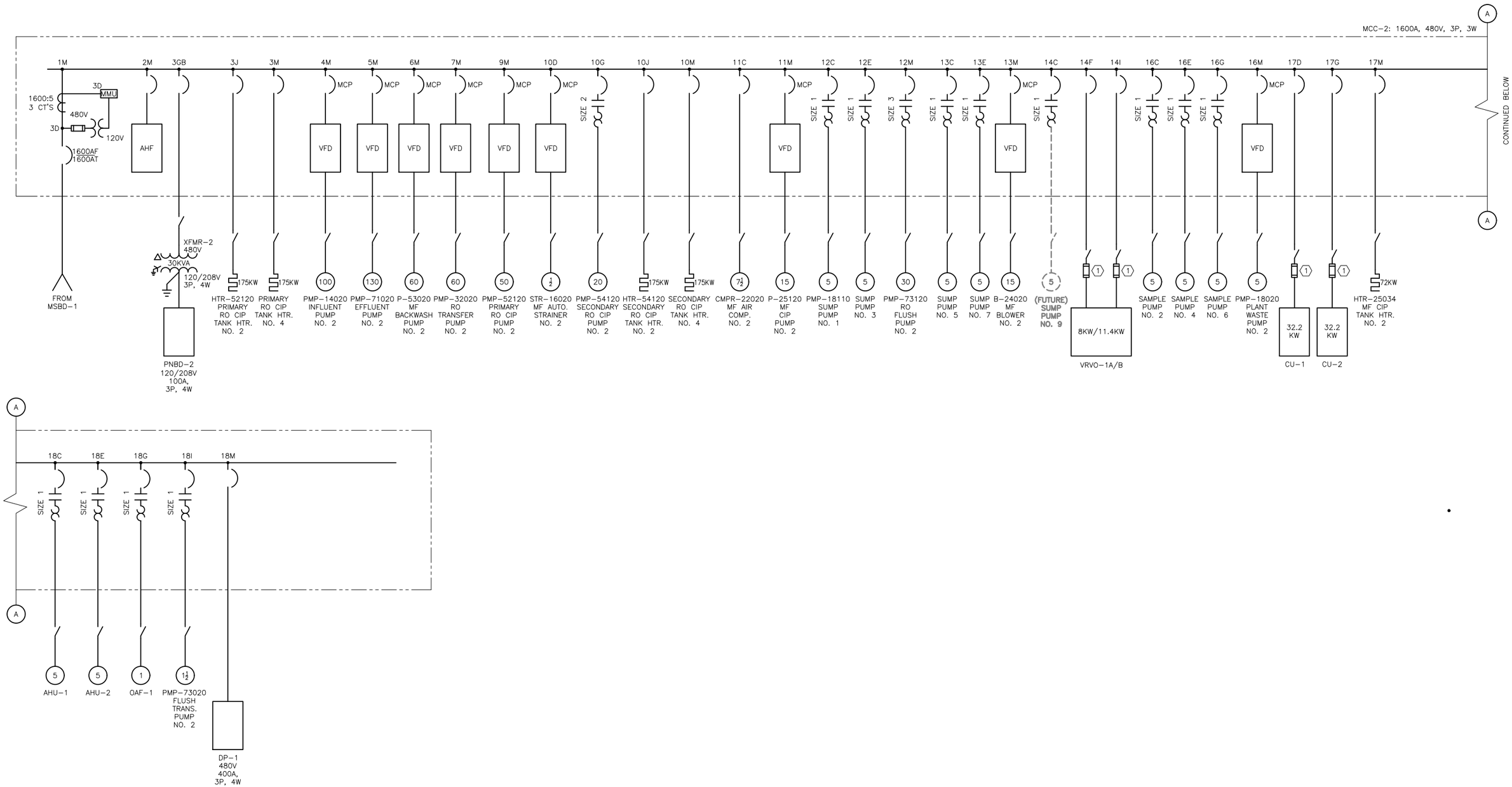
KEYED NOTES:

1. SIZE FUSES PER MANUFACTURER'S RECOMMENDATION.



SINGLE-LINE DIAGRAM MCC-2

REV. NO.	DATE	DRWN	CHKD	REMARKS

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PURIFIED WATER REPLENISHMENT PROJECT

ELECTRICAL
SINGLE-LINE DIAGRAM
MCC-2

PROJECT NO. 26793-214344
FILE NAME: 17-E-003.DWG

SHEET NO.
17-E-003

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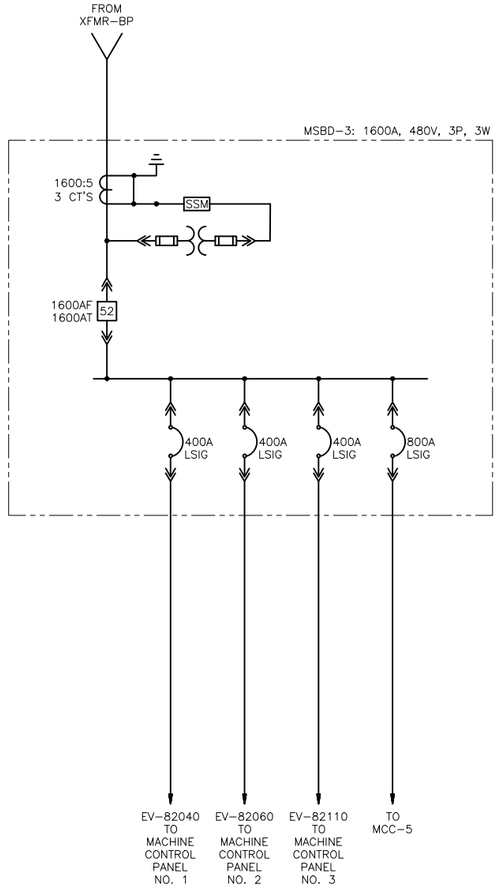

SINGLE–LINE DIAGRAM MSBD–3

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REV. NO.	DATE	DRWN	CHKD	REMARKS

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APPROVED BY: –
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

ELECTRICAL
SINGLE-LINE DIAGRAM
MSBD-3

PROJECT NO. 26793–214344
FILE NAME: 80–E–001.DWG

SHEET NO.
80-E-001

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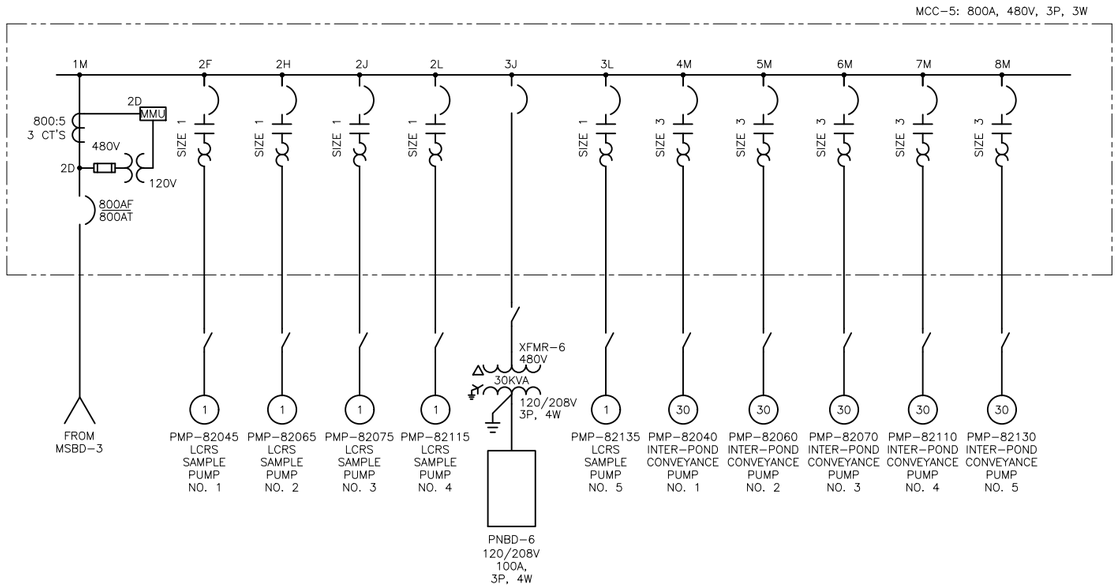

SINGLE-LINE DIAGRAM MCC-5

REV. NO.	DATE	DRWN	CHKD	REMARKS

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APPROVED BY: –
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

ELECTRICAL
SINGLE-LINE DIAGRAM
MCC-5

PROJECT NO. 26793-214344
FILE NAME: 80-E-002.DWG
SHEET NO.
80-E-002

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FROM MSBD-3

FROM MSBD-3

FROM MSBD-3

KEYED NOTES:

1. VENDOR PROVIDED PANEL.
2. VENDOR PROVIDED WIRING.

MACHINE CONTROL PANEL NO. 1 (EV-82040)

30A	60A	30A	60A	30A	60A	30A	60A	30A	60A
2	25	2	25	2	25	2	25	2	25
EVAPORATOR SUBMERSIBLE PUMP NO. 1	EVAPORATOR BLOWER NO. 1	EVAPORATOR SUBMERSIBLE PUMP NO. 2	EVAPORATOR BLOWER NO. 2	EVAPORATOR SUBMERSIBLE PUMP NO. 3	EVAPORATOR BLOWER NO. 3	EVAPORATOR SUBMERSIBLE PUMP NO. 4	EVAPORATOR BLOWER NO. 4	EVAPORATOR SUBMERSIBLE PUMP NO. 5	EVAPORATOR BLOWER NO. 5
EVAP-82041		EVAP-82042		EVAP-82043		EVAP-82044		EVAP-82045	

MACHINE CONTROL PANEL NO. 2 (EV-82060)

30A	60A	30A	60A	30A	60A	30A	60A	30A	60A	30A	60A	30A	60A
2	25	2	25	2	25	2	25	2	25	2	25	2	25
EVAPORATOR SUBMERSIBLE PUMP NO. 6	EVAPORATOR BLOWER NO. 6	EVAPORATOR SUBMERSIBLE PUMP NO. 7	EVAPORATOR BLOWER NO. 7	EVAPORATOR SUBMERSIBLE PUMP NO. 8	EVAPORATOR BLOWER NO. 8	EVAPORATOR SUBMERSIBLE PUMP NO. 9	EVAPORATOR BLOWER NO. 9	EVAPORATOR SUBMERSIBLE PUMP NO. 10	EVAPORATOR BLOWER NO. 10	EVAPORATOR SUBMERSIBLE PUMP NO. 11	EVAPORATOR BLOWER NO. 11	EVAPORATOR SUBMERSIBLE PUMP NO. 12	EVAPORATOR BLOWER NO. 12
EVAP-82061		EVAP-82062		EVAP-82063		EVAP-82064		EVAP-82065		EVAP-82066		EVAP-82067	

MACHINE CONTROL PANEL NO. 3 (EV-82110)

30A	60A	30A	60A	30A	60A	30A	60A	30A	60A	30A	60A	30A	60A	30A	60A
2	25	2	25	2	25	2	25	2	25	2	25	2	25	2	25
EVAPORATOR SUBMERSIBLE PUMP NO. 13	EVAPORATOR BLOWER NO. 13	EVAPORATOR SUBMERSIBLE PUMP NO. 14	EVAPORATOR BLOWER NO. 14	EVAPORATOR SUBMERSIBLE PUMP NO. 15	EVAPORATOR BLOWER NO. 15	EVAPORATOR SUBMERSIBLE PUMP NO. 16	EVAPORATOR BLOWER NO. 16	EVAPORATOR SUBMERSIBLE PUMP NO. 17	EVAPORATOR BLOWER NO. 17	EVAPORATOR SUBMERSIBLE PUMP NO. 18	EVAPORATOR BLOWER NO. 18	EVAPORATOR SUBMERSIBLE PUMP NO. 19	EVAPORATOR BLOWER NO. 19	EVAPORATOR SUBMERSIBLE PUMP NO. 20	EVAPORATOR BLOWER NO. 20	EVAPORATOR SUBMERSIBLE PUMP NO. 21	EVAPORATOR BLOWER NO. 21
EVAP-82111		EVAP-82112		EVAP-82113		EVAP-82114		EVAP-82115		EVAP-82116		EVAP-82117		EVAP-82118		EVAP-82119	

SINGLE-LINE DIAGRAMS MACHINE CONTROL PANELS 1, 2 AND 3

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: T. ADAMS
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APPROVED BY: –
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PURIFIED WATER REPLENISHMENT PROJECT

ELECTRICAL
SINGLE-LINE DIAGRAMS
MACHINE CONTROL PANELS 1, 2 AND 3

PROJECT NO. 26793-214344
FILE NAME: 80-E-003.DWG

SHEET NO.
80-E-003

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GENERAL INSTRUMENT OR FUNCTION SYMBOLS

SHARED DISPLAY/ SHARED CONTROL				
PRIMARY CHOICE	SECONDARY CHOICE	COMPUTER SOFTWARE	DISCRETE	LOCATION AND ACCESSIBILITY
◯	◇	⬡	◯	FIELD MOUNTED AND NORMALLY OPERATOR ACCESSIBLE
◯	◇	⬡	◯	PRIMARY CONTROL PANEL MOUNTED AND NORMALLY OPERATOR ACCESSIBLE
◯	◇	⬡	◯	PRIMARY CONTROL PANEL MOUNTED AND NOT NORMALLY OPERATOR ACCESSIBLE
◯	◇	⬡	◯	SECONDARY CONTROL PANEL MOUNTED AND NORMALLY OPERATOR ACCESSIBLE
◯	◇	⬡	◯	SECONDARY CONTROL PANEL MOUNTED AND NOT NORMALLY OPERATOR ACCESSIBLE

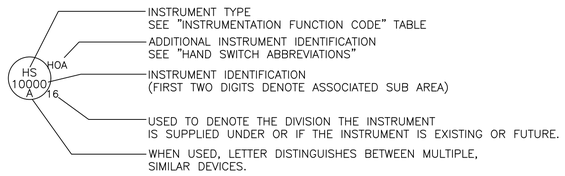
◯◯ INSTRUMENTS SHARING COMMON HOUSING

◯ PILOT LIGHT

MISCELLANEOUS SYMBOLS

- (M) MOTOR
- MCC — INDICATES INTERLOCK OR LOGIC IN A MOTOR CONTROL CENTER
- I — INDICATES GENERAL OR MISCELLANEOUS HARDWIRED INTERLOCK
- MS — MOTOR STARTER
- SCR — SILICONE CONTROL RECTIFIER
- VFD — VARIABLE FREQUENCY DRIVE
- P — PURGE OR FLUSHING DEVICE

TYPICAL TAG NUMBERS & DESIGNATION



HAND SWITCH ABBREVIATIONS

AO = AUTO/OFF
AM = AUTO/MANUAL
CM = COMPUTER/MANUAL
CL = COMPUTER/LOCAL
E-STOP = EMERGENCY STOP
FR = FORWARD/REVERSE
FOR = FORWARD/OFF/REVERSE
FS = FAST SLOW
FOS = FAST/OFF/SLOW
HOA = HAND/OFF/AUTO
LLS = LEAD/LAG/STANDBY
LOC = LOCAL/OFF/COMPUTER
LOR = LOCAL/OFF/REMOTE
LOS = LOCKOUT/STOP
LA = LOCAL/AUTO
LR = LOCAL/REMOTE
OC = OPEN/CLOSE
OCA = OPEN/CLOSE/AUTO
OO = ON/OFF
OOA = ON/OFF/AUTO
OSC = OPEN/STOP/CLOSE
RSL = RAISE/STOP/LOWER
SS = START/STOP
SOR = START/OFF/RESET

INSTRUMENTATION FUNCTION CODE

	FIRST LETTERS		SUCCEEDING LETTERS		
	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
	MEASURED/INITIATING VARIABLE	VARIABLE MODIFIER	READOUT/PASSIVE FUNCTION	OUTPUT/ACTIVE FUNCTION	FUNCTION MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE			CONTROL	CLOSED
D	USER'S CHOICE	DIFFERENCE, DIFFERENTIAL			DEVIATION
E	VOLTAGE		SENSOR, PRIMARY ELEMENT		
F	FLOW, FLOW RATE	RATIO			
G	USER'S CHOICE		GLASS, GAUGE, VIEWING DEVICE		
H	HAND				HIGH
I	CURRENT		INDICATE		
J	POWER		SCAN		
K	TIME, SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	MOISTURE				MIDDLE, INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE, RESTRICTION		OPEN
P	PRESSURE		POINT (TEST CONNECTION)		
Q	QUANTITY	INTEGRATE, TOTALIZE	INTEGRATE, TOTALIZE		
R	RADIATION		RECORD		RUN
S	SPEED, FREQUENCY	SAFETY		SWITCH	STOP
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	
V	VIBRATION, MECHANICAL, ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL, PROBE		
X	UNCLASSIFIED (1)	X-AXIS	ACCESSORY DEVICES, UNCLASSIFIED (1)	UNCLASSIFIED (1)	UNCLASSIFIED (1)
Y	EVENT, STATE, PRESENCE	Y-AXIS		AUXILIARY DEVICES	
Z	POSITION, DIMENSION	Z-AXIS, SAFETY INSTRUMENT SYSTEM		DRIVER, ACTUATOR, UNCLASSIFIED, FINAL CONTROL ELEMENT	

TABLE NOTES:
(1) WHEN USED SYMBOL OR SIGNAL LINE IS ANNOTATED.

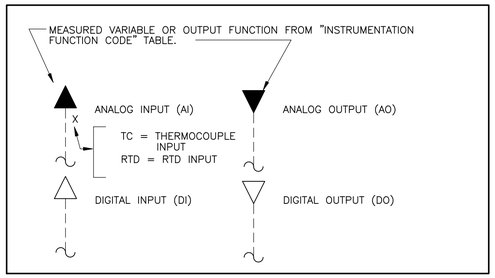
INSTRUMENT LINE SYMBOLS

- ELECTRICAL SIGNAL
- TELEPHONE SIGNAL
- ELECTROMAGNETIC OR SONIC SIGNAL (GUIDED)
- ELECTROMAGNETIC OR SONIC SIGNAL (UNGUIDED)
- PNEUMATIC SIGNAL
- CAPILLARY TUBE
- HYDRAULIC SUPPLY
- VENDOR SUPPLIED CABLE
- COMMUNICATION LINK – COPPER (HARDWIRED)
- COMMUNICATION LINK – FIBER OPTICS

ELECTRICAL / AIR SOURCES

- 120VAC UPS — UPS POWERED ELECTRICAL SOURCE
- ES — ELECTRICAL SOURCE
- IA — INSTRUMENT AIR SOURCE

I/O SIGNALS



PRIMARY ELEMENTS

- FE (M) — MAGNETIC FLOW METER
- FE — TURBINE OR PROPELLER FLOW METER
- FE — AVERAGING PITOT TUBE
- FE — ULTRASONIC FLOW METER
- FE — ROTAMETER
- FE — WEIR
- FE — ORIFICE PLATE
- FE — VENTURI TUBE
- FE — FLUME
- FE (X) — GENERAL INSERTION FLOW METER; IM=INSERT MAG
- FE — THERMAL MASS FLOW METER
- LE — FLOAT SWITCH
- LE — ULTRASONIC LEVEL SENSOR
- LE — RADAR LEVEL SENSOR
- LE — CAPACITANCE LEVEL SENSOR
- PI — PRESSURE GAUGE
- PDI — DIFFERENTIAL PRESSURE GAUGE
- TI — TEMPERATURE GAUGE
- AE (X) — GENERAL ANALYZER; pH=pH, DO=DISSOLVED OXYGEN, H2S=HYDROGEN SULFIDE, LEL=% LOWER EXPLOSIVE LIMIT, 02=OXYGEN, O3=OZONE, NH3=NITRATE, TURB=TURBIDITY, FL=FLUORIDE

GENERAL NOTES

1. THIS LEGEND APPLIES TO P&IDS ONLY AND MAY DIFFER FROM LEGENDS FOR OTHER SHEETS.

2. IN GENERAL THIS LEGEND SHEET AND THE P&IDS ARE BASED ON THE INTERNATIONAL SOCIETY OF AUTOMATION (ISA) STANDARDS AND RECOMMENDED PRACTICES FOR INSTRUMENTATION AND CONTROL. SOME MODIFICATIONS, ADDITIONS AND ALTERATIONS HAVE BEEN MADE AS REQUIRED TO ACCOMMODATE PROJECT REQUIREMENTS.

3. SOME PROCESS ITEMS SUCH AS EQUIPMENT ISOLATION VALVES, BYPASS LINES, ETC., WHICH ARE NOT CRITICAL FOR AN UNDERSTANDING OF THE INSTRUMENTATION FUNCTIONS ARE NOT SHOWN ON THE P&IDS.

4. SEE ELECTRICAL AND MECHANICAL SHEETS AND SPECIFICATIONS FOR ADDITIONAL CONTROL AND INTERLOCK REQUIREMENTS.

5. LIGHTER WEIGHT LINES, SHOWN AS ——— , INDICATE EQUIPMENT, ——— INSTRUMENTS OR PIPING THAT ARE EXISTING. WEIGHTED LINES, SHOWN AS ——— OR HEAVIER ——— , INDICATE EQUIPMENT, ~~INSTRUMENTS~~ OR PIPING THAT ARE NEW. DASHED WEIGHTED LINES, SHOWN AS - - - - - , INDICATED EQUIPMENT, INSTRUMENTS OR PIPING THAT ARE GROUPED AS A PACKAGE.

GENERAL ABBREVIATIONS

ADDITIONAL ABBREVIATIONS CAN BE FOUND ON SHEET 00-G-003

AI	ANALOG IN
AO	ANALOG OUT
CPU	CENTRAL PROCESSOR UNIT
DI	DIGITAL OR DISCRETE INPUT
DO	DIGITAL OUTPUT
FC	FAIL CLOSED
FO	FAIL OPEN OR FIBER OPTIC
HMI	HUMAN MACHINE INTERFACE
MCC	MOTOR CONTROL CENTER
NC	NORMALLY CLOSED
NPW	NON-POTABLE WATER
NO	NORMALLY OPEN
PLC	PROGRAMMABLE LOGIC CONTROLLER
PW	PLANT WATER
RIO	REMOTE INPUT/OUTPUT
UPS	UNINTERRUPTIBLE POWER SUPPLY
VFD	VARIABLE FREQUENCY DRIVE

FLOW STREAM ABBREVIATIONS

REFER SHEET 00-G-003 FOR FLOW STREAM ABBREVIATIONS.

LOCATION AREA CODES

AREA CODE	AREA DESCRIPTION
0	SAN JACINTO VALLEY RWRF
10	PLANTWIDE UTILITIES AND SERVICES
20	MICROFILTRATION
30	RO TRANSFER PUMP STATION
40	CHEMICAL SYSTEMS
50	REVERSE OSMOSIS
60	UV SYSTEM
70	AWPF ANCILLARY FACILITIES
80	BRINE PONDS
90	CONVEYANCE FACILITIES

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: N. GOKUL
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT
PURIFIED WATER REPLENISHMENT PROJECT

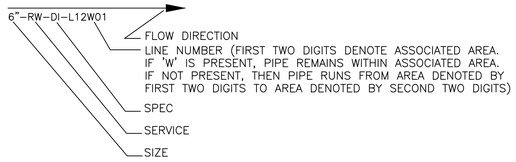
PROCESS AND INSTRUMENTATION DIAGRAM
LEGEND I

PROJECT NO. 26793-214344
FILE NAME: 00-I-001.dwg
SHEET NO.
00-I-001

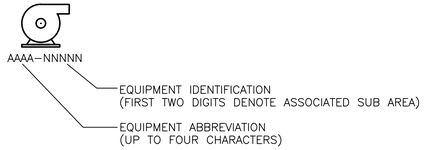
Z:\2017\Phoenix\EMWD\Export\00-I-001.dwg

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

TYPICAL PIPE TAG NUMBERS & DESIGNATION



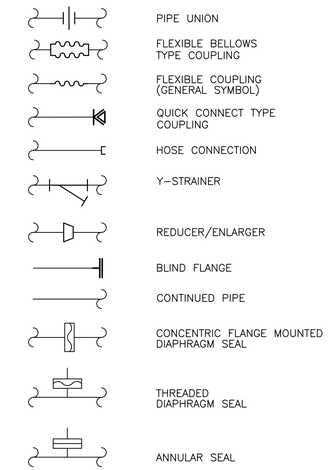
TYPICAL EQUIPMENT TAG NUMBERS & DESIGNATION



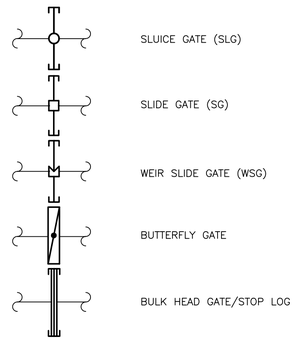
GENERAL NOTES

1. REFER TO SHEET 00-I-001 FOR ADDITIONAL NOTES.
2. REFER SHEET 00-G-003 FOR FLOW STREAM ABBREVIATIONS.

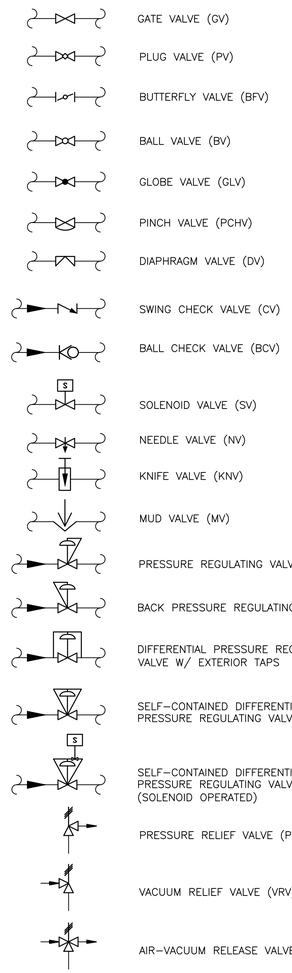
PIPE LINE SYMBOLS



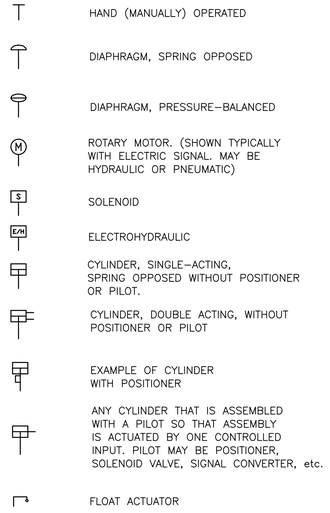
GATE SYMBOLS



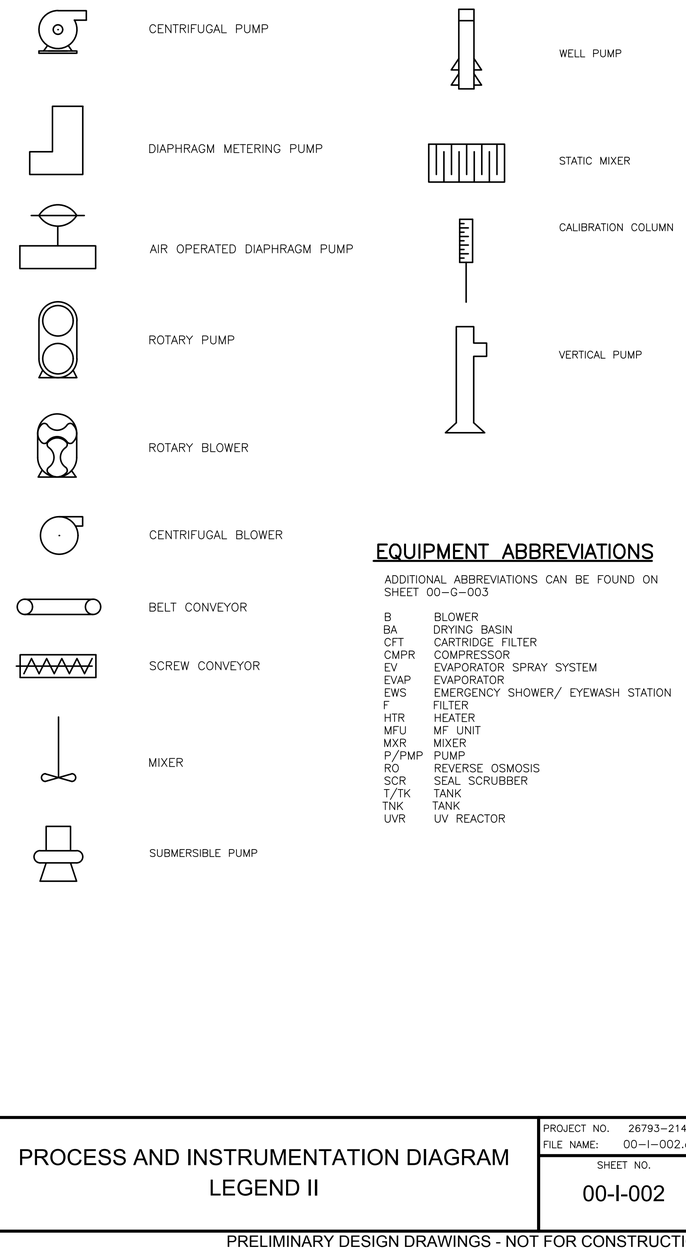
VALVE SYMBOLS



VALVE ACTUATORS



PROCESS EQUIPMENT



EQUIPMENT ABBREVIATIONS

ADDITIONAL ABBREVIATIONS CAN BE FOUND ON SHEET 00-G-003

B	BLOWER
BA	DRYING BASIN
CFT	CARTRIDGE FILTER
CMPR	COMPRESSOR
EV	EVAPORATOR SPRAY SYSTEM
EVAP	EVAPORATOR
EWS	EMERGENCY SHOWER/ EYEWASH STATION
F	FILTER
HTR	HEATER
MFU	MF UNIT
MXR	MIXER
P/PMP	PUMP
RO	REVERSE OSMOSIS
SCR	SEAL SCRUBBER
T/TK	TANK
TNK	TANK
UVR	UV REACTOR

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REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: N. GOKUL
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM LEGEND II

PROJECT NO. 26793-214344
FILE NAME: 00-I-002.dwg
SHEET NO.
00-I-002

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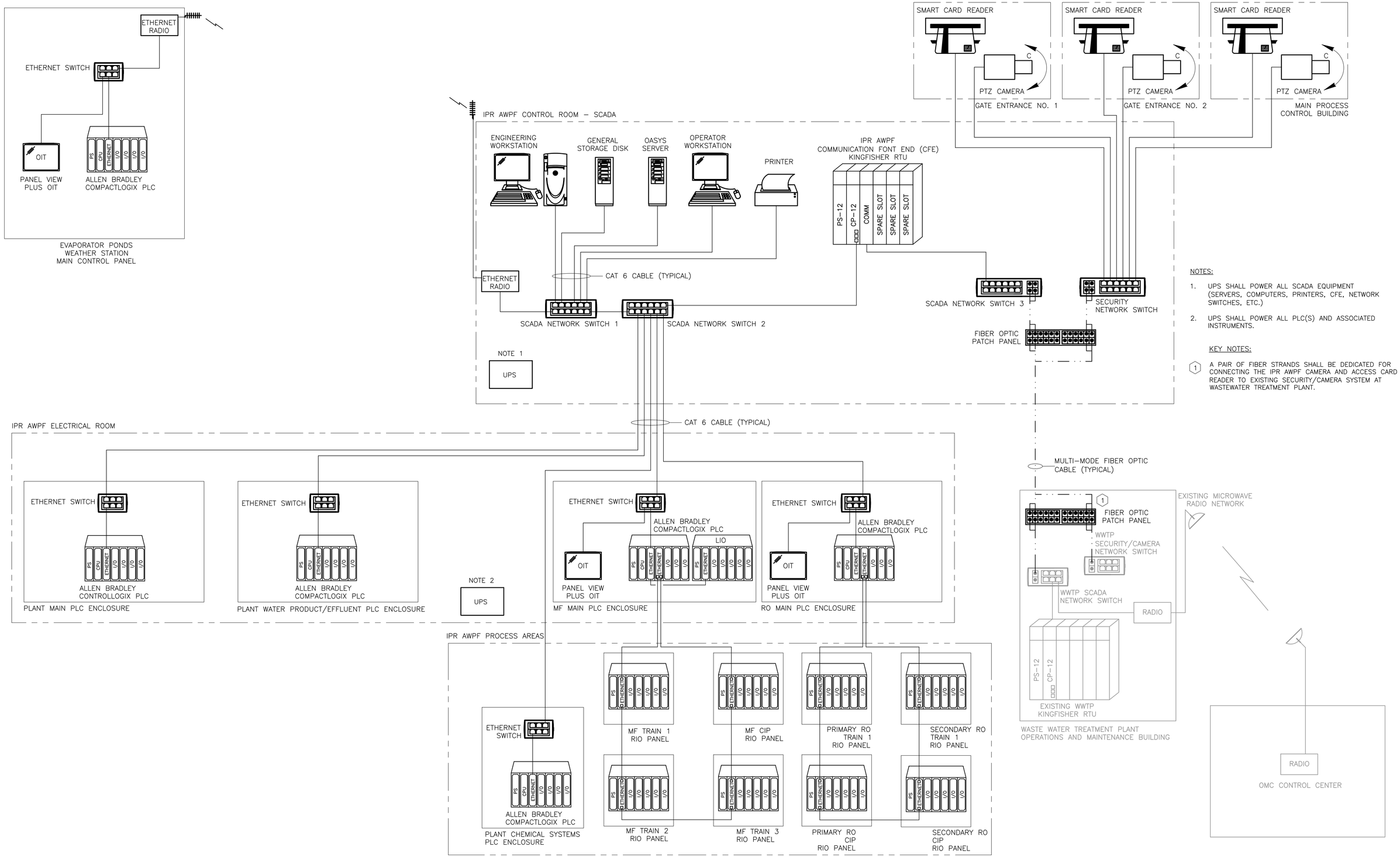

NOTES:

1. UPS SHALL POWER ALL SCADA EQUIPMENT (SERVERS, COMPUTERS, PRINTERS, CFE, NETWORK SWITCHES, ETC.)
2. UPS SHALL POWER ALL PLC(S) AND ASSOCIATED INSTRUMENTS.

KEY NOTES:

(1) A PAIR OF FIBER STRANDS SHALL BE DEDICATED FOR CONNECTING THE IPR AWPF CAMERA AND ACCESS CARD READER TO EXISTING SECURITY/CAMERA SYSTEM AT WASTEWATER TREATMENT PLANT.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: N. GOKUL
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

SYSTEM ARCHITECTURE

PROJECT NO. 26793-214344
FILE NAME: 00-I-003.dwg
SHEET NO. 00-I-003

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PLANT MAIN PLC

VFD-14010

FAULT XA 14010 | RUNNING YI 14010 | SPEED SI 14010 | L/R HS 14010 B | S/S HS 14010 C | SPEED POT SIK 14010

VFD-14020

FAULT XA 14020 | RUNNING YI 14020 | SPEED SI 14020 | L/R HS 14020 B | S/S HS 14020 C | SPEED POT SIK 14020

24"-MFI-ELSP-L14W008 → B/L SJVRWRF TERTIARY EFFLUENT PUMP STATION

BFV-41033

1"-SBS-CPVC-L4541A: BPV-41036, BCV-41037, BV-41038 → 45-I-002 FROM SODIUM BISULFITE

1"-SBS-CPVC-L4541B: BPV-41039, BCV-41040, BV-41041 → 45-I-002 FROM SODIUM BISULFITE

120VAC → AIT 41035 → CL

120VAC → FIT 41034 → Σ → FE 41034, AE 41035

24"-MFI-ELSP-L14W008

BV-41035

24"-MFI-ELSP-L1416

FIT 14030 ← 120VAC

24"-MFI-ELSP-L1416

STATIC MIXER

BFV-41031

BFV-41032 → 16-I-001 TO MF STRAINER

FE 14030

FUTURE

FUTURE

E-STOP HS 14010 A

LIT 14004 ← 120VAC

LSHH 14003

LSLL 14002

LE 14004

VE 14010

TE 14010

PRV-14012

BV-14014

PSH 14015

PI 14016

16"-MFI-ELSP-L14W003

CV-14013

BFV-14017

E-STOP HS 14020 A

VE 14020

TE 14020

PRV-14022

BV-14024

PSH 14025

PI 14026

16"-MFI-ELSP-L14W005

CV-14023

BFV-14027

ZSO 14001

ZSC 14001

HS 14001 A

HS 14001 B

24"-MFF-ELSP-L14W001

BFV-14001

B/L FROM SJVRWRF

120VAC UPS

FIT 14000

FE 14000

PMP-14010
INFLUENT PUMP NO. 1

PMP-14020
INFLUENT PUMP NO. 2

INFLUENT WET WELL

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: N. GOKUL
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM INFLUENT PUMP STATION

PROJECT NO. 26793-214344
FILE NAME: 14-I-001.dwg

SHEET NO. 14-I-001

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MF MAIN PLC

MF FEED FROM SOURCE
14-I-001
24"-MFI-ELSP

AS
49-I-002
BV-49951
IQ-49952
BPV-49953

AS
49-I-002
BV-49961
IQ-49962
BPV-49963

SHC (NOTE 2)
41-I-002
DV-41951
IQ-41952
BPV-41953

SHC (NOTE 2)
41-I-002
DV-41961
IQ-41962
BPV-41963

24"-MFI-ELSP

BV-16050
PIT 16051
NV-16051
PIT 16052
NV-16052

CONNECTIONS TO FUTURE STRAINERS

24"-MFI-ELSP
BFV-16009

12 INCH MF STRAINER NO. 1

YI 16010
XA 16010
HS 16010
HOA
STRAINER LCP
480V AC

PDSH 16010
V
ARV-16010
M
BV-16010

STR-16010
1/2 HP @ 1800 RPM

NOTE 1

24"-MFI-ELSP
BFV-16011

ZSC 16012
HS 16012
L/R
ZSO 16012
HS 16012
O/C
M
BFV 16012

3"-BWW-ELSP

6"-BWW-ELSP
BFV-16013

24"-MFI-ELSP
BFV-16019

12 INCH MF STRAINER NO. 2

PDSH 16020
V
ARV-16020
M
BV-16020

STR-16020
1/2 HP @ 1800 RPM

NOTE 1

24"-MFI-ELSP
BFV-16021

ZSC 16022
HS 16022
L/R
ZSO 16022
HS 16022
O/C
M
BFV 16022

3"-BWW-ELSP

6"-BWW-ELSP
BFV-16023

CONNECTIONS FROM FUTURE STRAINERS

YI 16020
XA 16020
HS 16020
HOA
STRAINER LCP

NOTE 1

24"-MFI-ELSP

NV-16060
PIT 16060
BV-16059

TCL2
AIT 16062
TCL2
AE 16062
FLOOR DRAIN
FI 16062
NV-16062
SAMPLE TAP
BV-16062
BV-16061

TIT 16063
BV-16063

TURB
AIT 16064
TURB
AE 16064
FLOOR DRAIN
FI 16064
NV-16064
BV-16064

MF FEED TO MF UNITS
24"-MFI-ELSP
21-I-001

CONNECTIONS FROM FUTURE STRAINERS

V
ARV-16065
BV-16064

BWW TO PROCESS WASTE GRAVITY SEWER
6"-BWW-ELSP
18-I-001

NOTES:

1. EQUIPMENT AND COMPONENTS WITHIN THIS BOX ARE SUPPLIED BY THE STRAINER MFGR AS PART OF A PACKAGED SYSTEM. THE STRAINER CONTROL PANEL IS ALSO INCLUDED AS PART OF THE PACKAGED EQUIPMENT.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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315 LIONSHEAD AVE., SUITE 2,
CARLSBAD, CA 92010
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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM
MF TRAINER

PROJECT NO. 26793-214344
FILE NAME: 16-I-001.dwg
SHEET NO.

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PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

PLANT MAIN PLC

LCP-18000
PLANT PROCESS WASTE PUMP
LOCAL CONTROL PANEL

LAH 18002	LAL 18001	FAULT XA 18010	RUNNING YI 18010	PAH 18012	FAULT XA 18020	RUNNING YI 18020	PAH 18022
			HOA HS 18010			HOA HS 18020	

LSH 18002
LSL 18001
LIT 18003
LE 18003

B/L
FROM CONTROL BUILDING SANITARY FLOWS
8"-SS-PVC-L18W005

16-I-001
FROM STRAINER BW
6"-BWW-ELSP-L18W006

21-I-001
FROM MF BW
16"-BWW-ELSP-L18W007

25-I-003
FROM MF CIP WASTE
6"-MCW-CPVC-L18W008

73-I-001
FROM RO FLUSH/ PERMEATE DUMP
3"-D-PVC-L7352

52-I-001
FROM PRIMARY RO CIP WASTE
X"-CLW-PVC-L52W012

54-I-001
FROM SECONDARY RO CIP WASTE
X"-CLW-PVC-L54W012

14"X16"

PMP-18010
PLANT PROCESS WASTE PUMP NO. 1

PMP-18020
PLANT PROCESS WASTE PUMP NO. 2

PSH 18012
PI 18013
BV-18011
CV-18014
BV-18015
6"X8"
6"-PPW-DI-L18W001

PSH 18022
PI 18023
BV-18021
CV-18024
BV-18025
6"X8"
6"-PPW-DI-L18W002

8"-PPW-DI-L18W009

PIT 18041
BV-18040
FIT 18042
120VAC
FE 18042
BV-18043
ARV-18045
GV-18044
8"-PPW-DI-L18W009
B/L
TO SJVRWRF

18-I-002
FROM PROCESS BUILDING SUMPS
3"-SW-PVC-L18W021

B/L
FROM CHEMICAL METERING AREA SUMP DRAINS
4"-CHEMD-PVC-L18W022

B/L
FROM BULK CHEMICAL AREA SUMP DRAINS
4"-CHEMD-PVC-L18W022

PLANT PROCESS WASTE PUMP STATION SUBMERSIBLE PUMPS/WETWELL

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT
PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM
PLANT PROCESS WASTE PUMP STATION

PROJECT NO. 26793-214344
FILE NAME: 18-I-001.dwg
SHEET NO.
18-I-001

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PLANT CHEMICAL SYSTEM PLC

FSL 18141

B/L
POTABLE WATER SUPPLY

1"-PW-XXX-L18W013

EWS-18140
EMERGENCY SHOWER/EYEWASH STATION

LCP-18130
SUMP PUMP CONTROL PANEL
(BY SUMP PUMP SUPPLIER)

HOA HS 18110 | FAULT XA 18110 | RUNNING YI 18110 | HOA HS 18120 | FAULT XA 18120 | RUNNING YI 18120 | LEVEL HI HI LAHH 18100 | LEVEL LOW LAL 18100 ← 480VAC

LSHH 18100
LSH 18100
LSL 18100
LSLL 18100

3"-SW-PVC-L18W010

BV-18112

3"-SW-PVC-L18W011

BV-18122

3"-SW-PVC-L18W012

18-I-001
TO DRAIN MANHOLE

CV-18111

CV-18121

PMP-18110
SUMP PUMP NO. 1

PMP-18120
SUMP PUMP NO. 2

TNK-18100
PROCESS ROOM SUMP

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM
SUMP PUMP STATION

PROJECT NO. 26793-214344
FILE NAME: 18-I-002.dwg

SHEET NO.
18-I-002

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MF TRAIN 1 RIO, MF TRAIN 2 RIO, MF TRAIN 3 RIO

BACKWASH SUPPLY
FROM BACKWASH SUPPLY PUMPS
33-I-001
12"-BWS-ELSP

MEMBRANE INTEGRITY TEST AIR
FROM COMPRESSED AIR SYSTEM
23-I-001
2"-MIT-316SS

CONTROL AIR
FROM COMPRESSED AIR SYSTEM
23-I-001
1"-CA-316SS

CONTROL AIR FOR LOCALLY MOUNTED PNEUMATIC VALVES

24"-MFF-ELSP

MF FILTRATE TO MF BREAK TANK
31-I-001

CONNECTIONS FROM FUTURE MF UNITS

SEE DRAWING 21-I-003 FOR TYPICAL MF UNIT FILTRATE END DETAILS

SEE DRAWING 21-I-002 FOR TYPICAL MF UNIT FEED END DETAILS

FILTRATE

FEED

MFUNT-21100
MF UNIT NO. 1

MFUNT-21200
MF UNIT NO. 2

MFUNT-21300
MF UNIT NO. 3

MF FEED
FROM STRAINERS
16-I-001
24"-MFI-ELSP

MF CIP SUPPLY
FROM MF CIP PUMPS
25-I-003
6"-MCS-CPVC

AIR SCOUR
FROM MF AIR SCOUR SYSTEM
24-I-001
4"-AS-316SS

6"-MCR-CPVC

MF CIP RETURN TO MF CIP PUMPS
25-I-003

16"-BWW-ELSP

BACKWASH WASTE TO PROCESS WASTE GRAVITY SEWER
18-I-001

NOTES:

1. MF SYSTEM DESIGN SHALL CONSIST OF 3 MF UNITS DURING FIRST PHASE (MFUNT-21100 THROUGH MFUNT-21300, WITH 5 ADDITIONAL UNITS PLANNED FOR FUTURE SYSTEM BUILD-OUT (MFUNT-21400 THROUGH MFUNT-21800).

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM MEMBRANE UNIT OVERALL SYSTEM

PROJECT NO. 26793-214344
FILE NAME: 21-I-001.dwg
SHEET NO. 001

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MF MAIN PLC

MF FEED
FROM MF FEED HEADER
(DWG. XX–X–XXX)

24"–MFI–ELSP

10"–MFI–ELSP

SKID LIMIT

10"–MFI–316SS

ZSC 21101 / HS 21101 / ZSO 21101 / HS 21101 / BFV 21101 — L/R, O/C, P

FLOW CONTROL VALVE/DIGITAL POSITIONER

ZIT 21103 / HS 21103 / ZC 21103 / HS 21103 / FCV 21103 — L/R, O/S/C, P

10"–BWW–316SS

12"–BWW–316SS

6"–MCS–316SS

PIT 21105

BV–21105

NV–21104

FIT 21106

M

FE 21106

FEED

ZSC 21130 / HS 21130 / ZSO 21130 / HS 21130 / BFV 21130 — L/R, O/C, P

12"–BWW–316SS

L/R, O/C: HS 21150 / HS 21150 / ZSC 21150 / ZSO 21150 / P / V / AVRV 21150

6"–MCR/MMR–316SS

MF CIP RETURN/RECYCLE

21–I–003

FOR MF UNIT FILTRATE END DETAIL, SEE DWG. 21–I–003

1"–MIT–316SS

MIT/COMPRESSED AIR

21–I–003

L/R, O/C: HS 21102 / HS 21102 / ZSC 21102 / ZSO 21102 / BFV 21102 / P

2"–D–PVC

1"–D–PVC

SKID LIMIT

FLOOR DRAIN

L/R, O/C: HS 21131 / HS 21131 / ZSC 21131 / ZSO 21131 / BFV 21131 / P

ZSC 21161 / HS 21161 / ZSO 21161 / HS 21161 / BFV 21161 — P

AIR SCOUR
FROM MF AIR SCOUR
HEADER (DWG.XX–X–XXX)

4"–AS–316SS

BFV–21160

CV–21162

PI 21163

BV–21163

4"–AS–316SS

BACKWASH WASTE
TO BACKWASH WASTE
HEADER (DWG.XX–X–XXX)

16"–BWW–ELSP

SKID LIMIT

12"–BWW–ELSP

12"–BWW–316SS

BV–21132

SAMPLE TAP

ZSC 21142 / HS 21142 / ZSO 21142 / HS 21142 / BFV 21142 — L/R, O/C, P

ZSC 21140 / HS 21140 / ZSO 21140 / HS 21140 / BFV 21140 — L/R, O/C, P

6"–MCS–CPVC

MF CIP SUPPLY
FROM MF CIP SUPPLY
HEADER (DWG. 21–I–001)

SKID LIMIT

ZSC 21141 / HS 21141 / ZSO 21141 / HS 21141 / BFV 21141 — L/R, O/C, P

2"–D–PVC

1"–D–PVC

FLOOR DRAIN

NOTES:

1. THIS TYPICAL MF UNIT DETAIL DRAWING DEPICTS MF UNIT MFUNT–21100. TAG NUMBERS FOR THE OTHER MF UNITS SHALL USE THE SAME TAGGING SCHEME, WHERE THE THIRD DIGIT OF THE LOOP NUMBER SHALL REPRESENT THE UNIT NUMBER. FOR EXAMPLE, THE MF FEED FLOWMETER FOR MFUNT–21100, FIT–21106, SHALL BE FIT–21206 FOR MFUNT–21200, AND FIT–21506 FOR FUTURE MFUNT–21500.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS INSTRUMENTATION DIAGRAM
MF UNIT DETAIL FEED END

PROJECT NO. 26793–214344
FILE NAME: 21–I–002.dwg
SHEET NO. 1

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MF MAIN PLC

MF CIP RETURN/RECYCLE
6"–MCR/MMR–CPVC
21–I–002

ZSC 21151 HS 21151 L/R
BFV 21151 ZSO 21151 HS 21151 O/C P

CV–21152

SKID LIMIT

ZSC 21154 HS 21154 L/R
BFV 21154 ZSO 21154 HS 21154 O/C P

TURB AIT 21115

6"–MCR–CPVC

MF CIP RETURN
TO MF CIP RETURN
HEADER (DWG. 21–I–001)

L/R HS 21110 HS 21110 O/C
ZSC 21110 ZSO 21110 P
BFV 21110

6"–MCR/MMR–CPVC

2"–D–PVC

ZSC 21153 HS 21153 L/R
BFV 21153 ZSO 21153 HS 21153 O/C P

1"–D–PVC

FLOOR DRAIN

TURB AE 21115

FLOOR DRAIN

FI 21115

NV–21115

SAMPLE TAP

BV–21115

BV–21114

V 2"–V–PVC

FLOOR DRAIN

L/R HS 21109 HS 21109 O/C
ZSC 21109 ZSO 21109 P
BFV 21109

2"–V–316SS

PIT 21112 BV–21112 NV–21111

10"–MFF–316SS

ZIT 21113 HS 21113 L/R
FCV 21113 ZC 21113 HS 21113 O/S/C P

FLOW CONTROL VALVE/DIGITAL POSITIONER

10"–MFF–316SS

ARV–21117 V

BV–21117

ZSC 21118 HS 21118 L/R
BFV 21118 ZSO 21118 HS 21118 O/C P

10"–MFF–ELSP 24"–MFF–ELSP

MF FILTRATE
TO MF FILTRATE HEADER
(DWG. 21–I–001)

NOTES:

1. THIS TYPICAL MF UNIT DETAIL DRAWING DEPICTS MF UNIT MFUNT–21100. TAG NUMBERS FOR THE OTHER MF UNITS SHALL USE THE SAME TAGGING SCHEME, WHERE THE THIRD DIGIT OF THE LOOP NUMBER SHALL REPRESENT THE UNIT NUMBER. FOR EXAMPLE, THE MF FILTRATE FLOW CONTROL VALVE FOR MFUNT–21100, FCV–21113, SHALL BE FCV–21213 FOR MFUNT–21200, AND FCV–21513 FOR FUTURE MFUNT–21500.

FOR MF UNIT FEED END DETAIL, SEE DWG. 21–I–002

CV–21175

L/R HS 21174 HS 21174 O/C
ZSC 21174 ZSO 21174 P
BV 21174

10"–BWS–316SS

ZSC 21116 HS 21116 L/R
BFV 21116 ZSO 21116 HS 21116 O/C P

2"–D–PVC 1"–D–PVC

FLOOR DRAIN

ZSC 21120 HS 21120 L/R
BFV 21120 ZSO 21120 HS 21120 O/C P

SKID LIMIT

10"–BWS–ELSP 12"–BWS–ELSP

BACKWASH SUPPLY
FROM BACKWASH SUPPLY
HEADER (DWG. 21–I–001)

1"–MIT–316SS

ZSC 21176 HS 21176 L/R
BFV 21176 ZSO 21176 HS 21176 O/C P

MIT/COMPRESSED AIR
1"–MIT–316SS
21–I–002

CV–21177

1"–MIT–316SS

BV–21173

PI 21173

PRV–21172

PI 21171

BV–21171

SKID LIMIT

BV–21170

1"–MIT–316SS 2"–MIT–316SS

MEMBRANE INTEGRITY TEST
AIR SUPPLY
FROM COMPRESSED AIR SUPPLY
HEADER (DWG. 21–I–001)

CONTROL AIR
TO LOCALLY MOUNTED
PNEUMATIC VALVE
ACTUATORS

PSL 21181

SKID LIMIT

1"–CA–316SS

BV–21180

COMPRESSED AIR SUPPLY
FROM COMPRESSED AIR SUPPLY
HEADER (DWG. 21–I–001)

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
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DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

PROJECT NO. 26793–214344
FILE NAME: 21–I–003.dwg

SHEET NO.

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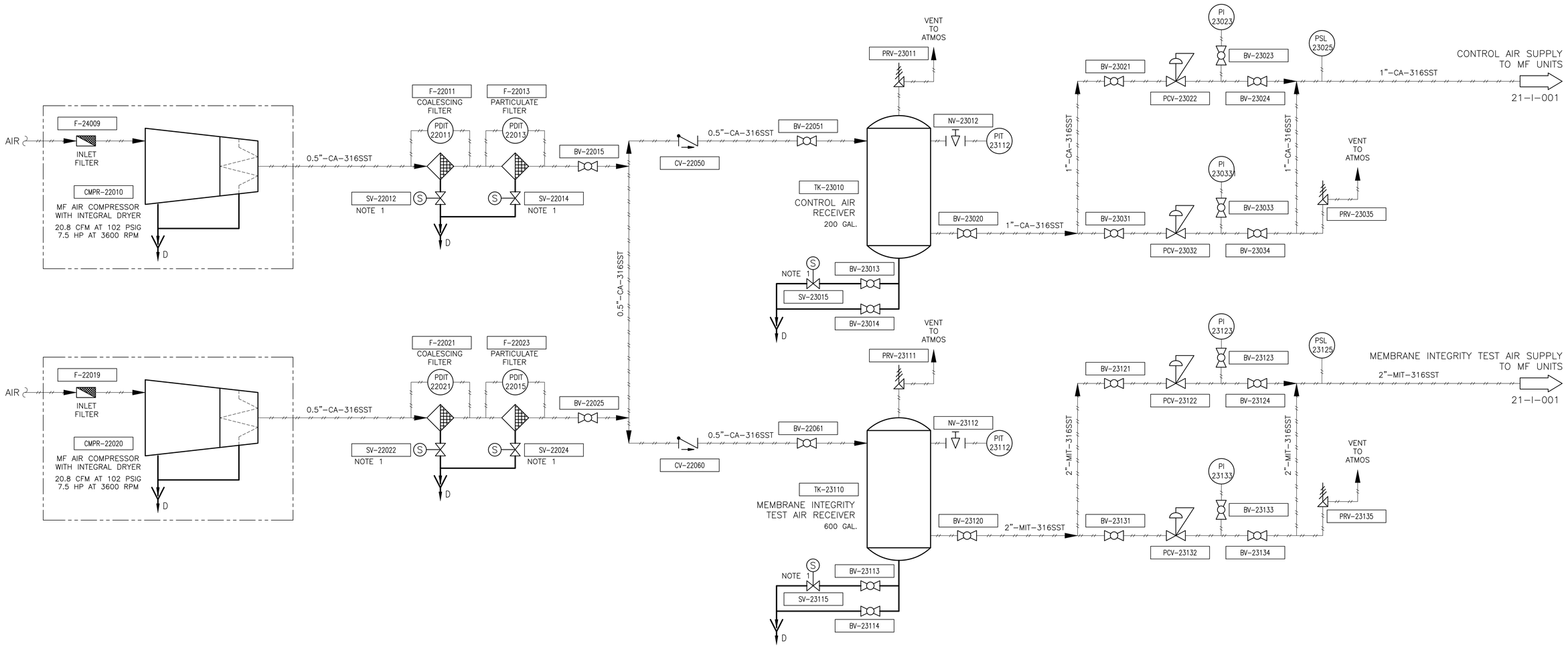
MF MAIN PLC



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
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CROSS CHK'D BY:
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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

□RO□E□□□ND□IN□TR□MENT□TION□DI□□R□M
M□□OM□RE□□ED□IR□□□TEM

PROJECT NO. 26793-214344
FILE NAME: 23-I-001.dwg
SHEET NO. □□□

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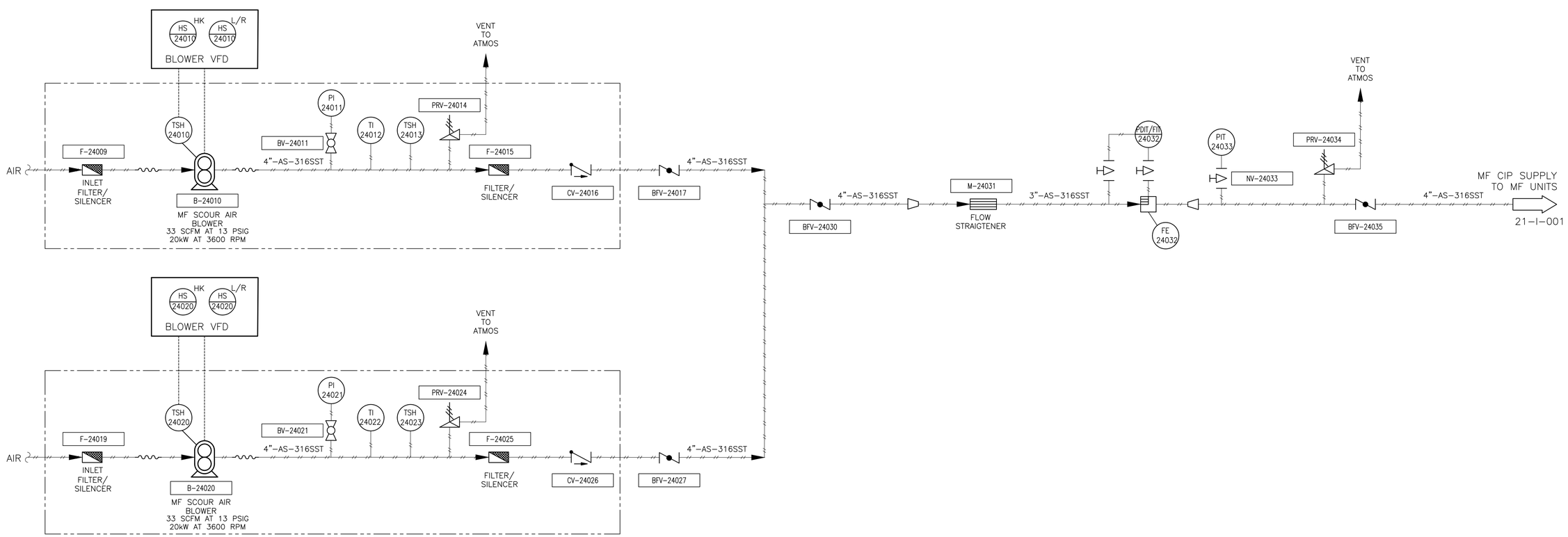
MF MAIN PLC



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
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CROSS CHK'D BY:
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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

□RO□E□□□ND□IN□TR□MENT□TION□DI□□R□M M□□IR□□O□R□□□TEM

PROJECT NO. 26793-214344
FILE NAME: 24-I-001.dwg
SHEET NO. □□I□□□

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MF CIP RIO

CITRIC ACID
44-I-002
1"-CIT-CPVC
NOTES 1, 2
1"-CIT-CPVC

CITRIC ACID
44-I-002
1"-CIT-CPVC
NOTES 1, 2

ZSC 44961 / HS 44961 / ZSO 44961 / HS 44961 / BV 44961 / P — L/R, O/C
ZSC 44951 / HS 44951 / ZSO 44951 / HS 44951 / BV 44951 / P — L/R, O/C

RO PERMEATE FROM RO SYSTEM
6"-PW-PVC
ZSC 73951 / HS 73951 / ZSO 73951 / HS 73951 / BFV 73951 / P — L/R, O/C
6"-PW-PVC

6"-PW-PVC
1"-CIT-CPVC
MXR-25010
TANK MIXER
6"-MCRA/REC-CPVC
6"-MCRA/REC-CPVC
MF ACID CLEANING RETURN/RECIRC FROM MF CIP PUMPS
25-I-003
6"-MCRA/REC-CPVC

HS 73952 / HS 73952 / ZSC 73952 / ZSO 73952 / BFV 73952 / P — L/R, O/C

ROUTE VENT PIPING THROUGH WALL TO OUTSIDE
V
M

HEATER CONTROL PANEL
480V AC

6"-PW-PVC
HS 73953 / HS 73953 / ZSC 73953 / ZSO 73953 / BFV 73953 / P — L/R, O/C
CV-73954

10"-OF-CPVC
LSH 25007
FLOOR DRAIN
LIT 25008
LSL 25009
1"-MCSA-CPVC
BV-25010
SAMPLE TAP

TANK IMMERSION HEATER
HTR-25014
MF ACID CIP TANK
T-25010
3,400 GAL.

BV-25005
pH AE 25004 / pH AIT/TIT 25004
LI 25010
TC 25014 / TSH 25014
BV-25006

BFV-25017
10"-MCSA-CPVC
ZSC 25018 / HS 25018 / ZSO 25018 / HS 25018 / BFV 25018 / P — L/R, O/C
10"-MCSA-CPVC
MF ACID CIP SUPPLY TO MF CIP PUMPS
25-I-003

ZSC 25019 / HS 25019 / ZSO 25019 / HS 25019 / BFV 25019 / P — L/R, O/C
6"-D-CPVC
FLOOR DRAIN

NOTES:

1. PIPING SHALL BE SECONDARY CONTAINED OUTSIDE OF SECONDARY CONTAINMENT STRUCTURE.

2. TRANSITION FROM SECONDARY CONTAINED TO SINGLE WALL PIPE SHALL OCCUR IMMEDIATELY UPSTREAM OF VALVES AT TANK.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
SHEET CHK'D BY:
CROSS CHK'D BY:
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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

RO END IN TREATMENT TION DIAGRAM
M ID I T N

PROJECT NO. 26793-214344
FILE NAME: 25-I-001.dwg
SHEET NO.

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MF CIP RIO

SODIUM HYDROXIDE
46-I-002
1"-SH-CPVC
NOTES 1, 2
1"-SH-CPVC
L/R
ZSC 46961 HS 46961
ZSO 46961 HS 46961
O/C
BV 46961
P
L/R
ZSC 46951 HS 46951
ZSO 46951 HS 46951
O/C
BV 46951
P
1"-SHC-CPVC
SODIUM HYPOCHLORITE
41-I-003
NOTES 1, 2
L/R
ZSC 41981 HS 41981
ZSO 41981 HS 41981
O/C
BV 41981
P
L/R
ZSC 41971 HS 41971
ZSO 41971 HS 41971
O/C
BV 41971
P
1"-SHC-CPVC
SODIUM HYPOCHLORITE
41-I-003
NOTES 1, 2
SODIUM HYDROXIDE
46-I-002
1"-SH-CPVC
NOTES 1, 2
1"-SHC-CPVC
1"-SHC-CPVC
L/R
ZSC 73961 HS 73961
ZSO 73961 HS 73961
O/C
BFV 73961
P
RO PERMEATE
FROM RO SYSTEM
6"-PW-PVC
6"-PW-PVC
6"-PW-PVC
1"-SH-CPVC
1"-SHC-CPVC
6"-MCRC/REC-CPVC
6"-MCRC/REC-CPVC
MF CAUSTIC CLEANING
RETURN/RECIRC
FROM MF CIP PUMPS
25-I-003
L/R O/C
HS 73962 HS 73962
ZSC 73962 ZSO 73962
P
BFV 73962
MXR-25030
TANK MIXER
M
HEATER
CONTROL
PANEL
480V AC
ROUTE VENT PIPING THROUGH
WALL TO OUTSIDE
V
10"-OF-CPVC
BV-25025
LSH 25027
pH
AE 25024
pH
AIT/TIT 25024
TANK IMMERSION
HEATER
HTR-25034
LI 25030
FLOOR
DRAIN
LIT 25028
TC 25034
TSH 25034
LSL 25029
BV-25026
BFV-25037
10"-MCSC-CPVC
1"-MCSC-CPVC
BV-25030
SAMPLE
TAP
MF CAUSTIC CIP TANK
T-25030
3,400 GAL.
L/R
ZSC 25039 HS 25039
ZSO 25039 HS 25039
O/C
BFV 25039
P
6"-D-CPVC
FLOOR
DRAIN
L/R O/C
HS 73963 HS 73963
ZSC 73963 ZSO 73963
P
BFV 73963
6"-PW-PVC
CV-73964
L/R
ZSC 25038 HS 25038
ZSO 25038 HS 25038
O/C
P
BFV 25038
10"-MCSC-CPVC
MF CAUSTIC CIP SUPPLY
TO MF CIP PUMPS
25-I-003

NOTES:

1. PIPING SHALL BE SECONDARY CONTAINED OUTSIDE OF SECONDARY CONTAINMENT STRUCTURE.

2. TRANSITION FROM SECONDARY CONTAINED TO SINGLE WALL PIPE SHALL OCCUR IMMEDIATELY UPSTREAM OF VALVES AT TANK.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

PROJECT NO. 26793-214344
FILE NAME: 25-I-002.dwg

SHEET NO.

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PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

MF CIP RIO

CIP RETURN/RECIRC TO MF ACID CIP TANK
25-I-001
6"-MCR/REC-CPVC
BFV 25256
HS 25256 O/C
HS 25256 L/R
ZSO 25256
ZSC 25256
P

CIP RETURN/RECIRC TO MF CAUSTIC CIP TANK
25-I-002
6"-MCR/REC-CPVC
BFV 25257
HS 25257 O/C
HS 25257 L/R
ZSO 25257
ZSC 25257
P

FROM MF ACID CIP TANK
25-I-001
10"-MCSA-CPVC
BFV 25101
HS 25101 O/C
HS 25101 L/R
ZSO 25101
ZSC 25101
P
BFV-25102
FSL 25103
I
PI 25105
BV-25105
6"-MCF-CPVC
BV-25104
FLOOR DRAIN
4"-MCF-CPVC
P-25110
CIP CIRCULATION PUMP
500 GPM AT 50 FT TDH
15 HP AT 1800 RPM
PI 25106
BV-25106
PSH 25107
V
ARV-25108
BV-25108
FLOOR DRAIN
STR-25109
CV-25111
BFV-25112

10"-MCF-CPVC

FROM MF CAUSTIC CIP TANK
25-I-002
10"-MCSC-CPVC
BFV 25121
HS 25121 O/C
HS 25121 L/R
ZSO 25121
ZSC 25121
P
BFV-25122
FSL 25123
I
PI 25125
BV-25125
6"-MCF-CPVC
BV-25124
FLOOR DRAIN
4"-MCF-CPVC
P-25120
CIP CIRCULATION PUMP
500 GPM AT 50 FT TDH
15 HP AT 1800 RPM
PI 25126
BV-25126
PSH 25127
V
ARV-25128
BV-25128
FLOOR DRAIN
STR-25129
CV-25131
BFV-25132

HOR
HS 25110
XA 25110
YI 25110
CIP CIRCULATION PUMP LCP

HOR
HS 25120
XA 25120
YI 25120
CIP CIRCULATION PUMP LCP

6"-MCF-CPVC

BV-25201
SAMPLE
FIT 25202
M
FE 25202

6"-MCR/REC-CPVC

RECIRCULATION
HS 25203 O/C
HS 25203 L/R
ZSO 25203
ZSC 25203
P
BFV 25203

pH
AIT 25253
AE 25253
COND
AIT 25252
AE 25252
HS 25255 O/C
HS 25255 L/R
ZSO 25255
ZSC 25255
P
BFV 25255
BV-25253
BV-25252
6"-MCR-CPVC
MF CLEANING RETURN FROM MF UNITS
21-I-001
BV-25251
SAMPLE
HS 25254 O/C
HS 25254 L/R
ZSO 25254
ZSC 25254
P
BFV 25254
6"-MCW-CPVC
MF CIP WASTE TO WASTE
18-I-001

ZSC 25204
HS 25204 L/R
ZSO 25204
HS 25204 O/C
P
BFV 25204
6"-MCF-CPVC
MF CIP SUPPLY TO MF UNITS
21-I-001

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM

MICROFILTRATION

PROJECT NO. 26793-214344
FILE NAME: 25-I-003.dwg
SHEET NO.

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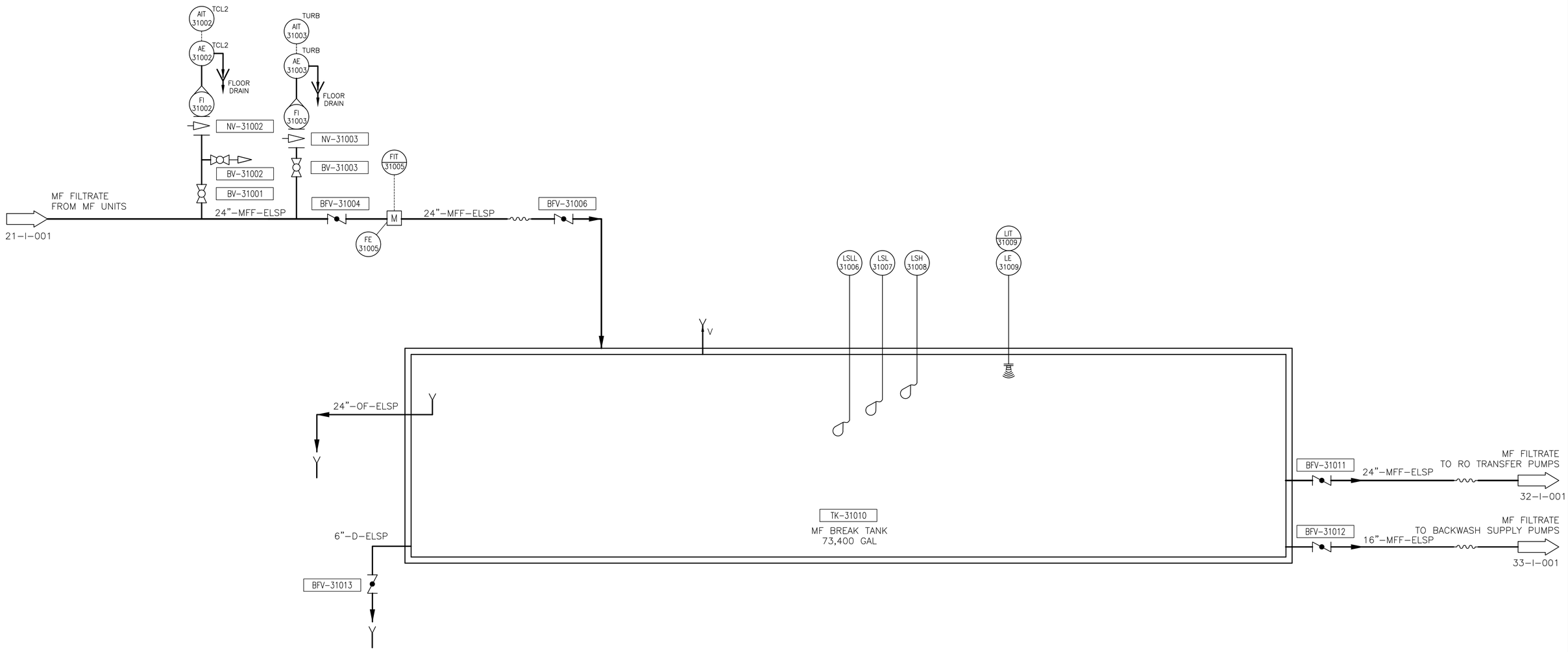
MF MAIN PLC



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

[illegible]RO[illegible]E[illegible]ND[illegible]IN[illegible]TR[illegible]MENT[illegible]TION[illegible]DI[illegible]R[illegible]M
M[illegible]RE[illegible]T[illegible]N[illegible]

PROJECT NO. 26793-214344
FILE NAME: 31-I-001.dwg
SHEET NO.
[illegible]

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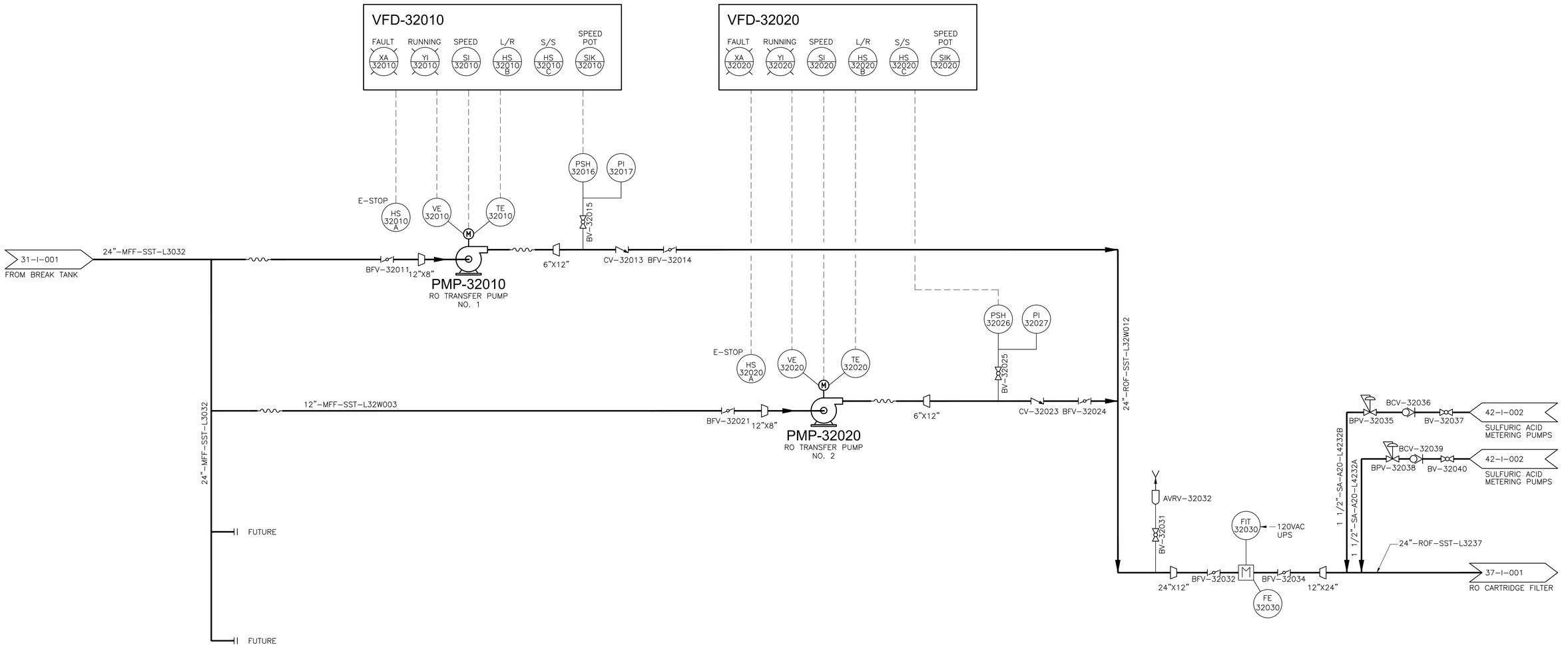
RO MAIN PLC



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
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SHEET CHK'D BY:
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APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM RO TRANSFER PUMPS

PROJECT NO. 26793-214344
FILE NAME: 32-I-001.dwg
SHEET NO.
32-I-001

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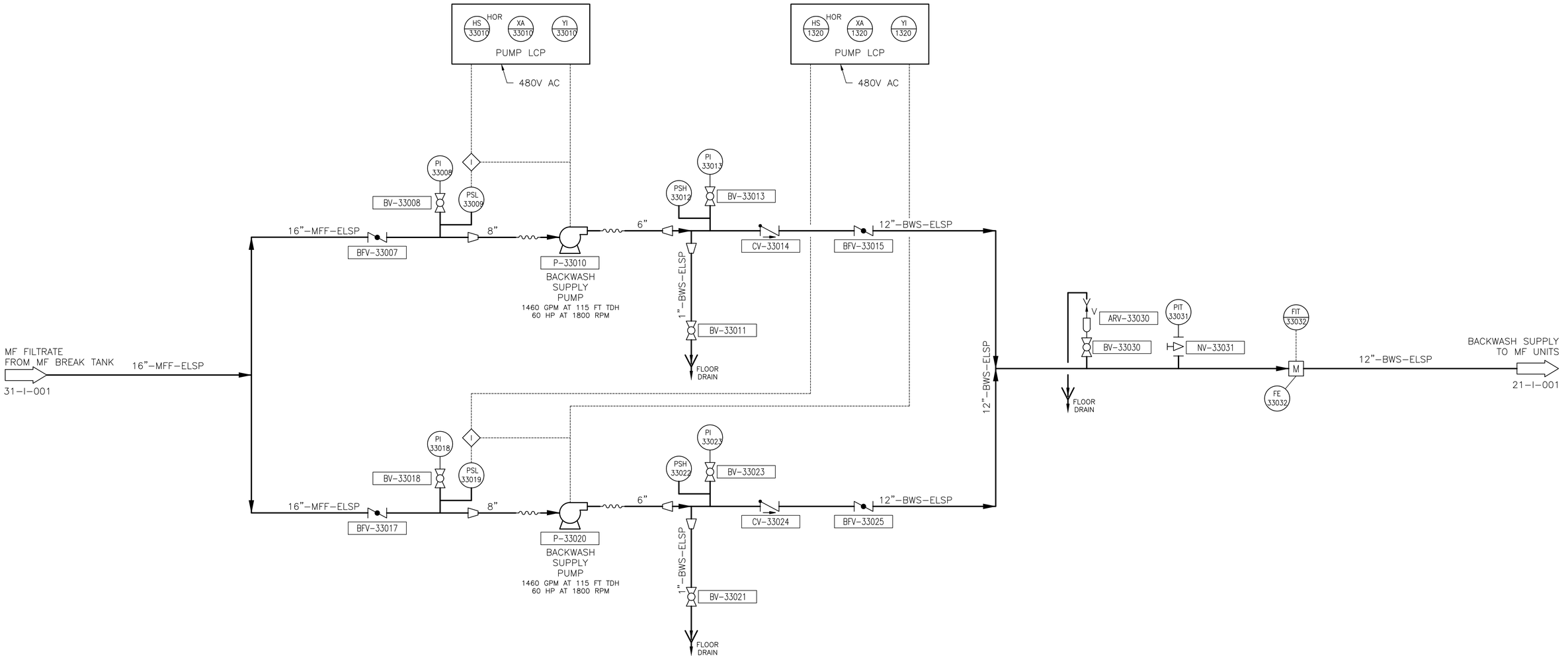
MF MAIN PLC



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. DUMMER
DRAWN BY: S. CHALMERS
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

SEPARATION PROCESSES, INC.
315□LIONSHEAD AVE, SUITE 2,
CARLSBAD, CA 92010
TEL: 7□0-400-3□□0 FAX: 7□0-400-3□□1

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

□RO□E□□□ND□IN□TR□MENT□TION□DI□□R□M

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PROJECT NO. 26793-214344
FILE NAME: 33-I-001.dwg
SHEET NO. □□□1□□□□

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RO MAIN PLC

32-I-001
RO TRANSFER PUMPS

AVRV-37000
BV-37001

24"-ROF-SST-L3237

PIT 37033
LOCATED AT THE RO FEED PANEL
BV-37034

BV-37032

FUTURE

FUTURE

12"X24"

12"-ROF-SST-L37W001

BFV-37012

12"X24"

12"-ROF-SST-L37W008

AVRV-37024
BV-37023

BFV-37022

AVRV-37026
BV-37025

CFT-37020
CARTRIDGE FILTER

BFV-37021

12"-ROF-SST-L37W009

BV-37027

BV-37028

D

D

AVRV-37014
BV-37013

AVRV-37016
BV-37015

CFT-37010
CARTRIDGE FILTER

PIT 37019
LOCATED AT THE RO FEED PANEL
BV-37020

12"-ROF-SST-L37W002

BFV-37011

12"X24"

24"X12"

3/8"-TI-PP-L3743B

3/8"-TI-PP-L3743A

BPV-37032
BCV-37033
BV-37035
43-I-002
THRESHOLD INHIBITOR

BPV-37036
BCV-37037
BV-37038
43-I-002
THRESHOLD INHIBITOR

24"-ROF-SST-L37W002

51-I-001
RO FEED PANEL

BV-37031

D

BV-37017

BV-37018

D

D

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92::17
Tel: (949) 752-5452

emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM PRIMARY CATRIDGE FILTERS

PROJECT NO. 26793-214344
FILE NAME: 37-I-001.dwg

SHEET NO.
37-I-001

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PLANT CHEMICAL SYSTEM PLC

LCP-41001
SUMP PUMP
LOCAL CONTROL PANEL
HOA
HS 41001
LAH 41002

LCP-41020
FILL STATION
LOCAL CONTROL PANEL
O/C/R
ZLO 41013
ZLC 41013
HS 41013 C
LI 41020
LAHH 41020
LALL 41020

6"–SHC–CPVC–L41W009

PSV–41011

LIT 41020
LSHH 41020
LE 41020
LSLL 41020

TNK-41020
SODIUM HYPOCHLORITE

DV–41021

LG 41020

4"–SHC–CPVC–L41W011

TO SEAL SCRUBBER

DV–41022

2"–SHC–CPVC–L41W012

DV–41023

ZSO 41028
HS 41028 B
ZSC 41028
HS 41028 A
L/R
O/C

TO STORAGE TANK

PRV–41032

DV–41027

DV–41028

2"–SHC–CPVC–L41W015

41–I–002 & 41–I–003
TO METERING AND TRANSFER PUMPS

V

BV–41009

SCR-41010
VENT WATER
SEAL SCRUBBER

D

ZSO 41013
HS 41013 B
ZSC 41013
HS 41013 A
L/R
O/C

CV–41012

DV–41013

DV–41014

FUTURE

QUICK CONNECT TO DELIVERY TRUCK

2"–SHC–CPVC–L41W002

CV–41007

DV–41008

DV–41006

B/L
TO PLANT PROCESS WASTE PS

DV–41005

1 1/2" QUICK CONNECT

DV–41004

BCV–41003

PMP-41001
PUMP

LSH 41002

3"–DR–PVC–L41W022

41–I–002
FROM METERING PUMP ROOM

CONTAINMENT AREA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM SODIUM HYPOCHLORITE STORAGE TANK

PROJECT NO. 26793–214344
FILE NAME: 41–I–001.dwg
SHEET NO.
41-I-001

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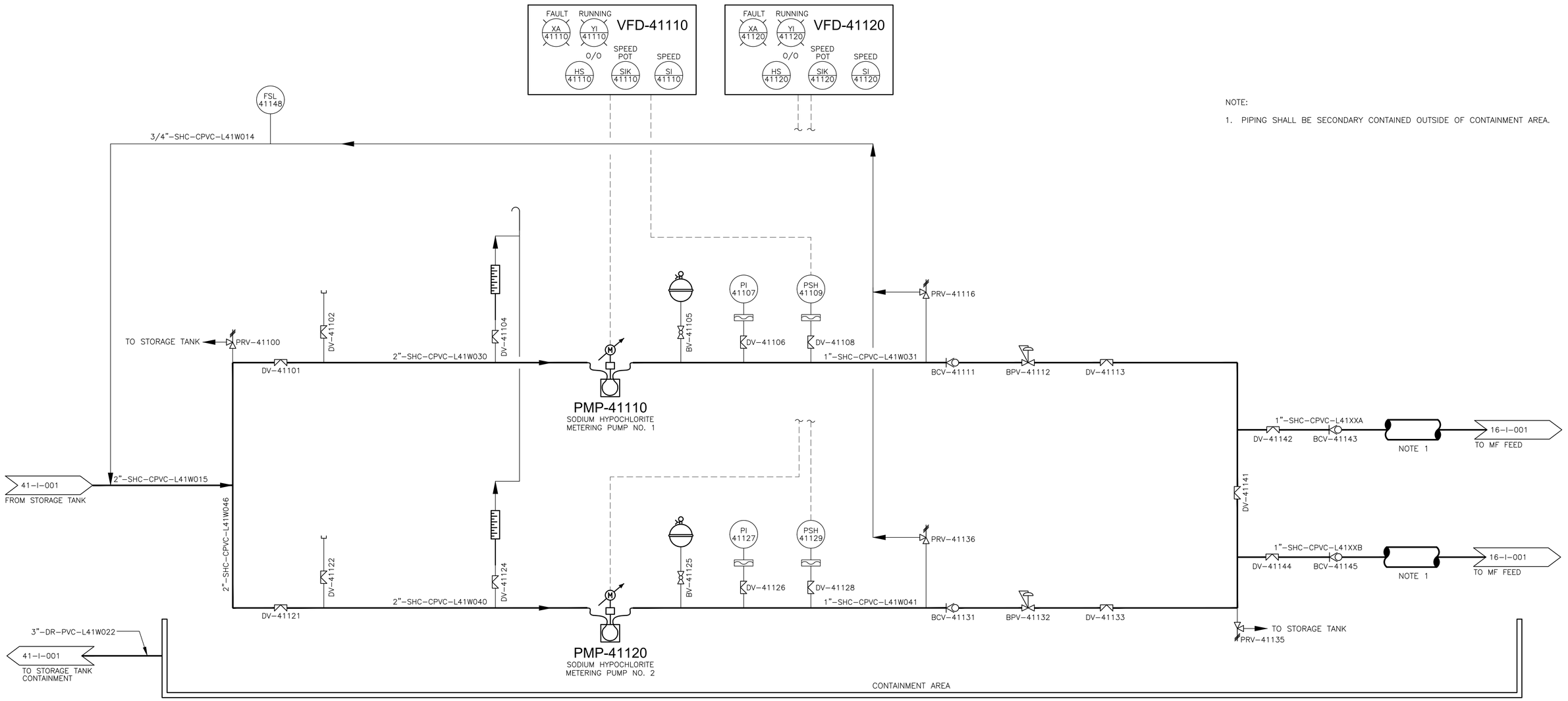
PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

PLANT CHEMICAL SYSTEM PLC



NOTE:

1. PIPING SHALL BE SECONDARY CONTAINED OUTSIDE OF CONTAINMENT AREA.

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REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM SODIUM HYPOCHLORITE METERING PUMPS

PROJECT NO. 26793-214344
FILE NAME: 41-I-002.dwg
SHEET NO. 41-I-002

Z:\2017\Phoenix\EMWD\Export\41-I-002.dwg

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PLANT CHEMICAL SYSTEM PLC

FAULT XA 41250 RUNNING YI 41250 VFD-41250
HOR HS 41250

FAULT XA 41260 RUNNING YI 41260 VFD-412□0
HOR HS 41260

2"–SHC–CPVC–L41W016
41–I–001
FROM STORAGE TANK

1 1/2"–SHC–CPVC–L41W080

PSL 41249
BV–41248
BV–41247

PMP-41250
SODIUM HYPOCHLORITE
TRANSFER PUMP NO. 1

PI 41252
BV–41251
PSH 41254
BV–41253
BCV–41255
BV–41256
2"–SHC–CPVC–L41W081
25–I–002
TO MF CIP AREA

1 1/2"–SHC–CPVC–L41W082

PSL 41259
BV–41258
BV–41257

PMP-412□0
SODIUM HYPOCHLORITE
TRANSFER PUMP NO. 2

PI 41262
BV–41261
PSH 41264
BV–41263
BCV–41265
BV–41266
BV–41267
2"–SHC–CPVC–L41W083
25–I–002
TO MF CIP AREA

CONTAINMENT AREA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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111 Academy Way, Suite 150
Irvine, California 92□17
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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM
SODIUM HYPOCHLORITE TRANSFER PUMPS

PROJECT NO. 26793–214344
FILE NAME: 41–I–003.dwg
SHEET NO.
41-I-003

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PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

PLANT CHEMICAL SYSTEM PLC

FSL 42040
B/L
1"–PW–XXX–L42W016
POTABLE WATER SUPPLY

EWS-42040
EMERGENCY SHOWER/EYEWASH STATION

FSL 42041
B/L
1"–PW–XXX–L42W017
POTABLE WATER SUPPLY

EWS-42041
EMERGENCY SHOWER/EYEWASH STATION

LCP-42010
FILL STATION LOCAL CONTROL PANEL
O/C/R
LAH 42030 | ZLO 42004 | ZLC 42004 | HS 42004 C | LI 42010 | LALL 42010 | LAHH 42010

DESSICANT
6"–SA–A20
VENT VALVE ASSEMBLY

LIT 42010 | LSHH 42010 | LE 42010 | LSLL 42010

ZSC 42004 | HS 42004 B (L/R)
ZSO 42004 | HS 42004 A (O/S/C)

QUICK CONNECT TO DELIVERY TRUCK
2"–SA–PVDF–L42W001
CV–42000 | BV–42002 | CV–42003 | BV–42004
BV–42001
BV–42005

QUICK CONNECT TO DELIVERY TRUCK
FUTURE

TNK-42010
SULFURIC ACID

BV–42011
LG 42010
BV–42012
4"–SA–A20
2"–SA–A20–L42W005
BV–42013

B/L
TO PLANT PROCESS WASTE PS
BV–42033

1 1/2" QUICK CONNECT
BV–42032

BCV–42031

LSH 42030

BV–42017 | BV–42018 | BV–42019
2"–SA–PVDF–L42W006
42–I–002 & 003
TO METERING PUMPS

3"–DR–PVC–L42W067
42–I–002
FROM METERING PUMP ROOM
CAONTAINMENT AREA

FSL 42042
B/L
1"–PW–XXX–L42W018
POTABLE WATER SUPPLY

EWS-42042
EMERGENCY SHOWER/EYEWASH STATION

FSL 42043
B/L
1"–PW–XXX–L42W019
POTABLE WATER SUPPLY

EWS-42043
EMERGENCY SHOWER/EYEWASH STATION

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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Irvine, California 92617
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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM SULFURIC ACID STORAGE TANK

PROJECT NO. 26793–214344
FILE NAME: 42–I–001.dwg
SHEET NO.
42-I-001

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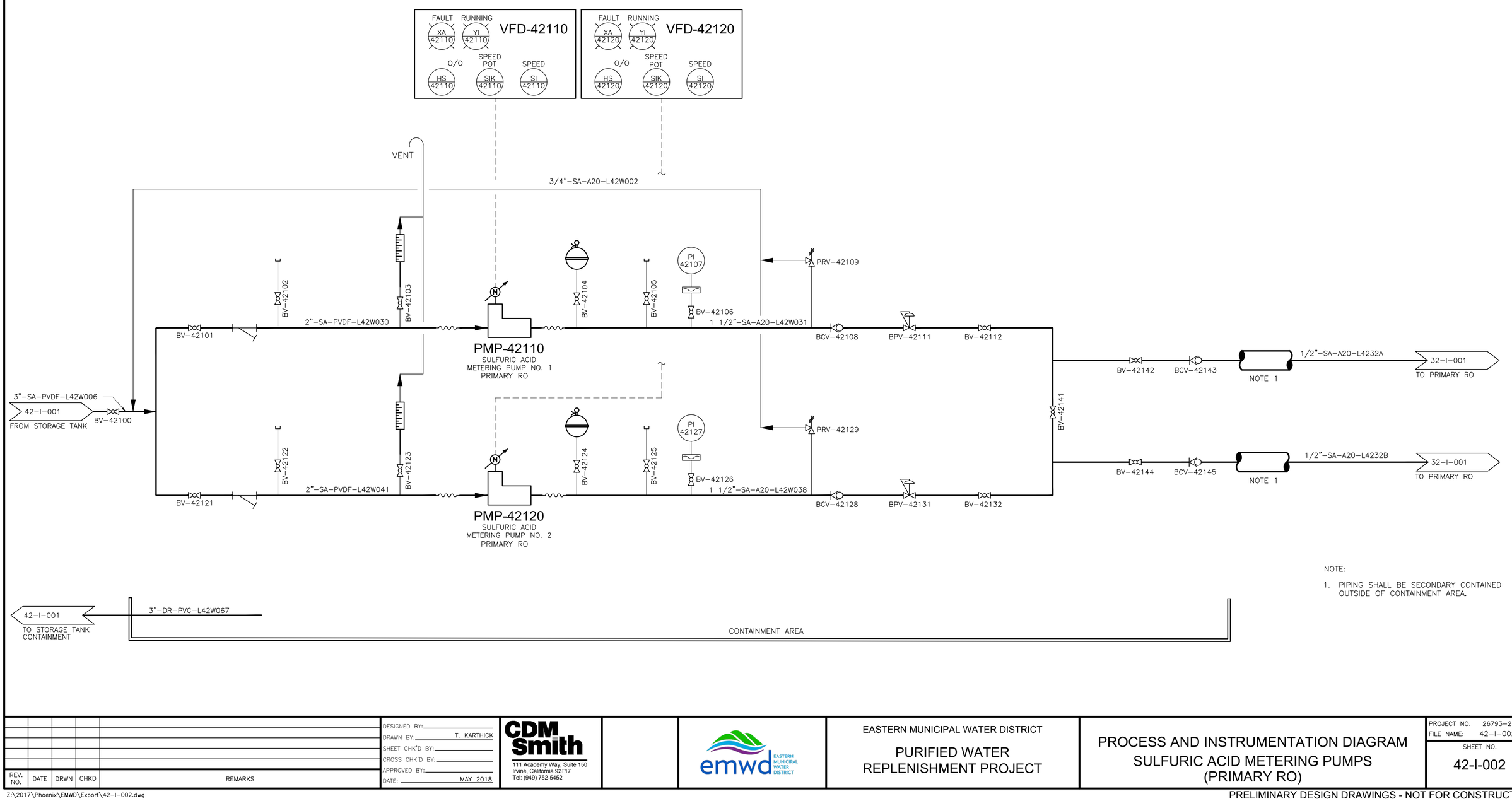
PLANT CHEMICAL SYSTEM PLC



NOTE:

1. PIPING SHALL BE SECONDARY CONTAINED OUTSIDE OF CONTAINMENT AREA.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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Tel: (949) 752-5452

emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM SULFURIC ACID METERING PUMPS (PRIMARY RO)

PROJECT NO. 26793-214344
FILE NAME: 42-I-002.dwg
SHEET NO.
42-I-002

Z:\2017\Phoenix\EMWD\Export\42-I-002.dwg

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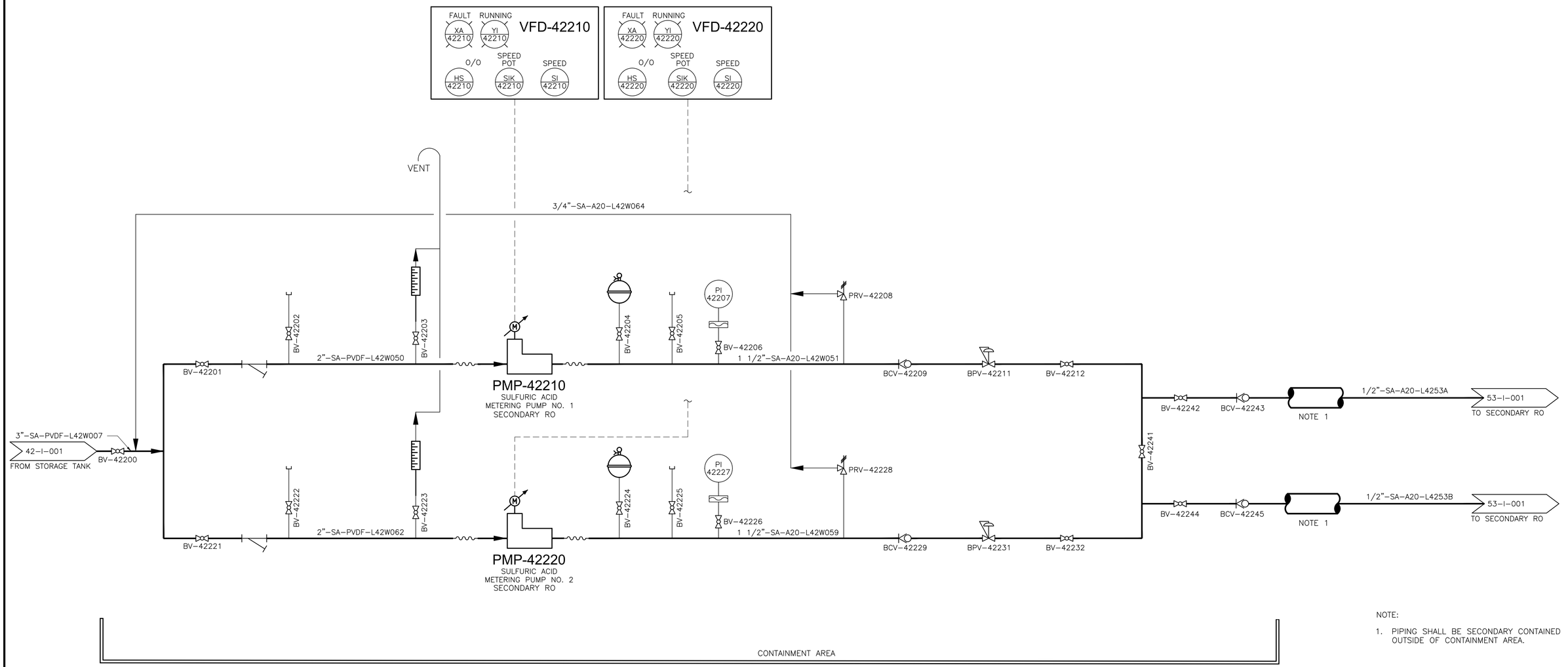
PLANT CHEMICAL SYSTEM PLC



NOTE:

1. PIPING SHALL BE SECONDARY CONTAINED OUTSIDE OF CONTAINMENT AREA.

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REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM SULFURIC ACID METERING PUMPS (SECONDARY RO)

PROJECT NO. 26793-214344
FILE NAME: 42-I-003.dwg

SHEET NO.
42-I-003

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PLANT CHEMICAL SYSTEM PLC

FSL 43040
B/L
1"-PW-XXX-L18W017
POTABLE WATER SUPPLY
EWS-43040
EMERGENCY SHOWER/EYEWASH STATION

FSL 43041
B/L
1"-PW-XXX-L18W018
POTABLE WATER SUPPLY
EWS-43041
EMERGENCY SHOWER/EYEWASH STATION

FSL 43042
B/L
1"-PW-XXX-L18W019
POTABLE WATER SUPPLY
EWS-43042
EMERGENCY SHOWER/EYEWASH STATION

TNK-43020
THRESHOLD INHIBITOR SHIPPING TOTE
BV-43022
QC-43025
BV-43024
WE 43021
SCALE
TNK-43021
THRESHOLD INHIBITOR STORAGE TOTE
BV-43023
BV-43027
ZSO 43028
HS 43028 B
L/R
O/C
ZSC 43028
HS 43028 A
M
BV-43028
BV-43029
1"-TI-SST-L43W015
43-I-002 & 43-I-003
TO METERING PUMPS

B/L
TO PLANT PROCESS WASTE PS
1 1/2" QUICK CONNECT
BV-43004
BV-43003
BCV-43002
LSH 43001
CONTAINMENT AREA
3"-DR-PVC-L43W068
43-I-002
FROM METERING PUMP ROOM

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

CDM Smith
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Irvine, California 92617
Tel: (949) 752-5452

emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM
THRESHOLD INHIBITOR STORAGE TOTE

PROJECT NO. 26793-214344
FILE NAME: 43-I-001.dwg

SHEET NO.
43-I-001

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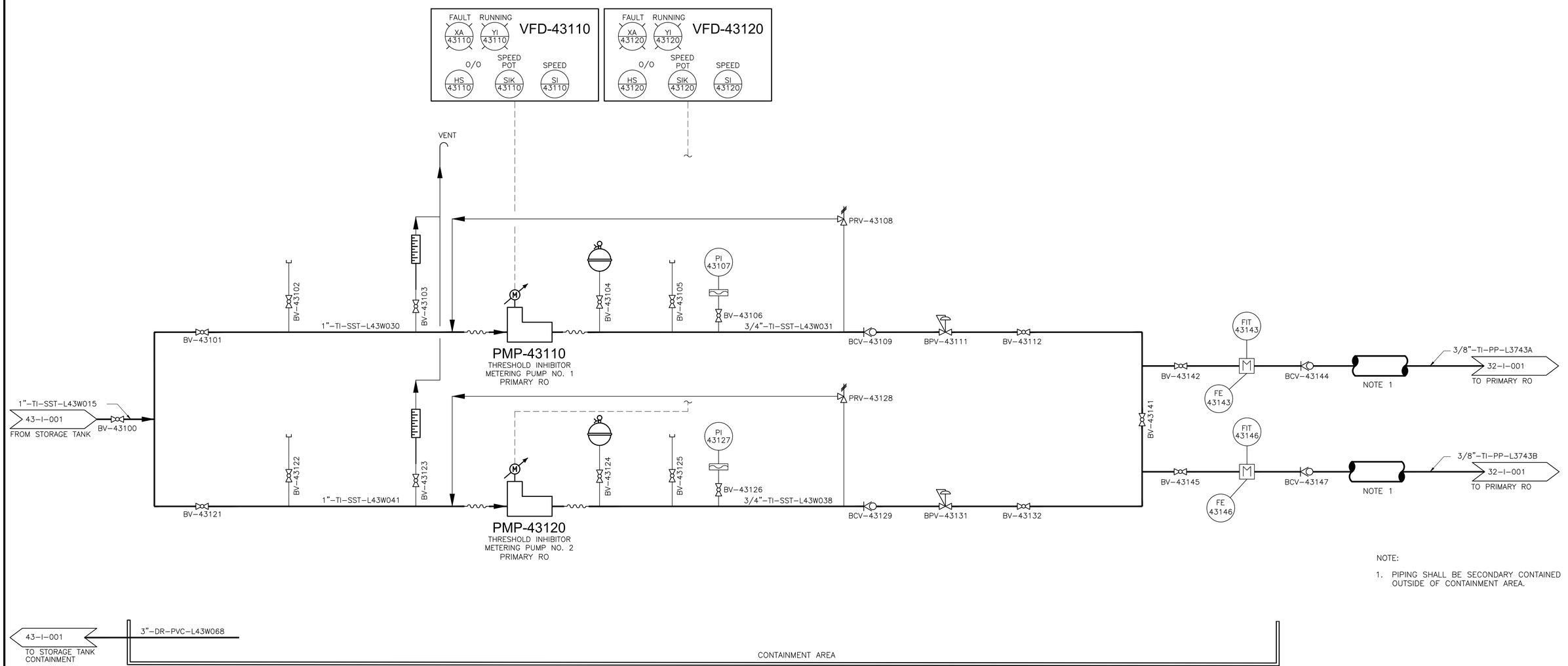
PLANT CHEMICAL SYSTEM PLC



NOTE:

1. PIPING SHALL BE SECONDARY CONTAINED OUTSIDE OF CONTAINMENT AREA.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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Irvine, California 92□17
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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM THRESHOLD INHIBITOR METERING PUMPS (PRIMARY RO)

PROJECT NO. 26793-214344
FILE NAME: 43-I-002.dwg
SHEET NO. 43-I-002

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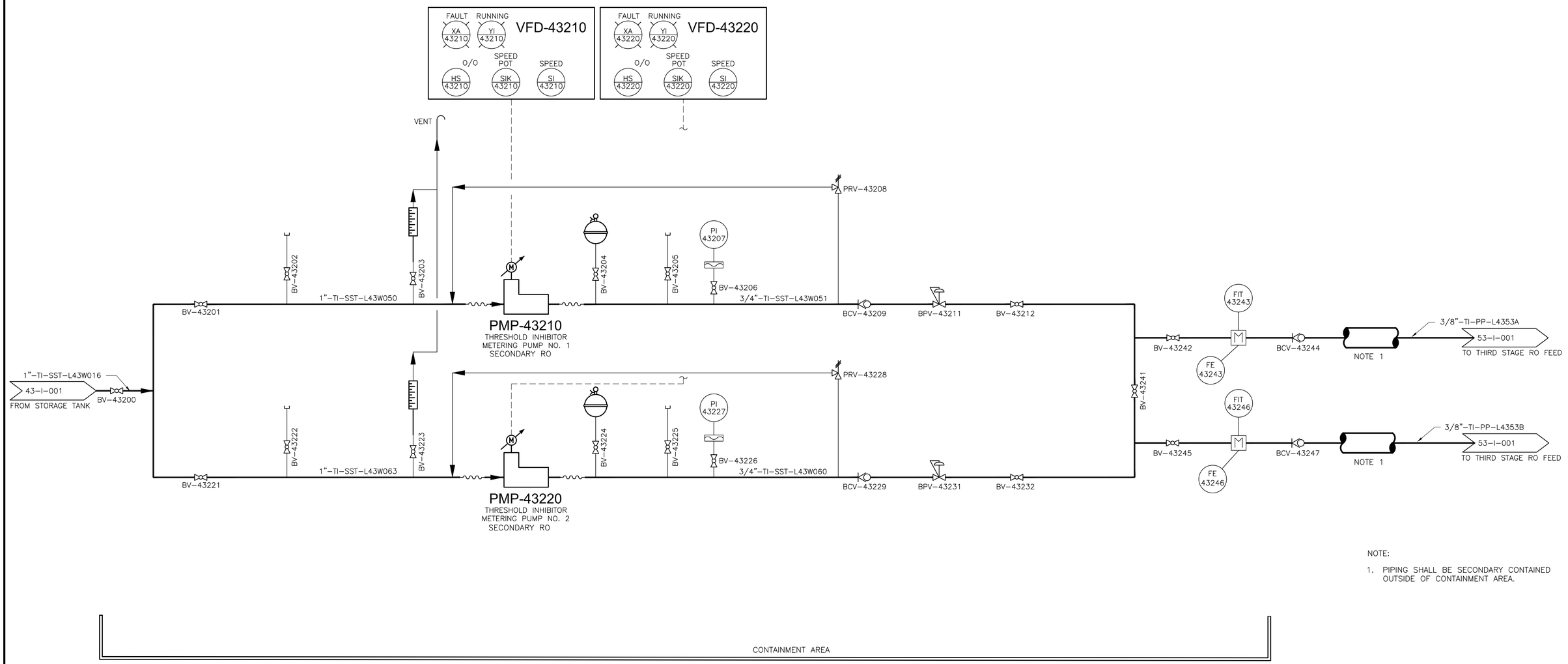
PLANT CHEMICAL SYSTEM PLC



NOTE:

1. PIPING SHALL BE SECONDARY CONTAINED OUTSIDE OF CONTAINMENT AREA.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: N. GOKUL
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92::17
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

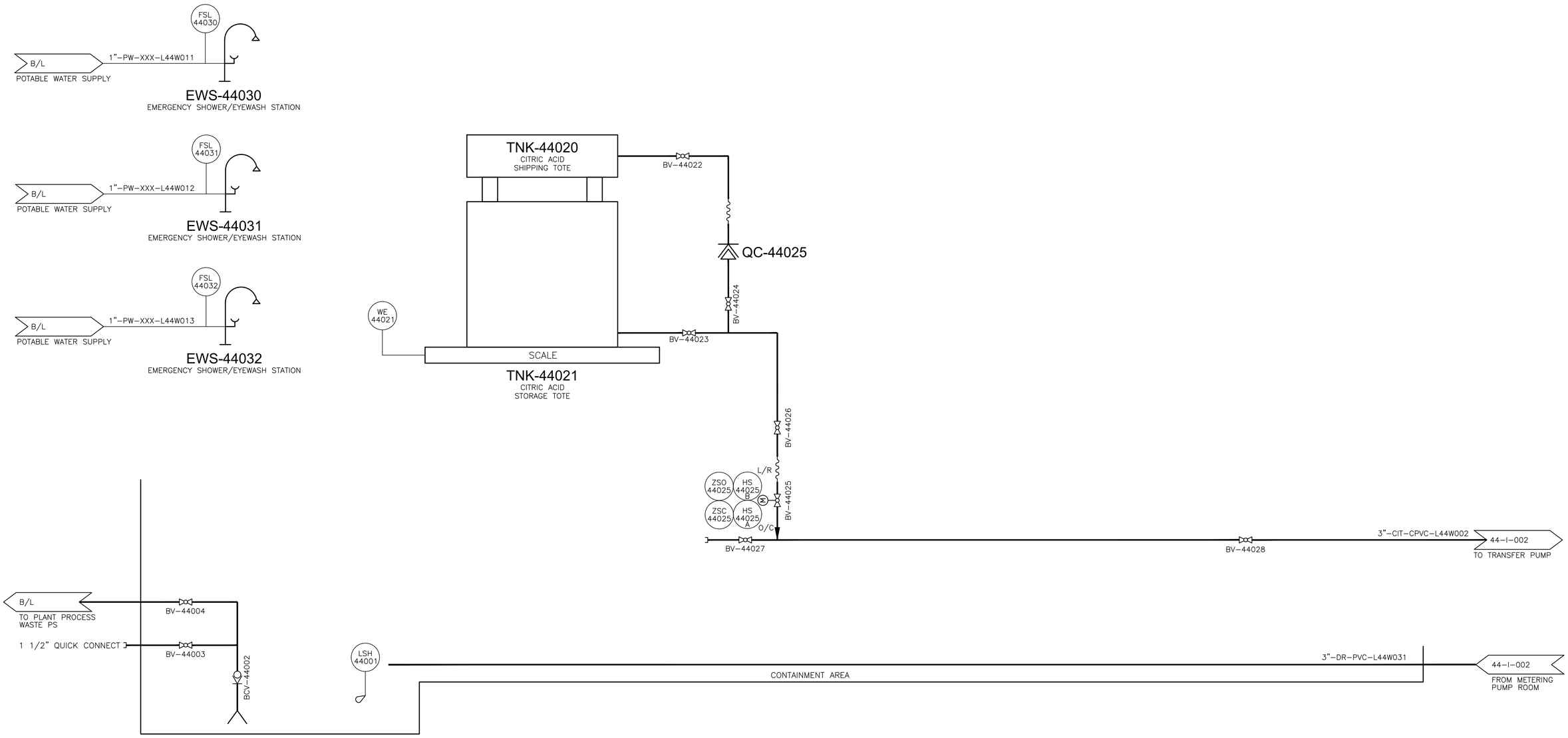
PROCESS AND INSTRUMENTATION DIAGRAM THRESHOLD INHIBITOR METERING PUMPS (SECONDARY RO)

PROJECT NO. 26793-214344
FILE NAME: 43-I-003.dwg
SHEET NO. 43-I-003

Z:\2017\Phoenix\EMWD\Export\43-I-003.dwg

PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

PLANT CHEMICAL SYSTEM PLC



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

CDM Smith
111 Academy Way, Suite 150
Irvine, California 92617
Tel: (949) 752-5452

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM CITRIC ACID STORAGE TOTE

PROJECT NO. 26793-214344
FILE NAME: 44-I-001.dwg
SHEET NO. 44-I-001

Z:\2017\Phoenix\EMWD\Export\44-I-001.dwg

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PLANT CHEMICAL SYSTEM PLC

VFD-44110 — FAULT XA 44110, RUNNING YI 44110, O/O HS 44110, SPEED POT SIK 44110, SPEED SI 44110

VFD-44120 — FAULT XA 44120, RUNNING YI 44120, O/O HS 44120, SPEED POT SIK 44120, SPEED SI 44120

VFD-44130 — FAULT XA 44130, RUNNING YI 44130, O/O HS 44130, SPEED SIK 44130, SPEED SI 44130

VFD-44140 — FAULT XA 44140, RUNNING YI 44140, O/O HS 44140, SPEED SIK 44140, SPEED SI 44140

NOTE:

1. PIPING SHALL BE SECONDARY CONTAINED OUTSIDE OF CONTAINMENT AREA.

44-I-001 FROM STORAGE TANK

3"-CIT-CPVC-L44W008

BV-44100

3"-CIT-CPVC-L44W025

BV-44101

BV-44102

PSL 44104

BV-44103

PMP-44110
CITRIC ACID TRANSFER NO. 1

PI 44106

PSH 44108

BV-44105

BV-44107

BCV-44109

BV-44111

BV-44112

NOTE 1

2"-CIT-CPVC-L4425A

54-I-001 TO SECONDARY RO CIP AREA

2"-CIT-CPVC-L4451

51-I-001 TO PRIMARY RO CIP AREA

BV-44133

BV-44113

2"-CIT-CPVC-L44W015

51-I-001 TO PRIMARY RO CIP AREA

BV-44132

2"-CIT-CPVC-L4425B

54-I-001 TO SECONDARY RO CIP AREA

3"-CIT-CPVC-L44W028

BV-44121

BV-44122

PSL 44124

BV-44123

PMP-44120
CITRIC ACID TRANSFER NO. 2

PI 44126

PSH 44128

BV-44125

BV-44127

BCV-44129

BV-44131

3"-CIT-CPVC-L44W030

BV-44151

BV-44152

PSL 44154

BV-44153

PMP-44130
CITRIC ACID TRANSFER NO. 3

PI 44156

PSH 44158

BV-44155

BV-44157

BCV-44159

BV-44161

BV-44182

2"-CIT-CPVC-L4425A

25-I-001 TO MF CIP AREA

BV-44183

3"-CIT-CPVC-L44W033

BV-44171

BV-44172

PSL 44174

BV-44173

PMP-44140
CITRIC ACID TRANSFER NO. 4

PI 44176

PSH 44178

BV-44175

BV-44177

BCV-44179

BV-44181

2"-CIT-CPVC-L4425B

25-I-001 TO MF CIP AREA

3"-DR-PVC-L44W031

44-I-001 TO STORAGE TANK CONTAINMENT

CONTAINMENT AREA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM CITRIC ACID TRANSFER PUMPS

PROJECT NO. 26793-214344
FILE NAME: 44-I-002.dwg
SHEET NO.
44-I-002

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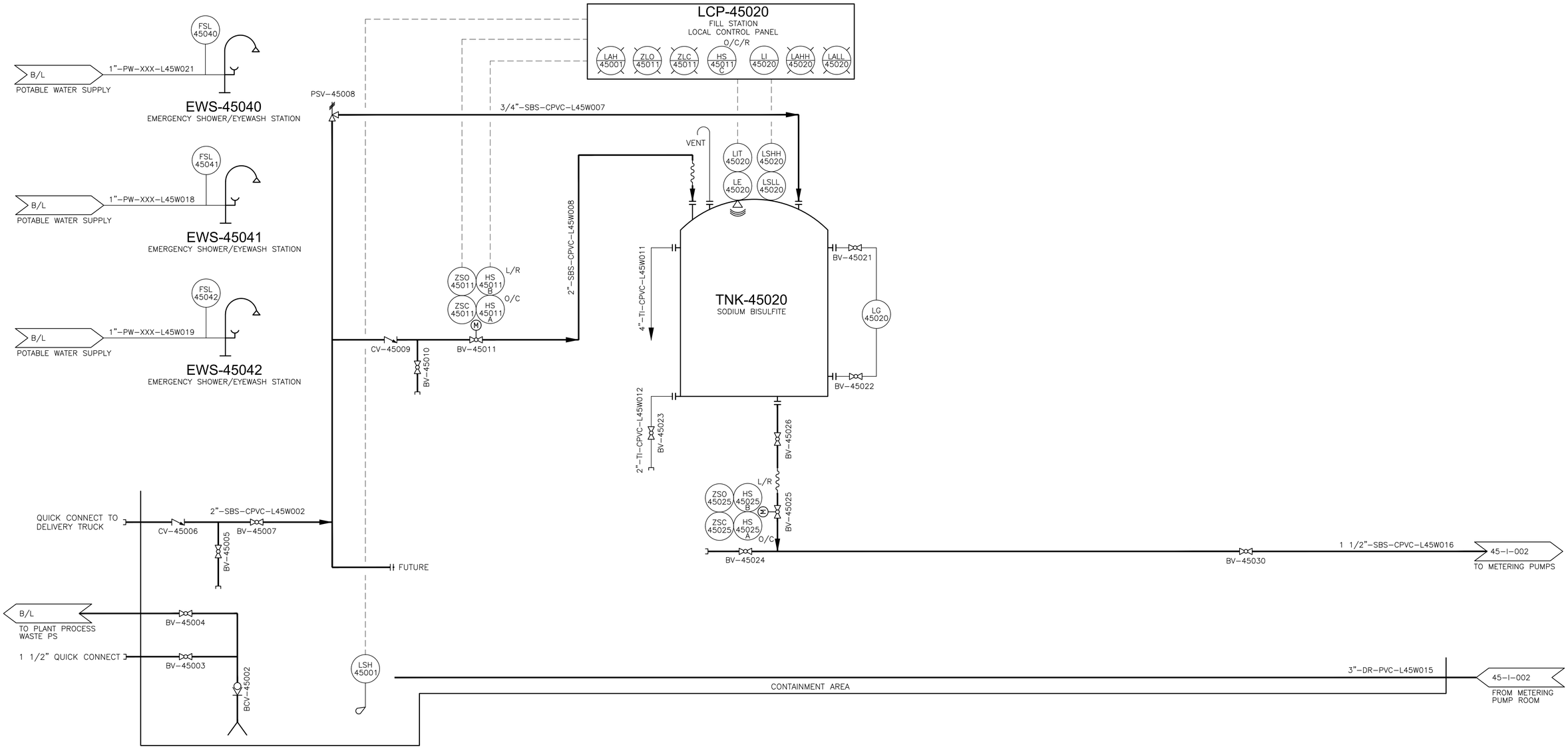
PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

PLANT CHEMICAL SYSTEM PLC



REV. NO.	DATE	DRWN	CHKD	REMARKS

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APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM SODIUM BISULFITE STORAGE TANK

PROJECT NO. 26793-214344
FILE NAME: 45-I-001.dwg

SHEET NO.
45-I-001

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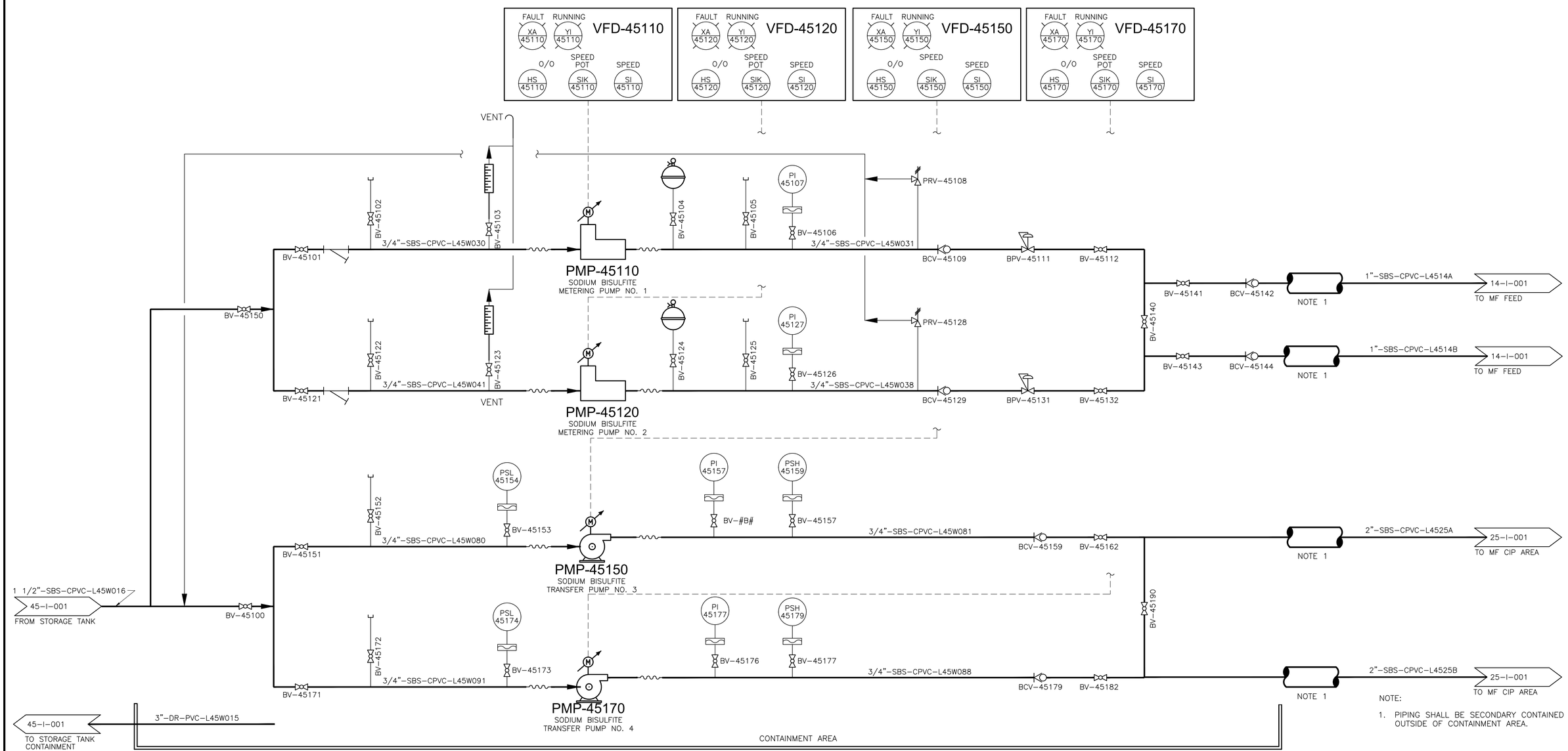
PLANT CHEMICAL SYSTEM PLC



NOTE:

1. PIPING SHALL BE SECONDARY CONTAINED OUTSIDE OF CONTAINMENT AREA.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM SODIUM BISULFITE METERING AND TRANSFER PUMPS

PROJECT NO. 26793-214344
FILE NAME: 45-I-002.dwg
SHEET NO. 45-I-002

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PLANT CHEMICAL SYSTEM PLC

LCP-4□020
FILL STATION
LOCAL CONTROL PANEL
O/C/R
LAH 46001 · ZLO 46011 · ZLC 46011 · HS 46011 C · LI 46020 · LAHH 46020 · LALL 46020

PSV-46008
3/4"-SH-PP-L46W007
VENT
LIT 46020 · LSHH 46020 · LE 46020 · LSLL 46020

TNK-4□020
SODIUM HYDROXIDE

2"-SH-PP-L46W008
4"-SH-PP-L46W011
2"-SH-PP-L46W012
DV-46023

ZSO 46011 · HS 46011 B · L/R · ZSC 46011 · HS 46011 A · O/C · (M)
CV-46009
DV-46011
DV-46010

DV-46021
LG 46020
DV-46022

ZSO 46028 · HS 46028 B · L/R · ZSC 46028 · HS 46028 A · O/C · (M)
DV-46027
DV-46028
DV-46029
2"-SH-PP-L46W015
46-I-002 & 46-I-003
TO TRANSFER & METERING PUMPS

FSL 46031
B/L
1"-PW-XXX-L46W019
POTABLE WATER SUPPLY
EWS-4□031
EMERGENCY SHOWER/EYEWASH STATION

FSL 46032
B/L
1"-PW-XXX-L46W020
POTABLE WATER SUPPLY
EWS-4□032
EMERGENCY SHOWER/EYEWASH STATION

FSL 46033
B/L
1"-PW-XXX-L46W021
POTABLE WATER SUPPLY
EWS-4□033
EMERGENCY SHOWER/EYEWASH STATION

QUICK CONNECT TO DELIVERY TRUCK
2"-SH-PP-L46W002
CV-46006
DV-46007
DV-46005

FUTURE

B/L
TO PLANT PROCESS WASTE PS
DV-46004

1 1/2" QUICK CONNECT
DV-46003
BCV-46002

LSH 46001

3"-DR-PVC-L46W034
46-I-002
FROM METERING PUMP ROOM
CONTAINMENT AREA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
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emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM
SODIUM HYDROXIDE STORAGE TANK

PROJECT NO. 26793-214344
FILE NAME: 46-I-001.dwg
SHEET NO.
4□-I-001

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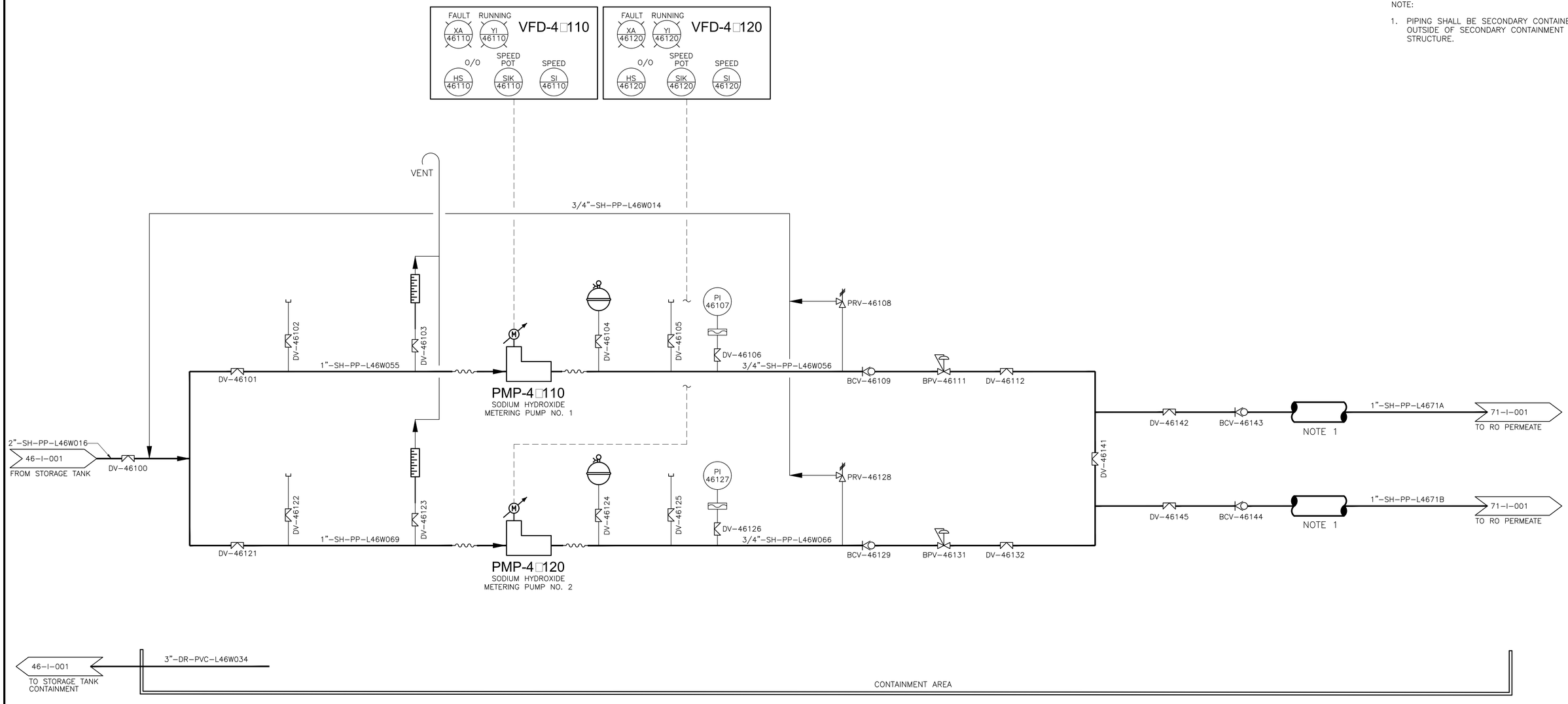
PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

PLANT CHEMICAL SYSTEM PLC



NOTE:

1. PIPING SHALL BE SECONDARY CONTAINED OUTSIDE OF SECONDARY CONTAINMENT STRUCTURE.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM
SODIUM HYDROXIDE METERING PUMPS

PROJECT NO. 26793-214344
FILE NAME: 46-I-002.dwg

SHEET NO.
4□-I-002

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PLANT CHEMICAL SYSTEM PLC

FAULT XA 46150 RUNNING YI 46150 VFD-4□150 HOR HS 46150

FAULT XA 46160 RUNNING YI 46160 VFD-4□1□0 HOR HS 46160

FAULT XA 46170 RUNNING YI 46170 VFD-4□170 HOR HS 46170

FAULT XA 46180 RUNNING YI 46180 VFD-4□180 HOR HS 46180

NOTE:

1. PIPING SHALL BE SECONDARY CONTAINED OUTSIDE OF SECONDARY CONTAINMENT STRUCTURE.

2"-SH-PP-L46W015A
46-I-001
FROM STORAGE TANK

2"-SH-PP-L46W080

PSL 46149
DV-46148
DV-46147

PMP-4□150
SODIUM HYDROXIDE TRANSFER PUMP NO. 1

BCV-46151

PI 46153
DV-46152
PSH 46155
DV-46154

DV-46156

DV-46169

NOTE 1

2"-SH-PP-L4625A
25-I-003
TO MF CIP AREA

2"-SH-PP-L46W082

PSL 46159
DV-46158
DV-46157

PMP-4□1□0
SODIUM HYDROXIDE TRANSFER PUMP NO. 2

BCV-46161

PI 46163
DV-46162
PSH 46165
DV-46164

DV-46166

NOTE 1

2"-SH-PP-L4625B
25-I-003
TO MF CIP AREA

2"-SH-PP-L46W015B
46-I-001
FROM STORAGE TANK

2"-SH-PP-L46W083

PSL 46169
DV-46168
DV-46167

PMP-4□170
SODIUM HYDROXIDE TRANSFER PUMP NO. 3

BCV-46171

PI 46172
DV-46172
PSH 46175
DV-46174

DV-46176

DV-46187
DV-46188
DV-46189

NOTE 1

2"-SH-PP-L4625C
54-I-001
TO SECONDARY RO CIP AREA

2"-SH-PP-L4625E
51-I-001
TO PRIMARY RO CIP AREA

DV-46190

2"-SH-PP-L4625F
51-I-001
TO PRIMARY RO CIP AREA

2"-SH-PP-L4625D
54-I-001
TO SECONDARY RO CIP AREA

2"-SH-PP-L46W086

PSL 46179
DV-46178
DV-46177

PMP-4□180
SODIUM HYDROXIDE TRANSFER PUMP NO. 4

BCV-46181

PI 46183
DV-46182
PSH 46185
DV-46184

DV-46186

3"-DR-PVC-L46W034
46-I-001
TO STORAGE TANK

CONTAINMENT AREA

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM SODIUM HYDROXIDE TRANSFER PUMPS

PROJECT NO. 26793-214344
FILE NAME: 46-I-003.dwg
SHEET NO.
4□-I-003

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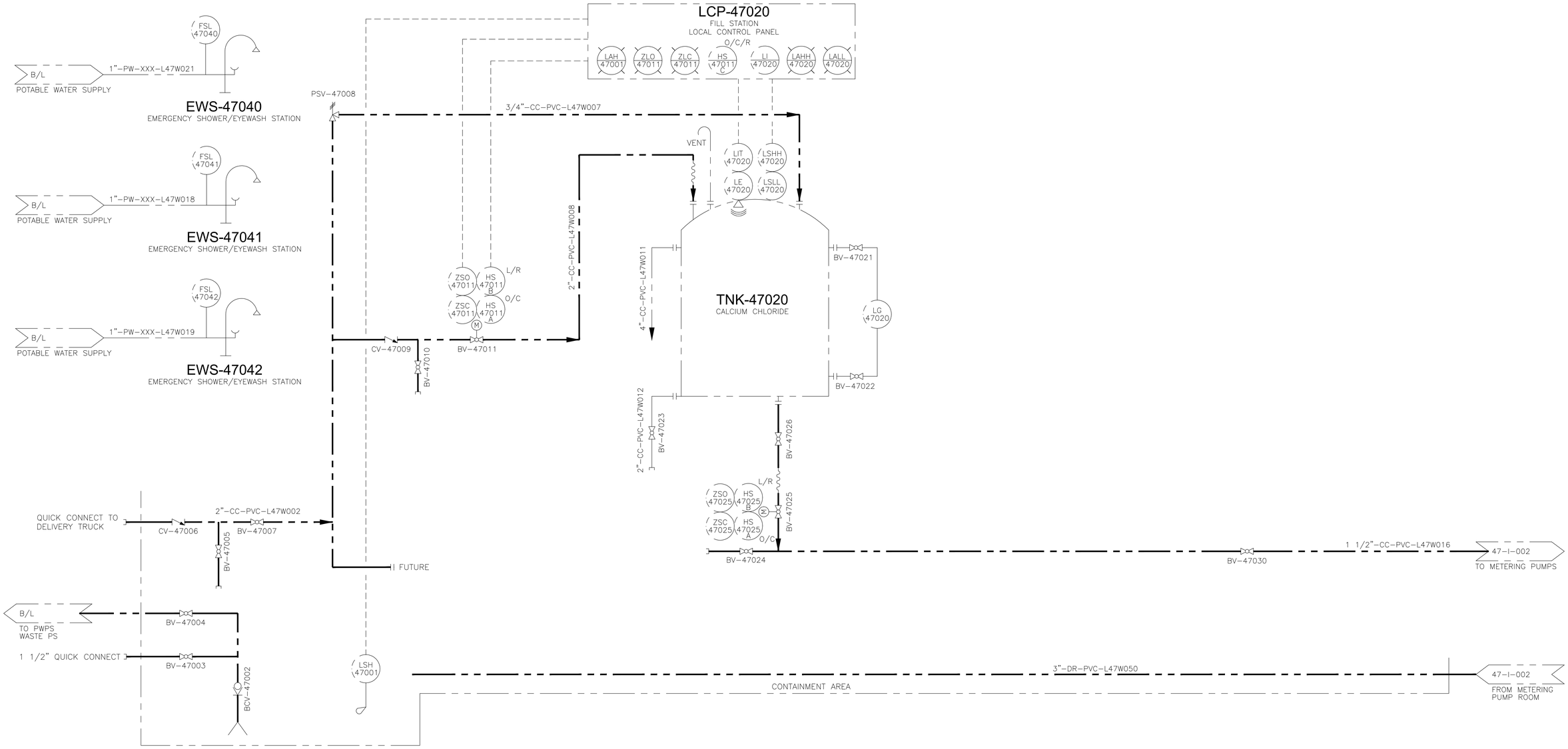
PLANT CHEMICAL SYSTEM PLC



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM CALCIUM CHLORIDE STORAGE TANK FUTURE

PROJECT NO. 26793-214344
FILE NAME: 47-I-001.dwg

SHEET NO.
47-I-001

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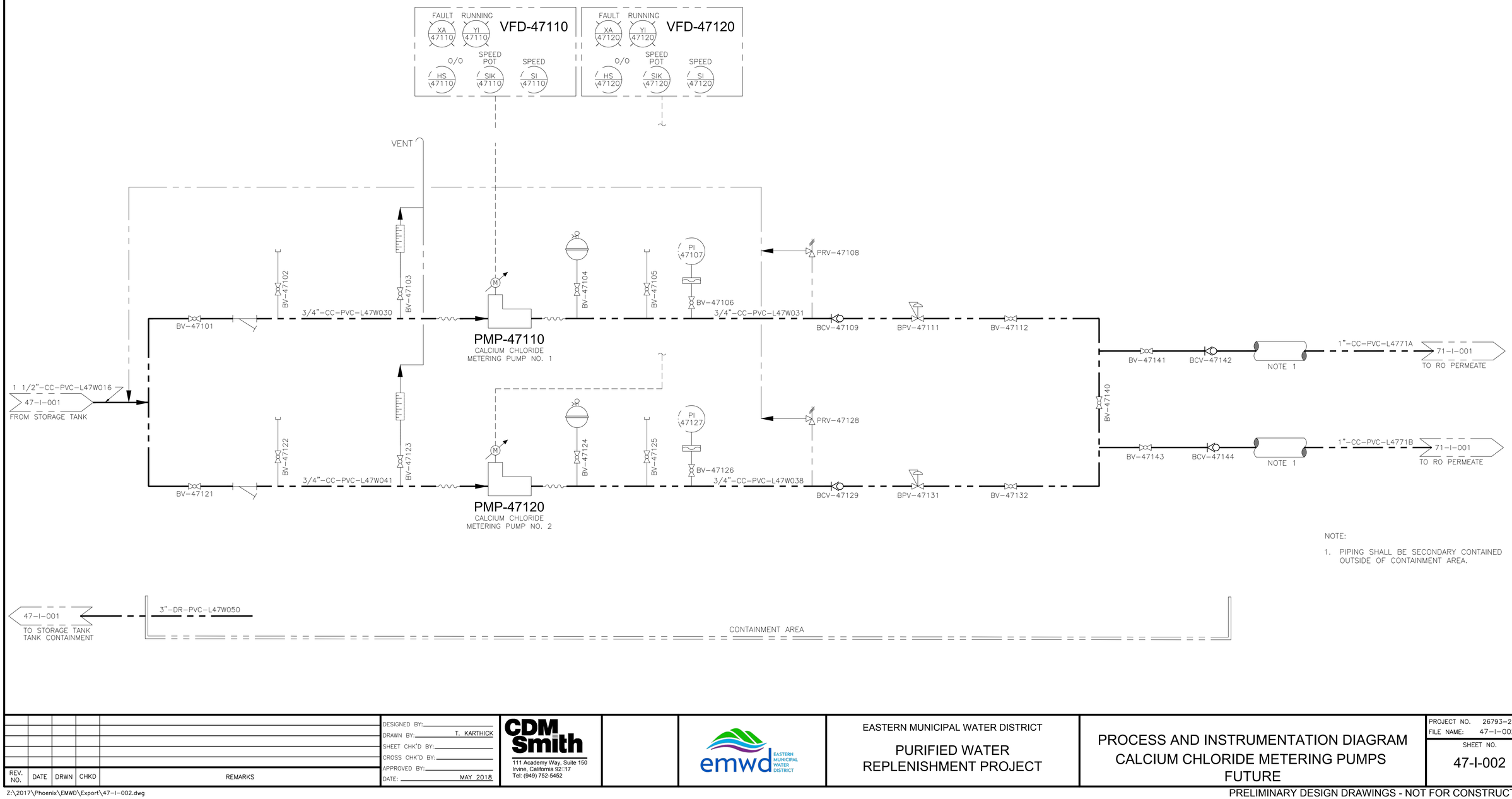
PLANT CHEMICAL SYSTEM PLC



NOTE:

1. PIPING SHALL BE SECONDARY CONTAINED OUTSIDE OF CONTAINMENT AREA.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM CALCIUM CHLORIDE METERING PUMPS FUTURE

PROJECT NO. 26793-214344
FILE NAME: 47-I-002.dwg
SHEET NO. 47-I-002

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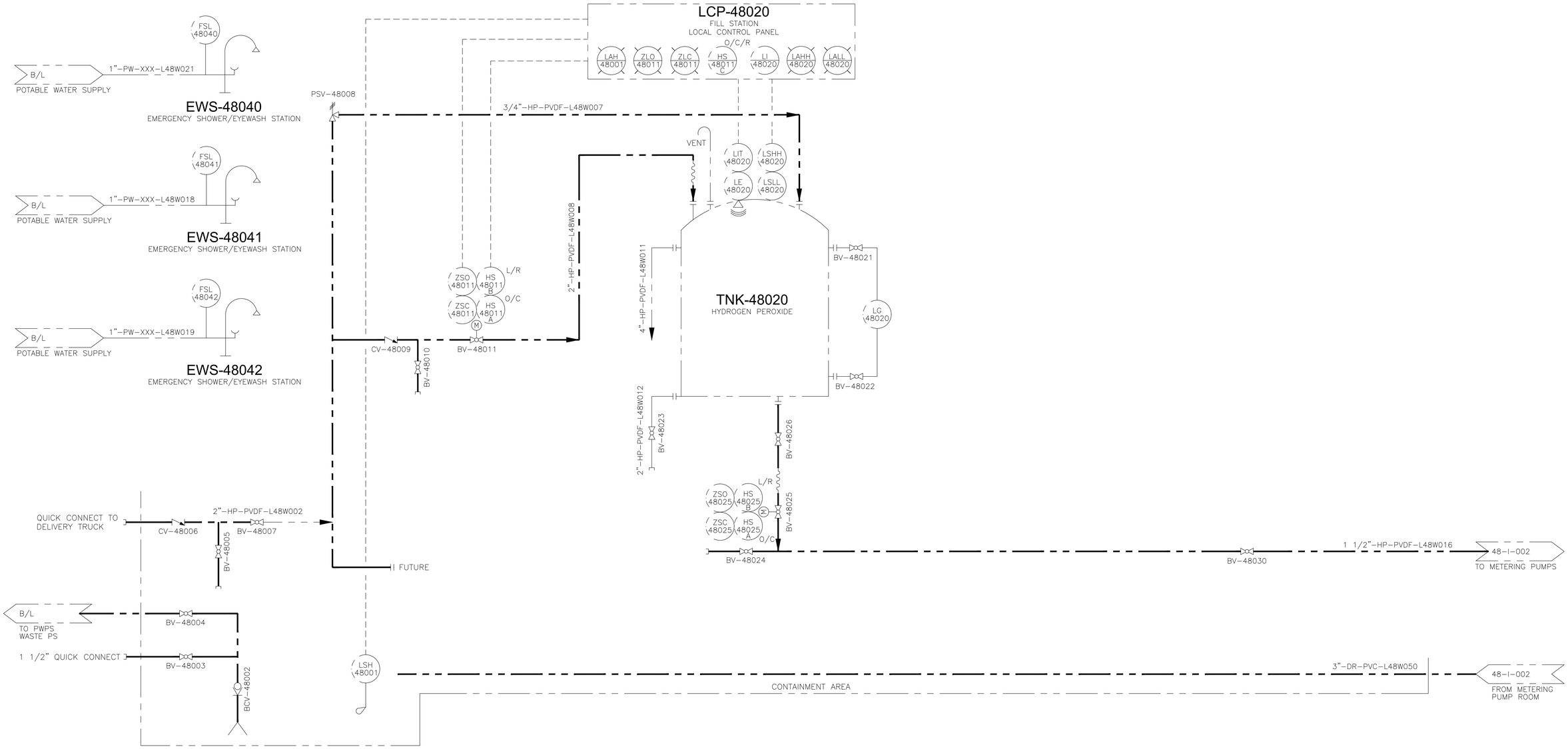
PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

PLANT CHEMICAL SYSTEM PLC



REV. NO.	DATE	DRWN	CHKD	REMARKS

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM HYDROGEN PEROXIDE STORAGE TANK FUTURE

PROJECT NO. 26793-214344
FILE NAME: 48-I-001.dwg

SHEET NO.
48-I-001

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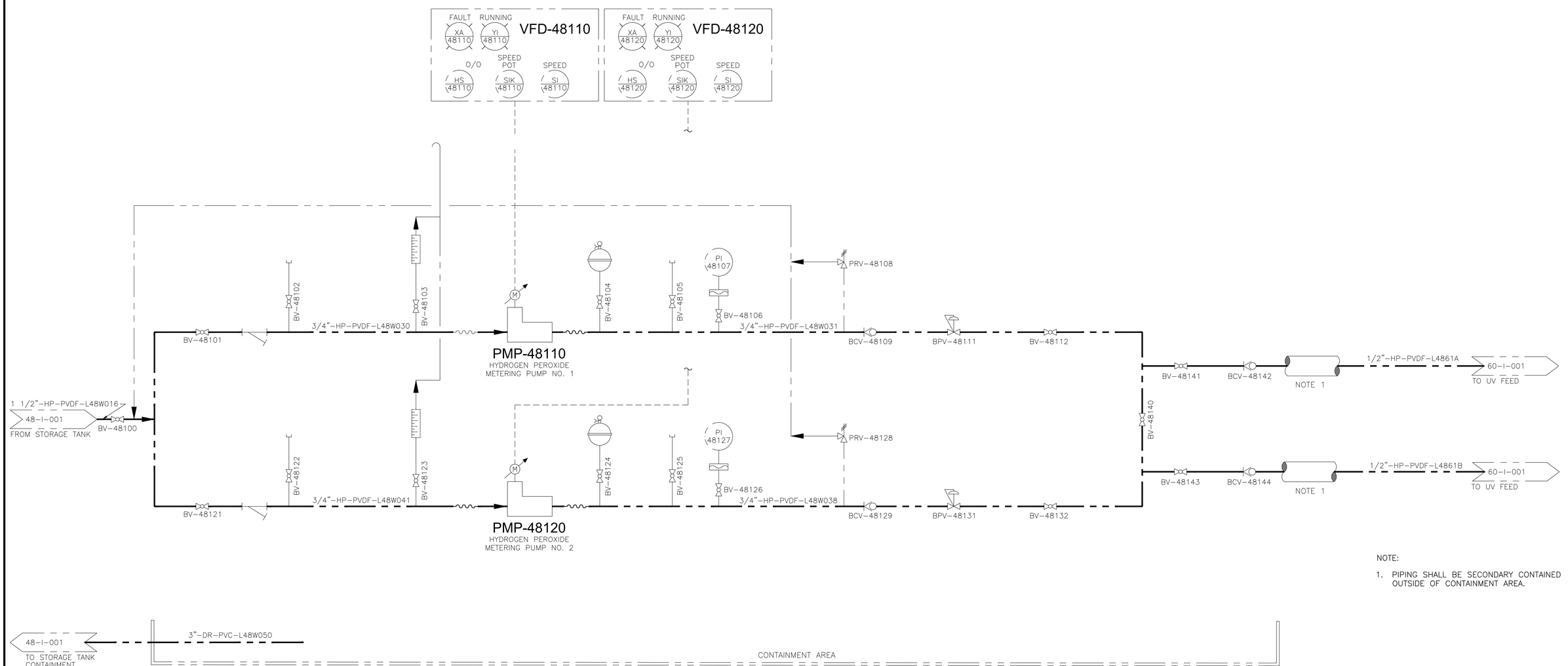
PLANT CHEMICAL SYSTEM PLC



NOTE:

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APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM HYDROGEN PEROXIDE METERING PUMPS FUTURE

PROJECT NO. 26793-214344
FILE NAME: 48-I-002.dwg
SHEET NO.
48-I-002

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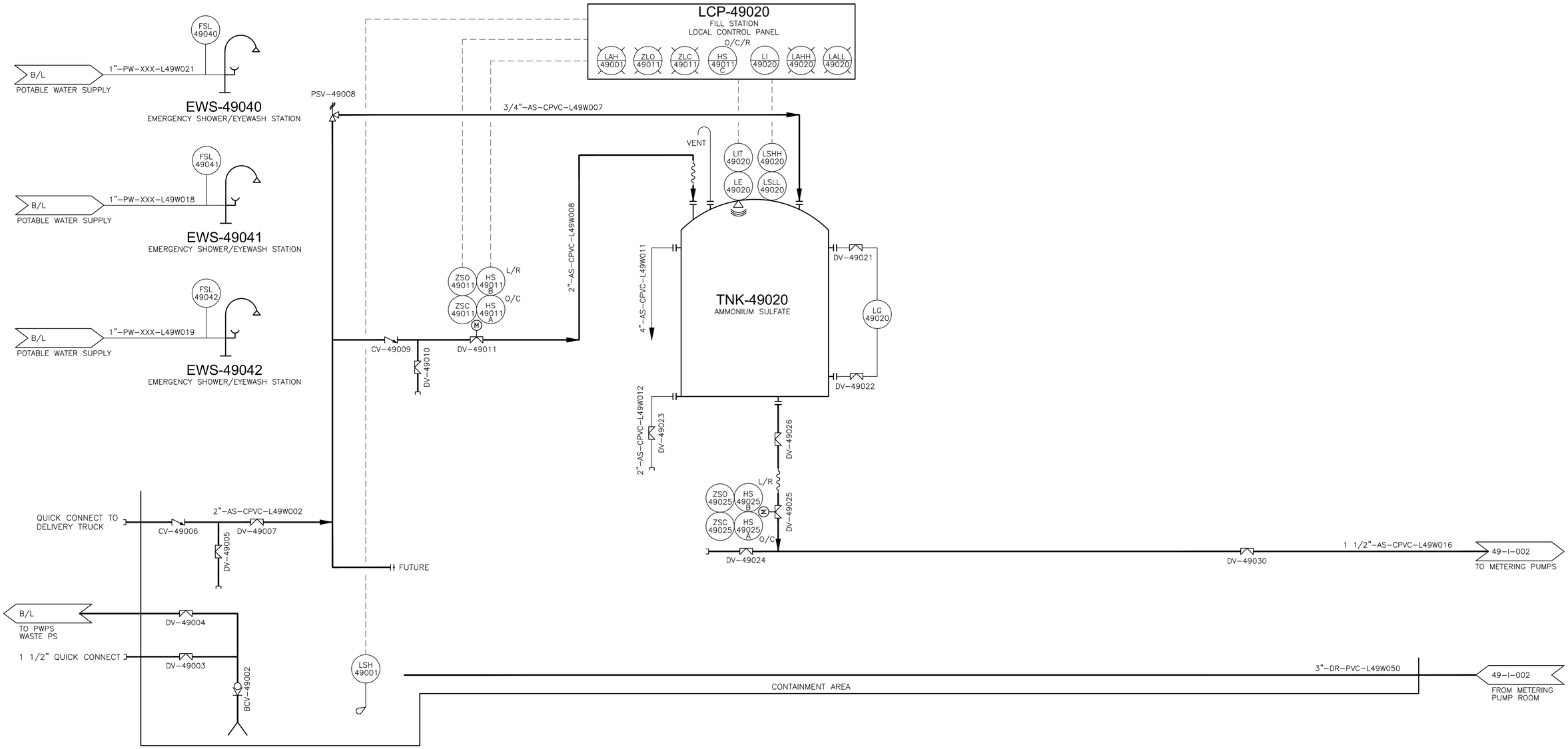
PRELIMINARY DESIGN DRAWINGS - NOT FOR CONSTRUCTION

PLANT CHEMICAL SYSTEM PLC



REV. NO.	DATE	DRWN	CHKD	REMARKS

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APPROVED BY:
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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM AMMONIUM SULFATE STORAGE TANK

PROJECT NO. 26793-214344
FILE NAME: 49-I-001.dwg

SHEET NO.
49-I-001

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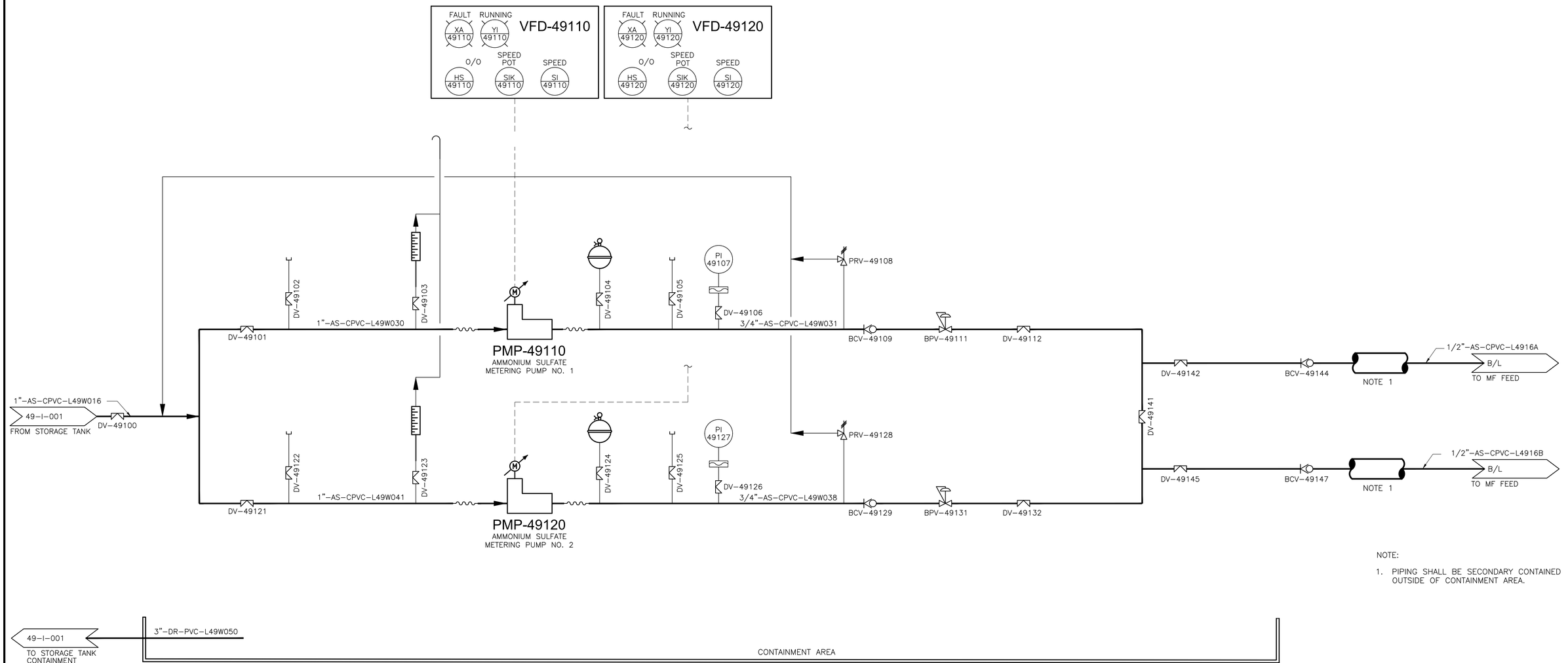
PLANT CHEMICAL SYSTEM PLC



NOTE:

1. PIPING SHALL BE SECONDARY CONTAINED OUTSIDE OF CONTAINMENT AREA.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
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APPROVED BY:
DATE: MAY 2018

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PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM AMMONIUM SULFATE METERING PUMPS

PROJECT NO. 26793-214344
FILE NAME: 49-I-002.dwg
SHEET NO.
49-I-002

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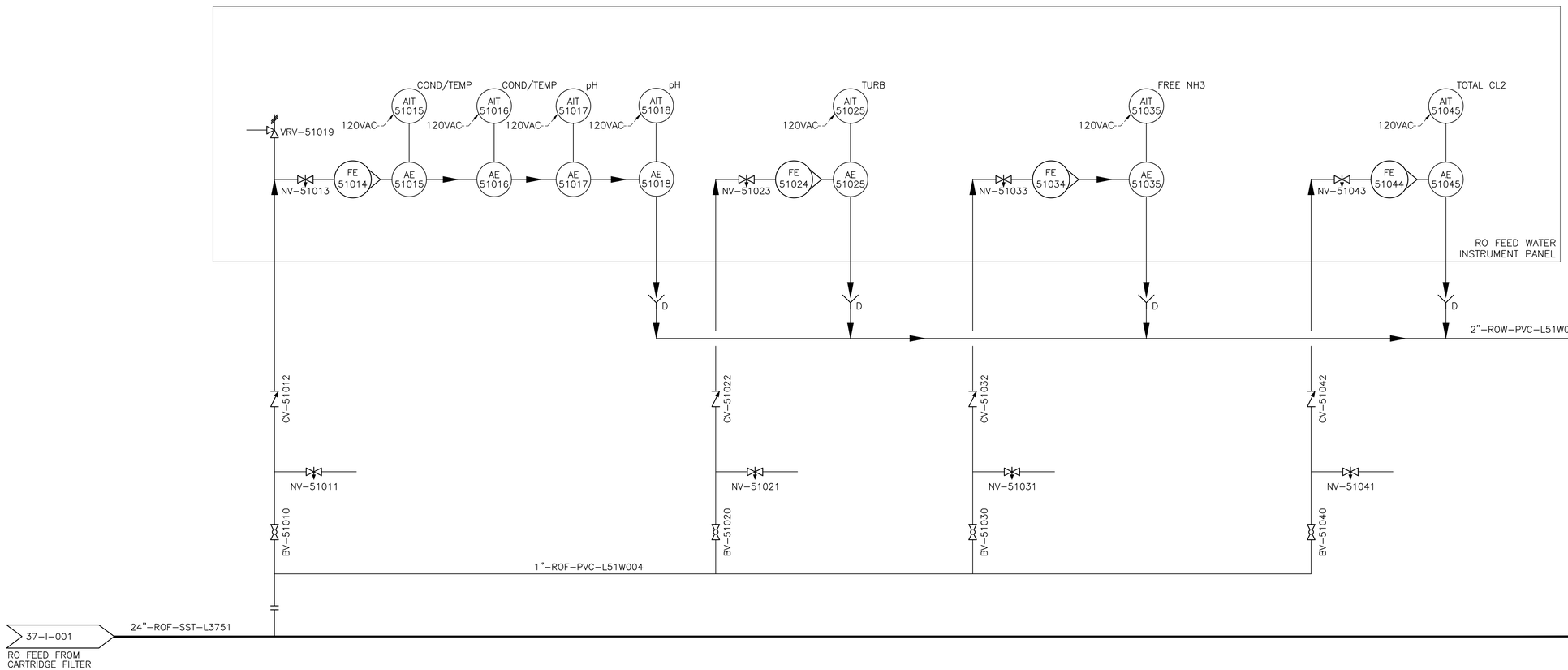
RO MAIN PLC



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PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM PRIMARY RO FEED PANEL

PROJECT NO. 26793-214344
FILE NAME: 51-I-001.dwg

SHEET NO.
51-I-001

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RO MAIN PLC

VFD-51050

FAULT XA 51050 | RUNNING YI 51050 | SPEED SI 51050 | L/R HS 51050 B | S/S HS 51050 C | SPEED POT SIK 51050 | VAH 51050 | TAH 51050 | VSH 51050 | TSH 51050 | VIT 51050 | TIT 51050

51-I-001
RO FEED DISTRIBUTION

24"-ROF-SST-L51W012

BFV-51051

ZSC 51051 / HS 51051 A L/R / ZSO 51051 / HS 51051 B O/C

PIT 51053

BV-51052

E-STOP
HS 51050 A

PRV-51050

BV-51060

TE 51050

PMP-51050
RO FEED PUMP

PSH 51055

BV-51054

PIT 51058

BV-51057

CV-51056

BFV-51059

12"-ROF-SST-L51W023

51-I-003
RO FEED TO TO UNIT 1

FUTURE

FUTURE

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM PRIMARY RO FEED PUMP UNIT I

PROJECT NO. 26793-214344
FILE NAME: 51-I-002.dwg

SHEET NO.
51-I-002

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PRIMARY RO TRAIN 1 RIO

51-I-002
FROM RO FEED PUMP

12"-ROF1-SST-L51W023

8"-ROF1-SST-L51W023

BV-51205

BFV-51206

12"X8"

8"X12"

BFV-51202

O/S/C L/R
HS 51202 B
HS 51202 A
ZSC 51202
ZSO 51202

BFV-51201

73-I-002
RO FLUSH SYSTEM

8"-FF-PVC-L7351

ARV-51221

BFV-51207

12"X8"

8"-ROF1-SST-L51W032

RO-51210
STAGE 1, BANK A
PRODUCT
CONCENTRATE
18 VESSELS
7 ELEMENTS

RO-51220
STAGE 1, BANK B
PRODUCT
CONCENTRATE
18 VESSELS
7 ELEMENTS

BV-51208
18 EA.

BV-51209
18 EA.

BV-51210
18 EA.

6"-ROC1-SST-L51W037

BFV-51203

6"-ROP1-SST-L51W038

6"-ROC1-SST-L51W035

BFV-51231

8"-ROC1-SST-L51W035

PIT 51211
NV-51212
NV-51213
NV-51214
BV-51215

PIT 51232
NV-51233
NV-51234
NV-51235

PIT 51236
PSH 51237
BV-51239

8"-ROC1-SSP-L51W063

BFV-51246

BV-51238

BFV-51247

PMP-51230
RO 2ND STAGE
BOOSTER PUMP

CV-51240

BFV-51241

8"-ROF2-SST-L51W036

AIT 51203 COND -120VAC
AE 51203
BV-51204

FIT 51242 -120VAC
FE 51242

8"X6"
6"X8"
BV-51243

BFV-51244

8"-CF/CR-PVC-L51W042

10"-CF/CR-PVC-L51W033

BFV-51205

BFV-51284

12"-ROP-SST-L51W030

BFV-51216

AVRV-51218 V

BFV-51217

FIT 51219
FE 51219

AIT 51256 COND
AE 51256
BV-51257
120VAC

120VAC FIT 51254
FE 51254

6"X10"

BFV-51258

ARV-51259

BFV-51245

RO-51250
STAGE 2
PRODUCT
CONCENTRATE
18 VESSELS
7 ELEMENTS

6"-ROP2-SST-L51W044

BFV-51251

PIT 51262
NV-51263
NV-51264
NV-51265

BV-51261

6"-CF/CR-PVC-L51W047

BFV-51285

L/R
ZSO 51249
HS 51249 A
O/S/C
ZSC 51249
HS 51249 B

BFV-51249
BFV-51248

PSH 51291
PIT 51292
NV-51293
NV-51294
NV-51295
BV-51290

COND
AIT 51296 -120VAC
AE 51296

L/R
ZSO 51298
HS 51298 A
O/C
ZSC 51298
HS 51298 B

CV-51297
BFV-51298

12"-ROP-SST-L51W030
60-I-001
RO PERMEATE

3"-PCR-PVC-L5152
BFV-51299
52-I-001
PRIMARY RO CIP TANK NO. 1

CV-51268
NV-51269
FE 51270
AIT 51271 COND -120VAC
AE 51271
D
NV-51267

BV-51266
NV-51264

L/R
ZSO 51272
HS 51272 A
O/S/C
ZSC 51272
HS 51272 B

FIT 51273 -120VAC
V
AVRV-51277

6"X3"
BV-51272
3"X6"
FE 51273

CV-51275
6"-D-SST-L5153
BFV-51276
53-I-001
TO SECONDARY RO SYSTEM

BV-51274

L/R
ZSO 51281
HS 51281 A
O/S/C
ZSC 51281
HS 51281 B

SST PVC
6"-D-PVC-L5118
CV-51282
BFV-51281
BFV-51283
RO WASTE COLECTION

8"-FF-PVC-L7351B
73-I-002
FROM FLUSH SYSTEM

10"-CF/CR-PVC-L5251B
52-I-003
TO PRIMARY CIP

10"-CF/CR-PVC-L5251A
52-I-003
TO PRIMARY CIP

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM PRIMARY RO MEMBRANE

PROJECT NO. 26793-214344
FILE NAME: 51-I-003.dwg
SHEET NO. 51-I-003

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PRIMARY RO CIP RIO

B/L
POTABLE WATER OR T22

51-I-003
PERMEATE CLEANING RETURN FROM PRIMARY RO

53-I-003
ROP TANK FILL FROM PERMEATE RO

ZIT 52001 / HS 52001 B / ZC 52001 / HS 52001 A — L/R, O/S/C
BFV-52001
X-PW-PVC-L52W003
3"-PCR-PVC-L52W002
BFV-52002
X-PCR-PVC-L52W001
BFV-52003

LCP-52030
TANK HEATER CONTROL PANEL

X-CLW-PVC-L52W012
TC 52020
HTR-52020
HEATER
BFV-52004
BFV-52006
LSH 52000
LIT 52000
LE 52000
BFV-52005
BFV-52007
LSL 52000
TNK-52000
PRIMARY RO CIP TANK NO. 1
X-CR/REC-PVC-L52W011
X-CF-PVC-L52W026

ZIT 52201 / HS 52201 B / ZC 52201 / HS 52201 A — L/R, O/S/C
BFV-52201
BFV-52202
BFV-52203
X-PCR-PVC-L52W001
X-PW-PVC-L52W002
X-PW-PVC-L52W003

LCP-52130
TANK HEATER CONTROL PANEL

X-CLW-PVC-L52W012
TC 52120
HTR-52120
HEATER
BFV-52105
BFV-52107
LSL 52100
LIT 52100
LE 52100
BFV-52106
LSH 52100
TNK-52100
PRIMARY RO CIP TANK NO. 2
X-CLW-PVC-L52W012

X-CR/REC-PVC-L52W011
BFV-52161
BFV-52261

FAULT / RUNNING — XA 52110 / YI 52110 — VFD-52110
O/O — HS 52110 B
SPEED POT — SIK 52110
SPEED — SI 52110

FAULT / RUNNING — XA 52120 / YI 52120 — VFD-52120
O/O — HS 52120 B
SPEED POT — SIK 52120
SPEED — SI 52120

PSL 52104 / PIT 52105
BV-52102
BV-52103
BFV-52101
X-CF-PVC-L52W005
TSH 52110 / HS 52110 A — LOS
PMP-52110
PRIMARY RO CIP PUMP NO. 1
PSH 52108 / PIT 52109
BV-52106
BV-52107
X-CF-PVC-L52W006
CV-52111
BFV-52112
X-PVC-CF-L52W027

PSL 52124 / PIT 52125
BV-52122
BV-52123
BFV-52121
X-CF-PVC-L52W007
TSH 52120 / HS 52120 A — LOS
PMP-52120
PRIMARY RO CIP PUMP NO. 2
PSH 52128 / PIT 52129
BV-52126
BV-52127
X-CF-PVC-L52W008
CV-52131
BFV-52132

AVRV-52024 / BV-52023
AVRV-52026 / BV-52025
CFT-52020
CARTRIDGE FILTER
BV-52027
BV-52028
X-PVC-CF-L52W024
X-PVC-CF-L52W025
BFV-52221
BFV-52222
10"-CF/CR-PVC-L5253A
BFV-52225

AIT 52142 / ASHL 52142 / AE 52142 — pH
TI 52140
TSH 52141
FIT 52144 — ES — PI 52147
BV-52146
BV-52145
BFV-52143
FE 52144

X-SH-PVC-L4652 → 46-I-002 SODIUM HYDROXIDE
X-CIT-PVC-L4452 → 44-I-002 CITRIC ACID

BV-52164
BV-52165
BV-52163
BV-52162
ZIT 52160 / HS 52160 B / ZC 52160 / HS 52160 A — L/R, O/S/C
BFV-52160

X-CR/REC-PVC-L52W011
ZIT 52158 / HS 52158 B / ZC 52158 / HS 52158 A — L/R, O/S/C
BFV-52158
X-CR/REC-PVC-L52W010
PSH 52156
BV-52155
ZIT 52153 / HS 52153 B / ZC 52153 / HS 52153 A — L/R, O/S/C
BFV-52153
ZIT 52154 / HS 52154 B / ZC 52154 / HS 52154 A — L/R, O/S/C
BFV-52154
51-I-003 FROM/TO PRIMARY RO
10"-CF/CR-PVC-L5253B
ZIT 52157 / HS 52157 B / ZC 52157 / HS 52157 A — L/R, O/S/C
BFV-52157
X-CR/REC-PVC-L52W009
PSH 52152
BV-52151
ZIT 52150 / HS 52150 B / ZC 52150 / HS 52150 A — L/R, O/S/C
BFV-52150
51-I-003 FROM/TO PRIMARY RO
10"-CF/CR-PVC-L5253A

ZIT 52159 / HS 52159 B / ZC 52159 / HS 52159 A — L/R, O/S/C
BFV-52159
X-CLW-PVC-L52W014
X-CLW-PVC-L52W012
18-I-001 TO CLAENING WASTE

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: N. GOKUL
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM PRIMARY RO CIP SYSTEM

PROJECT NO. 26793-214344
FILE NAME: 52-I-001.dwg
SHEET NO. 52-I-001

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SECONDARY RO TRAIN 1 RIO

43-I-003
THRESHOLD INHIBITOR
3/8"-TI-PP-L4353A

43-I-003
THRESHOLD INHIBITOR
3/8"-TI-PP-L4353B

42-I-003
SULFURIC ACID
1/2"-SA-A20-L4253A

42-I-003
SULFURIC ACID
1/2"-SA-A20-L4253B

BV-53015
BCV-53014
BPV-53039

BV-53017
BCV-53016
BPV-53040

BV-53011
BCV-53010
BPV-53041

BV-53013
BCV-53012
BPV-53042

6"-ROC-SS316-L5153
51-I-003
RO CONCENTRATE FROM PRIMARY RO UNIT 1
6"X8"
8"-ROC-SST-L5153

STATIC MIXER
STATIC MIXER

ZIT 53019
HS 53019 B
ZC 53019
HS 53019 A
L/R
O/S/C
BFV-53019

PIT 53023
PSL 53022
BV-53021
BV-53020

NV-53026
CV-53025
BV-53024
1"X1/2"

BFV-53018
8"X6"

PMP-53030
SECONDARY RO BOOSTER PUMP

PIT 53033
PSH 53034
BV-53032
BV-53031
CV-53035
BFV-53036
6"-ROF-SST-L53W004
53-I-002
TO SECONDARY RO UNIT 1 VESSELS

FUTURE CONNECTION TO OTHER SECONDARY BOOSTER PUMPS

120VAC
AIT 53028
pH
AE 53028
FE 53027

FAULT
RUNNING
XA 53030
YI 53030
VFD-53030
O/O
HS 53030
SPEED POT
SIK 53030
SPEED
SI 53030

FUTURE
51-I-003
RO CONCENTRATE FROM PRIMARY RO UNIT 2

FUTURE
51-I-003
RO CONCENTRATE FROM PRIMARY RO UNIT 3

ZIT 53038
HS 53038 B
ZC 53038
HS 53038 A
L/R
O/S/C
BFV-53037
BFV-53038

73-I-002
FROM FLUSH SYSTEM

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
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emwd EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM SECONDARY RO FEED PUMP

PROJECT NO. 26793-214344
FILE NAME: 53-I-001.dwg
SHEET NO.
53-I-001

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SECONDARY RO TRAIN 1 RIO

53-I-001
FROM SECONDARY RO BOOSTER PUMP

6"-ROF-SST-L53W004

ZSC 53101 / HS 53101 B / ZSO 53101 / HS 53101 A — L/R, O/C
BFV-53101

ZSC 53106 / HS 53106 B / ZSO 53106 / HS 53106 A — L/R, O/C
BFV-53106

RO-53110

STAGE 3A, BANK A, DUTY
PRODUCT
CONCENTRATE
5 VESSELS
4 ELEMENTS

STAGE 3B, BANK A, DUTY
PRODUCT
CONCENTRATE
5 VESSELS
4 ELEMENTS

ZSC 53104 / HS 53104 B / ZSO 53104 / HS 53104 A — L/R, O/C
BFV-53104

ZSC 53114 / HS 53114 B / ZSO 53114 / HS 53114 A — L/R, O/C
BFV-53114

6"-CF/CR-PVC-L53W007

ZSC 53107 / HS 53107 B / ZSO 53107 / HS 53107 A — L/R, O/C
BFV-53107

6"-CF/CR-PVC-L53W009

RO-53120

STAGE 3A, BANK B, STANDBY
PRODUCT
CONCENTRATE
5 VESSELS
4 ELEMENTS

STAGE 3B, BANK B, STANDBY
PRODUCT
CONCENTRATE
5 VESSELS
4 ELEMENTS

ZSC 53115 / HS 53115 B / ZSO 53115 / HS 53115 A — L/R, O/C
BFV-53115

ZSC 53112 / HS 53112 B / ZSO 53112 / HS 53112 A — L/R, O/C
BFV-53112

ZSC 53111 / HS 53111 B / ZSO 53111 / HS 53111 A — L/R, O/C
BFV-53111

COND/TEMP
AIT 53136
120VAC
VRV-53137
FE 53135
AE 53136
NV-53134
CV-53133
NV-53132
BV-53131
D
PIT 53139
BV-53138

4"-ROP-SST-L53W005

53-I-003
SECONDARY RO TRAIN 1 PERMEATE

ZSC 53125 / HS 53125 B / ZSO 53125 / HS 53125 A — L/R, O/C
BFV-53125
6"X4"

ZSC 53121 / HS 53121 B / ZSO 53121 / HS 53121 A — L/R, O/C
BFV-53121

ZSC 53129 / HS 53129 B / ZSO 53129 / HS 53129 A — L/R, O/C
BFV-53129

PIT 53128
BV-53127

4"-ROC-SST-L53W003

53-I-003
SECONDARY RO UNIT 1 CONCENTRATE

6"-CF/CR-PVC-L53W016

ZSC 53126 / HS 53126 B / ZSO 53126 / HS 53126 A — L/R, O/C
BFV-53126
6"X4"

ZSC 53130 / HS 53130 B / ZSO 53130 / HS 53130 A — L/R, O/C
BFV-53130

6"-CF/CR-PVC-L53W016

54-I-001
RO CIP FEED FROM/TO SECONDARY RO CIP SYSTEM

6"-CF/CR-PVC-L5453B

FUTURE FUTURE
FUTURE FUTURE
FUTURE FUTURE

54-I-001
RO CIP FEED FROM/TO SECONDARY RO CIP SYSTEM

6"-CF/CR-PVC-L5453A

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM SECONDARY RO UNIT 1

PROJECT NO. 26793-214344
FILE NAME: 53-I-002.dwg

SHEET NO.
53-I-002

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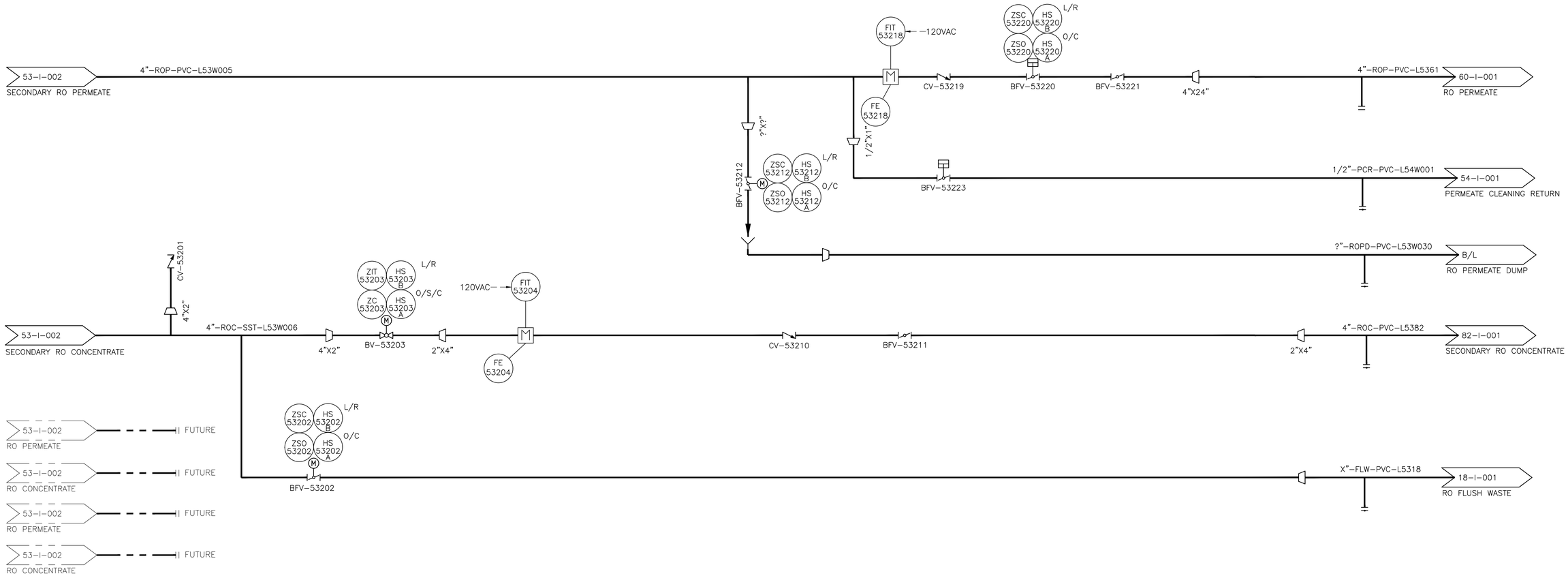
SECONDARY RO TRAIN 1 RIO



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY: T. KARTHICK
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM SECONDARY RO PERMEATE AND CONCENTRATE

PROJECT NO. 26793-214344
FILE NAME: 53-I-003.dwg
SHEET NO. 53-I-003

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SECONDARY RO CIP RIO

B/L
POTABLE WATER OR T22

53-I-003
PERMEATE CLEANING RETURN FROM SECONDARY RO

53-I-003
ROP TANK FILL FROM PERMEATE RO

LCP-54030
TANK HEATER CONTROL PANEL

LCP-54130
TANK HEATER CONTROL PANEL

HTR-54020
HEATER

HTR-54120
HEATER

TNK-54000
SECONDARY RO CIP TANK NO. 1

TNK-54100
SECONDARY RO CIP TANK NO. 2

PMP-54110
SECONDARY RO CIP PUMP NO. 1

PMP-54120
SECONDARY RO CIP PUMP NO. 2

VFD-54110

VFD-54120

CFT-54020
CARTRIDGE FILTER

X-PW-PVC-L54W003
X-PCR-PVC-L54W002
X-PCR-PVC-L54W001
X-CLW-PVC-L54W012
X-CR/REC-PVC-L54W011
X-CF-PVC-L54W026
X-CF-PVC-L54W027
X-CF-PVC-L54W005
X-CF-PVC-L54W006
X-CF-PVC-L54W007
X-CF-PVC-L54W008
X-PVC-CF-L54W024
X-PVC-CF-L54W025
6"-CF/CR-PVC-L5453A
X-CR/REC-PVC-L54W010
X-CR/REC-PVC-L54W009
6'-CF/CR-PVC-L5453B
6"-CF/CR-PVC-L5453B
X-CLW-PVC-L54W014
X-SH-PVC-L4654
X-CIT-PVC-L4454

BFV-54001 BFV-54002 BFV-54003 BFV-54161 BFV-54160 BFV-54006 BFV-54004 BFV-54005 BFV-54007 BFV-54201 BFV-54202 BFV-54203 BFV-54261 BFV-54106 BFV-54105 BFV-54107 BFV-54101 BFV-54121 BFV-54112 BFV-54132 BFV-54221 BFV-54222 BFV-54225 BFV-54143 BFV-54158 BFV-54153 BFV-54154 BFV-54157 BFV-54150

BV-54164 BV-54165 BV-54163 BV-54162 BV-54023 BV-54025 BV-54027 BV-54028 BV-54102 BV-54103 BV-54106 BV-54107 BV-54122 BV-54123 BV-54126 BV-54127 BV-54146 BV-54145 BV-54155 BV-54151 BV-54159

AVRV-54024 AVRV-54026

ZIT 54001 HS 54001 B L/R ZC 54001 HS 54001 A O/S/C
ZIT 54160 HS 54160 B L/R ZC 54160 HS 54160 A O/S/C
ZIT 54158 HS 54158 B L/R ZC 54158 HS 54158 A O/S/C
ZIT 54153 HS 54153 B L/R ZC 54153 HS 54153 A O/S/C
ZIT 54154 HS 54154 B L/R ZC 54154 HS 54154 A O/S/C
ZIT 54157 HS 54157 B L/R ZC 54157 HS 54157 A O/S/C
ZIT 54150 HS 54150 B L/R ZC 54150 HS 54150 A O/S/C
ZIT 54159 HS 54159 B L/R ZC 54159 HS 54159 A O/S/C
ZIT 54201 HS 54201 B L/R ZC 54201 HS 54201 A O/S/C

FAULT XA 54110 RUNNING YI 54110 O/O HS 54110 B SPEED POT SIK 54110 SPEED SI 54110
FAULT XA 54120 RUNNING YI 54120 O/O HS 54120 B SPEED POT SIK 54120 SPEED SI 54120

LSH 54000 LIT 54000 LE 54000 LSL 54000
LSH 54100 LIT 54100 LE 54100 LSL 54100
TC 54020 TC 54120
PSL 54104 PIT 54105 TSH 54110 HS 54110 A LOS PSH 54108 PIT 54109
PSL 54124 PIT 54125 TSH 54120 HS 54120 A LOS PSH 54128 PIT 54129
PSH 54156 PSH 54152
TI 54140 TSH 54141 AIT 54142 ASHL 54142 pH AE 54142 FIT 54144 ES PI 54147 FE 54144

XX? XXX ?XX

53-I-002 FROM/TO SECONDARY RO
53-I-002 FROM/TO SECONDARY RO
18-I-001 TO CLAENING WASTE

SODIUM HYDROXIDE
CITRIC ACID

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
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SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM SECONDARY RO CIP SYSTEM

PROJECT NO. 26793-214344
FILE NAME: 54-I-001.dwg
SHEET NO. 54-I-001

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PLANT WATER
PRODUCT/EFFLUENT PLC

VFD-71010
FAULT XA 71010 | RUNNING YI 71010 | SPEED SI 71010 | L/R HS 71010 B | S/S HS 71010 C | SPEED POT SIK 71010

VFD-71020
FAULT XA 71020 | RUNNING YI 71020 | SPEED SI 71020 | L/R HS 71020 B | S/S HS 71020 C | SPEED POT SIK 71020

B/L
FROM SJVRWRF

47-I-002
FROM CALCIUM CHLORIDE SYSTEM
1"-CC-PVC-L4771A

47-I-002
FROM CALCIUM CHLORIDE SYSTEM
1"-CC-PVC-L4771B

46-I-002
FROM SODIUM HYDROXIDE SYSTEM
1"-SH-PP-L4671A

46-I-002
FROM SODIUM HYDROXIDE SYSTEM
1"-SH-PP-L4671B

36"-RW-ELSP
24"-RW-HDPE-LXX71
36"X24"

BV-71029 18"X12"
PIT 71029
FIT 71030
120VAC
BCV-71037
BV-71038
BV-71036
BCV-71040
BV-71039
BCV-71042
BV-71041
BCV-71045
BV-71044
BPV-71041
BPV-71043
BPV-71046
18"X16"
12"X18"
FE 71030
18"-PW-ELSP-L71W005
16"-PW-HDPE-L71W005 SLIP-LINED
16"X18"
GV-71054
FE 71037
FIT 71037
18"X36"
GV-71034
120VAC
12"-RW-HDPE-L71W007
12"X24"
GV-71051 BFV-71050
FE 71052
FIT 71052
120VAC
BFV-71053
12"-RW-HDPE-L71W006
12"X24"
GV-71047 BFV-71046
FE 71048
FIT 71048
120VAC
BFV-71049
36"-PW-HDPE-L71W005
16-I-001
TO MF STRAINER EAST & WEST
SEE NOTE 1

12"-PW-ELSP-L71W004
12"-PW-ELSP-L71W015
FUTURE
FUTURE

PRV-71055
FE 71056
FIT 71056
18"-PW-HDPE-L71XXA
B/L
TO ALESSANDRO PONDS
ALESSANDRO PONDS BLENDING FACILITY

E-STOP
HS 71010 A
LSHH 71003
LSLL 71002
LIT 71004
LE 71004
VE 71010
TE 71010
PRV-71012
PSH 71015
PI 71016
BV-71014
AVRV-71018
BV-71018
CV-71013
BFV-71017

E-STOP
HS 71020 A
VE 71020
TE 71020
PRV-71022
PSH 71025
PI 71026
BV-71024
AVRV-71028
BV-71028
CV-71023
BFV-71027

PMP-71010
PRODUCT WATER PUMP NO. 1

PMP-71020
PRODUCT WATER PUMP NO. 2

FINAL PRODUCT WETWELL

53-I-003
RO PERMEATE FROM SECONDARY RO
4"-ROP-SS316-L5371

51-I-003
RO PERMEATE FROM PRIMARY RO
12"-ROP-SS316-L5173
12"X24"

52-I-001
TO CIP TANKS
X-ROC-PVC-L7152

73-I-001
TO FLUSH TANK
4"-ROP-316SS-L7173

73-I-001
FROM FLUSH TANK
4"-ROP-HDPE-L7371

12"-PW/OF-PVC-L71W009
B/L
TO STORM DRAIN

NOTE:
1. FLOW METER AT MT AVE WEST POND INLET TO BE PROVIDED BY OTHERS.

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DATE: MAY 2018

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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM PRODUCT WATER PUMP STATION

PROJECT NO. 26793-214344
FILE NAME: 71-I-001.dwg
SHEET NO. 71-I-001

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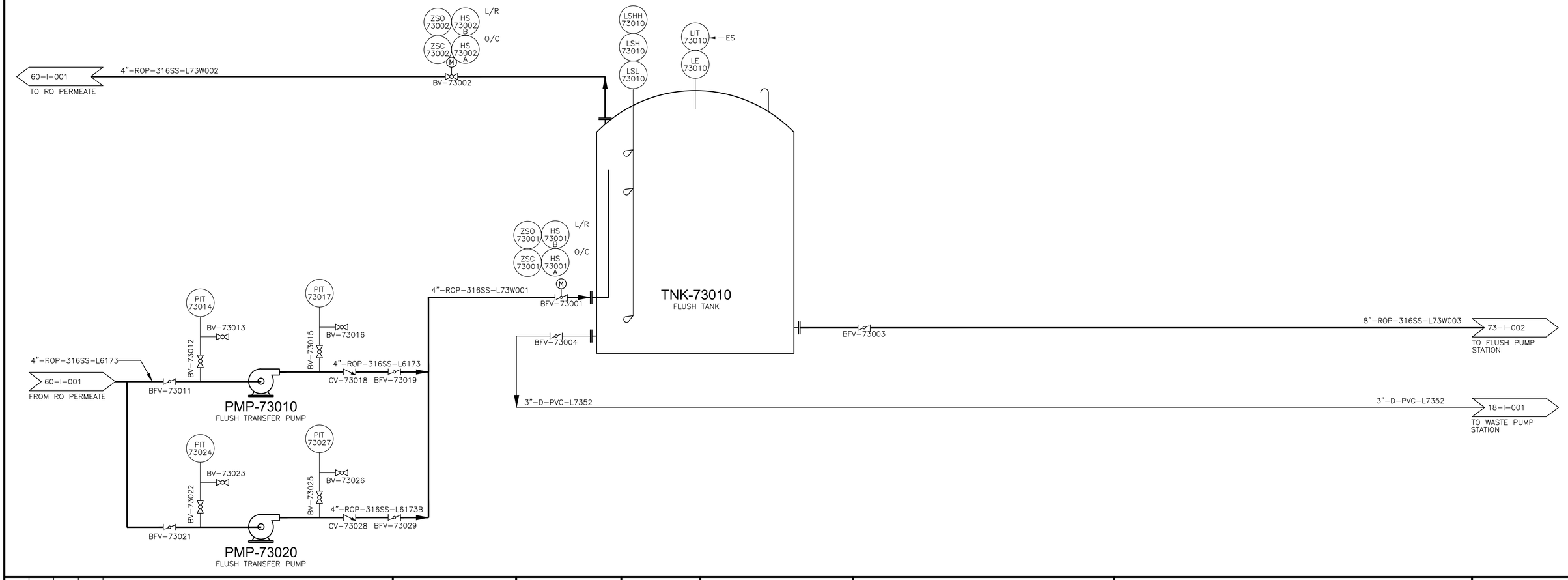
PLANT WATER
PRODUCT/EFFLUENT PLC



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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM FLUSH TRANSFER PUMPS AND FLUSH TANK

PROJECT NO. 26793-214344
FILE NAME: 73-I-001.dwg
SHEET NO.
73-I-001

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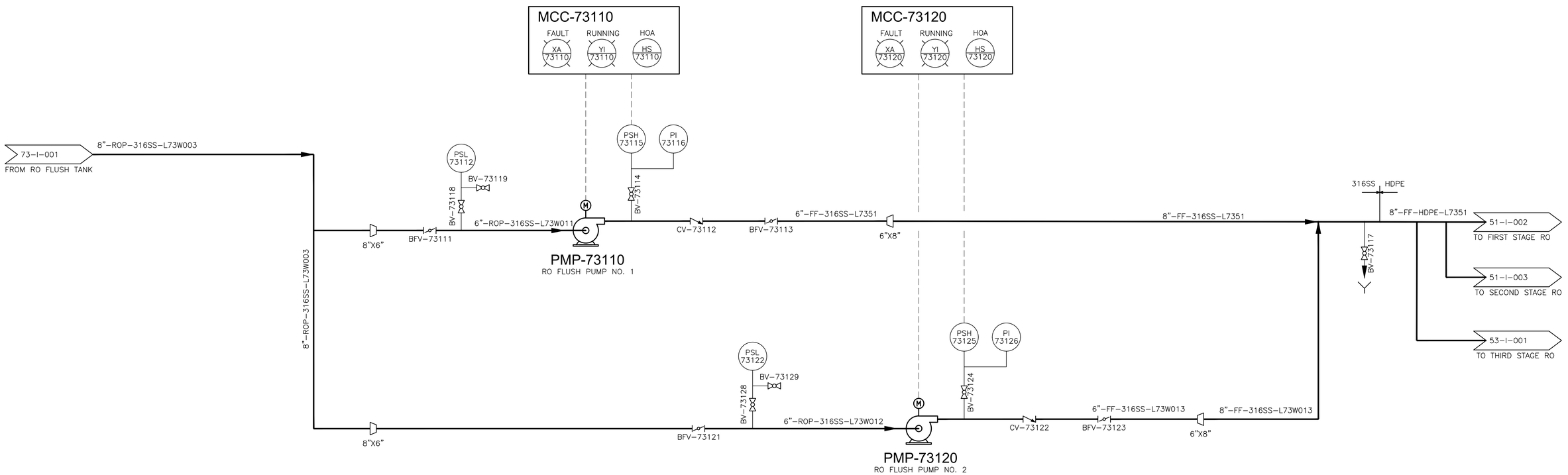
PLANT WATER
PRODUCT/EFFLUENT PLC



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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM RO FLUSH PUMPS

PROJECT NO. 26793-214344
FILE NAME: 73-I-002.dwg

SHEET NO.
73-I-002

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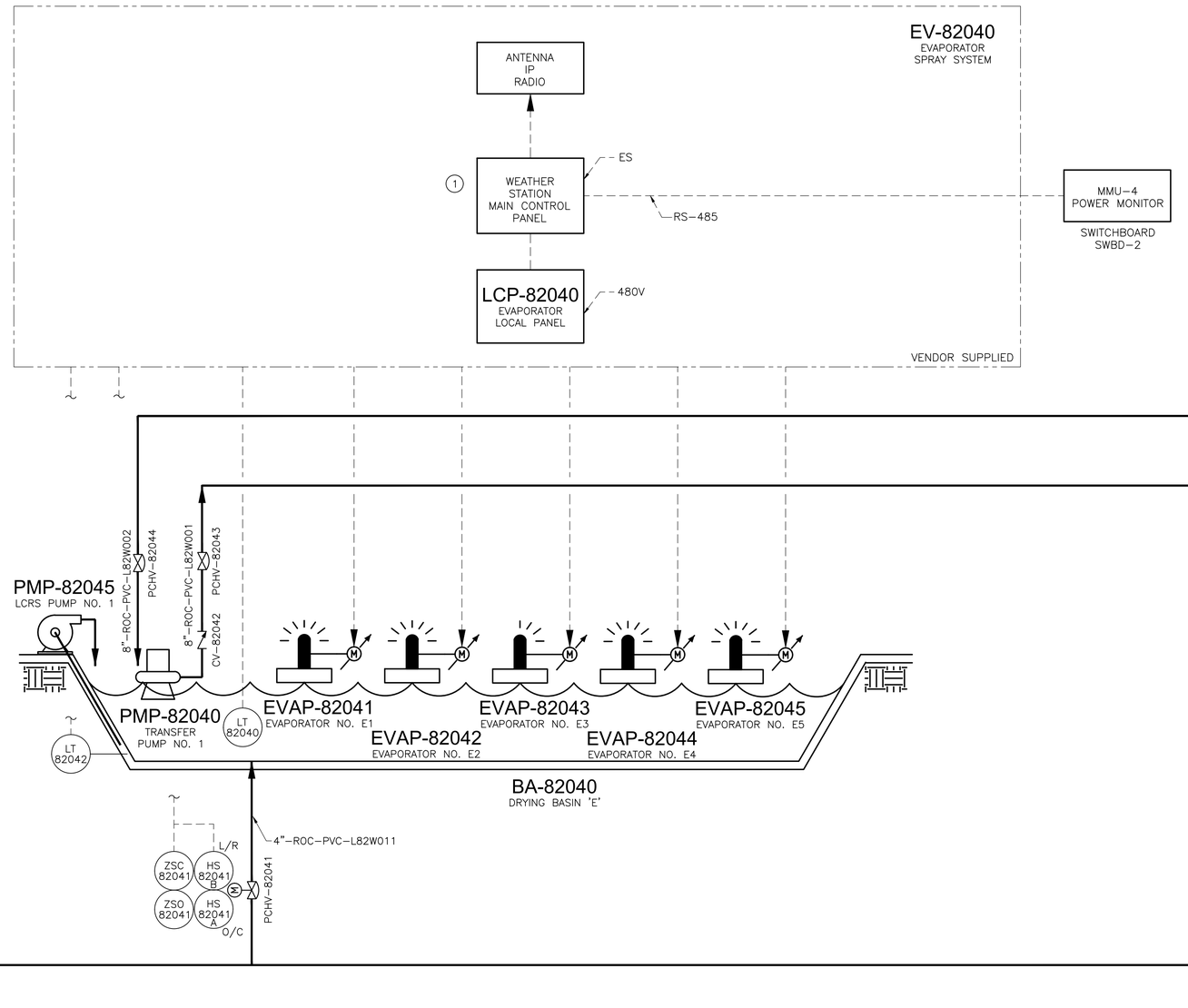
NOTES:

(1) VENDOR SUPPLIED WEATHER STATION INCLUDES WINDSPEED, WIND DIRECTION, HUMIDITY, TEMPERATURE AND RAIN MEASUREMENTS.

(2) THE IP RADIO ANTENNA SHALL BE MOUNTED ON THE ROOF OF THE CONTROL SHELTER.



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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM
EVAPORATION PONDS - SHEET 1

PROJECT NO. 26793-214344
FILE NAME: 82-I-001.dwg
SHEET NO.
82-I-001

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EV-820□0
EVAPORATOR
SPRAY SYSTEM

LCP-820□0
EVAPORATOR
LOCAL PANEL

480V

TO WEATHER STATION
MAIN CONTROL PANEL

VENDOR SUPPLIED

8"-ROC-HDPE-L82W008

8"-ROC-HDPE-L82W010

82-I-003
POND WATER

8"-ROC-HDPE-L82W002

82-I-001
POND WATER

8"-ROC-HDPE-L82W006

8"-ROC-HDPE-L82W001

82-I-001
POND WATER

8"-ROC-PVC-L82W005

8"-ROC-PVC-L82W014

8"-ROC-PVC-L82W007

8"-ROC-HDPE-L82W004

82-I-003
POND WATER

8"-ROC-PVC-L82W009

8"-ROC-PVC-L82W003

PCHV-82064

PCHV-82063

CV-82062

PCHV-82074

PCHV-82073

CV-82072

PMP-820□5
LCRS PUMP NO. 2

PMP-82075
LCRS PUMP NO. 3

PMP-820□0
TRANSFER
PUMP NO. 2

LT
82060

EVAP-820□1
EVAPORATOR NO. D1

EVAP-820□3
EVAPORATOR NO. D3

EVAP-820□5
EVAPORATOR NO. D5

EVAP-820□7
EVAPORATOR NO. D7

EVAP-820□2
EVAPORATOR NO. D2

EVAP-820□4
EVAPORATOR NO. D4

EVAP-820□□
EVAPORATOR NO. D6

PMP-82070
TRANSFER
PUMP NO. 3

LT
82070

LT
82071

LT
82072

BA-820□0
DRYING BASIN 'D'

BA-82070
DRYING BASIN 'C'

4"-ROC-PVC-L82W025

4"-ROC-PVC-L82W019

L/R

ZSC
82061

HS
82061
B

ZSO
82061

HS
82061
A

O/C

PCHV-82061

ZSC
82071

HS
82071
B

ZSO
82071

HS
82071
A

O/C

PCHV-82071

82-I-001
RO CONCENTRATE

4"-ROC-PVC-L5382

4"-ROC-PVC-L5382

82-I-003
RO CONCENTRATE

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
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SHEET CHK'D BY:
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PURIFIED WATER
REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM
EVAPORATION PONDS - SHEET 2

PROJECT NO. 26793-214344
FILE NAME: 82-I-002.dwg
SHEET NO.
82-I-002

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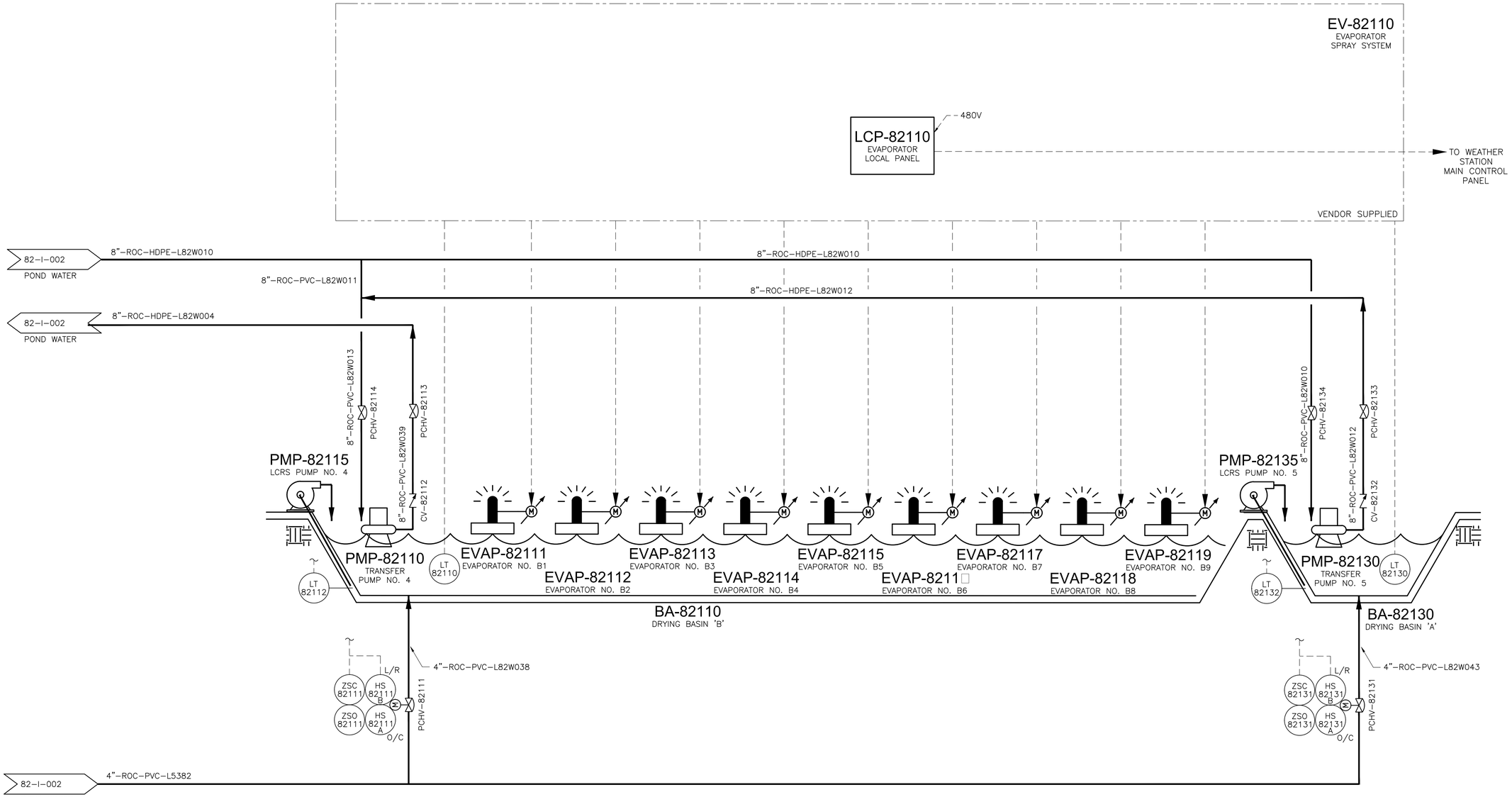

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
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SHEET CHK'D BY:
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EASTERN MUNICIPAL WATER DISTRICT

PURIFIED WATER
REPLENISHMENT PROJECT

PROCESS AND INSTRUMENTATION DIAGRAM
EVAPORATION PONDS - SHEET 3

PROJECT NO. 26793-214344
FILE NAME: 82-I-003.dwg
SHEET NO.
82-I-003

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Appendix H

SJVRWRF Secondary vs. Tertiary Effluent Evaluation

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Memorandum

To: *David Ahles, P.E., Senior Civil Engineer, Eastern Municipal Water District;*
John Wuerth, Recycled Water Program Analyst, Eastern Municipal Water District

From: *Robert Chalmers, P.E., Vice President, CDM Smith*
Jessica Koop, Project Engineer, CDM Smith

Date: *August 8, 2017*

Subject: *SJVRWRF Secondary vs. Tertiary Effluent for AWPF Evaluation*

This evaluation includes a review of San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) secondary versus tertiary effluent for further treatment through the Advanced Water Purification Facility (AWPF).

This evaluation was initiated for two reasons:

- Concerns over polymer used at SJVRWRF and the impact this polymer carryover may have on fouling the microfiltration (MF) membranes.
- For the tertiary effluent, there are two potential locations where the connection could be made for the AWPF, which are tertiary recycled water after the chlorine contact tank or the tertiary effluent pump station (TEPS).

MF membrane fouling has been encountered at other facilities with similar polymer usages in their wastewater treatment processes. Initially, polymer addition used in the tertiary treatment processes (rapid mix process) at SJVRWRF was the main concern and the use of secondary effluent may have been a solution to mitigate this potential problem. Polymer is also used in biosolids processing, where the biosolids sidestreams are returned to the either the primary influent or primary effluent splitter boxes, as well as added upstream of the secondary clarifiers. Thus, residual polymer is also expected in the secondary effluent and the impact on the MF membranes is likely to be similar for secondary and tertiary effluent.

The two potential locations for tertiary effluent are the existing chlorine contact tank or the TEPS. The two sources could have different water quality as the TEPS pumps from the tertiary effluent storage ponds and could have algae in the water. Connecting at the TEPS would eliminate the need for an influent pump station at the AWPF, but is oversized for the required AWPF influent pressure.

This memorandum presents a comparison of the three potential water sources (secondary effluent, tertiary effluent at the existing chlorine contact tank, and tertiary effluent at TEPS) as the source water for the AWPF.

Description

Three different influent sources were evaluated for advanced treatment for the Indirect Potable Reuse (IPR) preliminary design project. The following provides a description of each influent source and the associated treatment process:

1. Secondary Effluent – secondary effluent from the secondary effluent equalization basins at SJVRWRF, just upstream of the secondary effluent junction structure, would be pumped to the AWPF. The AWPF influent would be dosed with sodium hypochlorite and aqueous ammonia to achieve a 3-5 mg/L of residual chloramines to control bacteria growth on the membranes. The AWPF will include MF and reverse osmosis (RO) treatment followed by UV disinfection prior to pumping to the recharge ponds. The MF and UV disinfection would provide filtration and disinfection to meet the requirements of disinfected tertiary recycled water per Title 22 Paragraph 60301.230, which is required for indirect potable reuse projects with surface application per Title 22 Paragraph 60320.108, Pathogenic Microorganism Control.

2. Tertiary Effluent, Chlorine Contact – tertiary effluent would be pumped from the chlorine contact basins at SJVRWRF to the AWPF, just upstream of the tertiary effluent storage ponds. The AWPF influent would be dosed with sodium bisulfite to remove free chlorine in the influent and then dosed with sodium hypochlorite and aqueous ammonia to achieve a 3-5 mg/L of residual chloramines to control bacteria growth on the membranes. The AWPF would include MF and RO treatment prior to pumping to the recharge ponds.

3. Tertiary Effluent, TEPS – tertiary effluent would be pumped to the AWPF from the TEPS at SJVRWRF, just downstream of the tertiary effluent storage ponds. It is assumed that the free chlorine is removed in the storage ponds but the operators could dose sodium bisulfite on an as needed basis. The AWPF influent would be dosed with sodium hypochlorite and aqueous ammonia to achieve a 3-5 mg/L of residual chloramines to control bacteria growth on the membranes. The AWPF would include MF and RO treatment prior to pumping to the recharge ponds.

In all cases, the primary treatment processes achieve nitrification, representing a well oxidized effluent. Most MF systems operating on recycled water are primarily fouled by poorly oxidized organics present in secondary and tertiary effluents. Nitrified effluents have been shown to cause less membrane fouling at utilities such as Yucaipa Valley Water District.

Advantages & Disadvantages

The following tables summarizes the advantages and disadvantages for each influent source:

Table 1 – Advantages Table

Advantages		
Secondary Effluent	**Tertiary Effluent, Chlorine Contact**	**Tertiary Effluent, TEPS**
▪ Uses MF treatment for tertiary filtration and avoids cost of tertiary treatment at SJVRWRF. ▪ Sodium bisulfite addition is not required. ▪ Achieves the same log-removal credits for MF as tertiary treatment alternatives. ▪ Less likelihood of disinfection byproduct (DBP) production because effluent is not chlorinated. ▪ Reserves tertiary treatment capacity for future increased wastewater flows. ▪ Public perception of not taking Title 22 recycled water from farmers.	▪ Cleanest water from SJVRWRF, no algae or copper sulfate addition. ▪ Relies on existing disinfection process and UV disinfection is not required. ▪ Public perception of using the cleanest water from SJVRWRF. ▪ Lowest total suspended solids (TSS) of influent water. Due to the low TSS, could lead to the longest interval between MF cleanings but depends on impact of TSS vs. polymers. Only pilot testing can quantify impact. ▪ Less likely to have to shut down AWPF due to SJVRWRF upsets. ▪ Influent pump station can be located at the AWPF and limits operation and maintenance for the entire AWPF to one site.	▪ Relies on existing pump station and influent pumping is not required at AWPF. ▪ Sodium bisulfite addition may not be required. ▪ Relies on existing disinfection process and UV disinfection is not required. ▪ Less likely to have to shut down AWPF due to SJVRWRF upsets. ▪ Shortest influent pipeline.

Table 2 – Disadvantages Table

Disadvantages		
Secondary Effluent	**Tertiary Effluent, Chlorine Contact**	**Tertiary Effluent, TEPS**
▪ Influent pump station will be required at SJVRWRF, remote from AWPF. Operators will have to access two different sites to maintain and operate the AWPF. ▪ UV disinfection will be required for disinfection and to achieve required log removal credits.	▪ Paying for more treatment than is necessary since MF is required upstream of RO. ▪ Highest free chlorine residual and requires sodium bisulfite addition. ▪ Potential for DBP production.	▪ Paying for more treatment than is necessary since MF is required upstream of RO. ▪ More pumping head provided by TEPS than is necessary for AWPF, more power usage. ▪ Potential for DBP production.

Disadvantages		
Secondary Effluent	**Tertiary Effluent, Chlorine Contact**	**Tertiary Effluent, TEPS**
▪ Public perception of treating dirtier water. ▪ Potentially lower flux rate through the MF system. ▪ MF membranes cleanings may be greater depending on impact of TSS vs. polymers. Only pilot testing can quantify impact. ▪ Longest influent pipeline. ▪ Secondary effluent ponds do not allow the same amount of buffer as tertiary effluent ponds. In case of a plant upset, AWPF would need to be shut down. ▪ Polymer addition from the solids handling and DAF process may lead to fouling of the MF membranes. Pilot testing is required to accurately determine impact.	▪ Influent pump station will be required. ▪ Polymer addition from tertiary treatment, DAF process and solids handling may lead to fouling of the MF membranes and alum addition may lead to fouling of the RO membranes. Pilot testing is required to accurately determine impact. ▪ Public perception of taking Title 22 recycled water from farmers.	▪ Algae found on tertiary effluent ponds will require additional treatment. ▪ Copper sulfate used at tertiary ponds to reduces algae and could impact product water quality. ▪ Polymer addition from tertiary treatment, DAF process and solids handling may lead to fouling of the MF membranes and alum addition may lead to fouling of the RO membranes. Pilot testing is required to accurately determine impact. ▪ Public perception of taking Title 22 recycled water from farmers.

Preliminary Costs

The following table summarizes the cost comparison between each influent source and the impact it has on the overall treatment process. Costs are included for **Phase I only** and includes cost that are unique to each alternative (i.e. reverse osmosis systems are required for each alternative; therefore, the costs are not included in the table below). All costs included in the table are for July 2017 and include only costs that could be quantified for items listed in Table 1 and 2.

Table 3 – Preliminary Cost Estimate

Item		Secondary Effluent		Tertiary Effluent, Chlorine Contact		Tertiary Effluent, TEPS	
		Initial Cost	Annual O&M ($/year)	Initial Cost	Annual O&M ($/year)	Initial Cost	Annual O&M ($/year)
Influent Pumping Station (2 x 100 hp pumps)[1]		$200,000	$10,000	$200,000	$10,000	$-	$60,000
UV Disinfection System (2 MGD)[2]		$1,000,000	$37,000	$-	$-	$-	$-
Sodium Bisulfite Chemical System[3]		$-	$-	$77,000	$140,000	$77,000	$14,000
Sodium Hypochlorite Chemical System[4]		$-	$90,000	$-	$34,000	$-	$90,000
Increased Strainer Maintenance[5]		$-	$3,000	$-	$-	$-	$12,000
MF Membrane Area[6]		$2,600,000	$-	$2,000,000	-	$2,600,000	$-
MF System Cleaning[7]		$-	$35,900	$-	$25,200	$-	$35,900
24" Influent Piping to AWPF[8]		$1,027,000	$-	$490,000	$-	$107,000	$-
Subtotal		**$4,900,000**	**$180,000**	**$2,800,000**	**$210,000**	**$2,784,000**	**$220,000**
Contingency Subtotal	0%	$-		$-		$-	
Construction Total		$4,900,000		$2,800,000		$2,784,000	
Contractor's Overhead, Profit, and Insurance	0%	$-		$-		$-	
Construction Total with Contractor's Overhead, Profit, and Insurance		$4,900,000		$2,800,000		$2,800,000	
Implementation Costs	0%	$-		$-		$-	
Total Capital Costs		**$4,900,000**		**$2,800,000**		**$2,800,000**	
Annual O&M Costs			**$180,000**		**$210,000**		**$220,000**
Total Present Worth Cost[9]		**$9,000,000**		**$7,600,000**		**$7,800,000**	

[1]O&M cost for influent pump station include maintenance cost for the secondary effluent and tertiary effluent, chlorine contact. O&M cost for the tertiary effluent, TEPS includes energy lost due to more head than is necessary from the Perris Valley TEP. O&M cost does not include operational cost required for pumping to the AWPF since all scenarios are assumed to be the same.

[2]Assumes UV disinfection is required for only secondary effluent source water and not required for tertiary effluent sources.

[3]In the tertiary effluent- chlorine contact, sodium bisulfite installation and chemical cost is included assume a residual chlorine concentration in source water of 10 mg/L. In the tertiary effluent- TEPS, sodium bisulfite installation and minimal chemical cost is included due to limited use of the system due to lower residual chlorine in source water.

[4]Initial cost for installation of the sodium hypochlorite system is assumed to be the same in all three alternatives and is, therefore, not included in cost estimate. It is assumed that there is additional chlorine demand in secondary effluent and tertiary effluent – TEPS.

[5]Initial cost for installation of the strainers is assumed to be the same in all three alternatives and is, therefore, not included in cost estimate. It is assumed that there is additional maintenance required for the secondary effluent and tertiary effluent – TEPS.

[6]Additional MF membrane area is assumed for the secondary effluent and tertiary effluent – TEPS due to lower quality source water. Maintenance is assumed the same in all three alternatives except what is included in the MF cleaning cost item.

[7]More frequent cleanings are assumed for the MF membranes for the secondary effluent and tertiary effluent – TEPS due to lower quality source water. MF cleaning system installation is assumed to be constant between all three alternatives.

[8]Influent piping is assumed to extend approximately 300-feet into the AWPF site. It is assumed that influent piping will tap into the existing effluent piping along the front of the AWPF for the tertiary effluent – TEPS alternative.

[9]O&M Present Worth Cost assumed at a 2% interest rate over 30 years.

Conclusion

Based on the above advantages/disadvantages and preliminary cost differences, CDM Smith recommends tertiary effluent from the chlorine contact basins at SJVRWRF as the influent source for the AWPF. There is an existing cross-connection between the chlorine contact basins and TEPS. We recommend installing an additional influent pipeline to the existing TEPS Perris Valley effluent pipeline to utilize TEPS during periods of low algae in the tertiary effluent ponds or when flow from the chlorine contact basin is directed to the TEPS. CDM Smith also recommends pilot testing the various effluent sources to confirm their impact to the MF membranes.

Appendix I

Preliminary Cost Estimate Tables

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Opinion of Probable Construction Costs

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CDM Smith

Eastern Municipal Water District
IPR Project - AWPF Contract - Phase I

OPCC - 30% Design - December 2017

Project name	Indirect Potable Reuse San Jacinto CA Riverside
Estimator	RM, NC, SY
Labor rate table	CA17 Riverside
Equipment rate table	00 17 Equip Rate BF
Bid date	3/30/2018 5:00 PM
Notes	Opinion of Probable Construction Cost (OPCC) This is an Opinion of Probable Construction Cost only, as defined by the documents provided at the level of design indicated above. CDM has no control over the cost of labor, materials, equipment, or services furnished, over schedules, over contractor's methods of determining prices, competitive bidding, market conditions or negotiating terms. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids. There are not any costs provided for: Change Orders, Design Engineering, Construction Oversight, Client Costs, Finance or Funding Costs, Legal Fees, Land Acquisition or temporary/permanent Easements, Operations, or any other costs associated with this project that are not specifically part of the bidding contractor's proposed scope. Clarifications: 1. This OPCC is for Phase I only based on 30% Design Submittal. Phase II is excluded 2. AACE Class 3 Estimate, Engineering from 10% to 40% complete, -10% to -20% on the low side, and +10% to +30% on the high side 3. Contingency at 20% 4. Escalation at midpoint of construction - Not in Cost
Report format	Sorted by 'Bid Item/Area/95CSI Sctn/Element' 'Detail' summary Allocate addons

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
001 Contract No. 1 - Advanced Water Purification Facility (AWPF)									
005 General Requirements									
01590 Safety/Traffic/Pollution Control									
01590.50100 SWPPP									
Gravel @ Construction Entrance	100.00 sy	1.200	91	-	81	-	808	9.81 /sy	981
Roads, Parking & Laydown, Gravel Fill 6" deep	2,500.00 sy	15.000	1,142	-	1,017	-	10,775	5.17 /sy	12,934
Storm Water Discharge Plan & NPDS Permit	1.00 ea		-	-	-	-	2,694	2,693.75 /ea	2,694
Maintain Silt Fence	24.00 mo	384.000	26,125	-	-	-	-	1,088.54 /mo	26,125
Silt Fence - Wire Reinforced 3' Tall	2,577.00 lf	51.540	3,864	2,478	1,629	-	-	3.09 /lf	7,971
Remove Erosion Control	1.00 ls	40.000	2,721	-	-	-	-	2,721.36 /ls	2,721
01590.50100 SWPPP	**1.00 ls**	**491.740**	**33,944**	**2,478**	**2,727**		**14,277**	**53,426.29 /ls**	**53,426**
01590 Safety/Traffic/Pollution Control		**491.740**	**33,944**	**2,478**	**2,727**		**14,277**		**53,426**
005 General Requirements		**491.740**	**33,944**	**2,478**	**2,727**		**14,277**		**53,426**
010 Site Work									
02600 Drainage & Containment									
02600.50100 Stormwater Management per PDR 5.3.3									
Allowance for Drainage System & SW Detention Basin	1.00 ls		0	-		***150,000***	-	150,000.02 /ls	150,000
02600.50100 Stormwater Management per PDR 5.3.3	**1.00 ls**		**0**			**150,000**		**150,000.02 /ls**	**150,000**
02600 Drainage & Containment			**0**			**150,000**			**150,000**
02710 Base Courses									
02710.50100 Base Course Under Road Paving 6" Thick									
Aggregate Base-Roads	2,329.00 cy	66.941	6,078	-	4,368	-	-	4.49 /cy	10,447
Aggregate Base	2,329.00 cy		-	44,629	-	13,042	-	24.76 /cy	57,672
02710.50100 Base Course Under Road Paving 6" Thick	**2,329.00 cy**	**66.941**	**6,078**	**44,629**	**4,368**	**13,042**		**29.25 /cy**	**68,119**
02710.50105 Base Course Under Parking Paving 6" Thick									
Aggregate Base-Roads	257.00 cy	7.387	671	-	482	-	-	4.49 /cy	1,153
Aggregate Base	257.00 cy		-	4,925	-	1,439	-	24.76 /cy	6,364
02710.50105 Base Course Under Parking Paving 6" Thick	**257.00 cy**	**7.387**	**671**	**4,925**	**482**	**1,439**		**29.25 /cy**	**7,517**
02710 Base Courses		**74.328**	**6,749**	**49,554**	**4,850**	**14,482**			**75,635**
02740 Asphalt Paving									
02740.50100 Access Road 24' Wide 4" Thick									
Roadway- Bituminous Surface/Wearing Course 2.0"	13,969.00 sy	140.901	12,401	150,571	6,739	23,573	-	13.84 /sy	193,284
Roadway- Bituminous Binder/Intermediate Course 2.0"	13,969.00 sy	140.901	12,401	150,571	6,739	23,573	-	13.84 /sy	193,284
Roadway- Bituminous Base Course 4"	13,969.00 sy	196.703	17,313	290,434	9,408	45,469	-	25.96 /sy	362,624
Roadway- Tack Coat	13,969.00 sy		-	6,692	2,855	-	-	0.68 /sy	9,547
02740.50100 Access Road 24' Wide 4" Thick	**13,969.00 sy**	**478.505**	**42,116**	**598,267**	**25,741**	**92,614**		**54.32 /sy**	**758,738**
02740.50105 Parking 4" Thick									
Roadway- Bituminous Surface/Wearing Course 2.0"	1,543.00 sy	15.564	1,370	16,632	744	2,604	-	13.84 /sy	21,350
Roadway- Bituminous Binder/Intermediate Course 2.0"	1,543.00 sy	15.564	1,370	16,632	744	2,604	-	13.84 /sy	21,350
Roadway- Bituminous Base Course 4"	1,543.00 sy	21.728	1,912	32,081	1,039	5,022	-	25.96 /sy	40,055
Roadway- Tack Coat	1,543.00 sy		-	739	315	-	-	0.68 /sy	1,055
02740.50105 Parking 4" Thick	**1,543.00 sy**	**52.856**	**4,652**	**66,084**	**2,843**	**10,230**		**54.32 /sy**	**83,809**
02740 Asphalt Paving		**531.361**	**46,768**	**664,351**	**28,585**	**102,845**			**842,548**
02760 Pavement Specialty & Mark									
02760.50100 Road and Parking Markings									
Thermal Lines 8" Wide	2,273.00 lf		-	-	-	2,500	-	1.10 /lf	2,500
Parking Spaces	30.00 ea		-	-	-	300	-	10.00 /ea	300
Parking Spaces Handicap	2.00 ea		-	-	-	40	-	20.00 /ea	40
Painted Crosswalks	96.00 sf		-	-	-	192	-	2.00 /sf	192
Painted Handicap Symbol	2.00 ea		-	-	-	260	-	130.00 /ea	260
Painted Arrows	8.00 ea		-	-	-	160	-	20.00 /ea	160
Painted Letters	4.00 ea		-	-	-	80	-	20.00 /ea	80
02760.50100 Road and Parking Markings	**1.00 ls**					**3,532**		**3,532.30 /ls**	**3,532**
02760 Pavement Specialty & Mark						**3,532**			**3,532**
02775 Concrete Walkwalks									
02775.50100 From Parking and Around Building									
6" Sidewalks	4,769.00 sf		-	-	-	28,614	-	6.00 /sf	28,614
02775.50100 From Parking and Around Building	**4,769.00 sf**					**28,614**		**6.00 /sf**	**28,614**
02775 Concrete Walkwalks						**28,614**			**28,614**
02820 Fencing									
02820.50100 Security Enclosure									
6' Chain Link Fence	1,009.00 lf		-	-	-	20,180	-	20.00 /lf	20,180
6' Chain Link Fence Vehicle Gate 24' Wide	2.00 ea		-	-	-	1,600	-	800.00 /ea	1,600

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
02820.50100 Security Enclosure	**1,009.00 lf**					**21,780**		**21.59 /lf**	**21,780**
02820 Fencing						**21,780**			**21,780**
03000 Structures - Equipment Pads									
03000.50100 Generator Pad									
Mob / DeMob Earthwork Equip (2hr each way)	0.10 ea	0.400	31	-	43	-	-	735.90 /ea	74
Excav- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	11.60 cy	0.405	40	-	30	-	-	6.05 /cy	70
Load & Haul Cut to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	11.60 cy	0.439	35	-	25	-	-	5.19 /cy	60
Foundation Subgrade- Scarify & Recompact	156.60 sf	0.545	47	-	15	-	-	0.40 /sf	62
Place Backfill from Stockpile- Backhoe Loader C466- 7MT- 95HP/1.5cy/Plate Compactor (2ea)	5.60 cy	2.688	234	-	80	-	-	56.18 /cy	315
Load & Haul Backfill from Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	5.60 cy	0.212	17	-	12	-	-	5.19 /cy	29
Import Aggregate Base Fill	2.90 cy		-	72	-	21	-	32.19 /cy	93
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	7.90 cy	0.066	6	-	5	-	-	1.44 /cy	11
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	7.90 cy	1.129	87	-	107	-	-	24.64 /cy	195
Concrete: Foundation	5.00 cy	15.000	1,388	2,268	157	-	-	762.47 /cy	3,812
03000.50100 Generator Pad	**5.00 cy**	**20.884**	**1,887**	**2,340**	**474**	**21**		**944.37 /cy**	**4,722**
03000.50105 Transformer Pad									
Mob / DeMob Earthwork Equip (2hr each way)	0.08 ea	0.320	25	-	34	-	-	735.88 /ea	59
Excav- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	9.28 cy	0.324	32	-	24	-	-	6.05 /cy	56
Load & Haul Cut to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	9.28 cy	0.352	28	-	20	-	-	5.19 /cy	48
Foundation Subgrade- Scarify & Recompact	125.28 sf	0.436	38	-	12	-	-	0.40 /sf	50
Place Backfill from Stockpile- Backhoe Loader C466- 7MT- 95HP/1.5cy/Plate Compactor (2ea)	4.48 cy	2.150	188	-	64	-	-	56.18 /cy	252
Load & Haul Backfill from Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	4.48 cy	0.170	14	-	10	-	-	5.19 /cy	23
Import Aggregate Base Fill	2.32 cy		-	58	-	17	-	32.19 /cy	75
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	6.32 cy	0.053	5	-	4	-	-	1.44 /cy	9
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	6.32 cy	0.903	70	-	86	-	-	24.64 /cy	156
Concrete: Foundation	4.00 cy	12.000	1,110	1,814	125	-	-	762.47 /cy	3,050
03000.50105 Transformer Pad	**4.00 cy**	**16.708**	**1,510**	**1,872**	**379**	**17**		**944.37 /cy**	**3,777**
03000.50120 Chemical Tank Area									
Mob / DeMob Earthwork Equip (2hr each way)	1.00 ea	4.000	310	-	426	-	-	735.80 /ea	736
Excav- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	558.00 cy	19.493	1,916	-	1,461	-	-	6.05 /cy	3,377
Load & Haul Cut to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	558.00 cy	21.136	1,695	-	1,200	-	-	5.19 /cy	2,895
Foundation Subgrade- Scarify & Recompact	6,029.00 sf	20.970	1,829	-	575	-	-	0.40 /sf	2,403
Place Backfill from Stockpile- Backhoe Loader C466- 7MT- 95HP/1.5cy/Plate Compactor (2ea)	365.00 cy	175.200	15,277	-	5,228	-	-	56.18 /cy	20,504
Load & Haul Backfill from Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	253.00 cy	9.583	769	-	544	-	-	5.19 /cy	1,313
Import Aggregate Base Fill	112.00 cy		-	2,790	-	815	-	32.19 /cy	3,605
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	305.00 cy	2.542	250	-	190	-	-	1.44 /cy	440
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	305.00 cy	43.571	3,377	-	4,139	-	-	24.64 /cy	7,516
Concrete: Foundation	156.00 cy	468.000	43,306	70,748	4,892	-	-	762.47 /cy	118,946
Concrete: Curb	40.00 cy	360.000	33,312	20,696	4,646	-	-	1,466.34 /cy	58,653
Chemical-Resistant/Special Coating- (Prime & 2 Coats)	8,867.00 sf	354.680	25,471	14,459	-	-	-	4.50 /sf	39,930
03000.50120 Chemical Tank Area	**156.00 cy**	**1,479.176**	**127,511**	**108,692**	**23,300**	**815**		**1,668.71 /cy**	**260,319**
03000.50500 Foundation & SOG									
Chemical-Resistant/Special Coating- (Prime & 2 Coats); Metering Pumps Area	1,903.00 sf	76.120	5,466	3,103	-	-	-	4.50 /sf	8,570
03000.50500 Foundation & SOG	**1,903.00 sf**	**76.120**	**5,466**	**3,103**				**4.50 /sf**	**8,570**
03000 Structures - Equipment Pads		**1,592.887**	**136,374**	**116,007**	**24,153**	**853**			**277,388**
010 Site Work		**2,198.576**	**189,891**	**829,912**	**57,588**	**322,106**			**1,399,497**
018 Pipe From AWPF (Finished Water) to Slip Lining Location									
02300 Site Preparation									
02300.00.018.10 Trench/Earthwork for 24" PW-ELSP from AWPF to Slip Lining Location									
Layout & Stake Pipe Excavation	4,500.00 lf	22.500	2,096	575	-	-	-	0.59 /lf	2,671
Trenching- Excavator C320-20MT- 140HP/1.25cy- Average Exc.	7,416.21 cy	185.405	18,617	-	18,761	-	-	5.04 /cy	37,379
Trench Bedding-Excavator C320-20MT- 140HP/1.25cy	345.83 cy	34.583	3,040	-	1,335	-	-	12.65 /cy	4,374
Trench Pipe Zone Excavator C320-20MT- 140HP/1.25cy	1,573.67 cy	251.787	22,132	-	9,717	-	-	20.24 /cy	31,849
Trench Native Backfill- Loader C938 3cy	4,891.63 cy	366.872	31,990	-	10,459	-	-	8.68 /cy	42,449
3/8 Stone Bedding/Zone/Engineered Fill Material	345.83 cy		-	13,669	-	2,518	-	46.81 /cy	16,187
3/8 Stone Bedding/Zone/Engineered Fill Material	1,573.67 cy		-	62,200	-	11,456	-	46.81 /cy	73,657
Load & Haul Trenching Spoils to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	2,524.58 cy	95.628	7,670	-	5,429	-	-	5.19 /cy	13,099
Trench Shield- 8x20	5.00 u/mo		-	-	11,140	-	-	2,227.96 /u/mo	11,140
Pipe Detectable/Non-Detectable Tape	4,500.00 lf	22.500	1,848	316	-	-	-	0.48 /lf	2,164
Pipe Test	4,500.00 lf	225.000	20,960	4,599	-	-	-	5.68 /lf	25,559
Load Spoils from Stockpile Cat 325 Excavator-32MT- 180hp	2,524.58 cy	21.038	2,113	-	2,828	-	-	1.96 /cy	4,941
Haul Spoils/Off Site 18cy Rear Dump 2 Load/Hour	2,524.58 cy	91.140	7,064	-	8,657	-	-	6.23 /cy	15,721
02300.00.018.10 Trench/Earthwork for 24" PW-ELSP from AWPF to Slip Lining Location	**4,500.00 lf**	**1,316.454**	**117,528**	**81,360**	**68,327**	**13,974**		**62.49 /lf**	**281,189**
02300 Site Preparation		**1,316.454**	**117,528**	**81,360**	**68,327**	**13,974**			**281,189**
15245 Polyethylene Pipe									
15245.50018A HDPE Pipe from AWPF to Slip Lining Location - 24" dia.									
Unload Care & Protect HDPE Pipe & Fittings	4,500.00 lf	1.485	108	-	21	-	-	0.03 /lf	129
Layout HDPE Pipe & Fitting	4,500.00 lf	45.000	3,703	-	-	-	-	0.82 /lf	3,703

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15245.50018A HDPE Pipe from AWPF to Slip Lining Location - 24" dia.									
Plastic Pipe Equipment- Cat 320 Excavator	338.68 ch	338.684	30,041	-	30,516	-	-	178.80 /ch	60,557
HDPE IPS, Butt-Fused Pipe, DR 13.5, 24"	4,500.00 lf	1,440.000	118,491	349,662	-	-		104.03 /lf	468,153
HDPE IPS, Butt-Fused, 90 Bnd, DR 13.5, 24"	3.00 ea	30.300	2,493	4,285	-	-		2,259.45 /ea	6,778
HDPE IPS, Butt-Fused 22.5 Bend, DR 13.5, 24"	2.00 ea	18.520	1,524	941	-	-		1,232.62 /ea	2,465
HDPE IPS, Butt-Fused Concentric Reducer, DR 13.5, 24 x 18	1.00 ea	8.040	662	885	-	-		1,546.59 /ea	1,547
Mileage & Per Diem for Tech	2.00 trip		-	-	-	900	683	791.25 /trip	1,583
HDPE Fusion Machine & Tech 8"-24"	42.34 day		-	-	33,710	16,934	-	1,196.25 /day	50,644
15245.50018A HDPE Pipe from AWPF to Slip Lining Location - 24" dia.	**4,500.00 lf**	**1,882.029**	**157,022**	**355,773**	**64,247**	**17,834**	**683**	**132.35 /lf**	**595,559**
15245 Polyethylene Pipe	**4,500.00 LF**	**1,882.029**	**157,022**	**355,773**	**64,247**	**17,834**	**683**	**132.35 /LF**	**595,559**
018 Pipe From AWPF (Finished Water) to Slip Lining Location		**3,198.483**	**274,550**	**437,133**	**132,574**	**31,808**	**683**		**876,748**
035 Yard Pipe									
02300 Site Preparation									
02300.00.035.10 Earthwork from SJVRWRF to Influent Pump									
Layout & Stake Pipe Excavation	2,000.00 lf	10.000	932	256	-	-	-	0.59 /lf	1,187
Trenching- Excavator C320-20MT- 140HP/1.25cy- Average Exc.	1,779.75 cy	44.494	4,468	-	4,502	-	-	5.04 /cy	8,970
Trench Bedding-Excavator C320-20MT- 140HP/1.25cy	116.67 cy	11.667	1,025	-	450	-	-	12.65 /cy	1,476
Trench Pipe Zone Excavator C320-20MT- 140HP/1.25cy	466.07 cy	74.572	6,555	-	2,878	-	-	20.24 /cy	9,433
Trench Native Backfill- Loader C938 3cy	928.08 cy	69.606	6,069	-	1,984	-	-	8.68 /cy	8,054
Sand Bedding/Zone/Engineered Fill Material	116.67 cy		-	4,650	-	971	-	48.18 /cy	5,621
Sand Bedding/Zone/Engineered Fill Material	466.07 cy		-	18,577	-	3,878	-	48.18 /cy	22,454
Load & Haul Trenching Spoils to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	851.67 cy	32.260	2,588	-	1,832	-	-	5.19 /cy	4,419
Pipe Interferences @ Trench Excavation	2.00 ea	8.000	720	256	300	-	-	637.50 /ea	1,275
Pipe Test	2,000.00 lf	100.000	9,315	2,044	-	-	-	5.68 /lf	11,359
Pipe Locates (Pot Hole)	4.00 ea	16.000	1,440	256	599	-	-	573.62 /ea	2,294
Concrete Thrust Block, 24"	5.00 ea	22.500	2,096	549	-	-	-	529.06 /ea	2,645
Load Spoils from Stockpile Cat 325 Excavator-32MT- 180hp	851.67 cy	7.097	713	-	954	-	-	1.96 /cy	1,667
Haul Spoils/Off Site 18cy Rear Dump 2 Load/Hour	851.67 cy	30.746	2,383	-	2,920	-	-	6.23 /cy	5,303
02300.00.035.10 Earthwork from SJVRWRF to Influent Pump	**2,000.00 lf**	**426.942**	**38,303**	**26,587**	**16,420**	**4,848**		**43.08 /lf**	**86,158**
02300 Site Preparation		**426.942**	**38,303**	**26,587**	**16,420**	**4,848**			**86,158**
15245 Polyethylene Pipe									
15245.50035A HDPE Pipe from SJVRWRF Chlorine Contact Basin to Influent Pump, 24" d									
Unload Care & Protect HDPE Pipe & Fittings	2,000.00 lf	0.660	48	-	9	-	-	0.03 /lf	57
Layout HDPE Pipe & Fitting	2,000.00 lf	20.000	1,646	-	-	-	-	0.82 /lf	1,646
Plastic Pipe Equipment- Cat 320 Excavator	147.19 ch	147.192	13,056	-	13,262	-	-	178.80 /ch	26,318
HDPE IPS, Butt-Fused Pipe, DR 13.5, 24"	2,000.00 lf	640.000	52,663	155,405	-	-		104.03 /lf	208,068
HDPE IPS, Butt-Fused, 90 Bnd, DR 13.5, 24"	3.00 ea	30.300	2,493	4,285	-	-		2,259.45 /ea	6,778
Mileage & Per Diem for Tech	1.00 trip		-	-	-	450	341	791.25 /trip	791
HDPE Fusion Machine & Tech 8"-24"	18.40 day		-	-	14,650	7,360	-	1,196.25 /day	22,010
15245.50035A HDPE Pipe from SJVRWRF Chlorine Contact Basin to Influent Pump, 24" d	**2,000.00 lf**	**838.152**	**69,906**	**159,690**	**27,922**	**7,810**	**341**	**132.83 /lf**	**265,669**
15245.50035B HDPE Pipe from SJVRWRF TEPS to Process Stream, 24" dia.									
Unload Care & Protect HDPE Pipe & Fittings	536.00 lf	0.177	13	-	3	-	-	0.03 /lf	15
Layout HDPE Pipe & Fitting	536.00 lf	5.360	441	-	-	-	-	0.82 /lf	441
Plastic Pipe Equipment- Cat 320 Excavator	39.45 ch	39.450	3,499	-	3,554	-	-	178.80 /ch	7,054
HDPE IPS, Butt-Fused Pipe, DR 13.5, 24"	536.00 lf	171.520	14,114	41,649	-	-		104.03 /lf	55,762
HDPE IPS, Butt-Fused, 90 Bnd, DR 13.5, 24"	3.00 ea	30.300	2,493	4,285	-	-		2,259.45 /ea	6,778
HDPE IPS, Butt-Fused Tee, DR 13.5, 24"	1.00 ea	14.930	1,229	1,482	-	-		2,710.62 /ea	2,711
Mileage & Per Diem for Tech	1.00 trip		-	-	-	450	341	791.25 /trip	791
HDPE Fusion Machine & Tech 8"-24"	4.93 day		-	-	3,926	1,972	-	1,196.25 /day	5,898
15245.50035B HDPE Pipe from SJVRWRF TEPS to Process Stream, 24" dia.	**536.00 LF**	**261.737**	**21,789**	**47,416**	**7,483**	**2,422**	**341**	**148.23 /LF**	**79,450**
15245.50035C HDPE Pipe from Process Stream Discharge to SJVRWRF, 24" dia.									
Unload Care & Protect HDPE Pipe & Fittings	2,000.00 lf	0.660	48	-	9	-	-	0.03 /lf	57
Layout HDPE Pipe & Fitting	2,000.00 lf	20.000	1,646	-	-	-	-	0.82 /lf	1,646
Plastic Pipe Equipment- Cat 320 Excavator	147.19 ch	147.192	13,056	-	13,262	-	-	178.80 /ch	26,318
HDPE IPS, Butt-Fused Pipe, DR 13.5, 24"	2,000.00 lf	640.000	52,663	155,405	-	-		104.03 /lf	208,068
HDPE IPS, Butt-Fused, 90 Bnd, DR 13.5, 24"	3.00 ea	30.300	2,493	4,285	-	-		2,259.45 /ea	6,778
HDPE IPS, Butt-Fused 45 Bend, DR 13.5, 24"	2.00 ea	18.520	1,524	1,763	-	-		1,643.29 /ea	3,287
HDPE IPS, Butt-Fused Tee, DR 13.5, 24 x 16	1.00 ea	14.930	1,229	1,139	-	-		2,367.84 /ea	2,368
Mileage & Per Diem for Tech	1.00 trip		-	-	-	450	341	791.25 /trip	791
HDPE Fusion Machine & Tech 8"-24"	20.00 day		-	-	15,925	8,000	-	1,196.25 /day	23,925
15245.50035C HDPE Pipe from Process Stream Discharge to SJVRWRF, 24" dia.	**2,000.00 LF**	**871.602**	**72,658**	**162,592**	**29,197**	**8,450**	**341**	**136.62 /LF**	**273,238**
15245 Polyethylene Pipe	**4,536.00 LF**	**1,971.491**	**164,352**	**369,698**	**64,601**	**18,682**	**1,024**	**136.32 /LF**	**618,357**
035 Yard Pipe		**2,398.433**	**202,655**	**396,285**	**81,021**	**23,530**	**1,024**		**704,515**
050 Process Control Building									
02315 Earthwork									
02315.50500 Foundation & SOG - Excavation, Bed & Backfill									
Mob / DeMob Earthwork Equip (2hr each way)	1.00 ea	4.000	310	-	426	-	-	735.78 /ea	736
Excav- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	1,909.00 cy	66.690	6,556	-	4,997	-	-	6.05 /cy	11,553

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
02315.50500 Foundation & SOG - Excavation, Bed & Backfill									
Load & Haul Cut to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	1,909.00 cy	72.311	5,800	-	4,105	-	-	5.19 /cy	9,905
Foundation Subgrade- Scarify & Recompact	22,541.00 sf	78.403	6,836	-	2,149	-	-	0.40 /sf	8,985
Place Backfill from Stockpile- Backhoe Loader C466- 7MT- 95HP/1.5cy/Plate Compactor (2ea)	786.00 cy	377.280	32,897	-	11,257	-	-	56.18 /cy	44,154
Load & Haul Backfill from Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	369.00 cy	13.977	1,121	-	794	-	-	5.19 /cy	1,915
Import Aggregate Base Fill	417.00 cy		-	10,388	-	3,036	-	32.19 /cy	13,424
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	1,540.00 cy	12.833	1,262	-	962	-	-	1.44 /cy	2,223
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	1,540.00 cy	220.000	17,052	-	20,896	-	-	24.64 /cy	37,948
02315.50500 Foundation & SOG - Excavation, Bed & Backfill	**1,909.00 cy**	**845.494**	**71,834**	**10,388**	**45,585**	**3,036**		**68.54 /cy**	**130,843**
02315 Earthwork		**845.494**	**71,834**	**10,388**	**45,585**	**3,036**			**130,843**
03000 Structures - Equipment Pads									
03000.50500 Foundation & SOG									
Concrete: Footing	79.00 cy	237.000	21,930	35,827	2,477	-	-	762.47 /cy	60,235
Concrete: Slab on Grade 12" Thick	1,044.00 cy	3,654.000	338,116	460,130	32,740	-	-	795.96 /cy	830,987
Concrete Sealing; Process area	16,127.00 sf	254.162	20,636	8,930	-	-	-	1.83 /sf	29,567
03000.50500 Foundation & SOG	**16,127.00 sf**	**4,145.162**	**380,683**	**504,888**	**35,218**			**57.10 /sf**	**920,789**
03000 Structures - Equipment Pads		**4,145.162**	**380,683**	**504,888**	**35,218**				**920,789**
04200 Masonry									
04200.50500 CMU 4" Split Face & Ground Face Textures with Light Gage Metal Framing									
Exterior Split Face CMU Wall, 4" Thick	1,985.00 sf		-	-	-	49,625	-	25.00 /sf	49,625
Layout Cold-Formed Metal Stud Walls	164.00 lf	0.820	74	-	-	-	-	0.45 /lf	74
Load Bearing Steel Stud 6-0/0" x 1-5/8" 20ga/33mil	1,875.50 lf	48.763	4,389	2,893	-	-		3.88 /lf	7,282
Track- 6-0/0" x 1-1/4" 20ga/33mil	328.00 lf	8.528	768	377	-	-		3.49 /lf	1,145
Track Bridging- 6-0/0" x 1-1/4" 20ga/33mil	656.00 lf	32.800	2,952	867	-	-		5.82 /lf	3,820
Scissor Lift	40.00 ch		-	-	168	-	-	4.19 /ch	168
Strap Bracing- 20ga/33mil x 2"	533.00 lf	5.330	480	463	-	-	-	1.77 /lf	943
04200.50500 CMU 4" Split Face & Ground Face Textures with Light Gage Metal Framing	**1,985.00 sf**	**96.241**	**8,663**	**4,601**	**168**	**49,625**		**31.77 /sf**	**63,056**
04200 Masonry		**96.241**	**8,663**	**4,601**	**168**	**49,625**			**63,056**
05120 Structural Steel (Engineered Building)									
05120.50500 Roof Framing									
1-1/2" Non Shrink Grout under Base Plates	27.00 cf			1,207	-	-	-	44.71 /cf	1,207
W 10x39 Column (24,843 lbs)	637.00 lf	149.058	15,755	63,474	6,435	-	-	134.48 /lf	85,664
W 8x28 Beam (50,232 lbs)	1,794.00 lf	301.392	31,857	128,343	13,011	-	-	96.55 /lf	173,210
Z20020 @ 6 kg/m, 4.02 lb/ft Purlins Channel Beams (11,256 lbs)	2,800.00 lf	90.720	9,589	28,759	3,916	-	-	15.09 /lf	42,264
L 4- x 4- x 1/2 L. Cross-Bracing at Columns (1,638 lbs)	128.00 lf	9.830	1,039	4,186	424	-	-	44.14 /lf	5,650
L 4- x 4- x 1/2 L. Cross-Bracing at Roof (5,786 lbs)	452.00 lf	34.714	3,669	14,782	1,499	-	-	44.14 /lf	19,950
8/16in Steel Gusset Plates (6,371 lbs)	312.00 sf	38.226	4,040	16,277	1,650	-	-	70.41 /sf	21,968
16/16in Steel Base Plates (6,371 lbs)	156.00 sf	38.226	4,040	16,277	1,650	-	-	140.82 /sf	21,968
Galvanize by Fabrication Weight	106,497.00 lbs		-	-	-	-	68,025	0.64 /lbs	68,025
05120.50500 Roof Framing	**53.25 tn**	**662.166**	**69,990**	**273,306**	**28,585**		**68,025**	**8,261.14 /tn**	**439,906**
05120 Structural Steel (Engineered Building)		**662.166**	**69,990**	**273,306**	**28,585**		**68,025**		**439,906**
05140 Aluminum									
05140.50500 Floor Grating and Frames									
3 x3 x1/2 Alum. Angle	308.00 lf	59.635	6,303	3,809	1,880	-	-	38.94 /lf	11,993
2-1/2x3/16 Press.Lok Type DF	1,632.00 sf	277.440	28,991	135,100	-	-	-	100.55 /sf	164,091
05140.50500 Floor Grating and Frames	**1,632.00 sf**	**337.075**	**35,294**	**138,909**	**1,880**			**107.90 /sf**	**176,084**
05140 Aluminum		**337.075**	**35,294**	**138,909**	**1,880**				**176,084**
05300 Steel Roof Deck (Engineered Building)									
05300.50500 Flat Roof System									
3in-16/20ga Cellular Deck	15,615.00 sf	374.760	39,611	99,741	11,816	-	-	9.68 /sf	151,168
Elastomeric EPDM Sheet Waterproofing 60 Mils	15,615.00 sf	437.220	32,989	30,321	-	-	-	4.05 /sf	63,310
FRP Batt Insul. - Kraft Faced R30 (9.0")	15,615.00 sf	124.920	11,350	11,969	-	-	-	1.49 /sf	23,319
Metal Coping, Steel (Galv & Enamel)	708.00 sf	42.480	4,069	4,341	-	-	-	11.88 /sf	8,411
Downspouts - Alum	252.00 lf	50.400	4,828	1,033	-	-	-	23.26 /lf	5,862
Wire Strainers @ Downspouts	16.00 ea	16.000	1,533	1,022	-	-	-	159.67 /ea	2,555
05300.50500 Flat Roof System	**15,615.00 sf**	**1,045.780**	**94,381**	**148,428**	**11,816**			**16.31 /sf**	**254,625**
05300 Steel Roof Deck (Engineered Building)		**1,045.780**	**94,381**	**148,428**	**11,816**				**254,625**
06600 Plastic									
06600.50500 FRP Wall Panels with Backing Board (Framing Incl. in Ext. Siding Metal									
FRP Paneling	8,689.00 sf	217.225	19,552	16,761	-	-	-	4.18 /sf	36,313
Channel- 6-0/0"	583.50 lf	5.835	525	694	-	-	-	2.09 /lf	1,220
Gypsum Board Sheathing - 1/2"	8,689.00 sf	69.512	6,257	2,234	-	-	-	0.98 /sf	8,491
Drywall Screws 1-1/4"	9.24 M		-	113	-	-	-	12.26 /M	113
Tape & Finish	8,689.00 sf	78.201	7,039	-	-	-	-	0.81 /sf	7,039
Corner Bead & Trim	178.56 lf	3.571	321	46	-	-	-	2.06 /lf	367
Joint Tape	3,212.52 lf		-	28	-	-	-	0.01 /lf	28
Joint Compound	1,198.19 lbs		-	245	-	-	-	0.20 /lbs	245

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
06600.50500 FRP Wall Panels with Backing Board (Framing Incl. in Ext. Siding Metal	**8,689.00 sf**	**374.344**	**33,694**	**20,121**				**6.19 /sf**	**53,815**
06600.50510 Interior Partiions - FRP Both Sides with Backing Board									
FRP Paneling	11,578.00 sf	289.450	26,053	22,334	-	-	-	4.18 /sf	48,387
Steel Stud 6-0/0" 20ga	4,840.96 lf	96.819	8,715	6,756	-	-	-	3.20 /lf	15,471
Gypsum Board Sheathing - 1/2"	11,578.00 sf	92.624	8,337	2,977	-	-	-	0.98 /sf	11,314
Drywall Screws 1-1/4"	12.31 M		-	151	-	-	-	12.26 /M	151
Tape & Finish	11,578.00 sf	104.202	9,379	-	-	-	-	0.81 /sf	9,379
Corner Bead & Trim	238.08 lf	4.762	429	61	-	-	-	2.06 /lf	489
Joint Tape	4,283.36 lf		-	37	-	-	-	0.01 /lf	37
Joint Compound	1,597.58 lbs		-	327	-	-	-	0.20 /lbs	327
06600.50510 Interior Partiions - FRP Both Sides with Backing Board	**11,578.00 sf**	**587.857**	**52,912**	**32,643**				**7.39 /sf**	**85,555**
06600.50520 Interior Partiions - FRP 1 Side w/ Back Board & GB Other Side									
FRP Paneling - One Side	3,829.00 sf	95.725	8,616	7,386	-	-	-	4.18 /sf	16,002
Channel- 6-0/0"	386.00 lf	3.860	347	459	-	-	-	2.09 /lf	807
Steel Stud 6-0/0" 20ga	3,194.00 lf	63.880	5,750	4,458	-	-	-	3.20 /lf	10,208
Gypsum Board Sheathing - 1/2"	3,829.00 sf	30.632	2,757	984	-	-	-	0.98 /sf	3,742
Gypboard- 5/8"- Abuse Resistant - Other Side	1,339.00 sf	10.712	964	492	-	-	-	1.09 /sf	1,456
Drywall Screws 1-1/4"	8.12 M		-	100	-	-	-	12.26 /M	100
Tape & Finish	1,339.00 sf	12.051	1,085	-	-	-	-	0.81 /sf	1,085
Corner Bead & Trim	157.00 lf	3.140	283	40	-	-	-	2.06 /lf	323
Joint Tape	2,827.00 lf		-	25	-	-	-	0.01 /lf	25
Joint Compound	1,054.00 lbs		-	215	-	-	-	0.20 /lbs	215
06600.50520 Interior Partiions - FRP 1 Side w/ Back Board & GB Other Side	**3,829.00 sf**	**220.000**	**19,802**	**14,159**				**8.87 /sf**	**33,961**
06600 Plastic		**1,182.201**	**106,408**	**66,923**					**173,331**
07411 Standing Seam Metal Roofing (Engineered Building)									
07411.50500 Low-Pitched Roof System									
Protection Board EPS Membrane 1/4"	6,238.00 sf	31.190	2,353	2,789	-	-	-	0.82 /sf	5,142
FRP Batt Insul. - Kraft Faced R30 (9.0")	6,238.00 sf	49.904	4,534	4,781	-	-	-	1.49 /sf	9,316
Steel Stand Seam Rf Panels Standard/Aluminized 10"w 22 ga	6,238.00 sf	212.092	19,933	42,236	-	-	-	9.97 /sf	62,169
Aluminum Wall Flashing, .040" (mill or paint finish) - 12" w	56.00 lf	2.800	268	179	-	-	-	7.98 /lf	447
Facia, Alum .032", Colored	189.00 sf	11.340	1,086	1,449	-	-	-	13.41 /sf	2,535
Gutter Units - Alum	113.00 lf	7.910	758	462	-	-	-	10.79 /lf	1,220
Downspouts - Alum	60.00 lf	12.000	1,150	246	-	-	-	23.26 /lf	1,396
Wire Strainers @ Downspouts	4.00 ea	4.000	383	256	-	-	-	159.67 /ea	639
07411.50500 Low-Pitched Roof System	**6,238.00 sf**	**331.236**	**30,466**	**52,398**				**13.28 /sf**	**82,864**
07411 Standing Seam Metal Roofing (Engineered Building)		**331.236**	**30,466**	**52,398**					**82,864**
07460 Wall Panels (Engineered Building)									
07460.50500 Exterior Vertical Metal Panels on Light Gage Metal Framing									
Layout Cold-Formed Metal Stud Walls	460.00 lf	2.300	207	-	-	-	-	0.45 /lf	207
Load Bearing Steel Stud 6-0/0" x 1-5/8" 20ga/33mil	9,077.64 lf	236.019	21,244	14,003	-	-		3.88 /lf	35,247
Track- 6-0/0" x 1-1/4" 20ga/33mil	920.00 lf	23.920	2,153	1,058	-	-		3.49 /lf	3,211
Track Bridging- 6-0/0" x 1-1/4" 20ga/33mil	2,300.00 lf	115.000	10,351	3,041	-	-		5.82 /lf	13,392
Strap Bracing- 20ga/33mil x 2"	1,495.00 lf	14.950	1,346	1,299	-	-	-	1.77 /lf	2,644
Mansard Soffit (to 1' wide)	671.00 sf	46.970	4,228	1,457	-	-	-	8.47 /sf	5,685
Steel Corrugated or Ribbed Siding (Galv or Painted) 20 ga	10,039.00 sf	411.599	37,047	38,474	-	-	-	7.52 /sf	75,522
07460.50500 Exterior Vertical Metal Panels on Light Gage Metal Framing	**10,039.00 sf**	**850.758**	**76,575**	**59,332**				**13.54 /sf**	**135,908**
07460 Wall Panels (Engineered Building)		**850.758**	**76,575**	**59,332**					**135,908**
08110 Hollow Metal Doors & Frames									
08110.50500 Exterior Doors & Frames; Painted									
Operator- Light Equipment	16.00 mh	16.000	1,566	-	-	-	-	97.85 /mh	1,566
10K Telescopic Boom Forklift- Gradall 534	16.00 hr		-	-	1,186	-	-	74.12 /hr	1,186
Grout Hollow Metal Frame	12.00 ea	81.818	6,643	511	-	-	-	596.18 /ea	7,154
3'-4" x 7-0 HM Door/Frame; Single Leaf	10.00 ea	75.000	6,751	25,550	-	-	-	3,230.06 /ea	32,301
6'-3 x 7'-4 HM Door/Frame; Double Leaf	2.00 ea	20.000	1,800	8,943	-	-	-	5,371.33 /ea	10,743
Paint Exterior Door/Frame- Epoxy (Prime & 2 Coats)	649.00 sf	12.980	932	996	-	-	-	2.97 /sf	1,928
08110.50500 Exterior Doors & Frames; Painted	**12.00 ea**	**205.798**	**17,692**	**36,000**	**1,186**			**4,573.11 /ea**	**54,877**
08110.50510 Interior Doors & Frames; Painted									
Operator- Light Equipment	16.00 mh	16.000	1,566	-	-	-	-	97.85 /mh	1,566
10K Telescopic Boom Forklift- Gradall 534	16.00 hr		-	-	1,186	-	-	74.12 /hr	1,186
Grout Hollow Metal Frame	20.00 ea	136.364	11,072	852	-	-	-	596.18 /ea	11,924
3'-4" x 7-0 HM Door/Frame; Single Leaf	16.00 ea	120.000	10,801	40,880	-	-	-	3,230.06 /ea	51,681
6'-3 x 7'-4 HM Door/Frame; Double Leaf	4.00 ea	40.000	3,600	17,885	-	-	-	5,371.34 /ea	21,485
Paint Exterior Door/Frame- Epoxy (Prime & 2 Coats)	1,113.00 sf	22.260	1,599	1,708	-	-	-	2.97 /sf	3,307
08110.50510 Interior Doors & Frames; Painted	**20.00 ea**	**334.624**	**28,637**	**61,325**	**1,186**			**4,557.42 /ea**	**91,148**
08110 Hollow Metal Doors & Frames		**540.422**	**46,329**	**97,325**	**2,372**				**146,026**
08360 Overhead Doors									
08360.50500 Exterior Overhead Coiling Door									

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
08360.50500 Exterior Overhead Coiling Door									
Operator- Light Equipment	8.00 mh	8.000	783	-	-	-	-	97.85 /mh	783
10K Telescopic Boom Forklift- Gradall 534	8.00 hr		-	-	593	-	-	74.12 /hr	593
10' x 12' Coiling Ovhd Door- w/Oper	3.00 ea		-	-	-	21,600	-	7,200.00 /ea	21,600
08360.50500 Exterior Overhead Coiling Door	**3.00 ea**	**8.000**	**783**		**593**	**21,600**		**7,658.58 /ea**	**22,976**
08360 Overhead Doors		**8.000**	**783**		**593**	**21,600**			**22,976**
08410 Storefronts- Aluminum									
08410.50500 Entrance System									
Operator- Light Equipment	8.00 mh	8.000	783	-	-	-	-	97.85 /mh	783
10K Telescopic Boom Forklift- Gradall 534	8.00 hr		-	-	593	-	-	74.12 /hr	593
Alum Framed Storefront - Commercial, Bronze Anodized, (incl 3/8" clear glass); Double Insulated	240.00 sf	29.520	2,259	7,499	-	-	-	40.66 /sf	9,758
Alum Double Dr & Fr - Bronze Anodized, (incl 3/8" clear glass); Double Insulated	3.00 ea	15.000	1,148	3,937	-	-	-	1,694.95 /ea	5,085
08410.50500 Entrance System	**240.00 sf**	**52.520**	**4,189**	**11,437**	**593**			**67.58 /sf**	**16,219**
08410 Storefronts- Aluminum		**52.520**	**4,189**	**11,437**	**593**				**16,219**
08520 Aluminum Windows									
08520.50500 Exterior Windows									
Operator- Light Equipment	8.00 mh	8.000	783	-	-	-	-	97.85 /mh	783
10K Telescopic Boom Forklift- Gradall 534	8.00 hr		-	-	593	-	-	74.12 /hr	593
Alum Fixed Window, Clear Anodized, Insul Glass (SF Reference): Insulated Translucent Panels	399.00 sf	99.750	3,842	19,369	-	-	-	58.18 /sf	23,212
08520.50500 Exterior Windows	**399.00 sf**	**107.750**	**4,625**	**19,369**	**593**			**61.62 /sf**	**24,588**
08520 Aluminum Windows		**107.750**	**4,625**	**19,369**	**593**				**24,588**
08710 Door Hardware									
08710.50500 Exterior Doors & Frames									
Exterior Single Leaf Door Hardware N.O.C	10.00 ea	47.500	4,275	25,550	-	-	-	2,982.54 /ea	29,825
Exterior Double Leaf Door Hardware N.O.C	2.00 ea	18.000	1,620	7,665	-	-	-	4,642.58 /ea	9,285
08710.50500 Exterior Doors & Frames	**12.00 ea**	**65.500**	**5,896**	**33,215**				**3,259.21 /ea**	**39,111**
08710.50510 Interior Doors & Frames									
Exterior Single Leaf Door Hardware N.O.C	16.00 ea	76.000	6,841	40,880	-	-	-	2,982.54 /ea	47,721
Exterior Double Leaf Door Hardware N.O.C	4.00 ea	36.000	3,240	15,330	-	-	-	4,642.58 /ea	18,570
08710.50510 Interior Doors & Frames	**20.00 ea**	**112.000**	**10,081**	**56,210**				**3,314.55 /ea**	**66,291**
08710 Door Hardware		**177.500**	**15,976**	**89,425**					**105,401**
08950 Translucent Wall & Roof Assemblies									
08950.50500 Exterior Walls									
Scissor Lift	40.00 ch		-	-	168	-	-	4.19 /ch	168
Translucent Wall Panel	632.00 sf	51.192	3,917	27,239	-	-	-	49.30 /sf	31,156
08950.50500 Exterior Walls	**632.00 sf**	**51.192**	**3,917**	**27,239**	**168**			**49.56 /sf**	**31,324**
08950 Translucent Wall & Roof Assemblies		**51.192**	**3,917**	**27,239**	**168**				**31,324**
09260 Gypsum Board & Non Load Bearing Framing									
09260.50500 Wall Panels - Exterior CMU Wall (Framing Incl. CMU Walls)									
Gypboard- 5/8"- Abuse Resistant	1,985.00 sf	15.880	1,429	729	-	-	-	1.09 /sf	2,158
Drywall Screws 1-1/4"	2.11 M		-	26	-	-	-	12.27 /M	26
Tape & Finish	1,985.00 sf	17.865	1,608	-	-	-	-	0.81 /sf	1,608
Corner Bead & Trim	193.60 lf	3.872	349	49	-	-	-	2.06 /lf	398
Joint Tape	734.23 lf		-	6	-	-	-	0.01 /lf	6
Joint Compound	273.85 lbs		-	56	-	-	-	0.20 /lbs	56
09260.50500 Wall Panels - Exterior CMU Wall (Framing Incl. CMU Walls)	**1,985.00 sf**	**37.617**	**3,386**	**867**				**2.14 /sf**	**4,253**
09260.50510 Interior Partitions - GB Both Sides									
Channel- 6-0/0"	1,163.32 lf	11.633	1,047	1,384	-	-	-	2.09 /lf	2,431
Steel Stud 6-0/0" 20ga	8,640.24 lf	172.805	15,554	12,059	-	-	-	3.20 /lf	27,613
Gypboard- 5/8"- Abuse Resistant - Both Sides	19,414.00 sf	155.312	13,979	7,130	-	-	-	1.09 /sf	21,110
Drywall Screws 1-1/4"	20.63 M		-	253	-	-	-	12.27 /M	253
Tape & Finish	19,414.00 sf	174.726	15,727	-	-	-	-	0.81 /sf	15,727
Corner Bead & Trim	667.20 lf	13.344	1,201	170	-	-	-	2.06 /lf	1,372
Joint Tape	7,179.55 lf		-	62	-	-	-	0.01 /lf	62
Joint Compound	2,677.78 lbs		-	547	-	-	-	0.20 /lbs	547
09260.50510 Interior Partitions - GB Both Sides	**19,414.00 sf**	**527.820**	**47,508**	**21,607**				**3.56 /sf**	**69,115**
09260 Gypsum Board & Non Load Bearing Framing		**565.437**	**50,894**	**22,474**					**73,368**
09300 Pocelain Tile									
09300.50500 Floor Finish									
Final Clean/Protect- Ceramic Tile	1,312.00 sf	6.560	532	50	-	-	-	0.44 /sf	583
Glazed Tile Floor- Thin Set	1,312.00 sf	64.288	5,217	10,727	-	-	-	12.15 /sf	15,943
09300.50500 Floor Finish	**1,312.00 sf**	**70.848**	**5,749**	**10,777**				**12.60 /sf**	**16,526**
09300.50505 Wall Finish									
Final Clean/Protect- Ceramic Tile	1,845.00 sf	9.225	749	71	-	-	-	0.44 /sf	819
Glazed Tile Wall- Thin Set	1,845.00 sf	130.995	10,629	13,553	-	-	-	13.11 /sf	24,182
Glazed Tile Base Thin-Set	206.00 lf	25.750	2,089	1,311	-	-	-	16.51 /lf	3,400

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
09300.50505 Wall Finish	**1,845.00 sf**	**165.970**	**13,467**	**14,934**				**15.39 /sf**	**28,401**
09300 Pocelain Tile		**236.818**	**19,216**	**25,711**					**44,928**
09510 Acoustical Panel Ceilings									
09510.50500 Ceiling Finishes									
Clean/Touch-up/Replace Acoustic Panels	4,981.00 sf	24.905	2,242	191	-	-	-	0.49 /sf	2,433
2'x2'x3/4" Mineral Fiber Board Ceiling w/Susp Sys	4,981.00 sf	114.563	10,312	14,826	-	-	-	5.05 /sf	25,138
09510.50500 Ceiling Finishes	**4,981.00 sf**	**139.468**	**12,553**	**15,017**				**5.54 /sf**	**27,571**
09510.75C3031 Ceiling Finishes - Gypsum Board									
Channel- 4-0/0"	107.00 lf	1.070	96	97	-	-	-	1.81 /lf	193
Steel Stud 4-0/0" 20ga	758.00 lf	15.160	1,365	839	-	-	-	2.91 /lf	2,203
Gypboard- 5/8"- Abuse Resistant	946.00 sf	7.568	681	347	-	-	-	1.09 /sf	1,029
Drywall Screws 1-1/4"	1.01 M		-	12	-	-	-	12.27 /M	12
Tape & Finish	946.00 sf	8.514	766	-	-	-	-	0.81 /sf	766
Corner Bead & Trim	126.00 lf	2.520	227	32	-	-	-	2.06 /lf	259
Joint Tape	351.00 lf		-	3	-	-	-	0.01 /lf	3
Joint Compound	131.00 lbs		-	27	-	-	-	0.20 /lbs	27
09510.75C3031 Ceiling Finishes - Gypsum Board	**946.00 sf**	**34.832**	**3,135**	**1,357**				**4.75 /sf**	**4,493**
09510 Acoustical Panel Ceilings		**174.300**	**15,688**	**16,375**					**32,063**
09650 Resilient Flooring									
09650.50500 Floor Finish									
Clean/Protect- Resilient Floor	1,816.00 sf	9.080	682	70	-	-	-	0.41 /sf	751
Resilient Flooring N.O.C.	1,816.00 sf	161.624	12,137	36,539	-	-	-	26.80 /sf	48,676
6" Vinyl Base	304.00 lf	7.600	571	711	-	-	-	4.22 /lf	1,281
09650.50500 Floor Finish	**1,816.00 sf**	**178.304**	**13,390**	**37,319**				**27.92 /sf**	**50,709**
09650 Resilient Flooring		**178.304**	**13,390**	**37,319**					**50,709**
09680 Carpeting									
09680.50500 Floor Finish									
Clean/Protect- Carpeting	311.00 sy	13.995	1,051	107	-	-	-	3.72 /sy	1,158
26oz Carpet Tiles	311.00 sy	16.483	1,238	20,461	-	-	-	69.77 /sy	21,699
Vinyl Base- 6"	372.00 lf	9.300	698	870	-	-	-	4.22 /lf	1,568
09680.50500 Floor Finish	**311.00 sy**	**39.778**	**2,987**	**21,438**				**78.54 /sy**	**24,425**
09680 Carpeting		**39.778**	**2,987**	**21,438**					**24,425**
09910 Architectural Painting									
09910.50500 Gypsum Board Wall Surfaces									
Painting Preparation & Consumables- Total SF	7,202.00 sf	36.010	2,586	920	-	-	-	0.49 /sf	3,506
Paint Interior Walls- Epoxy (Prime & 2 Coats)	7,202.00 sf	108.030	7,758	11,222	-	-	-	2.64 /sf	18,980
09910.50500 Gypsum Board Wall Surfaces	**7,202.00 sf**	**144.040**	**10,344**	**12,142**				**3.12 /sf**	**22,486**
09910.50510 FRP Wall Surfaces									
Painting Preparation & Consumables- Total SF	24,096.00 sf	120.480	8,652	3,078	-	-	-	0.49 /sf	11,730
Paint Interior Walls- Epoxy (Prime & 2 Coats)	24,096.00 sf	361.440	25,956	37,546	-	-	-	2.64 /sf	63,502
09910.50510 FRP Wall Surfaces	**24,096.00 sf**	**481.920**	**34,609**	**40,624**				**3.12 /sf**	**75,232**
09910.50520 Gypsum Board Ceiling Surfaces									
Painting Preparation & Consumables- Total SF	946.00 sf	4.730	340	121	-	-	-	0.49 /sf	461
Paint Interior Walls- Epoxy (Prime & 2 Coats)	946.00 sf	14.190	1,019	1,474	-	-	-	2.64 /sf	2,493
09910.50520 Gypsum Board Ceiling Surfaces	**946.00 sf**	**18.920**	**1,359**	**1,595**				**3.12 /sf**	**2,954**
09910 Architectural Painting		**644.880**	**46,311**	**54,361**					**100,672**
09981 Special & High Performance Coatings									
09981.50150 Metering Pump Floor Area									
Chemical-Resistant/Special Coating- (Prime & 2 Coats)	1,903.00 sf	76.120	5,466	3,103	-	-	-	4.50 /sf	8,570
09981.50150 Metering Pump Floor Area	**1,903.00 sf**	**76.120**	**5,466**	**3,103**				**4.50 /sf**	**8,570**
09981 Special & High Performance Coatings		**76.120**	**5,466**	**3,103**					**8,570**
10210 Sunshades									
10210.50500 Over Exterior Windows									
Scissor Lift	40.00 ch		-	-	168	-	-	4.19 /ch	168
Fixed Alum Sunshades, Bronze Fin. 28" x 8'-6" Long	1.00 ea	8.000	802	1,629	-	-	-	2,430.61 /ea	2,431
Fixed Alum Sunshadesr, Bronze Fin. 28" x 14'-0" Long	3.00 ea	40.000	4,009	8,048	-	-	-	4,019.06 /ea	12,057
Fixed Alum Sunshades, Bronze Fin. 28" x 16'-0" Long	1.00 ea	16.000	1,604	3,066	-	-	-	4,669.59 /ea	4,670
10210.50500 Over Exterior Windows	**5.00 ea**	**64.000**	**6,414**	**12,743**	**168**			**3,865.00 /ea**	**19,325**
10210 Sunshades		**64.000**	**6,414**	**12,743**	**168**				**19,325**
15300 Fire Protection									
15300.50500 Using PBRWS Unit Rate @ $2.36/sf									
Fire Protection Allowance	23,957.00 sf			0	0	67,846	-	2.83 /sf	67,846
15300.50500 Using PBRWS Unit Rate @ $2.36/sf	**23,957.00 sf**					**67,846**		**2.83 /sf**	**67,846**
15300 Fire Protection						**67,846**			**67,846**
15400 Plumbing									

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15400.50500 Using PBRWS Unit Rate @ $7.09/sf									
Plumbing Allowance	23,957.00 sf			0	-	203,826	-	8.51 /sf	203,826
15400.50500 Using PBRWS Unit Rate @ $7.09/sf	**23,957.00 sf**					**203,826**		**8.51 /sf**	**203,826**
15400 Plumbing						**203,826**			**203,826**
15500 HVAC									
15500.50500 Using PBRWS Unit Rate @ $25.26/sf									
HVAC Allowance	23,957.00 sf			0	-	726,185	-	30.31 /sf	726,185
15500.50500 Using PBRWS Unit Rate @ $25.26/sf	**23,957.00 sf**					**726,185**		**30.31 /sf**	**726,185**
15500 HVAC						**726,185**			**726,185**
050 Process Control Building		**12,413.134**	**1,110,482**	**1,697,491**	**127,738**	**1,072,118**	**68,025**		**4,075,853**
052 Influent Pump Station									
02250 Sheeting, Shoring & Bracing									
02250.50520 Sheet Piling 33'-4" Long x 22'-4" Wide x 11'-4" Deep									
Design Shoring System-Average	1.00 ls		-	-	-	2,500	-	2,500.00 /ls	2,500
Survey & Layout Shoring	96.00 lf	9.600	788	-	-	-	-	8.21 /lf	788
Mobilize Pile Driving Equipment	1.00 ea		-	-	-	10,000	-	10,000.00 /ea	10,000
Steel Sheeting 25' x 38psf, left in place	2,496.00 sf	187.200	16,552	84,499	7,345	-	-	43.43 /sf	108,396
Install & Remove Wales/Struts/Connectors	4.74 ton	42.660	3,772	4,844	1,674	-	-	2,170.89 /ton	10,290
Cut-off Sheet Steel Piles	96.00 lf	19.200	1,598	-	181		-	18.53 /lf	1,779
02250.50520 Sheet Piling 33'-4" Long x 22'-4" Wide x 11'-4" Deep	**2,496.00 sf**	**258.660**	**22,711**	**89,343**	**9,199**	**12,500**		**53.59 /sf**	**133,753**
02250 Sheeting, Shoring & Bracing		**258.660**	**22,711**	**89,343**	**9,199**	**12,500**			**133,753**
02300 Site Preparation									
02300.50520 Excavate, Bedding & Backfill									
Mob / DeMob Earthwork Equip (8hr each way)	1.00 ea	4.000	310	-	426	-	-	735.79 /ea	736
Excav- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	520.00 cy	18.166	1,786	-	1,361	-	-	6.05 /cy	3,147
Load & Haul Cut to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	520.00 cy	19.697	1,580	-	1,118	-	-	5.19 /cy	2,698
Foundation Subgrade- Scarify & Recompact	540.00 sf	1.878	164	-	51	-	-	0.40 /sf	215
Place Backfill from Stockpile- Backhoe Loader C466- 7MT- 95HP/1.5cy/Plate Compactor (2ea)	269.00 cy	129.120	11,259	-	3,853	-	-	56.18 /cy	15,111
Load & Haul Backfill from Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	229.00 cy	8.674	696	-	492	-	-	5.19 /cy	1,188
Import Aggregate Base Fill	40.00 cy		-	996	-	291	-	32.19 /cy	1,288
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	291.00 cy	2.425	238	-	182	-	-	1.44 /cy	420
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	291.00 cy	41.571	3,222	-	3,949	-	-	24.64 /cy	7,171
02300.50520 Excavate, Bedding & Backfill	**520.00 cy**	**225.531**	**19,254**	**996**	**11,432**	**291**		**61.49 /cy**	**31,974**
02300 Site Preparation		**225.531**	**19,254**	**996**	**11,432**	**291**			**31,974**
03000 Structures - Equipment Pads									
03000.50520 Concrete Pump Station									
Concrete: Base 2' Thick	31.00 cy	93.000	8,606	14,059	972	-	-	762.47 /cy	23,637
Concrete: Wall 1'-6" Thick	77.00 cy	462.000	42,750	37,871	4,472	-	-	1,105.11 /cy	85,094
Concrete: Elevated Slab 1'-2" Thick	12.00 cy	66.000	6,107	6,055	697	-	-	1,071.62 /cy	12,859
03000.50520 Concrete Pump Station	**120.00 cy**	**621.000**	**57,463**	**57,986**	**6,141**			**1,013.25 /cy**	**121,590**
03000 Structures - Equipment Pads		**621.000**	**57,463**	**57,986**	**6,141**				**121,590**
11212 Turbine Pumps									
11212.50520 MF Feed Pumps PMP-14010 & PMP-14020; WIGEN's Budgetary Pricing									
Vertical Turbine Pump Spare Parts	1.00 lot	2.000	163	2,844	-	-	-	3,007.21 /lot	3,007
Furnish Lubricants	20.00 gal		-	-	-	-	1,138	56.88 /gal	1,138
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse & Care Vert Turbine Pumps	2.00 u/mo	4.000	327	-	-	-	-	163.47 /u/mo	327
Vert Turbine Pump 100 HP	2.00 ea	80.000	6,539	***91,000***	-	-	-	48,769.33 /ea	97,539
Set VFD Control	2.00 ea	24.000	1,962	-	-	-	-	980.81 /ea	1,962
Grout Equip Base- Non Shrink, Non Metallic	16.67 cf	25.001	1,793	-	-	-	1,251	182.66 /cf	3,044
Test & Check Vert Turbine Pumps	2.00 ea	2.000	163	-	-	-	-	81.74 /ea	163
Install Equip- RT Crane 80 MT	32.00 ch	32.000	3,158	-	5,201	-	-	261.21 /ch	8,359
Install Strainers	2.00 ea	9.600	816	-	260	-	-	538.11 /ea	1,076
SS Anchor Bolts/Sleeve 3/4" x 8"	16.00 ea	4.000	294	-	-	-	273	35.46 /ea	567
11212.50520 MF Feed Pumps PMP-14010 & PMP-14020; WIGEN's Budgetary Pricing	**2.00 ea**	**190.601**	**15,850**	**95,550**	**5,621**		**2,662**	**59,841.26 /ea**	**119,683**
11212 Turbine Pumps		**190.601**	**15,850**	**95,550**	**5,621**		**2,662**		**119,683**
052 Influent Pump Station		**1,295.792**	**115,278**	**243,875**	**32,393**	**12,791**	**2,662**		**407,000**
054 Product Water Pump Station									
02250 Sheeting, Shoring & Bracing									
02250.50540 Sheet Piling 33'-4" Long x 22'-4" Wide x 11'-4" Deep									
Design Shoring System-Average	1.00 ls		-	-	-	2,500	-	2,500.00 /ls	2,500
Survey & Layout Shoring	114.00 lf	11.400	936	-	-	-	-	8.21 /lf	936
Mobilize Pile Driving Equipment	1.00 ea		-	-	-	10,000	-	10,000.00 /ea	10,000
Steel Sheeting 25' x 38psf, left in place	1,288.00 sf	96.600	8,541	43,604	3,790	-	-	43.43 /sf	55,935
Install & Remove Wales/Struts/Connectors	2.44 ton	21.960	1,942	2,494	862	-	-	2,170.89 /ton	5,297

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
02250.50540 Sheet Piling 33'-4" Long x 22'-4" Wide x 11'-4" Deep									
Cut-off Sheet Steel Piles	114.00 lf	22.800	1,898	-	215		-	18.53 /lf	2,113
02250.50540 Sheet Piling 33'-4" Long x 22'-4" Wide x 11'-4" Deep	**1,288.00 sf**	**152.760**	**13,317**	**46,097**	**4,866**	**12,500**		**59.61 /sf**	**76,781**
02250 Sheeting, Shoring & Bracing		**152.760**	**13,317**	**46,097**	**4,866**	**12,500**			**76,781**
02300 Site Preparation									
02300.50540 Excavate, Bedding & Backfill									
Mob / DeMob Earthwork Equip (8hr each way)	1.00 ea	4.000	310	-	426	-	-	735.80 /ea	736
Excav- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	324.00 cy	11.319	1,113	-	848	-	-	6.05 /cy	1,961
Load & Haul Cut to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	324.00 cy	12.273	984	-	697	-	-	5.19 /cy	1,681
Foundation Subgrade- Scarify & Recompact	772.00 sf	2.685	234	-	74	-	-	0.40 /sf	308
Place Backfill from Stockpile- Backhoe Loader C466- 7MT- 95HP/1.5cy/Plate Compactor (2ea)	182.00 cy	87.360	7,617	-	2,607	-	-	56.18 /cy	10,224
Load & Haul Backfill from Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	182.00 cy	6.894	553	-	391	-	-	5.19 /cy	944
Import Aggregate Base Fill	14.00 cy		-	349	-	102	-	32.19 /cy	451
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	146.00 cy	1.217	120	-	91	-	-	1.44 /cy	211
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	146.00 cy	20.857	1,617	-	1,981	-	-	24.64 /cy	3,598
02300.50540 Excavate, Bedding & Backfill	**324.00 cy**	**146.605**	**12,548**	**349**	**7,114**	**102**		**62.08 /cy**	**20,113**
02300 Site Preparation		**146.605**	**12,548**	**349**	**7,114**	**102**			**20,113**
03000 Structures - Equipment Pads									
03000.50540 Concrete Pump Station									
Concrete: Base 2' Thick	35.00 cy	105.000	9,716	15,873	1,098	-	-	762.47 /cy	26,687
Concrete: Wall 1'-6" Thick	54.00 cy	324.000	29,981	26,559	3,136	-	-	1,105.11 /cy	59,676
Concrete: Elevated Slab 1'-2" Thick	17.00 cy	93.500	8,652	8,578	987	-	-	1,071.62 /cy	18,218
03000.50540 Concrete Pump Station	**106.00 cy**	**522.500**	**48,349**	**51,011**	**5,221**			**986.61 /cy**	**104,580**
03000 Structures - Equipment Pads		**522.500**	**48,349**	**51,011**	**5,221**				**104,580**
11212 Turbine Pumps									
11212.50540 Pumps PMP-14010 & PMP-14020									
Vertical Turbine Pump Spare Parts	1.00 lot	2.000	163	2,844	-	-	-	3,007.21 /lot	3,007
Furnish Lubricants	20.00 gal		-	-	-	-	1,138	56.88 /gal	1,138
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse & Care Vert Turbine Pumps	2.00 u/mo	4.000	327	-	-	-	-	163.47 /u/mo	327
Vert Turbine Pump 130 HP	2.00 ea	112.000	9,154	170,625	-	-	-	89,889.57 /ea	179,779
Set VFD Control	2.00 ea	24.000	1,962	-	-	-	-	980.80 /ea	1,962
Grout Equip Base- Non Shrink, Non Metallic	16.67 cf	25.001	1,793	-	-	-	1,251	182.66 /cf	3,044
Test & Check Vert Turbine Pumps	2.00 ea	2.000	163	-	-	-	-	81.73 /ea	163
Install Equip- RT Crane 80 MT	32.00 ch	32.000	3,158	-	5,201	-	-	261.21 /ch	8,359
Install Strainers	2.00 ea	9.600	816	-	260	-	-	538.11 /ea	1,076
SS Anchor Bolts/Sleeve 3/4" x 8"	16.00 ea	4.000	294	-	-	-	273	35.46 /ea	567
11212.50540 Pumps PMP-14010 & PMP-14020	**2.00 ea**	**222.601**	**18,465**	**175,175**	**5,621**		**2,662**	**100,961.50 /ea**	**201,923**
11212 Turbine Pumps		**222.601**	**18,465**	**175,175**	**5,621**		**2,662**		**201,923**
054 Product Water Pump Station		**1,044.465**	**92,679**	**272,632**	**22,823**	**12,602**	**2,662**		**403,397**
056 Automatic Strainers									
11331 Strainers/Grinders									
11331.50560 MF Auto Strainer s No. 1 and 2 - 1,700 gpm, 1/2 hp, SS 316									
Mob / DeMob Earthwork Equip (2hr each way)	1.00 ea	4.000	310	-	426	-	-	735.79 /ea	736
Excav- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	25.00 cy	0.873	86	-	65	-	-	6.05 /cy	151
Load & Haul Cut to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	25.00 cy	0.947	76	-	54	-	-	5.19 /cy	130
Foundation Subgrade- Scarify & Recompact	447.00 sf	1.555	136	-	43	-	-	0.40 /sf	178
Place Backfill from Stockpile- Backhoe Loader C466- 7MT- 95HP/1.5cy/Plate Compactor (2ea)	14.00 cy	6.720	586	-	201	-	-	56.18 /cy	786
Load & Haul Backfill from Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	6.00 cy	0.227	18	-	13	-	-	5.19 /cy	31
Import Aggregate Base Fill	8.00 cy		-	199	-	58	-	32.19 /cy	258
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	19.00 cy	0.158	16	-	12	-	-	1.44 /cy	27
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	19.00 cy	2.714	210	-	258	-	-	24.64 /cy	468
Concrete:Foundation	12.00 cy	36.000	3,331	5,442	376	-	-	762.47 /cy	9,150
Concrete: Equipment Pad	2.00 cy	10.000	925	933	116	-	-	987.03 /cy	1,974
Strainers Spare Parts	1.00 lot	2.000	163	2,844	-	-	-	3,007.22 /lot	3,007
Furnish Lubricants	10.00 gal		-	284	-	-	-	28.44 /gal	284
Equipment Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Automatic, Self-Backwash Strainer 1,700 gpm; Quote from Wigen 12/20/2017	2.00 ea	48.000	4,081	***62,563***	1,300	-	-	33,971.78 /ea	67,944
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse & Care of Strainers	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Grout Strainers Base- Non Shrink, Non Metallic	2.50 cf	3.750	269	-	-	-	188	182.66 /cf	457
Test & Check Strainers	2.00 ea	16.000	1,308	-	-	-	-	653.87 /ea	1,308
Install Equip- RT Crane 80 MT	16.00 ch	16.000	1,579	-	2,600	-	-	261.21 /ch	4,179
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11331.50560 MF Auto Strainer s No. 1 and 2 - 1,700 gpm, 1/2 hp, SS 316	**2.00 ea**	**160.945**	**14,039**	**73,971**	**5,624**	**58**	**324**	**47,008.07 /ea**	**94,016**

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
11331 Strainers/Grinders		160.945	14,039	73,971	5,624	58	324		94,016
056 Automatic Strainers		160.945	14,039	73,971	5,624	58	324	/ea	94,016
060 Process Equipment									
11228 Membrane Systems									
11228.50600 MF System Based on WIGEN's Material Budgetary Pricing									
Concrete: Equipment Pad 6" Thick	56.00 cy	280.000	25,909	26,112	3,252	-	-	987.03 /cy	55,274
Install Equipment- RT Crane 40 MT	40.00 ch	40.000	3,947	-	3,937	-	-	197.11 /ch	7,884
2.3 MGD 1,590 gpm MF Units No. 1, 2 & 3; Scinor P72, Toray HFU-2020; 64 Membranes per Unit	3.00 ea		-	***1,421,875***	-	-	-	473,958.33 /ea	1,421,875
MF Air Compressors - 2 ea	2.00 ea		-	***79,625***	-	-	-	39,812.50 /ea	79,625
Block Valves, Bleed Valves, Additional Control Elements, I/O, Solenoids, PLC Programming	1.00 ls		-	***108,063***	-	-	-	108,062.50 /ls	108,063
Micro Filtration Equipment Spare Parts	1.00 lot	2.000	163	2,844	-	-	-	3,007.21 /lot	3,007
Equipment Manuf.Rep.	2.00 day		-	3,413	-	-	-	1,706.25 /day	3,413
Unload/Protect Equip - Medium Equip	3.00 ea	12.000	951	-	240	-	-	397.22 /ea	1,192
Install Filter Micro Module Racks	3.00 ea	72.000	6,121	-	1,950	-	-	2,690.54 /ea	8,072
Connect Filter Micro Module Racks	3.00 ea	360.000	30,606	-	9,752	-	-	13,452.68 /ea	40,358
Install Micro Filters in Filter Modules	192.00 ea	96.000	7,846	-	-	-	-	40.87 /ea	7,846
Install Compressors	2.00 ea	48.000	4,081	-	1,300	-	-	2,690.53 /ea	5,381
Install Air Compressor Sound Attenuation	2.00 ea	48.000	4,081	-	1,300	-	-	2,690.54 /ea	5,381
Install Air Receiver	2.00 ea	48.000	4,081	-	1,300	-	-	2,690.53 /ea	5,381
Grout Micro Filtration Equip Base- Non Shrink, Non Metallic	16.67 cf	25.001	1,793	-	-	-	1,251	182.66 /cf	3,044
Test & Check Micro Filtration Equipment	2.30 ea	73.600	6,016	-	-	-	-	2,615.47 /ea	6,016
Test/Flush Filter Micro Module Racks	3.00 ea	120.000	9,808	-	-	-	-	3,269.33 /ea	9,808
SS Anchor Bolts/Sleeve 1/2" x 8"	50.00 ea	12.500	920	-	-	-	455	27.49 /ea	1,375
11228.50600 MF System Based on WIGEN's Material Budgetary Pricing	**2.30 mgd**	**1,237.101**	**106,324**	**1,641,931**	**23,032**		**1,706**	**770,866.82 /mgd**	**1,772,994**
11228.50610 Primary RO System Based on WIGEN's Material Budgetary Pricing									
Install Equipment- RT Crane 40 MT	40.00 ch	40.000	3,947	-	3,937	-	-	197.11 /ch	7,884
2.2 MGD 1,500 gpm RO Unit No. 1; 9 Vessels x 6 Racks=54; Stage1 @ 4 Racks; Stage2 @ 2 Racks	54.00 ea		-	***841,750***	-	-	-	15,587.96 /ea	841,750
RO Filtration Equipment Spare Parts	1.00 lot	2.000	163	2,844	-	-	-	3,007.21 /lot	3,007
Equipment Manuf.Rep.	2.00 day		-	3,413	-	-	-	1,706.25 /day	3,413
Unload/Protect Equip - Medium Equip	1.00 ea	4.000	317	-	80	-	-	397.23 /ea	397
Install Filter RO Module Racks	6.00 ea	144.000	12,243	-	3,901	-	-	2,690.54 /ea	16,143
Connect Filter RO Module Racks	6.00 ea	720.000	61,213	-	19,503	-	-	13,452.68 /ea	80,716
Install RO Filters in Filter Modules	378.00 ea	189.000	15,448	-	-	-	-	40.87 /ea	15,448
Test & Check RO Filtration Equipment	1.00 ea	32.000	2,615	-	-	-	-	2,615.46 /ea	2,615
Test/Flush Filter RO Module Racks	6.00 ea	240.000	19,616	-	-	-	-	3,269.33 /ea	19,616
SS Anchor Bolts/Sleeve 1/2" x 8"	24.00 ea	6.000	441	-	-	-	218	27.50 /ea	660
11228.50610 Primary RO System Based on WIGEN's Material Budgetary Pricing	**2.20 mgd**	**1,377.000**	**116,004**	**848,006**	**27,421**		**218**	**450,749.76 /mgd**	**991,649**
11228.50620 Secondary RO System Based on WIGEN's Material Budgetary Pricing									
Install Equipment- RT Crane 40 MT	16.00 ch	16.000	1,579	-	1,575	-	-	197.11 /ch	3,154
0.30 MGD 220 gpm Secondary RO Unit; 5 Vessels x 4 Racks	20.00 ea		-	***534,625***	-	-	-	26,731.25 /ea	534,625
RO Filtration Equipment Spare Parts	1.00 lot	2.000	163	2,844	-	-	-	3,007.21 /lot	3,007
Equipment Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	1.00 ea	4.000	317	-	80	-	-	397.23 /ea	397
Install Filter RO Module Racks	4.00 ea	96.000	8,162	-	2,600	-	-	2,690.53 /ea	10,762
Connect Filter RO Module Racks	4.00 ea	480.000	40,809	-	13,002	-	-	13,452.68 /ea	53,811
Install RO Filters in Filter Modules	80.00 ea	40.000	3,269	-	-	-	-	40.87 /ea	3,269
Test & Check RO Filtration Equipment	1.00 ea	32.000	2,615	-	-	-	-	2,615.46 /ea	2,615
Test/Flush Filter RO Module Racks	4.00 ea	160.000	13,077	-	-	-	-	3,269.33 /ea	13,077
SS Anchor Bolts/Sleeve 1/2" x 8"	16.00 ea	4.000	294	-	-	-	146	27.49 /ea	440
11228.50620 Secondary RO System Based on WIGEN's Material Budgetary Pricing	**0.30 mgd**	**834.000**	**70,286**	**539,175**	**17,257**		**146**	**2,089,547.63 /mgd**	**626,864**
11228 Membrane Systems		3,448.101	292,614	3,029,112	67,711		2,070		3,391,507
060 Process Equipment		3,448.101	292,614	3,029,112	67,711		2,070		3,391,507
061 Filter & Media									
13227 Cartridge Filters									
13227.50610 CFT-37010 & CFT-37020 -RO Cartridge Filters 3,000 gpm, 32-M-001									
Mob / DeMob Earthwork Equip (2hr each way)	1.00 ea	4.000	310	-	426	-	-	735.80 /ea	736
Excav- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	23.00 cy	0.803	79	-	60	-	-	6.05 /cy	139
Load & Haul Cut to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	23.00 cy	0.871	70	-	49	-	-	5.19 /cy	119
Foundation Subgrade- Scarify & Recompact	406.00 sf	1.412	123	-	39	-	-	0.40 /sf	162
Place Backfill from Stockpile- Backhoe Loader C466- 7MT- 95HP/1.5cy/Plate Compactor (2ea)	13.00 cy	6.240	544	-	186	-	-	56.18 /cy	730
Load & Haul Backfill from Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	5.00 cy	0.189	15	-	11	-	-	5.19 /cy	26
Import Aggregate Base Fill	8.00 cy		-	199	-	58	-	32.19 /cy	258
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	18.00 cy	0.150	15	-	11	-	-	1.44 /cy	26
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	18.00 cy	2.571	199	-	244	-	-	24.64 /cy	444
Concrete: Foundation	10.00 cy	30.000	2,776	4,535	314	-	-	762.47 /cy	7,625
Concrete: Equipment Pad	1.00 cy	5.000	463	466	58	-	-	987.04 /cy	987
Cartridge Filter Manuf.Rep.	1.00 day		-	-	-	-	1,706	1,706.25 /day	1,706

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
13227.50610 CFT-37010 & CFT-37020 -RO Cartridge Filters 3,000 gpm, 32-M-001									
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse & Care Horiz End Suction Centrifugal Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Grout Equip Base- Non Shrink, Non Metallic	4.00 cf	6.000	430	-	-	-	300	182.66 /cf	731
Test & Check Cartidge Filters	2.00 ea	16.000	1,308	-	-	-	-	653.87 /ea	1,308
Install Equipment- RT Crane 40 MT	8.00 ch	8.000	789	-	787	-	-	197.11 /ch	1,577
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
Cartridge Filter, SS 316L with EPR Seals; WIGEN Mat. Budgetary Pricing	2.00 ea	40.000	3,726	***85,593***	-	-	-	44,659.32 /ea	89,319
13227.50610 CFT-37010 & CFT-37020 -RO Cartridge Filters 3,000 gpm, 32-M-001	**2.00 ea**	**133.237**	**11,793**	**90,793**	**2,346**	**58**	**2,143**	**53,566.46 /ea**	**107,133**
13227.50610A Primary RO CIP Cartridge Filter per Sheet No. 54-M-001									
Concrete: Equipment Pad	1.00 cy	5.000	463	466	58	-	-	987.04 /cy	987
Cartridge Filter Manuf.Rep.	1.00 day		-	-	-	-	1,706	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	1.00 ea	4.000	317	-	80	-	-	397.22 /ea	397
Warehouse & Care Horiz End Suction Centrifugal Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Grout Equip Base- Non Shrink, Non Metallic	4.00 cf	6.000	430	-	-	-	300	182.66 /cf	731
Test & Check Cartidge Filters	1.00 ea	8.000	654	-	-	-	-	653.87 /ea	654
Install Equipment- RT Crane 40 MT	8.00 ch	8.000	789	-	787	-	-	197.11 /ch	1,577
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
Cartridge Filter, SS 316L with EPR Seals	1.00 ea	24.000	2,236	***38,325***	-	-	-	40,560.69 /ea	40,561
13227.50610A Primary RO CIP Cartridge Filter per Sheet No. 54-M-001	**1.00 ea**	**59.000**	**5,200**	**38,791**	**926**		**2,143**	**47,059.68 /ea**	**47,060**
13227.50610B Secondary RO CIP Cartridge Filter per Sheet No. 54-M-001									
Concrete: Equipment Pad	1.00 cy	5.000	463	466	58	-	-	987.03 /cy	987
Cartridge Filter Manuf.Rep.	1.00 day		-	-	-	-	1,706	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	1.00 ea	4.000	317	-	80	-	-	397.22 /ea	397
Warehouse & Care Horiz End Suction Centrifugal Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.47 /u/mo	163
Grout Equip Base- Non Shrink, Non Metallic	2.00 cf	3.000	215	-	-	-	150	182.66 /cf	365
Test & Check Cartidge Filters	1.00 ea	8.000	654	-	-	-	-	653.87 /ea	654
Install Equipment- RT Crane 40 MT	8.00 ch	8.000	789	-	787	-	-	197.11 /ch	1,577
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
Cartridge Filter, SS 316L with EPR Seals	1.00 ea	24.000	2,236	***25,550***	-	-	-	27,785.68 /ea	27,786
13227.50610B Secondary RO CIP Cartridge Filter per Sheet No. 54-M-001	**1.00 ea**	**56.000**	**4,985**	**26,016**	**926**		**1,993**	**33,919.36 /ea**	**33,919**
13227 Cartridge Filters		**248.237**	**21,977**	**155,601**	**4,197**	**58**	**6,279**		**188,112**
061 Filter & Media		**248.237**	**21,977**	**155,601**	**4,197**	**58**	**6,279**		**188,112**
062 Pumps									
11211 Centrifugal Pumps									
11211.50620 P-106 - MF Backwash Pumps 1,460 gpm, 60 hp; Horizontal Centrifugal, En									
Mob / DeMob Earthwork Equip (2hr each way)	1.00 ea	4.000	310	-	426	-	-	735.79 /ea	736
Excav- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	18.00 cy	0.629	62	-	47	-	-	6.05 /cy	109
Load & Haul Cut to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	18.00 cy	0.682	55	-	39	-	-	5.19 /cy	93
Foundation Subgrade- Scarify & Recompact	330.00 sf	1.148	100	-	31	-	-	0.40 /sf	132
Place Backfill from Stockpile- Backhoe Loader C466- 7MT- 95HP/1.5cy/Plate Compactor (2ea)	10.00 cy	4.800	419	-	143	-	-	56.18 /cy	562
Load & Haul Backfill from Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	10.00 cy	0.379	30	-	22	-	-	5.19 /cy	52
Import Aggregate Base Fill	6.00 cy		-	149	-	44	-	32.19 /cy	193
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	14.00 cy	0.117	11	-	9	-	-	1.44 /cy	20
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	14.00 cy	2.000	155	-	190	-	-	24.64 /cy	345
Concrete: Foundation	8.00 cy	24.000	2,221	3,628	251	-	-	762.47 /cy	6,100
Concrete: Equipment Pad	2.00 cy	10.000	925	933	116	-	-	987.03 /cy	1,974
Horiz End Suction Centrifugal Pump Spare Parts	1.00 lot		-	1,138	-	-	-	1,137.50 /lot	1,138
Furnish Lubricants	12.00 gal		-	341	-	-	-	28.44 /gal	341
Pump Manuf.Rep.	1.00 day		-	-	-	-	1,706	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse & Care Horiz End Suction Centrifugal Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Horiz End Suction Centrifugal Pump 60 HP; WIGEN Mat. Budgetary Pricing	2.00 ea	16.000	1,308	***189,963***	-	-	-	95,635.12 /ea	191,270
Set VFD Control	2.00 ea	24.000	1,962	-	-	-	-	980.81 /ea	1,962
Grout Equip Base- Non Shrink, Non Metallic	11.00 cf	16.500	1,183	-	-	-	826	182.66 /cf	2,009
Test & Check Horiz Centrifugal Split Case Pumps	2.00 ea	16.000	1,308	-	-	-	-	653.87 /ea	1,308
Remove/Realign Drive Coupling to Bump Motor < 3-0/0"	2.00 ea	6.000	490	-	-	-	-	245.20 /ea	490
Install Equipment- RT Crane 40 MT	8.00 ch	8.000	789	-	787	-	-	197.11 /ch	1,577
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11211.50620 P-106 - MF Backwash Pumps 1,460 gpm, 60 hp; Horizontal Centrifugal, En	**2.00 ea**	**146.254**	**12,273**	**196,151**	**2,221**	**44**	**2,669**	**106,679.04 /ea**	**213,358**
11211.50620A P-106 - MF CIP Backwash Pumps 500 gpm, 15 hp, Horizontal Centrifugal,									
Concrete: Equipment Pad	2.00 cy	10.000	925	933	116	-	-	987.03 /cy	1,974
Horiz End Suction Centrifugal Pump Spare Parts	1.00 lot		-	1,138	-	-	-	1,137.50 /lot	1,138
Furnish Lubricants	12.00 gal		-	341	-	-	-	28.44 /gal	341
Pump Manuf.Rep.	1.00 day		-	-	-	-	1,706	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse & Care Horiz End Suction Centrifugal Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Horiz End Suction Centrifugal Pump 15 HP; WIGEN Mat. Budgetary Pricing	2.00 ea	16.000	1,308	***96,688***	-	-	-	48,997.62 /ea	97,995

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
11211.50620A P-106 - MF CIP Backwash Pumps 500 gpm, 15 hp, Horizontal Centrifugal,									
Set VFD Control	2.00 ea	24.000	1,962	-	-	-	-	980.80 /ea	1,962
Grout Equip Base- Non Shrink, Non Metallic	4.00 cf	6.000	430	-	-	-	300	182.66 /cf	731
Test & Check Horiz Centrifugal Split Case Pumps	2.00 ea	16.000	1,308	-	-	-	-	653.87 /ea	1,308
Remove/Realign Drive Coupling to Bump Motor < 3-0/0"	2.00 ea	6.000	490	-	-	-	-	245.20 /ea	490
Install Equipment- RT Crane 40 MT	8.00 ch	8.000	789	-	787	-	-	197.11 /ch	1,577
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11211.50620A P-106 - MF CIP Backwash Pumps 500 gpm, 15 hp, Horizontal Centrifugal,	**2.00 ea**	**98.000**	**8,157**	**99,099**	**1,064**		**2,143**	**55,231.54 /ea**	**110,463**
11211.50620B PMP-32010 & PMP-32010 - RO Transfer Pumps 1,900 gpm, 60 hp, Horizontal									
Mob / DeMob Earthwork Equip (2hr each way)	1.00 ea	4.000	310	-	426	-	-	735.80 /ea	736
Excav- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	37.00 cy	1.293	127	-	97	-	-	6.05 /cy	224
Load & Haul Cut to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	37.00 cy	1.402	112	-	80	-	-	5.19 /cy	192
Foundation Subgrade- Scarify & Recompact	495.00 sf	1.722	150	-	47	-	-	0.40 /sf	197
Place Backfill from Stockpile- Backhoe Loader C466- 7MT- 95HP/1.5cy/Plate Compactor (2ea)	18.00 cy	8.640	753	-	258	-	-	56.18 /cy	1,011
Load & Haul Backfill from Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	18.00 cy	0.682	55	-	39	-	-	5.19 /cy	93
Import Aggregate Base Fill	9.00 cy		-	224	-	66	-	32.19 /cy	290
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	28.00 cy	0.233	23	-	17	-	-	1.44 /cy	40
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	28.00 cy	4.000	310	-	380	-	-	24.64 /cy	690
Concrete: Foundation	9.00 cy	27.000	2,498	4,082	282	-	-	762.47 /cy	6,862
Concrete: Equipment Pad	1.00 cy	5.000	463	466	58	-	-	987.04 /cy	987
Horiz End Suction Centrifugal Pump Spare Parts	1.00 lot		-	1,138	-	-	-	1,137.50 /lot	1,138
Furnish Lubricants	12.00 gal		-	341	-	-	-	28.44 /gal	341
Pump Manuf.Rep.	1.00 day		-	-	-	-	1,706	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse & Care Horiz End Suction Centrifugal Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Horiz End Suction Centrifugal Pump 60 HP; WIGEN Mat. Budgetary Pricing	2.00 ea	72.000	5,885	***54,600***	-	-	-	30,242.40 /ea	60,485
Set VFD Control	2.00 ea	24.000	1,962	-	-	-	-	980.81 /ea	1,962
Grout Equip Base- Non Shrink, Non Metallic	6.00 cf	9.000	646	-	-	-	450	182.66 /cf	1,096
Test & Check Horiz Centrifugal Split Case Pumps	2.00 ea	16.000	1,308	-	-	-	-	653.87 /ea	1,308
Remove/Realign Drive Coupling to Bump Motor < 3-0/0"	2.00 ea	6.000	490	-	-	-	-	245.20 /ea	490
Install Equipment- RT Crane 40 MT	8.00 ch	8.000	789	-	787	-	-	197.11 /ch	1,577
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11211.50620B PMP-32010 & PMP-32010 - RO Transfer Pumps 1,900 gpm, 60 hp, Horizontal	**2.00 ea**	**200.972**	**16,826**	**60,851**	**2,631**	**66**	**2,293**	**41,333.45 /ea**	**82,667**
11211.50620C PMP-51230 - Second Stage RO Booster Pump 644 gpm, 15 hp; Horizontal Ce									
Concrete: Equipment Pad	1.00 cy	5.000	463	466	58	-	-	987.03 /cy	987
Horiz End Suction Centrifugal Pump Spare Parts	1.00 lot		-	569	-	-	-	568.75 /lot	569
Furnish Lubricants	6.00 gal		-	171	-	-	-	28.44 /gal	171
Pump Manuf.Rep.	1.00 day		-	-	-	-	1,706	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	1.00 ea	4.000	317	-	80	-	-	397.22 /ea	397
Warehouse & Care Horiz End Suction Centrifugal Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Horiz End Suction Centrifugal Pump 15 HP	1.00 ea	8.000	654	9,384	-	-	-	10,038.26 /ea	10,038
Set VFD Control	1.00 ea	12.000	981	-	-	-	-	980.79 /ea	981
Grout Equip Base- Non Shrink, Non Metallic	2.00 cf	3.000	215	-	-	-	150	182.66 /cf	365
Test & Check Horiz Centrifugal Split Case Pumps	1.00 ea	8.000	654	-	-	-	-	653.87 /ea	654
Remove/Realign Drive Coupling to Bump Motor < 3-0/0"	1.00 ea	3.000	245	-	-	-	-	245.20 /ea	245
Install Equipment- RT Crane 40 MT	4.00 ch	4.000	395	-	394	-	-	197.11 /ch	788
SS Anchor Bolts/Sleeve 3/4" x 8"	4.00 ea	1.000	74	-	-	-	68	35.46 /ea	142
11211.50620C PMP-51230 - Second Stage RO Booster Pump 644 gpm, 15 hp; Horizontal Ce	**1.00 ea**	**50.000**	**4,160**	**10,590**	**532**		**1,925**	**17,207.03 /ea**	**17,207**
11211.50620D Primary RO CIP Pumps 880 gpm, 50 hp; Horizontal Centrifugal, End Sucti									
Concrete: Equipment Pad	3.00 cy	15.000	1,388	1,399	174	-	-	987.03 /cy	2,961
Horiz End Suction Centrifugal Pump Spare Parts	1.00 lot		-	1,138	-	-	-	1,137.50 /lot	1,138
Furnish Lubricants	12.00 gal		-	341	-	-	-	28.44 /gal	341
Pump Manuf.Rep.	1.00 day		-	-	-	-	1,706	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse & Care Horiz End Suction Centrifugal Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Horiz End Suction Centrifugal Pump 50 HP; WIGEN Mat. Budgetary Pricing	2.00 ea	48.000	3,923	***26,618***	-	-	-	15,270.36 /ea	30,541
Set VFD Control	2.00 ea	24.000	1,962	-	-	-	-	980.80 /ea	1,962
Grout Equip Base- Non Shrink, Non Metallic	14.00 cf	21.000	1,506	-	-	-	1,051	182.66 /cf	2,557
Test & Check Horiz Centrifugal Split Case Pumps	2.00 ea	16.000	1,308	-	-	-	-	653.87 /ea	1,308
Remove/Realign Drive Coupling to Bump Motor < 3-0/0"	2.00 ea	6.000	490	-	-	-	-	245.20 /ea	490
Install Equipment- RT Crane 40 MT	8.00 ch	8.000	789	-	787	-	-	197.11 /ch	1,577
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11211.50620D Primary RO CIP Pumps 880 gpm, 50 hp; Horizontal Centrifugal, End Sucti	**2.00 ea**	**150.000**	**12,311**	**29,495**	**1,122**		**2,894**	**22,911.08 /ea**	**45,822**
11211.50620E Secondary RO CIP Pumps 400 gpm, 20 hp; Horizontal Centrifugal, End Suc									
Concrete: Equipment Pad	1.00 cy	5.000	463	466	58	-	-	987.04 /cy	987
Horiz End Suction Centrifugal Pump Spare Parts	1.00 lot		-	1,138	-	-	-	1,137.50 /lot	1,138
Furnish Lubricants	12.00 gal		-	341	-	-	-	28.44 /gal	341
Pump Manuf.Rep.	1.00 day		-	-	-	-	1,706	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
11211.50620E Secondary RO CIP Pumps 400 gpm, 20 hp; Horizontal Centrifugal, End Suc									
Warehouse & Care Horiz End Suction Centrifugal Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Horiz End Suction Centrifugal Pump 20 HP; WIGEN Mat. Budgetary Pricing	2.00 ea	20.000	1,635	***18,200***	-	-	-	9,917.34 /ea	19,835
Set VFD Control	2.00 ea	24.000	1,962	-	-	-	-	980.80 /ea	1,962
Grout Equip Base- Non Shrink, Non Metallic	4.00 cf	6.000	430	-	-	-	300	182.66 /cf	731
Test & Check Horiz Centrifugal Split Case Pumps	2.00 ea	16.000	1,308	-	-	-	-	653.87 /ea	1,308
Remove/Realign Drive Coupling to Bump Motor < 3-0/0"	2.00 ea	6.000	490	-	-	-	-	245.20 /ea	490
Install Equipment- RT Crane 40 MT	8.00 ch	8.000	789	-	787	-	-	197.11 /ch	1,577
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11211.50620E Secondary RO CIP Pumps 400 gpm, 20 hp; Horizontal Centrifugal, End Suc	**2.00 ea**	**97.000**	**8,022**	**20,145**	**1,006**		**2,143**	**15,657.75 /ea**	**31,315**
11211.50620G RO Flush Pump No. 1 and 2 per Sheet No. 73-M-001									
Concrete: Equipment Pad	1.00 cy	5.000	463	466	58	-	-	987.03 /cy	987
Horiz End Suction Centrifugal Pump Spare Parts	1.00 lot		-	1,138	-	-	-	1,137.50 /lot	1,138
Furnish Lubricants	12.00 gal		-	341	-	-	-	28.44 /gal	341
Pump Manuf.Rep.	1.00 day		-	-	-	-	1,706	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse & Care Horiz End Suction Centrifugal Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Horiz End Suction Centrifugal Pump 60 HP	2.00 ea	72.000	5,885	93,844	-	-	-	49,864.28 /ea	99,729
Set VFD Control	2.00 ea	24.000	1,962	-	-	-	-	980.80 /ea	1,962
Grout Equip Base- Non Shrink, Non Metallic	4.00 cf	6.000	430	-	-	-	300	182.66 /cf	731
Test & Check Horiz Centrifugal Split Case Pumps	2.00 ea	16.000	1,308	-	-	-	-	653.87 /ea	1,308
Remove/Realign Drive Coupling to Bump Motor < 3-0/0"	2.00 ea	6.000	490	-	-	-	-	245.20 /ea	490
Install Equipment- RT Crane 40 MT	8.00 ch	8.000	789	-	787	-	-	197.11 /ch	1,577
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11211.50620G RO Flush Pump No. 1 and 2 per Sheet No. 73-M-001	**2.00 ea**	**149.000**	**12,272**	**95,789**	**1,006**		**2,143**	**55,604.68 /ea**	**111,209**
11211.50620H RO Transfer Pump No. 1 and 2 per Sheet No. 73-M-001									
Concrete: Equipment Pad	1.00 cy	5.000	463	466	58	-	-	987.03 /cy	987
Horiz End Suction Centrifugal Pump Spare Parts	1.00 lot		-	1,138	-	-	-	1,137.50 /lot	1,138
Furnish Lubricants	12.00 gal		-	341	-	-	-	28.44 /gal	341
Pump Manuf.Rep.	1.00 day		-	-	-	-	1,706	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse & Care Horiz End Suction Centrifugal Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Horiz End Suction Centrifugal Pump 30 HP	2.00 ea	32.000	2,615	37,538	-	-	-	20,076.49 /ea	40,153
Set VFD Control	2.00 ea	24.000	1,962	-	-	-	-	980.80 /ea	1,962
Grout Equip Base- Non Shrink, Non Metallic	2.00 cf	3.000	215	-	-	-	150	182.66 /cf	365
Test & Check Horiz Centrifugal Split Case Pumps	2.00 ea	16.000	1,308	-	-	-	-	653.87 /ea	1,308
Remove/Realign Drive Coupling to Bump Motor < 3-0/0"	2.00 ea	6.000	490	-	-	-	-	245.20 /ea	490
Install Equipment- RT Crane 40 MT	8.00 ch	8.000	789	-	787	-	-	197.11 /ch	1,577
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11211.50620H RO Transfer Pump No. 1 and 2 per Sheet No. 73-M-001	**2.00 ea**	**106.000**	**8,787**	**39,483**	**1,006**		**1,993**	**25,634.23 /ea**	**51,268**
11211 Centrifugal Pumps		**997.226**	**82,809**	**551,603**	**10,587**	**109**	**18,202**		**663,311**
11212 Turbine Pumps									
11212.50620 PMP-51050 - Primary RO Feed Pump 1,870 gpm, 350 hp; Vertical Turbine									
Vertical Turbine Pump Spare Parts	1.00 lot	2.000	163	2,844	-	-	-	3,007.21 /lot	3,007
Furnish Lubricants	6.00 gal		-	-	-	-	341	56.88 /gal	341
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Large Equip	1.00 ea	12.000	990	-	325	-	-	1,314.90 /ea	1,315
Warehouse & Care Vert Turbine Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Vert Turbine Pump 350 HP; WIGEN Mat. Budgetary Pricing	1.00 ea	60.000	4,904	***182,000***	-	-	-	186,904.00 /ea	186,904
Set VFD Control	1.00 ea	12.000	981	-	-	-	-	980.80 /ea	981
Grout Equip Base- Non Shrink, Non Metallic	20.00 cf	30.000	2,152	-	-	-	1,502	182.66 /cf	3,653
Test & Check Vert Turbine Pumps	1.00 ea	1.000	82	-	-	-	-	81.74 /ea	82
Install Equip- RT Crane 80 MT	16.00 ch	16.000	1,579	-	2,600	-	-	261.21 /ch	4,179
Install Strainers	1.00 ea	4.800	408	-	130	-	-	538.11 /ea	538
SS Anchor Bolts/Sleeve 3/4" x 12"	8.00 ea	2.000	147	-	-	-	164	38.87 /ea	311
11212.50620 PMP-51050 - Primary RO Feed Pump 1,870 gpm, 350 hp; Vertical Turbine	**1.00 ea**	**141.800**	**11,569**	**186,550**	**3,055**		**2,007**	**203,181.11 /ea**	**203,181**
11212.50620A PMP-53030 - Secondary RO Feed Pump 224 gpm, 15 hp; Vertical Turbine									
Vertical Turbine Pump Spare Parts	1.00 lot	2.000	163	2,844	-	-	-	3,007.21 /lot	3,007
Furnish Lubricants	6.00 gal		-	-	-	-	341	56.88 /gal	341
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	1.00 ea	4.000	317	-	80	-	-	397.23 /ea	397
Warehouse & Care Vert Turbine Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Vert Turbine Pump 15 HP; WIGEN Mat. Budgetary Pricing	1.00 ea	16.000	1,308	***17,063***	-	-	-	18,370.23 /ea	18,370
Set VFD Control	1.00 ea	12.000	981	-	-	-	-	980.80 /ea	981
Grout Equip Base- Non Shrink, Non Metallic	2.00 cf	3.000	215	-	-	-	150	182.66 /cf	365
Test & Check Vert Turbine Pumps	1.00 ea	1.000	82	-	-	-	-	81.74 /ea	82
Remove/Realign Drive Coupling to Bump Motor < 1-1/2"	1.00 ea	2.000	163	-	-	-	-	163.46 /ea	163
Install Equip- RT Crane 80 MT	8.00 ch	8.000	789	-	1,300	-	-	261.21 /ch	2,090
Install Strainers	1.00 ea	4.800	408	-	130	-	-	538.10 /ea	538

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
11212.50620A PMP-53030 - Secondary RO Feed Pump 224 gpm, 15 hp; Vertical Turbine									
SS Anchor Bolts/Sleeve 3/4" x 12"	4.00 ea	1.000	74	-	-	-	82	38.87 /ea	155
11212.50620A PMP-53030 - Secondary RO Feed Pump 224 gpm, 15 hp; Vertical Turbine	**1.00 ea**	**55.800**	**4,664**	**21,613**	**1,510**		**573**	**28,360.17 /ea**	**28,360**
11212 Turbine Pumps		**197.600**	**16,233**	**208,163**	**4,566**		**2,580**		**231,541**
11217 Submersible Pumps									
11217.50620 Pump PMP-41001									
Sump Pump Spare Parts	1.00 lot	2.000	163	1,706	-	-	-	1,869.71 /lot	1,870
Furnish Lubricants	5.00 gal		-	-	-	-	284	56.88 /gal	284
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	1.00 ea	4.000	317	-	80	-	-	397.23 /ea	397
Warehouse/Care Submersible Sump Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Sump Pump 10 HP	1.00 ea	4.800	408	3,413	130	-	-	3,950.60 /ea	3,951
Install Guide Rails	1.00 ea	2.000	163	-	-	-	-	163.46 /ea	163
Install Base Elbow	1.00 ea	2.000	163	-	-	-	-	163.46 /ea	163
Grout Equip Base- Non Shrink, Non Metallic	4.00 cf	6.000	430	-	-	-	300	182.66 /cf	731
Test & Check	1.00 ea	8.000	654	-	-	-	-	653.87 /ea	654
Install Equipment- RT Crane 80 MT	8.00 ch	8.000	789	-	1,300	-	-	261.21 /ch	2,090
SS Anchor Bolts/Sleeve 3/4" x 8"	4.00 ea	1.000	74	-	-	-	68	35.46 /ea	142
11217.50620 Pump PMP-41001	**1.00 ea**	**39.800**	**3,326**	**6,825**	**1,510**		**653**	**12,314.52 /ea**	**12,315**
11217.50625 Pumps PMP-18110 & PMP-18120									
Sump Pump Spare Parts	1.00 lot	2.000	163	1,706	-	-	-	1,869.72 /lot	1,870
Furnish Lubricants	10.00 gal		-	-	-	-	569	56.88 /gal	569
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse/Care Submersible Sump Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Sump Pump 10 HP	2.00 ea	9.600	816	6,825	260	-	-	3,950.61 /ea	7,901
Install Guide Rails	2.00 ea	4.000	327	-	-	-	-	163.47 /ea	327
Install Base Elbow	2.00 ea	4.000	327	-	-	-	-	163.47 /ea	327
Grout Equip Base- Non Shrink, Non Metallic	8.00 cf	12.000	861	-	-	-	601	182.66 /cf	1,461
Test & Check	2.00 ea	16.000	1,308	-	-	-	-	653.87 /ea	1,308
Install Equipment- RT Crane 80 MT	8.00 ch	8.000	789	-	1,300	-	-	261.21 /ch	2,090
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11217.50625 Pumps PMP-18110 & PMP-18120	**2.00 ea**	**67.600**	**5,536**	**10,238**	**1,721**		**1,306**	**9,400.00 /ea**	**18,800**
11217 Submersible Pumps		**107.400**	**8,862**	**17,063**	**3,231**		**1,959**		**31,115**
062 Pumps		**1,302.226**	**107,905**	**776,828**	**18,384**	**109**	**22,741**		**925,966**
065 Chemical Storage and Feed Systems									
11218 Chemical Sample/Transfer/Metering Pumps									
11218.50650A PMP-45110 & PMP-45130 - Sodium Bisulfate MF Feed Metering Pumps									
Chemical Metering Pump Spare Parts	1.00 lot	2.000	163	1,706	-	-	-	1,869.71 /lot	1,870
Furnish Chemical Metering Pump Lube	6.00 gal		-	341	-	-	-	56.88 /gal	341
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse/Care Chem. Metering Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.47 /u/mo	163
Chemical Metering Pump 36 gph	2.00 ea	12.000	981	5,688	-	-	-	3,334.15 /ea	6,668
Grout Equip Base- Non Shrink, Non Metallic	3.33 cf	5.000	359	-	-	-	250	182.66 /cf	609
Test & Check Chemical Metering Pumps	2.00 ea	3.200	262	-	-	-	-	130.77 /ea	262
Install Equipment- RT Crane 80 MT	8.00 ch	8.000	789	-	1,300	-	-	261.21 /ch	2,090
SS Anchor Bolts/Sleeve 1/2" x 6"	8.00 ea	2.000	147	-	-	-	73	27.50 /ea	220
11218.50650A PMP-45110 & PMP-45130 - Sodium Bisulfate MF Feed Metering Pumps	**2.00 ea**	**42.200**	**3,499**	**9,441**	**1,460**		**323**	**7,361.68 /ea**	**14,723**
11218.50650AA Sodium Bisulfate MF Feed Transfer Pumps									
Chemical Transfer Pump Spare Parts	1.00 lot	1.000	82	1,706	-	-	-	1,787.99 /lot	1,788
Furnish Chemical Transfer Pump Lubricants	6.00 gal		-	341	-	-	-	56.88 /gal	341
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse/Care Chem. Transfer Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Chemical Transfer Pump 70 gph	2.00 ea	12.000	981	7,963	-	-	-	4,471.65 /ea	8,943
Grout Equip Base- Non Shrink, Non Metallic	3.33 cf	4.995	358	-	-	-	250	182.66 /cf	608
Test & Check Chemical Transfer Pumps	2.00 ea	3.200	262	-	-	-	-	130.78 /ea	262
Install Equipment- RT Crane 80 MT	8.00 ch	8.000	789	-	1,300	-	-	261.21 /ch	2,090
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11218.50650AA Sodium Bisulfate MF Feed Transfer Pumps	**2.00 ea**	**41.195**	**3,417**	**11,716**	**1,460**		**386**	**8,489.89 /ea**	**16,980**
11218.50650B PMP-49110 & PMP-49130 - Aqueous Ammonia MF Feed Metering Pumps									
Chemical Metering Pump Spare Parts	1.00 lot	2.000	163	1,706	-	-	-	1,869.72 /lot	1,870
Furnish Chemical Metering Pump Lube	6.00 gal		-	341	-	-	-	56.88 /gal	341
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse/Care Chem. Metering Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Chemical Metering Pump 4.0 gph	2.00 ea	8.000	654	3,413	-	-	-	2,033.19 /ea	4,066

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
11218.50650B PMP-49110 & PMP-49130 - Aqueous Ammonia MF Feed Metering Pumps									
Grout Equip Base- Non Shrink, Non Metallic	3.33 cf	5.000	359	-	-	-	250	182.66 /cf	609
Test & Check Chemical Metering Pumps	2.00 ea	3.200	262	-	-	-	-	130.77 /ea	262
Install Equipment- RT Crane 80 MT	8.00 ch	8.000	789	-	1,300	-	-	261.21 /ch	2,090
SS Anchor Bolts/Sleeve 1/2" x 6"	8.00 ea	2.000	147	-	-	-	73	27.50 /ea	220
11218.50650B PMP-49110 & PMP-49130 - Aqueous Ammonia MF Feed Metering Pumps	**2.00 ea**	**38.200**	**3,172**	**7,166**	**1,460**		**323**	**6,060.72 /ea**	**12,121**
11218.50650C PMP-41110 & PMP-41130 - Sodium Hypochlorite MF Feed Metering Pumps									
Chemical Metering Pump Spare Parts	1.00 lot	2.000	163	1,706	-	-	-	1,869.71 /lot	1,870
Furnish Chemical Metering Pump Lube	6.00 gal		-	341	-	-	-	56.88 /gal	341
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse/Care Chem. Metering Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Chemical Metering Pump 19 gph	2.00 ea	12.000	981	3,413	-	-	-	2,196.65 /ea	4,393
Grout Equip Base- Non Shrink, Non Metallic	3.33 cf	5.000	359	-	-	-	250	182.66 /cf	609
Test & Check Chemical Metering Pumps	2.00 ea	3.200	262	-	-	-	-	130.77 /ea	262
Install Equipment- RT Crane 80 MT	8.00 ch	8.000	789	-	1,300	-	-	261.21 /ch	2,090
SS Anchor Bolts/Sleeve 1/2" x 6"	8.00 ea	2.000	147	-	-	-	73	27.50 /ea	220
11218.50650C PMP-41110 & PMP-41130 - Sodium Hypochlorite MF Feed Metering Pumps	**2.00 ea**	**42.200**	**3,499**	**7,166**	**1,460**		**323**	**6,224.18 /ea**	**12,448**
11218.50650CC PMP-41250 & PMP-41260 - Sodium Hypochlorite MF CIP Transfer Pumps									
Chemical Transfer Pump Spare Parts	1.00 lot	1.000	82	1,706	-	-	-	1,787.98 /lot	1,788
Furnish Chemical Transfer Pump Lubricants	6.00 gal		-	341	-	-	-	56.88 /gal	341
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse/Care Chem. Transfer Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.47 /u/mo	163
Chemical Transfer Pump 70 gph	2.00 ea	12.000	981	7,963	-	-	-	4,471.65 /ea	8,943
Grout Equip Base- Non Shrink, Non Metallic	3.33 cf	4.995	358	-	-	-	250	182.66 /cf	608
Test & Check Chemical Transfer Pumps	2.00 ea	3.200	262	-	-	-	-	130.77 /ea	262
Install Equipment- RT Crane 80 MT	8.00 ch	8.000	789	-	1,300	-	-	261.21 /ch	2,090
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11218.50650CC PMP-41250 & PMP-41260 - Sodium Hypochlorite MF CIP Transfer Pumps	**2.00 ea**	**41.195**	**3,417**	**11,716**	**1,460**		**387**	**8,489.89 /ea**	**16,980**
11218.50650D PMP-42110 & PMP-42130 - Sulfuric Acid Pri. RO Feed Metering Pumps									
Chemical Transfer Pump Spare Parts	1.00 lot	1.000	82	1,706	-	-	-	1,787.99 /lot	1,788
Furnish Chemical Transfer Pump Lubricants	6.00 gal		-	341	-	-	-	56.88 /gal	341
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse/Care Chem. Transfer Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Chemical Transfer Pump 5.0 gph	2.00 ea	8.000	654	3,413	-	-	-	2,033.19 /ea	4,066
Grout Equip Base- Non Shrink, Non Metallic	3.33 cf	4.995	358	-	-	-	250	182.66 /cf	608
Test & Check Chemical Transfer Pumps	2.00 ea	3.200	262	-	-	-	-	130.77 /ea	262
Install Equipment- RT Crane 80 MT	8.00 ch	8.000	789	-	1,300	-	-	261.21 /ch	2,090
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11218.50650D PMP-42110 & PMP-42130 - Sulfuric Acid Pri. RO Feed Metering Pumps	**2.00 ea**	**37.195**	**3,090**	**7,166**	**1,460**		**387**	**6,051.43 /ea**	**12,103**
11218.50650DD PMP-42210 & PMP-42230 - Sulfuric Acid Sec. RO Feed Metering Pumps									
Chemical Transfer Pump Spare Parts	1.00 lot	1.000	82	1,706	-	-	-	1,787.98 /lot	1,788
Furnish Chemical Transfer Pump Lubricants	6.00 gal		-	341	-	-	-	56.88 /gal	341
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.23 /ea	794
Warehouse/Care Chem. Transfer Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Chemical Transfer Pump 2.0 gph	2.00 ea	4.800	392	3,413	-	-	-	1,902.41 /ea	3,805
Grout Equip Base- Non Shrink, Non Metallic	3.33 cf	4.995	358	-	-	-	250	182.66 /cf	608
Test & Check Chemical Transfer Pumps	2.00 ea	3.200	262	-	-	-	-	130.77 /ea	262
Install Equipment- RT Crane 80 MT	8.00 ch	8.000	789	-	1,300	-	-	261.21 /ch	2,090
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11218.50650DD PMP-42210 & PMP-42230 - Sulfuric Acid Sec. RO Feed Metering Pumps	**2.00 ea**	**33.995**	**2,828**	**7,166**	**1,460**		**387**	**5,920.65 /ea**	**11,841**
11218.50650E PMP-43110 & PMP-43130 - Threshold Inhibitor Pri. RO Feed Metering Pump									
Chemical Transfer Pump Spare Parts	1.00 lot	1.000	82	1,706	-	-	-	1,787.99 /lot	1,788
Furnish Chemical Transfer Pump Lubricants	6.00 gal		-	341	-	-	-	56.88 /gal	341
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse/Care Chem. Transfer Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Chemical Transfer Pump 2.0 gph	2.00 ea	4.800	392	3,413	-	-	-	1,902.41 /ea	3,805
Grout Equip Base- Non Shrink, Non Metallic	3.33 cf	4.995	358	-	-	-	250	182.66 /cf	608
Test & Check Chemical Transfer Pumps	2.00 ea	3.200	262	-	-	-	-	130.78 /ea	262
Install Equipment- RT Crane 80 MT	8.00 ch	8.000	789	-	1,300	-	-	261.20 /ch	2,090
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11218.50650E PMP-43110 & PMP-43130 - Threshold Inhibitor Pri. RO Feed Metering Pump	**2.00 ea**	**33.995**	**2,828**	**7,166**	**1,460**		**387**	**5,920.65 /ea**	**11,841**
11218.50650EE PMP-43210 & PMP-43230 - Threshold Inhibitor Sec. RO Feed Metering Pump									
Chemical Transfer Pump Spare Parts	1.00 lot	1.000	82	1,706	-	-	-	1,787.99 /lot	1,788
Furnish Chemical Transfer Pump Lubricants	6.00 gal		-	341	-	-	-	56.88 /gal	341

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
11218.50650EE PMP-43210 & PMP-43230 - Threshold Inhibitor Sec. RO Feed Metering Pump									
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse/Care Chem. Transfer Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Chemical Transfer Pump 1.0 gph	2.00 ea	4.800	392	3,413	-	-	-	1,902.41 /ea	3,805
Grout Equip Base- Non Shrink, Non Metallic	3.33 cf	4.995	358	-	-	-	250	182.66 /cf	608
Test & Check Chemical Transfer Pumps	2.00 ea	3.200	262	-	-	-	-	130.78 /ea	262
Install Equipment- RT Crane 80 MT	8.00 ch	8.000	789	-	1,300	-	-	261.21 /ch	2,090
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11218.50650EE PMP-43210 & PMP-43230 - Threshold Inhibitor Sec. RO Feed Metering Pump	**2.00 ea**	**33.995**	**2,828**	**7,166**	**1,460**		**386**	**5,920.66 /ea**	**11,841**
11218.50650G PMP-44110 & PMP-44130 - Citric Acid MF/RO CIP Transfer Pumps									
Chemical Transfer Pump Spare Parts	1.00 lot	1.000	82	3,413	-	-	-	3,494.23 /lot	3,494
Furnish Chemical Transfer Pump Lubricants	12.00 gal		-	683	-	-	-	56.88 /gal	683
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	4.00 ea	16.000	1,268	-	320	-	-	397.22 /ea	1,589
Warehouse/Care Chem. Transfer Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.47 /u/mo	163
Chemical Transfer Pump 1.0 gph	4.00 ea	9.600	785	6,825	-	-	-	1,902.41 /ea	7,610
Grout Equip Base- Non Shrink, Non Metallic	6.66 cf	9.990	717	-	-	-	500	182.66 /cf	1,217
Test & Check Chemical Transfer Pumps	4.00 ea	6.400	523	-	-	-	-	130.77 /ea	523
Install Equipment- RT Crane 80 MT	8.00 ch	8.000	789	-	1,300	-	-	261.21 /ch	2,090
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11218.50650G PMP-44110 & PMP-44130 - Citric Acid MF/RO CIP Transfer Pumps	**4.00 ea**	**54.990**	**4,474**	**12,626**	**1,621**		**637**	**4,839.47 /ea**	**19,358**
11218.50650I PMP-46110 & PMP-46130 - Sodium Hydroxide AWPF Product Water Metering P									
Chemical Transfer Pump Spare Parts	1.00 lot	1.000	82	1,706	-	-	-	1,787.98 /lot	1,788
Furnish Chemical Transfer Pump Lubricants	6.00 gal		-	341	-	-	-	56.88 /gal	341
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse/Care Chem. Transfer Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Chemical Transfer Pump 21 gph	2.00 ea	12.000	981	4,550	-	-	-	2,765.40 /ea	5,531
Grout Equip Base- Non Shrink, Non Metallic	3.33 cf	4.995	358	-	-	-	250	182.66 /cf	608
Test & Check Chemical Transfer Pumps	2.00 ea	3.200	262	-	-	-	-	130.77 /ea	262
Install Equipment- RT Crane 80 MT	8.00 ch	8.000	789	-	1,300	-	-	261.21 /ch	2,090
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11218.50650I PMP-46110 & PMP-46130 - Sodium Hydroxide AWPF Product Water Metering P	**2.00 ea**	**41.195**	**3,417**	**8,304**	**1,460**		**387**	**6,783.64 /ea**	**13,567**
11218.50650II PMP-46150 & PMP-46160 - Sodium Hydroxide MF/RP CIP Transfer Pupms									
Chemical Transfer Pump Spare Parts	1.00 lot	1.000	82	3,413	-	-	-	3,494.23 /lot	3,494
Furnish Chemical Transfer Pump Lubricants	12.00 gal		-	683	-	-	-	56.88 /gal	683
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	4.00 ea	16.000	1,268	-	321	-	-	397.22 /ea	1,589
Warehouse/Care Chem. Transfer Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Chemical Transfer Pump 1.0 gph	4.00 ea	9.600	785	6,825	-	-	-	1,902.41 /ea	7,610
Grout Equip Base- Non Shrink, Non Metallic	6.66 cf	9.990	717	-	-	-	500	182.66 /cf	1,216
Test & Check Chemical Transfer Pumps	4.00 ea	6.400	523	-	-	-	-	130.77 /ea	523
Install Equipment- RT Crane 80 MT	8.00 ch	8.000	789	-	1,300	-	-	261.21 /ch	2,090
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11218.50650II PMP-46150 & PMP-46160 - Sodium Hydroxide MF/RP CIP Transfer Pupms	**4.00 ea**	**54.990**	**4,474**	**12,626**	**1,621**		**636**	**4,839.47 /ea**	**19,358**
11218 Chemical Sample/Transfer/Metering Pumps		**495.344**	**40,941**	**109,428**	**17,846**		**4,948**		**173,162**
11240 Chemical Totes									
11240.50650E Threshold Inhibitor Storage Tank 275 gal; Totes on Scale									
on Scale 275 gal	1.00 ea		-	683	-	-	-	682.50 /ea	683
11240.50650E Threshold Inhibitor Storage Tank 275 gal; Totes on Scale	**1.00 ea**			**683**				**682.50 /ea**	**683**
11240.50650F Threshold Inhibitor Storage Tank 275 gal; Totes on Scale									
on Scale 275 gal	1.00 ea	4.000	327	683	-	-	-	1,009.43 /ea	1,009
11240.50650F Threshold Inhibitor Storage Tank 275 gal; Totes on Scale	**1.00 ea**	**4.000**	**327**	**683**				**1,009.43 /ea**	**1,009**
11240.50650G Threshold Inhibitor Storage Tank 275 gal; Totes on Scale									
on Scale 275 gal	1.00 ea	4.000	327	683	-	-	-	1,009.44 /ea	1,009
11240.50650G Threshold Inhibitor Storage Tank 275 gal; Totes on Scale	**1.00 ea**	**4.000**	**327**	**683**				**1,009.44 /ea**	**1,009**
11240 Chemical Totes		**8.000**	**654**	**2,048**					**2,701**
13200 Tanks									
13200.50100A TNK-45020 - Sodium Bisulfate Storage Tank 10,300 gal, XLPE									
Concrete: Equipment Pad 2-'6" Thick	15.00 cy	75.000	6,940	6,994	871	-	-	987.03 /cy	14,805
Unload & Protect Poly Tanks	1.00 ea	3.429	330	-	104	-	-	434.30 /ea	434
10,300 Gal. Polyethylene Storage Tank	1.00 ea	21.600	2,079	25,729	657	-	-	28,464.88 /ea	28,465
Install Tank Holdowns < 15,000 Gallons Tank	4.00 ea	22.857	2,129	-		-	-	532.31 /ea	2,129
Steel Anchor Bolts/Sleeve 1/2" x 8"	16.00 ea	4.000	333	-	-	-	61	24.66 /ea	395
Install Above Ground Tank Control Panel	1.00 ea	4.000	373	-	-	-	128	500.36 /ea	500
Test Above Ground Tank	1.00 ea	8.000	745	-	-	-	-	745.23 /ea	745

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
13200.50100A TNK-45020 - Sodium Bisulfate Storage Tank 10,300 gal, XLPE	**1.00 ea**	**138.886**	**12,929**	**32,723**	**1,633**		**189**	**47,473.94 /ea**	**47,474**
13200.50100B TNK-49020 - Aqueous Ammonia Storage Tank 750 gal, Welded Steel, Phenol									
Concrete: Equipment Pad 2-'6" Thick	4.00 cy	20.000	1,851	1,865	232	-	-	987.03 /cy	3,948
Unload & Protect Above Ground Tank	1.00 ea	3.429	330	-	104	-	-	434.30 /ea	434
750 Gallon Steel Tank	1.00 ea	30.000	2,887	2,811	913	-	-	6,610.55 /ea	6,611
Install Holdowns < 1,000 Gallons Tank	4.00 ea	11.429	1,065	-		-	-	266.16 /ea	1,065
SS Anchor Bolts/Sleeve 1/2" x 8"	16.00 ea	4.000	333	-	-	-	164	31.04 /ea	497
Install Above Ground Tank Control Panel	1.00 ea	4.000	373	-	-	-	128	500.36 /ea	500
Test Above Ground Tank	1.00 ea	8.000	745	-	-	-	-	745.22 /ea	745
13200.50100B TNK-49020 - Aqueous Ammonia Storage Tank 750 gal, Welded Steel, Phenol	**1.00 ea**	**80.858**	**7,584**	**4,676**	**1,249**		**291**	**13,799.86 /ea**	**13,800**
13200.50100C TNK-41020 - Sodium Hypochlorite Storage Tank 6,600 gal, XLPE with HDPE									
Concrete: Equipment Pad 2-'6" Thick	15.00 cy	75.000	6,940	6,994	871	-	-	987.03 /cy	14,805
Unload & Protect Poly Tanks	1.00 ea	3.429	330	-	104	-	-	434.30 /ea	434
6,600 Gal. Polyethylene Storage Tank	1.00 ea	43.200	4,158	21,718	1,314	-	-	27,189.56 /ea	27,190
SCR-41010 Vent Water Seal Scrubber	1.00 ea	12.000	1,155	12,775	365	-	-	14,295.03 /ea	14,295
Install Tank Holdowns < 10,000 Gallons Tank	4.00 ea	22.857	2,129	-		-	-	532.31 /ea	2,129
Steel Anchor Bolts/Sleeve 1/2" x 8"	16.00 ea	4.000	333	-	-	-	61	24.66 /ea	395
Install Above Ground Tank Control Panel	1.00 ea	4.000	373	-	-	-	128	500.36 /ea	500
Test Above Ground Tank	1.00 ea	8.000	745	-	-	-	-	745.23 /ea	745
13200.50100C TNK-41020 - Sodium Hypochlorite Storage Tank 6,600 gal, XLPE with HDPE	**1.00 ea**	**172.486**	**16,163**	**41,487**	**2,655**		**189**	**60,493.65 /ea**	**60,494**
13200.50100D TNK-42020 - Sulfuric Acid Storage Tank 1,700 gal; Welded Steel, Phenol									
Concrete: Equipment Pad	5.00 cy	25.000	2,313	2,331	290	-	-	987.03 /cy	4,935
Unload & Protect Above Ground Tank	1.00 ea	3.429	330	-	104	-	-	434.30 /ea	434
1,700 Gallon Steel Tank	1.00 ea	36.000	3,465	5,110	1,095	-	-	9,670.05 /ea	9,670
Install Holdowns < 5,000 Gallons Tank	4.00 ea	11.429	1,065	-		-	-	266.16 /ea	1,065
SS Anchor Bolts/Sleeve 1/2" x 8"	16.00 ea	4.000	333	-	-	-	164	31.04 /ea	497
Install Above Ground Tank Control Panel	1.00 ea	4.000	373	-	-	-	128	500.36 /ea	500
Test Above Ground Tank	1.00 ea	8.000	745	-	-	-	-	745.22 /ea	745
13200.50100D TNK-42020 - Sulfuric Acid Storage Tank 1,700 gal; Welded Steel, Phenol	**1.00 ea**	**91.858**	**8,624**	**7,441**	**1,490**		**291**	**17,846.39 /ea**	**17,846**
13200.50100I TNK-46020 - Sodium Hydroxide Storage Tank 6,600 gal, XLPE with HDPE Li									
Concrete: Equipment Pad 2-'6" Thick	15.00 cy	75.000	6,940	6,994	871	-	-	987.03 /cy	14,805
Unload & Protect Poly Tanks	1.00 ea	3.429	330	-	104	-	-	434.30 /ea	434
6,600 Gal. Polyethylene Storage Tank	1.00 ea	43.200	4,158	21,718	1,314	-	-	27,189.57 /ea	27,190
Install Tank Holdowns < 10,000 Gallons Tank	4.00 ea	22.857	2,129	-		-	-	532.31 /ea	2,129
Steel Anchor Bolts/Sleeve 1/2" x 8"	16.00 ea	4.000	333	-	-	-	61	24.66 /ea	395
Install Above Ground Tank Control Panel	1.00 ea	4.000	373	-	-	-	128	500.36 /ea	500
Test Above Ground Tank	1.00 ea	8.000	745	-	-	-	-	745.22 /ea	745
13200.50100I TNK-46020 - Sodium Hydroxide Storage Tank 6,600 gal, XLPE with HDPE Li	**1.00 ea**	**160.486**	**15,008**	**28,712**	**2,290**		**189**	**46,198.62 /ea**	**46,199**
13200 Tanks		**644.574**	**60,308**	**115,039**	**9,316**		**1,150**		**185,812**
15112 Butterfly Valves									
15112.00.035.30 BFV for CPVC Pipe									
Unload Care & Protect PVC Butterfly Valves	4.00 ea	0.320	26	-	-	-	46	17.96 /ea	72
Butterfly Valve, PVC, Flg, Lever Operated, 1"	2.00 ea	3.360	276	216	-	-	-	246.31 /ea	493
Butterfly Valve, PVC, Flg, Lever Operated, 2"	2.00 ea	3.360	276	216	-	-	-	246.30 /ea	493
15112.00.035.30 BFV for CPVC Pipe	**4.00 ea**	**7.040**	**579**	**432**			**46**	**264.26 /ea**	**1,057**
15112 Butterfly Valves		**7.040**	**579**	**432**			**46**		**1,057**
15114 Check Valves									
15114.00.035.10 Ball Check Valve for SS316 Pipes									
Unload Care & Protect Check Valves	18.00 ea	1.440	118	-	-	-	205	17.96 /ea	323
Check Valve, SS, Soc, 0.75"	14.00 ea	21.700	1,786	4,970	-	-	-	482.53 /ea	6,755
Check Valve, SS, Soc, 1.50"	2.00 ea	6.320	520	1,213	-	-	-	866.53 /ea	1,733
Check Valve, SS, Soc, 2.00"	2.00 ea	8.340	686	1,467	-	-	-	1,076.69 /ea	2,153
15114.00.035.10 Ball Check Valve for SS316 Pipes	**18.00 ea**	**37.800**	**3,110**	**7,650**			**205**	**609.17 /ea**	**10,965**
15114.00.035.15 Ball Check Valve for A20 Pipes									
Unload Care & Protect Check Valves	14.00 ea	1.120	92	-	-	-	159	17.96 /ea	251
Check Valve, SS, Flg, 1.5"	12.00 ea	14.520	1,195	10,532	-	-	-	977.22 /ea	11,727
Check Valve, SS, Flg, 2.0"	2.00 ea	3.000	247	2,772	-	-	-	1,509.34 /ea	3,019
15114.00.035.15 Ball Check Valve for A20 Pipes	**14.00 ea**	**18.640**	**1,534**	**13,304**			**159**	**1,071.19 /ea**	**14,997**
15114.00.035.30 Ball Check Valve for CPVC Pipes									
Unload Care & Protect Check Valves	36.00 ea	2.880	237	-	-	-	410	17.96 /ea	646
Ball Check Valve, CPVC, True-Union 0.75"	12.00 ea	7.800	642	1,119	-	-	-	146.76 /ea	1,761
Ball Check Valve, CPVC, True-Union 1.00"	9.00 ea	6.570	541	993	-	-	-	170.41 /ea	1,534
Ball Check Valve, CPVC, True-Union 1.50"	5.00 ea	4.050	333	938	-	-	-	254.34 /ea	1,272
Ball Check Valve, CPVC, True-Union 2.00"	10.00 ea	9.500	782	2,480	-	-	-	326.15 /ea	3,261
15114.00.035.30 Ball Check Valve for CPVC Pipes	**36.00 ea**	**30.800**	**2,534**	**5,531**			**410**	**235.40 /ea**	**8,474**
15114 Check Valves		**87.240**	**7,179**	**26,484**			**774**		**34,436**
15115 Diaphragm Valves									

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15115.00.035.10 Diaphragm Valves									
Unload Care & Protect Valves	28.00 ea	2.240	184	-	-	-	319	17.96 /ea	503
Diaphragm Valve, flg, 3"	2.00 ea	4.600	379	4,934	-	-	-	2,656.48 /ea	5,313
Diaphragm Valve, Screw Joint, 1.00"	10.00 ea	8.500	699	14,425	-	-	-	1,512.43 /ea	15,124
Diaphragm Valve, Screw Joint, 1.50"	2.00 ea	2.020	166	3,231	-	-	-	1,698.69 /ea	3,397
Diaphragm Valve, Screw Joint, 2.00"	14.00 ea	17.500	1,440	25,041	-	-	-	1,891.54 /ea	26,481
15115.00.035.10 Diaphragm Valves	**28.00 ea**	**34.860**	**2,868**	**47,632**			**319**	**1,814.96 /ea**	**50,819**
15115 Diaphragm Valves		**34.860**	**2,868**	**47,632**			**319**		**50,819**
15117 Ball Valve									
15117.00.035.10 Ball Valve for SS316 Pipes									
Unload Care & Protect Valves	76.00 ea	6.080	500	-	-	-	865	17.96 /ea	1,365
Ball Valve, SS, Soc, 0.75"	36.00 ea	55.800	4,592	13,204	-	-	-	494.32 /ea	17,796
Ball Valve, SS, Soc, 1.00"	30.00 ea	63.000	5,184	12,890	-	-	-	602.46 /ea	18,074
Ball Valve, SS, Soc, 1.50"	10.00 ea	31.600	2,600	779	-	-	-	337.94 /ea	3,379
15117.00.035.10 Ball Valve for SS316 Pipes	**76.00 ea**	**156.480**	**12,876**	**26,873**			**865**	**534.39 /ea**	**40,614**
15117.00.035.15 Ball Valve for A20 Pipes									
Unload Care & Protect Valves	46.00 ea	3.680	303	-	-	-	523	17.96 /ea	826
Ball Valve, SS, Flg, 1.5"	24.00 ea	55.440	4,562	21,504	-	-	-	1,086.07 /ea	26,066
Ball Valve, SS, Flg, 2"	22.00 ea	97.900	8,056	51,614	-	-	-	2,712.26 /ea	59,670
15117.00.035.15 Ball Valve for A20 Pipes	**46.00 ea**	**157.020**	**12,920**	**73,118**			**523**	**1,881.77 /ea**	**86,561**
15117.00.035.20 Ball Valve for ELSP Pipes									
Unload Care & Protect Valves	3.00 ea	0.240	20	-	-	-	34	17.96 /ea	54
Ball Valve, Wrench Operated, Flange, 1"	2.00 ea	2.500	206	1,138	-	-	-	671.61 /ea	1,343
Ball Valve, Wrench Operated, Flange, 2"	1.00 ea	1.250	103	909	-	-	-	1,012.21 /ea	1,012
15117.00.035.20 Ball Valve for ELSP Pipes	**3.00 ea**	**3.990**	**328**	**2,047**			**34**	**803.10 /ea**	**2,409**
15117.00.035.30 Ball Valve for CPVC Pipes									
Unload Care & Protect Valves	130.00 ea	10.400	856	-	-	-	1,479	17.96 /ea	2,335
Ball Valve, CPVC, True Union, 0.75"	44.00 ea	28.600	2,353	633	-	-	-	67.86 /ea	2,986
Ball Valve, CPVC, True Union, 1.00"	29.00 ea	21.170	1,742	498	-	-	-	77.25 /ea	2,240
Ball Valve, CPVC, True Union, 1.50"	21.00 ea	17.010	1,400	600	-	-	-	95.23 /ea	2,000
Ball Valve, CPVC, True Union, 2.00"	36.00 ea	34.200	2,814	1,357	-	-	-	115.87 /ea	4,171
15117.00.035.30 Ball Valve for CPVC Pipes	**130.00 ea**	**111.380**	**9,165**	**3,088**			**1,479**	**105.63 /ea**	**13,732**
15117 Ball Valve		**428.870**	**35,290**	**105,125**			**2,901**		**143,316**
15119 Special Purpose Valves & Accessories (Solenoid/Relief/et al)									
15119.00.035.10 Pressure Regulating Valve									
Unload Care & Protect Valves	17.00 ea	1.360	112	-	-	-	193	17.96 /ea	305
Pressure Regulating Valve- 0-3/4"	8.00 ea	21.760	1,791	1,866	-	-	-	457.01 /ea	3,656
Pressure Regulating Valve- 1"	3.00 ea	9.090	748	836	-	-	-	528.01 /ea	1,584
Pressure Regulating Valve- 1-1/2"	4.00 ea	15.800	1,300	2,366	-	-	-	916.53 /ea	3,666
Pressure Regulating Valve- 2"	2.00 ea	9.700	798	967	-	-	-	882.52 /ea	1,765
15119.00.035.10 Pressure Regulating Valve	**17.00 ea**	**57.710**	**4,749**	**6,034**			**193**	**645.68 /ea**	**10,977**
15119.00.035.20 Needle Valve									
Unload Care & Protect Valves	22.00 ea	1.760	145	-	-	-	250	17.96 /ea	395
316 Stainless Steel Needle Valve- 1-0/0 (Threaded)	10.00 ea	8.700	716	2,286	-	-	-	300.23 /ea	3,002
316 Stainless Steel Needle Valve- 2-0/0 (Threaded)	6.00 ea	8.280	681	2,764	-	-	-	574.24 /ea	3,445
PVC Needle Valve- 0-1/2 (Threaded)	6.00 ea	3.120	257	369	-	-	-	104.21 /ea	625
15119.00.035.20 Needle Valve	**22.00 ea**	**21.860**	**1,799**	**5,419**			**250**	**339.46 /ea**	**7,468**
15119.00.035.30 Flow Control Valve									
Unload Care & Protect Valves	3.00 ea	0.240	20	-	-	-	34	17.96 /ea	54
Flow Control Valve 10"	3.00 ea	23.490	1,933	17,063	-	-	-	6,331.80 /ea	18,995
15119.00.035.30 Flow Control Valve	**3.00 ea**	**23.730**	**1,953**	**17,063**			**34**	**6,349.76 /ea**	**19,049**
15119.00.035.40 Air Release Valve									
Unload Care & Protect Valves	17.00 ea	1.360	112	-	-	-	193	17.96 /ea	305
Air Release Valve- 1-1/2"	3.00 ea	4.350	358	410	-	-	-	255.81 /ea	767
Air Release Valve- 2"	4.00 ea	6.720	553	546	-	-	-	274.74 /ea	1,099
Air Release Valve- 3"	2.00 ea	6.060	499	273	-	-	-	385.83 /ea	772
Air Release Valve- 4"	4.00 ea	12.120	997	546	-	-	-	385.83 /ea	1,543
Air Release Valve- 6"	4.00 ea	12.120	997	546	-	-	-	385.83 /ea	1,543
15119.00.035.40 Air Release Valve	**17.00 ea**	**42.730**	**3,516**	**2,321**			**193**	**354.70 /ea**	**6,030**
15119.00.035.50 Pressure Release Valve									
Unload Care & Protect Valves	29.00 ea	2.320	191	-	-	-	330	17.96 /ea	521
Pressure Release Valve- 0-3/4"	16.00 ea	43.520	3,581	3,731	-	-	-	457.00 /ea	7,312
Pressure Release Valve- 1"	4.00 ea	12.120	997	1,115	-	-	-	528.01 /ea	2,112
Pressure Release Valve- 2"	4.00 ea	19.400	1,596	1,934	-	-	-	882.52 /ea	3,530
Pressure Release Valve- 3"	5.00 ea	24.250	1,995	3,413	-	-	-	1,081.59 /ea	5,408
15119.00.035.50 Pressure Release Valve	**29.00 ea**	**101.610**	**8,361**	**10,192**			**330**	**651.14 /ea**	**18,883**
15119.00.035.60 Back Pressure Regulating Valve									

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15119.00.035.60 Back Pressure Regulating Valve									
Unload Care & Protect Valves	14.00 ea	1.120	92	-	-	-	159	17.96 /ea	251
Back Pressure Regulating Valve - .75"	8.00 ea	24.000	1,975	12,194	-	-	-	1,771.11 /ea	14,169
Back Pressure Regulating Valve - 1.5"	6.00 ea	26.220	2,158	9,828	-	-	-	1,997.59 /ea	11,986
15119.00.035.60 Back Pressure Regulating Valve	**14.00 ea**	**51.340**	**4,225**	**22,022**			**159**	**1,886.13 /ea**	**26,406**
15119 Special Purpose Valves & Accessories (Solenoid/Relief/et al)		**298.980**	**24,602**	**63,050**			**1,160**		**88,812**
15221 Stainless Steel Pipe									
15221.00.200B TNK-49020 - Aqueous Ammonia Storage Tank Piping, SS316 3/4" dia.									
Clevis-Med (Anvil 260)/Angle Bracket (194-1) Steel Pipe, 0- 3/4"	105.00 ea	176.400	14,515	15,527	-	-	-	286.12 /ea	30,042
Flexible Metal Connector, Bronze w/Copper Ends, 0.75"	6.00 ea	5.760	474	424	-	-	-	149.73 /ea	898
Unload Care & Protect Pipe/Fittings	830.00 lbs	0.274	20	-	4	-	-	0.03 /lbs	24
Layout Pipe & Fitting	830.00 lf	8.300	683	-	-	-	-	0.82 /lf	683
316L Sch 40s SS Pipe T&C, 0- 3/4"	830.00 lf	66.400	5,464	3,682	-	-	-	11.02 /lf	9,146
Forged 316L SS-Class 2000 Thrd. 90 Ell, 0- 3/4"	45.00 ea	37.800	3,110	2,518	-	-	-	125.09 /ea	5,629
Forged 316L SS-Class 2000 Thrd. Tee, 0- 3/4"	15.00 ea	18.450	1,518	1,335	-	-	-	190.21 /ea	2,853
Forged 316L SS-Class 3000 Thrd. Coupling, 0- 3/4"	80.00 ea	66.400	5,464	2,366	-	-	-	97.87 /ea	7,830
15221.00.200B TNK-49020 - Aqueous Ammonia Storage Tank Piping, SS316 3/4" dia.	**830.00 lf**	**379.784**	**31,248**	**25,853**	**4**			**68.80 /lf**	**57,105**
15221.00.200B1 TNK-49020 - Aqueous Ammonia Storage Tank Piping, SS316 1" dia.									
Clevis-Med (Anvil 260)/Angle Bracket (194-1) Steel Pipe, 1.00"	15.00 ea	25.200	2,074	2,218	-	-	-	286.12 /ea	4,292
Flexible Metal Connector, Bronze w/Copper Ends, 1.00"	4.00 ea	4.320	355	301	-	-	-	164.19 /ea	657
Unload Care & Protect Pipe/Fittings	120.00 lbs	0.040	3	-	1	-	-	0.03 /lbs	3
Layout Pipe & Fitting	120.00 lf	1.200	99	-	-	-	-	0.82 /lf	99
316L Sch 40s SS Pipe T&C, 1.00"	120.00 lf	10.800	889	754	-	-	-	13.69 /lf	1,643
Forged 316L SS-Class 2000 Thrd. 90 Ell, 1.00"	14.00 ea	14.140	1,164	976	-	-	-	152.81 /ea	2,139
Forged 316L SS-Class 2000 Thrd. Tee, 1.00"	5.00 ea	7.450	613	590	-	-	-	240.63 /ea	1,203
Forged 316L SS-Class 3000 Thrd. Coupling, 1.00"	10.00 ea	10.100	831	470	-	-	-	130.16 /ea	1,302
15221.00.200B1 TNK-49020 - Aqueous Ammonia Storage Tank Piping, SS316 1" dia.	**120.00 lf**	**73.250**	**6,027**	**5,310**	**1**			**94.48 /lf**	**11,338**
15221.00.200B2 TNK-49020 - Aqueous Ammonia Storage Tank Piping, SS316 1.50" dia.									
Clevis-Med (Anvil 260)/Angle Bracket (194-1) Steel Pipe, 1.50"	18.00 ea	30.240	2,488	2,899	-	-	-	299.31 /ea	5,388
Flexible Metal Connector, Bronze w/Copper Ends, 1.50"	4.00 ea	4.800	395	422	-	-	-	204.32 /ea	817
304 SS Thrd. Companion Flange Class 150, 1.50"	4.00 ea	4.200	346	348	-	-		173.40 /ea	694
Unload Care & Protect Pipe/Fittings	140.00 lbs	0.046	3	-	1	-	-	0.03 /lbs	4
Layout Pipe & Fitting	140.00 lf	1.400	115	-	-	-	-	0.82 /lf	115
316L Sch 40s SS Pipe T&C, 1.50"	140.00 lf	16.800	1,382	1,449	-	-	-	20.23 /lf	2,832
Forged 316L SS-Class 2000 Thrd. 90 Ell, 1.50"	15.00 ea	19.200	1,580	2,730	-	-	-	287.33 /ea	4,310
Forged 316L SS-Class 3000 Thrd. Coupling, 1.50"	14.00 ea	17.920	1,475	1,482	-	-	-	211.20 /ea	2,957
Forged 316L SS-Class 3000 Thrd. Cap, 1.50"	4.00 ea	2.720	224	1,092	-	-	-	328.87 /ea	1,315
Forged 316L SS-Class 3000 SW Tee, 1.50"	4.00 ea	19.560	1,610	973	-	-	-	645.67 /ea	2,583
15221.00.200B2 TNK-49020 - Aqueous Ammonia Storage Tank Piping, SS316 1.50" dia.	**140.00 lf**	**116.886**	**9,618**	**11,396**	**1**			**150.10 /lf**	**21,014**
15221.00.200B3 TNK-49020 - Aqueous Ammonia Storage Tank Piping, SS316 2" dia.									
Clevis-Med (Anvil 260)/Angle Bracket (194-1) Steel Pipe, 2.00"	5.00 ea	8.400	691	812	-	-	-	300.67 /ea	1,503
Flexible Metal Connector, Bronze w/Copper Ends, 2.00"	2.00 ea	2.680	221	275	-	-	-	247.54 /ea	495
304 SS Thrd. Companion Flange Class 150, 2.00"	2.00 ea	2.580	212	174	-	-		193.15 /ea	386
Unload Care & Protect Pipe/Fittings	40.00 lbs	0.013	1	-	0	-	-	0.03 /lbs	1
Layout Pipe & Fitting	40.00 lf	0.400	33	-	-	-	-	0.82 /lf	33
316L Sch 40s SS Pipe T&C, 2.00"	40.00 lf	5.600	461	547	-	-	-	25.20 /lf	1,008
Forged 316L SS-Class 2000 Thrd. 90 Ell, 2.00"	6.00 ea	9.480	780	1,387	-	-	-	361.11 /ea	2,167
Forged 316L SS-Class 2000 Thrd. Tee, 2.00"	4.00 ea	9.320	767	1,259	-	-	-	506.40 /ea	2,026
Forged 316L SS-Class 3000 Thrd. Coupling, 2.00"	5.00 ea	7.800	642	662	-	-	-	260.77 /ea	1,304
Forged 316L SS-Class 3000 Thrd. Cap, 2.00"	2.00 ea	1.660	137	649	-	-	-	392.81 /ea	786
15221.00.200B3 TNK-49020 - Aqueous Ammonia Storage Tank Piping, SS316 2" dia.	**40.00 lf**	**47.933**	**3,944**	**5,764**	**0**			**242.71 /lf**	**9,708**
15221.00.400D TNK-42020 - Sulfuric Acid Storage Tank Piping, A20 3/4" dia.									
Clevis-Med (Anvil 260)/Angle Bracket (194-1) Steel Pipe, 0- 3/4"	25.00 ea	42.000	3,456	4,621	-	-	-	323.08 /ea	8,077
Flexible Metal Connector, Bronze w/Copper Ends, 0.75"	4.00 ea	3.840	316	283	-	-	-	149.73 /ea	599
Unload Care & Protect Pipe/Fittings	200.00 lbs	0.066	5	-	1	-	-	0.03 /lbs	6
Layout Pipe & Fitting	200.00 lf	2.000	165	-	-	-	-	0.82 /lf	165
316L Sch 40s SS Pipe T&C, 0- 3/4"	200.00 lf	16.000	1,317	1,109	-	-	-	12.13 /lf	2,426
Forged 316L SS-Class 2000 Thrd. 90 Ell, 0- 3/4"	12.00 ea	10.080	829	839	-	-	-	139.08 /ea	1,669
Forged 316L SS-Class 2000 Thrd. Tee, 0- 3/4"	4.00 ea	4.920	405	445	-	-	-	212.46 /ea	850
Forged 316L SS-Class 3000 Thrd. Coupling, 0- 3/4"	22.00 ea	18.260	1,503	813	-	-	-	105.27 /ea	2,316
15221.00.400D TNK-42020 - Sulfuric Acid Storage Tank Piping, A20 3/4" dia.	**200.00 lf**	**97.166**	**7,995**	**8,111**	**1**			**80.53 /lf**	**16,107**
15221.00.400D1 TNK-42020 - Sulfuric Acid Storage Tank Piping, A20 1.5" dia.									
Clevis-Med (Anvil 260)/Angle Bracket (194-1) Steel Pipe, 1.50"	105.00 ea	176.400	14,515	21,140	-	-	-	339.58 /ea	35,656
Flexible Metal Connector, Bronze w/Copper Ends, 1.50"	6.00 ea	7.200	592	633	-	-	-	204.32 /ea	1,226
304 SS Thrd. Companion Flange Class 150, 1.50"	4.00 ea	4.200	346	435	-	-		195.15 /ea	781
Unload Care & Protect Pipe/Fittings	820.00 lbs	0.271	20	-	4	-	-	0.03 /lbs	24
Layout Pipe & Fitting	820.00 lf	8.200	675	-	-	-	-	0.82 /lf	675
316L Sch 40s SS Pipe T&C, 1.50"	820.00 lf	98.400	8,097	10,610	-	-	-	22.81 /lf	18,707
Forged 316L SS-Class 2000 Thrd. 90 Ell, 1.50"	45.00 ea	57.600	4,740	10,238	-	-	-	332.83 /ea	14,977

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15221.00.400D1 TNK-42020 - Sulfuric Acid Storage Tank Piping, A20 1.5" dia.									
Forged 316L SS-Class 3000 Thrd. Coupling, 1.50"	85.00 ea	108.800	8,953	11,250	-	-	-	237.67 /ea	20,202
Forged 316L SS-Class 3000 Thrd. Cap, 1.50"	4.00 ea	2.720	224	1,365	-	-	-	397.09 /ea	1,588
Forged 316L SS-Class 3000 SW Tee, 1.50"	8.00 ea	39.120	3,219	2,433	-	-	-	706.49 /ea	5,652
15221.00.400D1 TNK-42020 - Sulfuric Acid Storage Tank Piping, A20 1.5" dia.	**820.00 lf**	**502.911**	**41,380**	**58,103**	**4**			**121.33 /lf**	**99,487**
15221.00.400D2 TNK-42020 - Sulfuric Acid Storage Tank Piping, A20 2.0 " dia.									
Clevis-Med (Anvil 260)/Angle Bracket (194-1) Steel Pipe, 2.00"	20.00 ea	33.600	2,765	4,061	-	-	-	341.28 /ea	6,826
Flexible Metal Connector, Bronze w/Copper Ends, 2.00"	2.00 ea	2.680	221	275	-	-	-	247.54 /ea	495
304 SS Thrd. Companion Flange Class 150, 2.00"	2.00 ea	2.580	212	217	-	-		214.90 /ea	430
Unload Care & Protect Pipe/Fittings	160.00 lbs	0.053	4	-	1	-	-	0.03 /lbs	5
Layout Pipe & Fitting	160.00 lf	1.600	132	-	-	-	-	0.82 /lf	132
316L Sch 40s SS Pipe T&C, 2.00"	160.00 lf	22.400	1,843	2,736	-	-	-	28.62 /lf	4,579
Forged 316L SS-Class 2000 Thrd. 90 Ell, 2.00"	10.00 ea	15.800	1,300	2,889	-	-	-	418.88 /ea	4,189
Forged 316L SS-Class 2000 Thrd. Tee, 2.00"	4.00 ea	9.320	767	1,573	-	-	-	585.07 /ea	2,340
Forged 316L SS-Class 3000 Thrd. Coupling, 2.00"	12.00 ea	18.720	1,540	1,986	-	-	-	293.87 /ea	3,526
Forged 316L SS-Class 3000 Thrd. Cap, 2.00"	2.00 ea	1.660	137	811	-	-	-	473.93 /ea	948
15221.00.400D2 TNK-42020 - Sulfuric Acid Storage Tank Piping, A20 2.0 " dia.	**160.00 lf**	**108.413**	**8,920**	**14,548**	**1**			**146.68 /lf**	**23,469**
15221.00.400D3 TNK-42020 - Sulfuric Acid Storage Tank Piping, A20 3.0" dia.									
Clevis-Med (Anvil 260)/Angle Bracket (194-1) Steel Pipe, 2.00"	13.00 ea	21.840	1,797	2,640	-	-	-	341.29 /ea	4,437
Flexible Metal Connector, Bronze w/Copper Ends, 3"	2.00 ea	4.420	364	374	-	-	-	368.91 /ea	738
304 SS Thrd. Companion Flange Class 150, 2.00"	2.00 ea	2.580	212	218	-	-		214.90 /ea	430
Unload Care & Protect Pipe/Fittings	100.00 lbs	0.033	2	-	0	-	-	0.03 /lbs	3
Layout Pipe & Fitting	100.00 lf	1.000	82	-	-	-	-	0.82 /lf	82
316L Sch 40s SS Pipe T&C, 2.00"	100.00 lf	14.000	1,152	1,710	-	-	-	28.62 /lf	2,862
Forged 316L SS-Class 2000 Thrd. 90 Ell, 2.00"	10.00 ea	15.800	1,300	2,889	-	-	-	418.88 /ea	4,189
Forged 316L SS-Class 2000 Thrd. Tee, 2.00"	6.00 ea	13.980	1,150	2,360	-	-	-	585.07 /ea	3,510
Forged 316L SS-Class 3000 Thrd. Coupling, 2.00"	10.00 ea	15.600	1,284	1,655	-	-	-	293.87 /ea	2,939
Forged 316L SS-Class 3000 Thrd. Cap, 2.00"	2.00 ea	1.660	137	811	-	-	-	473.94 /ea	948
15221.00.400D3 TNK-42020 - Sulfuric Acid Storage Tank Piping, A20 3.0" dia.	**100.00 lf**	**90.913**	**7,481**	**12,656**	**0**			**201.37 /lf**	**20,137**
15221.00.500E Threshold Inhibitor Storage Tote Piping, SS316 3/4" dia.									
Clevis-Med (Anvil 260)/Angle Bracket (194-1) Steel Pipe, 0- 3/4"	110.00 ea	184.800	15,206	16,266	-	-	-	286.12 /ea	31,473
Flexible Metal Connector, Bronze w/Copper Ends, 0.75"	6.00 ea	5.760	474	424	-	-	-	149.73 /ea	898
Unload Care & Protect Pipe/Fittings	880.00 lbs	0.290	21	-	4	-	-	0.03 /lbs	25
Layout Pipe & Fitting	880.00 lf	8.800	724	-	-	-	-	0.82 /lf	724
316L Sch 40s SS Pipe T&C, 0- 3/4"	880.00 lf	70.400	5,793	3,904	-	-	-	11.02 /lf	9,697
Forged 316L SS-Class 2000 Thrd. 90 Ell, 0- 3/4"	45.00 ea	37.800	3,110	2,518	-	-	-	125.09 /ea	5,629
Forged 316L SS-Class 2000 Thrd. Tee, 0- 3/4"	15.00 ea	18.450	1,518	1,335	-	-	-	190.21 /ea	2,853
Forged 316L SS-Class 3000 Thrd. Coupling, 0- 3/4"	90.00 ea	74.700	6,147	2,662	-	-	-	97.87 /ea	8,808
15221.00.500E Threshold Inhibitor Storage Tote Piping, SS316 3/4" dia.	**880.00 lf**	**401.000**	**32,994**	**27,110**	**4**			**68.30 /lf**	**60,108**
15221.00.500E1 Threshold Inhibitor Storage Tote Piping, SS316 1.0" dia.									
Clevis-Med (Anvil 260)/Angle Bracket (194-1) Steel Pipe, 1.00"	15.00 ea	25.200	2,074	2,218	-	-	-	286.12 /ea	4,292
Flexible Metal Connector, Bronze w/Copper Ends, 1.00"	2.00 ea	2.160	178	151	-	-	-	164.19 /ea	328
Unload Care & Protect Pipe/Fittings	120.00 lbs	0.040	3	-	1	-	-	0.03 /lbs	3
Layout Pipe & Fitting	120.00 lf	1.200	99	-	-	-	-	0.82 /lf	99
316L Sch 40s SS Pipe T&C, 1.00"	120.00 lf	10.800	889	754	-	-	-	13.69 /lf	1,643
Forged 316L SS-Class 2000 Thrd. 90 Ell, 1.00"	14.00 ea	14.140	1,164	976	-	-	-	152.81 /ea	2,139
Forged 316L SS-Class 2000 Thrd. Tee, 1.00"	5.00 ea	7.450	613	590	-	-	-	240.63 /ea	1,203
Forged 316L SS-Class 3000 Thrd. Coupling, 1.00"	12.00 ea	12.120	997	565	-	-	-	130.16 /ea	1,562
15221.00.500E1 Threshold Inhibitor Storage Tote Piping, SS316 1.0" dia.	**120.00 lf**	**73.110**	**6,016**	**5,254**	**1**			**93.91 /lf**	**11,270**
15221 Stainless Steel Pipe		**1,891.366**	**155,622**	**174,104**	**16**				**329,742**
15242 CPVC Pipe & Fittings									
15242.00.100A TNK-45020 - Sodium Bisulfate Storage Tank Piping, CPVC 1.0" dia.									
Angle Bracket-LD & U-Bolt (Anvil 194-1/137) Plastic, 1.00"	80.00 ea	96.000	7,899	2,730	-	-	-	132.87 /ea	10,629
Riser Clamp (Anvil 40), 1.0"	80.00 ea	72.000	5,925	1,820	-	-	-	96.81 /ea	7,745
Flexible Metal Connector, Bronze w/Threaded Ends, 1.00"	4.00 ea	2.040	168	301	-	-	-	117.29 /ea	469
Unload Care & Protect Pipe/Fittings	400.00 lf	0.132	10	-	2	-	-	0.03 /lf	11
Layout Pipe & Fitting	400.00 lf	4.000	329	-	-	-	-	0.82 /lf	329
CPVC Schd. 80 Pipe, 1.00"	400.00 lf	20.000	1,646	2,962	-	-		11.52 /lf	4,608
CPVC Sch 80. 90 Ell , 1.00"	52.00 ea	8.840	727	607	-	-	-	25.67 /ea	1,335
CPVC Sch 80. Tee , 1.00"	25.00 ea	5.750	473	421	-	-	-	35.78 /ea	895
CPVC Joint Primer- Quart	1.50 qrt		-	45	-	-	-	30.03 /qrt	45
CPVC Solvent Cement Low VOC- Quart	1.50 qrt		-	67	-	-	-	44.76 /qrt	67
15242.00.100A TNK-45020 - Sodium Bisulfate Storage Tank Piping, CPVC 1.0" dia.	**400.00 lf**	**208.762**	**17,177**	**8,954**	**2**			**65.33 /lf**	**26,133**
15242.00.100A1 TNK-45020 - Sodium Bisulfate Storage Tank Piping, CPVC 1.5" dia.									
Angle Bracket-LD & U-Bolt (Anvil 194-1/137) Plastic, 1.50"	20.00 ea	24.000	1,975	819	-	-	-	139.69 /ea	2,794
Riser Clamp (Anvil 40), 1.50"	20.00 ea	18.000	1,481	455	-	-	-	96.81 /ea	1,936
Flexible Metal Connector, Bronze w/Threaded Ends, 1.50"	2.00 ea	1.060	87	211	-	-	-	149.20 /ea	298
1-1/2" 150# A307 Steel Bolt Sets	2.00 ea		-	5	-	-	-	2.28 /ea	5
1-1/2" Full Faced Red Rubber (SBR) Gasket 1/8"	2.00 ea		-	1	-	-	-	0.68 /ea	1

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15242.00.100A1 TNK-45020 - Sodium Bisulfate Storage Tank Piping, CPVC 1.5" dia.									
Unload Care & Protect Pipe/Fittings	100.00 lf	0.033	2	-	0	-	-	0.03 /lf	3
Layout Pipe & Fitting	100.00 lf	1.000	82	-	-	-	-	0.82 /lf	82
CPVC Schd. 80 Pipe, 1.50"	100.00 lf	6.000	494	1,239	-	-		17.33 /lf	1,732
CPVC Sch 80. 90 Ell , 1.50"	15.00 ea	3.600	296	423	-	-	-	47.96 /ea	719
CPVC Sch 80. Tee , 1.50"	6.00 ea	1.980	163	224	-	-	-	64.49 /ea	387
CPVC Sch 80 Flange (Van Stone) , 1.50"	2.00 ea	1.020	84	78	-	-	-	81.07 /ea	162
CPVC Joint Primer- Quart	0.20 qrt		-	6	-	-	-	30.05 /qrt	6
CPVC Solvent Cement Low VOC- Quart	0.20 qrt		-	9	-	-	-	44.75 /qrt	9
15242.00.100A1 TNK-45020 - Sodium Bisulfate Storage Tank Piping, CPVC 1.5" dia.	**100.00 lf**	**56.693**	**4,665**	**3,470**	**0**			**81.35 /lf**	**8,135**
15242.00.100A2 TNK-45020 - Sodium Bisulfate Storage Tank Piping, CPVC 2" dia.									
Angle Bracket-LD & U-Bolt (Anvil 194-1/137) Plastic, 2.00"	8.00 ea	9.600	790	355	-	-	-	143.11 /ea	1,145
Riser Clamp (Anvil 40), 2.00"	8.00 ea	7.200	592	182	-	-	-	96.81 /ea	774
Flexible Metal Connector, Bronze w/Threaded Ends, 2.00"	2.00 ea	1.180	97	275	-	-	-	185.83 /ea	372
2-0/0" 150# A307 Steel Bolt Sets	2.00 ea		-	5	-	-	-	2.28 /ea	5
2-0/0" Full Faced Red Rubber (SBR) Gasket 1/8"	2.00 ea		-	2	-	-	-	0.77 /ea	2
Unload Care & Protect Pipe/Fittings	40.00 lf	0.013	1	-	0	-	-	0.03 /lf	1
Layout Pipe & Fitting	40.00 lf	0.400	33	-	-	-	-	0.82 /lf	33
CPVC Schd. 80 Pipe, 2.00"	40.00 lf	2.800	230	686	-	-		22.91 /lf	917
CPVC Sch 80. 90 Ell , 2.00"	10.00 ea	2.700	222	340	-	-	-	56.26 /ea	563
CPVC Sch 80. Tee , 2.00"	8.00 ea	2.960	244	363	-	-	-	75.80 /ea	606
CPVC Sch 80 Flange (Van Stone) , 2.00"	2.00 ea	1.060	87	95	-	-	-	90.96 /ea	182
CPVC Joint Primer- Quart	0.20 qrt		-	6	-	-	-	30.05 /qrt	6
CPVC Solvent Cement Low VOC- Quart	0.20 qrt		-	9	-	-	-	44.75 /qrt	9
15242.00.100A2 TNK-45020 - Sodium Bisulfate Storage Tank Piping, CPVC 2" dia.	**40.00 lf**	**27.913**	**2,297**	**2,317**	**0**			**115.34 /lf**	**4,614**
15242.00.100A3 TNK-45020 - Sodium Bisulfate Storage Tank Piping, CPVC 3" dia.									
Angle Bracket-LD & U-Bolt (Anvil 194-1/137) Plastic, 3.00"	8.00 ea	10.800	889	410	-	-	-	162.27 /ea	1,298
Riser Clamp (Anvil 40), 3.00"	8.00 ea	9.600	790	228	-	-	-	127.18 /ea	1,017
Flexible Metal Connector, Bronze w/Threaded Ends, 3"	2.00 ea	1.260	104	374	-	-	-	238.90 /ea	478
Unload Care & Protect Pipe/Fittings	60.00 lf	0.020	1	-	0	-	-	0.03 /lf	2
Layout Pipe & Fitting	60.00 lf	0.600	49	-	-	-	-	0.82 /lf	49
CPVC Schd. 80 Pipe, 3.00"	60.00 lf	4.800	395	1,934	-	-		38.81 /lf	2,328
CPVC Sch 80. 90 Ell , 3.00"	6.00 ea	2.040	168	533	-	-	-	116.78 /ea	701
CPVC Sch 80. Tee , 3.00"	1.00 ea	0.500	41	115	-	-	-	156.59 /ea	157
CPVC Joint Primer- Quart	0.50 qrt		-	15	-	-	-	30.02 /qrt	15
CPVC Solvent Cement Low VOC- Quart	0.50 qrt		-	22	-	-	-	44.78 /qrt	22
15242.00.100A3 TNK-45020 - Sodium Bisulfate Storage Tank Piping, CPVC 3" dia.	**60.00 lf**	**29.620**	**2,437**	**3,630**	**0**			**101.13 /lf**	**6,068**
15242.00.300C TNK-41020 - Sodium Hypochlorite Storage Tank Piping, CPVC 3/4" dia.									
Angle Bracket-LD & U-Bolt (Anvil 194-1/137) Plastic, 0- 3/4"	28.00 ea	33.600	2,765	860	-	-	-	129.46 /ea	3,625
Riser Clamp (Anvil 40), 2.00"	28.00 ea	25.200	2,074	637	-	-	-	96.81 /ea	2,711
Flexible Metal Connector, Bronze w/Threaded Ends, 0.75"	4.00 ea	2.000	165	283	-	-	-	111.88 /ea	448
Unload Care & Protect Pipe/Fittings	140.00 lf	0.046	3	-	1	-	-	0.03 /lf	4
Layout Pipe & Fitting	140.00 lf	1.400	115	-	-	-	-	0.82 /lf	115
CPVC Schd. 80 Pipe, 0- 3/4"	140.00 lf	7.000	576	704	-	-		9.14 /lf	1,280
CPVC Sch 80. 90 Ell , 0- 3/4"	28.00 ea	4.760	392	206	-	-	-	21.35 /ea	598
CPVC Sch 80. Tee , 0- 3/4"	10.00 ea	2.300	189	138	-	-	-	32.69 /ea	327
CPVC Joint Primer- Quart	0.20 qrt		-	6	-	-	-	30.00 /qrt	6
CPVC Solvent Cement Low VOC- Quart	0.20 qrt		-	9	-	-	-	44.75 /qrt	9
15242.00.300C TNK-41020 - Sodium Hypochlorite Storage Tank Piping, CPVC 3/4" dia.	**140.00 lf**	**76.306**	**6,278**	**2,842**	**1**			**65.15 /lf**	**9,122**
15242.00.300C1 TNK-41020 - Sodium Hypochlorite Storage Tank Piping, CPVC 1" dia.									
Angle Bracket-LD & U-Bolt (Anvil 194-1/137) Plastic, 1.00"	50.00 ea	60.000	4,937	1,706	-	-	-	132.87 /ea	6,643
Riser Clamp (Anvil 40), 2.00"	50.00 ea	45.000	3,703	1,138	-	-	-	96.81 /ea	4,840
Flexible Metal Connector, Bronze w/Threaded Ends, 1.00"	4.00 ea	2.040	168	301	-	-	-	117.29 /ea	469
Unload Care & Protect Pipe/Fittings	250.00 lf	0.083	6	-	1	-	-	0.03 /lf	7
Layout Pipe & Fitting	250.00 lf	2.500	206	-	-	-	-	0.82 /lf	206
CPVC Schd. 80 Pipe, 1.00"	250.00 lf	12.500	1,029	1,851	-	-		11.52 /lf	2,880
CPVC Sch 80. 90 Ell , 1.00"	14.00 ea	2.380	196	164	-	-	-	25.67 /ea	359
CPVC Sch 80. Tee , 1.00"	14.00 ea	3.220	265	236	-	-	-	35.78 /ea	501
CPVC Joint Primer- Quart	1.13 qrt		-	34	-	-	-	30.03 /qrt	34
CPVC Solvent Cement Low VOC- Quart	1.13 qrt		-	51	-	-	-	44.77 /qrt	51
15242.00.300C1 TNK-41020 - Sodium Hypochlorite Storage Tank Piping, CPVC 1" dia.	**250.00 lf**	**127.723**	**10,509**	**5,480**	**1**			**63.96 /lf**	**15,991**
15242.00.300C2 TNK-41020 - Sodium Hypochlorite Storage Tank Piping, CPVC 1.5" dia.									
Angle Bracket-LD & U-Bolt (Anvil 194-1/137) Plastic, 1.50"	14.00 ea	16.800	1,382	573	-	-	-	139.69 /ea	1,956
Riser Clamp (Anvil 40), 2.00"	14.00 ea	12.600	1,037	319	-	-	-	96.81 /ea	1,355
Flexible Metal Connector, Bronze w/Threaded Ends, 1.50"	2.00 ea	1.060	87	211	-	-	-	149.20 /ea	298
Unload Care & Protect Pipe/Fittings	70.00 lf	0.023	2	-	0	-	-	0.03 /lf	2
Layout Pipe & Fitting	70.00 lf	0.700	58	-	-	-	-	0.82 /lf	58
CPVC Schd. 80 Pipe, 1.50"	70.00 lf	4.200	346	867	-	-		17.33 /lf	1,213
CPVC Sch 80. 90 Ell , 1.50"	9.00 ea	2.160	178	254	-	-	-	47.96 /ea	432

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15242.00.300C2 TNK-41020 - Sodium Hypochlorite Storage Tank Piping, CPVC 1.5" dia.									
CPVC Sch 80. Tee , 1.50"	6.00 ea	1.980	163	224	-	-	-	64.49 /ea	387
CPVC Joint Primer- Quart	0.50 qrt		-	15	-	-	-	30.02 /qrt	15
CPVC Solvent Cement Low VOC- Quart	0.50 qrt		-	22	-	-	-	44.80 /qrt	22
15242.00.300C2 TNK-41020 - Sodium Hypochlorite Storage Tank Piping, CPVC 1.5" dia.	**70.00 lf**	**39.523**	**3,252**	**2,485**	**0**			**81.97 /lf**	**5,738**
15242.00.300C3 TNK-41020 - Sodium Hypochlorite Storage Tank Piping, CPVC 2" dia.									
Angle Bracket-LD & U-Bolt (Anvil 194-1/137) Plastic, 2.00"	14.00 ea	16.800	1,382	621	-	-	-	143.10 /ea	2,003
Riser Clamp (Anvil 40), 2.00"	14.00 ea	12.600	1,037	319	-	-	-	96.81 /ea	1,355
Flexible Metal Connector, Bronze w/Threaded Ends, 2.00"	2.00 ea	1.180	97	275	-	-	-	185.83 /ea	372
2-0/0" Full Faced Red Rubber (SBR) Gasket 1/8"	2.00 ea		-	2	-	-	-	0.77 /ea	2
Unload Care & Protect Pipe/Fittings	70.00 lf	0.023	2	-	0	-	-	0.03 /lf	2
Layout Pipe & Fitting	70.00 lf	0.700	58	-	-	-	-	0.82 /lf	58
CPVC Schd. 80 Pipe, 2.00"	70.00 lf	4.900	403	1,201	-	-		22.91 /lf	1,604
CPVC Sch 80. 90 Ell , 2.00"	10.00 ea	2.700	222	340	-	-	-	56.26 /ea	563
CPVC Sch 80. Tee , 2.00"	5.00 ea	1.850	152	227	-	-	-	75.80 /ea	379
CPVC Sch 80. Cap , 2.00"	2.00 ea	0.320	26	55	-	-	-	40.77 /ea	82
CPVC Sch 80 Flange (Van Stone) , 2.00"	2.00 ea	1.060	87	95	-	-	-	90.96 /ea	182
CPVC Joint Primer- Quart	1.00 qrt		-	30	-	-	-	30.03 /qrt	30
CPVC Solvent Cement Low VOC- Quart	1.00 qrt		-	45	-	-	-	44.76 /qrt	45
15242.00.300C3 TNK-41020 - Sodium Hypochlorite Storage Tank Piping, CPVC 2" dia.	**70.00 lf**	**42.133**	**3,467**	**3,208**	**0**			**95.36 /lf**	**6,675**
15242.00.300C4 TNK-41020 - Sodium Hypochlorite Storage Tank Piping, CPVC 3" dia.									
Angle Bracket-LD & U-Bolt (Anvil 194-1/137) Plastic, 3.00"	40.00 ea	54.000	4,443	2,048	-	-	-	162.27 /ea	6,491
Riser Clamp (Anvil 40), 3.00"	40.00 ea	48.000	3,950	1,138	-	-	-	127.18 /ea	5,087
Flexible Metal Connector, Bronze w/Threaded Ends, 3"	4.00 ea	2.520	207	748	-	-	-	238.90 /ea	956
Unload Care & Protect Pipe/Fittings	200.00 lf	0.066	5	-	1	-	-	0.03 /lf	6
Layout Pipe & Fitting	200.00 lf	2.000	165	-	-	-	-	0.82 /lf	165
CPVC Schd. 80 Pipe, 3.00"	200.00 lf	16.000	1,317	6,445	-	-		38.81 /lf	7,762
CPVC Sch 80. 90 Ell , 3.00"	10.00 ea	3.400	280	888	-	-	-	116.78 /ea	1,168
CPVC Sch 80. Tee , 3.00"	4.00 ea	2.000	165	462	-	-	-	156.59 /ea	626
CPVC Joint Primer- Quart	2.00 qrt		-	60	-	-	-	30.03 /qrt	60
CPVC Solvent Cement Low VOC- Quart	2.00 qrt		-	90	-	-	-	44.76 /qrt	90
15242.00.300C4 TNK-41020 - Sodium Hypochlorite Storage Tank Piping, CPVC 3" dia.	**200.00 lf**	**127.986**	**10,531**	**11,878**	**1**			**112.05 /lf**	**22,409**
15242.00.900H TNK-46020 - Sodium Hydroxide Storage Tank Piping, CPVC 3/4" dia.									
Angle Bracket-LD & U-Bolt (Anvil 194-1/137) Plastic, 0- 3/4"	63.00 ea	75.600	6,221	1,935	-	-	-	129.46 /ea	8,156
Riser Clamp (Anvil 40), 3/4"	63.00 ea	56.700	4,666	1,433	-	-	-	96.81 /ea	6,099
Flexible Metal Connector, Bronze w/Threaded Ends, 0.75"	4.00 ea	2.000	165	283	-	-	-	111.88 /ea	448
Unload Care & Protect Pipe/Fittings	500.00 lf	0.165	12	-	2	-	-	0.03 /lf	14
Layout Pipe & Fitting	500.00 lf	5.000	411	-	-	-	-	0.82 /lf	411
CPVC Schd. 80 Pipe, 0- 3/4"	500.00 lf	25.000	2,057	2,514	-	-		9.14 /lf	4,571
CPVC Sch 80. 90 Ell , 0- 3/4"	52.00 ea	8.840	727	383	-	-	-	21.35 /ea	1,110
CPVC Sch 80. Tee , 0- 3/4"	12.00 ea	2.760	227	165	-	-	-	32.69 /ea	392
CPVC Joint Primer- Quart	2.00 qrt		-	60	-	-	-	30.03 /qrt	60
CPVC Solvent Cement Low VOC- Quart	2.00 qrt		-	90	-	-	-	44.76 /qrt	90
15242.00.900H TNK-46020 - Sodium Hydroxide Storage Tank Piping, CPVC 3/4" dia.	**500.00 lf**	**176.065**	**14,486**	**6,862**	**2**			**42.70 /lf**	**21,351**
15242.00.900H1 TNK-46020 - Sodium Hydroxide Storage Tank Piping, CPVC 1.0" dia.									
Angle Bracket-LD & U-Bolt (Anvil 194-1/137) Plastic, 1.00"	10.00 ea	12.000	987	341	-	-	-	132.87 /ea	1,329
Riser Clamp (Anvil 40), 2.00"	10.00 ea	9.000	741	228	-	-	-	96.81 /ea	968
Flexible Metal Connector, Bronze w/Threaded Ends, 1.00"	4.00 ea	2.040	168	301	-	-	-	117.29 /ea	469
Unload Care & Protect Pipe/Fittings	70.00 lf	0.023	2	-	0	-	-	0.03 /lf	2
Layout Pipe & Fitting	70.00 lf	0.700	58	-	-	-	-	0.82 /lf	58
CPVC Schd. 80 Pipe, 1.00"	70.00 lf	3.500	288	518	-	-		11.52 /lf	806
CPVC Sch 80. 90 Ell , 1.00"	6.00 ea	1.020	84	70	-	-	-	25.67 /ea	154
CPVC Sch 80. Tee , 1.00"	4.00 ea	0.920	76	67	-	-	-	35.79 /ea	143
CPVC Joint Primer- Quart	1.00 qrt		-	30	-	-	-	30.03 /qrt	30
CPVC Solvent Cement Low VOC- Quart	1.00 qrt		-	45	-	-	-	44.76 /qrt	45
15242.00.900H1 TNK-46020 - Sodium Hydroxide Storage Tank Piping, CPVC 1.0" dia.	**70.00 lf**	**29.203**	**2,403**	**1,601**	**0**			**57.20 /lf**	**4,004**
15242.00.900H2 TNK-46020 - Sodium Hydroxide Storage Tank Piping, CPVC 2.0" dia.									
Angle Bracket-LD & U-Bolt (Anvil 194-1/137) Plastic, 2.00"	33.00 ea	39.600	3,259	1,464	-	-	-	143.11 /ea	4,722
Riser Clamp (Anvil 40), 2.00"	33.00 ea	29.700	2,444	751	-	-	-	96.81 /ea	3,195
Flexible Metal Connector, Bronze w/Threaded Ends, 2.00"	2.00 ea	1.180	97	275	-	-	-	185.83 /ea	372
2-0/0" 150# A307 Steel Bolt Sets	2.00 ea		-	5	-	-	-	2.28 /ea	5
2-0/0" Full Faced Red Rubber (SBR) Gasket 1/8"	2.00 ea		-	2	-	-	-	0.77 /ea	2
Unload Care & Protect Pipe/Fittings	260.00 lf	0.086	6	-	1	-	-	0.03 /lf	7
Layout Pipe & Fitting	260.00 lf	2.600	214	-	-	-	-	0.82 /lf	214
CPVC Schd. 80 Pipe, 2.00"	260.00 lf	18.200	1,498	4,460	-	-		22.91 /lf	5,958
CPVC Sch 80. 90 Ell , 2.00"	25.00 ea	6.750	555	851	-	-	-	56.26 /ea	1,407
CPVC Sch 80. Tee , 2.00"	8.00 ea	2.960	244	363	-	-	-	75.80 /ea	606
CPVC Sch 80 Flange (Van Stone) , 2.00"	2.00 ea	1.060	87	95	-	-	-	90.96 /ea	182
CPVC Joint Primer- Quart	2.00 qrt		-	60	-	-	-	30.03 /qrt	60

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15242.00.900H2 TNK-46020 - Sodium Hydroxide Storage Tank Piping, CPVC 2.0" dia.									
CPVC Solvent Cement Low VOC- Quart	2.00 qrt		-	90	-	-	-	44.76 /qrt	90
15242.00.900H2 TNK-46020 - Sodium Hydroxide Storage Tank Piping, CPVC 2.0" dia.	**260.00 lf**	**102.136**	**8,403**	**8,413**	**1**			**64.69 /lf**	**16,818**
15242.00.910 Storage Tote/Tank - Citrc Acid Storage Tank Piping, CPVC 3" dia.									
Angle Bracket-LD & U-Bolt (Anvil 194-1/137) Plastic, 2.00"	14.00 ea	16.800	1,382	621	-	-	-	143.11 /ea	2,003
Riser Clamp (Anvil 40), 2.00"	14.00 ea	12.600	1,037	319	-	-	-	96.81 /ea	1,355
Flexible Metal Connector, Bronze w/Threaded Ends, 2.00"	2.00 ea	1.180	97	275	-	-	-	185.83 /ea	372
2-0/0" Full Faced Red Rubber (SBR) Gasket 1/8"	2.00 ea		-	2	-	-	-	0.77 /ea	2
Unload Care & Protect Pipe/Fittings	70.00 lf	0.023	2	-	0	-	-	0.03 /lf	2
Layout Pipe & Fitting	70.00 lf	0.700	58	-	-	-	-	0.82 /lf	58
CPVC Schd. 80 Pipe, 2.00"	70.00 lf	4.900	403	1,201	-	-		22.91 /lf	1,604
CPVC Sch 80. 90 Ell , 2.00"	10.00 ea	2.700	222	340	-	-	-	56.26 /ea	563
CPVC Sch 80. Tee , 2.00"	5.00 ea	1.850	152	227	-	-	-	75.80 /ea	379
CPVC Sch 80. Cap , 2.00"	2.00 ea	0.320	26	55	-	-	-	40.76 /ea	82
CPVC Sch 80 Flange (Van Stone) , 2.00"	2.00 ea	1.060	87	95	-	-	-	90.96 /ea	182
CPVC Joint Primer- Quart	1.00 qrt		-	30	-	-	-	30.04 /qrt	30
CPVC Solvent Cement Low VOC- Quart	1.00 qrt		-	45	-	-	-	44.76 /qrt	45
15242.00.910 Storage Tote/Tank - Citrc Acid Storage Tank Piping, CPVC 3" dia.	**200.00 lf**	**42.133**	**3,467**	**3,208**	**0**			**33.38 /lf**	**6,675**
15242.00.920 Storage Tote/Tank - Citric Acid Storage Tank Piping, CPVC 2" dia.									
Angle Bracket-LD & U-Bolt (Anvil 194-1/137) Plastic, 2.00"	14.00 ea	16.800	1,382	621	-	-	-	143.11 /ea	2,003
Riser Clamp (Anvil 40), 2.00"	14.00 ea	12.600	1,037	319	-	-	-	96.81 /ea	1,355
Flexible Metal Connector, Bronze w/Threaded Ends, 2.00"	2.00 ea	1.180	97	275	-	-	-	185.83 /ea	372
2-0/0" Full Faced Red Rubber (SBR) Gasket 1/8"	2.00 ea		-	11	-	-	-	5.69 /ea	11
Unload Care & Protect Pipe/Fittings	140.00 lf	2.999	218	-	43	-	-	1.86 /lf	261
Layout Pipe & Fitting	140.00 lf	1.400	115	-	-	-	-	0.82 /lf	115
CPVC Schd. 80 Pipe, 2.00"	140.00 lf	9.800	806	2,401	-	-		22.91 /lf	3,208
CPVC Sch 80. 90 Ell , 2.00"	10.00 ea	2.700	222	340	-	-	-	56.26 /ea	563
CPVC Sch 80. Tee , 2.00"	5.00 ea	1.850	152	227	-	-	-	75.80 /ea	379
CPVC Sch 80. Cap , 2.00"	2.00 ea	0.320	26	55	-	-	-	40.76 /ea	82
CPVC Sch 80 Flange (Van Stone) , 2.00"	2.00 ea	1.060	87	95	-	-	-	90.96 /ea	182
CPVC Joint Primer- Quart	2.00 qrt		-	60	-	-	-	30.04 /qrt	60
CPVC Solvent Cement Low VOC- Quart	2.00 qrt		-	90	-	-	-	44.76 /qrt	90
15242.00.920 Storage Tote/Tank - Citric Acid Storage Tank Piping, CPVC 2" dia.	**140.00 lf**	**50.709**	**4,144**	**4,494**	**43**			**62.00 /lf**	**8,681**
15242 CPVC Pipe & Fittings		**1,136.905**	**93,516**	**68,844**	**53**				**162,413**
065 Chemical Storage and Feed Systems		**5,033.179**	**421,558**	**712,187**	**27,231**		**11,296**		**1,172,272**
067 Storage Tanks									
13200 Tanks									
13200.50620 T-1119-1 - MF Break Tank 73,400 gal, Welded Steel, Ladder, Safety Cage									
Mob / DeMob Earthwork Equip (2hr each way)	1.00 ea	4.000	310	-	426	-	-	735.79 /ea	736
Excav- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	84.00 cy	2.934	288	-	220	-	-	6.05 /cy	508
Load & Haul Cut to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	84.00 cy	3.182	255	-	181	-	-	5.19 /cy	436
Foundation Subgrade- Scarify & Recompact	755.00 sf	2.626	229	-	72	-	-	0.40 /sf	301
Place Backfill from Stockpile- Backhoe Loader C466- 7MT- 95HP/1.5cy/Plate Compactor (2ea)	21.00 cy	10.080	879	-	301	-	-	56.18 /cy	1,180
Load & Haul Backfill from Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	63.00 cy	2.386	191	-	135	-	-	5.19 /cy	327
Import Aggregate Base Fill	42.00 cy		-	1,046	-	306	-	32.19 /cy	1,352
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	63.00 cy	0.525	52	-	39	-	-	1.44 /cy	91
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	63.00 cy	9.000	698	-	855	-	-	24.64 /cy	1,552
Concrete: Tank Foundation	43.00 cy	129.000	11,937	19,501	1,349	-	-	762.47 /cy	32,786
Access Cage & Ladder-Steel	22.00 lf	2.750	287	3,275	-	-	-	161.91 /lf	3,562
3 Rail-Handrail Steel w/Toe	80.00 lf	20.000	2,090	4,088	-	-	-	77.22 /lf	6,178
2 x3/16 Steel Grate-Stnd.	160.00 sf	27.200	2,842	7,205	-	-	-	62.80 /sf	10,047
Painting Preparation & Consumables- Total SF	2,500.00 sf	12.500	898	319	-	-	-	0.49 /sf	1,217
Paint Metals- Epoxy (Prime & 2 Coats)- SF	2,500.00 sf	37.500	2,693	6,640	-	-	-	3.73 /sf	9,333
Unload & Protect Above Ground Tank	1.00 ea	3.429	330	-	104	-	-	434.30 /ea	434
73,400 Gallon Steel Tank	1.00 ea	86.400	8,316	183,981	2,628	-	-	194,924.83 /ea	194,925
Install Holdowns	16.00 ea	91.429	8,517	-		-	-	532.31 /ea	8,517
SS Anchor Bolts/Sleeve 1/2" x 8"	64.00 ea	16.000	1,333	-	-	-	654	31.04 /ea	1,987
Install Above Ground Tank Control Panel	1.00 ea	4.000	373	-	-	-	128	500.36 /ea	500
Test Above Ground Tank	1.00 ea	8.000	745	-	-	-	-	745.22 /ea	745
13200.50620 T-1119-1 - MF Break Tank 73,400 gal, Welded Steel, Ladder, Safety Cage	**1.00 ea**	**472.941**	**43,262**	**226,055**	**6,310**	**306**	**782**	**276,714.86 /ea**	**276,715**
13200.50620A T-106 - MF CIP Tanks 3,400 gal, FRP, Tank Heater 72 Kw									
Concrete: Equipment Pad 6" Thick	3.00 cy	15.000	1,388	1,399	174	-	-	987.03 /cy	2,961
Unload & Protect Fiberglass Tanks	2.00 ea	6.857	660	-	209	-	-	434.29 /ea	869
3,400 Gal. Flat Bottom FRP Storage Tank; WIGEN Mat. Budgetary Pricing	2.00 ea	43.200	4,158	***24,273***	1,314	-	-	14,872.29 /ea	29,745
Install Holdowns < 5,000 Gallons Tank	8.00 ea	22.857	2,129	-		-	-	266.15 /ea	2,129
SS Anchor Bolts/Sleeve 1/2" x 8"	32.00 ea	8.000	666	-	-	-	327	31.04 /ea	993
Hydro Test Fiberglass Tanks	2.00 ea	16.000	1,490	-	-	-	-	745.23 /ea	1,490
Tank Heater, Elect 72KW, 480volts, 3 phase; WIGEN Mat. Budgetary Pricing	2.00 ea	12.000	1,203	***18,907***	-	-	-	10,054.85 /ea	20,110

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
13200.50620A T-106 - MF CIP Tanks 3,400 gal, FRP, Tank Heater 72 Kw	**2.00 ea**	**123.914**	**11,695**	**44,578**	**1,697**		**327**	**29,148.51 /ea**	**58,297**
13200.50620B TNK-52000 & TNK-52100 - Primary RO CIP Tank 6,000 gal, FRP; Top Access									
Concrete: Equipment Pad 6" Thick	4.00 cy	20.000	1,851	1,865	232	-	-	987.03 /cy	3,948
Access Cage & Ladder - SS	24.00 lf	13.714	1,433	4,083	-	-	-	229.82 /lf	5,516
3 Rail-Handrail - SS w/Toe	30.00 lf	7.500	784	4,216	-	-	-	166.65 /lf	4,999
2-1/4x3/16 Press.Lok Type D	60.00 sf	10.200	1,066	4,292	-	-	-	89.30 /sf	5,358
Unload & Protect Fiberglass Tanks	2.00 ea	6.857	660	-	209	-	-	434.29 /ea	869
6,000 Gal. Sloped Bottom FRP Storage Tank; WIGEN Mat. Budgetary Pricing	2.00 ea	86.400	8,316	***25,550***	2,628	-	-	18,247.08 /ea	36,494
Access hatch	2.00 ea	6.000	577	1,278	183	-	-	1,018.75 /ea	2,038
Internal Pipe Return	2.00 ea	6.000	577	1,278	183	-	-	1,018.75 /ea	2,038
Siphon Outlet	2.00 ea	3.000	289	639	91	-	-	509.38 /ea	1,019
Install Holdowns < 10,000 Gallons Tank	16.00 ea	91.429	8,517	-		-	-	532.31 /ea	8,517
SS Anchor Bolts/Sleeve 1/2" x 8"	64.00 ea	16.000	1,333	-	-	-	654	31.04 /ea	1,987
Hydro Test Fiberglass Tanks	2.00 ea	16.000	1,490	-	-	-	-	745.23 /ea	1,490
Tank Heater, Elect 75KW, 480volts, 3 phase: WIGEN Mat. Budgetary Pricing	4.00 ea	24.000	2,405	***38,325***	-	-	-	10,182.59 /ea	40,730
13200.50620B TNK-52000 & TNK-52100 - Primary RO CIP Tank 6,000 gal, FRP; Top Access	**2.00 ea**	**307.100**	**29,298**	**81,525**	**3,526**		**654**	**57,501.32 /ea**	**115,003**
13200.50620C TNK-54000 & TNK-54100 - Secondary RO CIP Tank 3,200 gal, FRP; Top Acce									
Concrete: Equipment Pad 6" Thick	3.00 cy	15.000	1,388	1,399	174	-	-	987.03 /cy	2,961
Access Cage & Ladder - SS	14.00 lf	8.000	836	2,382	-	-	-	229.82 /lf	3,218
3 Rail-Handrail - SS w/Toe	22.00 lf	5.500	575	3,092	-	-	-	166.65 /lf	3,666
2-1/4x3/16 Press.Lok Type D	44.00 sf	7.480	782	3,148	-	-	-	89.30 /sf	3,929
Unload & Protect Fiberglass Tanks	2.00 ea	6.857	660	-	209	-	-	434.29 /ea	869
3,200 Gal. Sloped Bottom FRP Storage Tank; WIGEN Mat. Budgetary Pricing	2.00 ea	43.200	4,158	***20,440***	1,314	-	-	12,956.04 /ea	25,912
Access hatch	2.00 ea	6.000	577	1,278	183	-	-	1,018.76 /ea	2,038
Internal Pipe Return	2.00 ea	6.000	577	1,278	183	-	-	1,018.75 /ea	2,038
Siphon Outlet	2.00 ea	3.000	289	639	91	-	-	509.38 /ea	1,019
Install Holdowns < 10,000 Gallons Tank	16.00 ea	91.429	8,517	-		-	-	532.31 /ea	8,517
SS Anchor Bolts/Sleeve 1/2" x 8"	64.00 ea	16.000	1,333	-	-	-	654	31.04 /ea	1,987
Hydro Test Fiberglass Tanks	2.00 ea	16.000	1,490	-	-	-	-	745.23 /ea	1,490
Tank Heater, Elect 15KW, 480volts, 3 phase: WIGEN Mat. Budgetary Pricing	4.00 ea	24.000	2,405	***38,325***	-	-	-	10,182.60 /ea	40,730
13200.50620C TNK-54000 & TNK-54100 - Secondary RO CIP Tank 3,200 gal, FRP; Top Acce	**2.00 ea**	**248.466**	**23,587**	**71,978**	**2,153**		**654**	**49,186.63 /ea**	**98,373**
13200.50620D TNK-73010 - RO Permeate Flush Tank 15,100 gal, FRP; Ladder, Safety Ca									
Mob / DeMob Earthwork Equip (2hr each way)	1.00 ea	4.000	310	-	426	-	-	735.80 /ea	736
Excav- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	27.00 cy	0.943	93	-	71	-	-	6.05 /cy	163
Load & Haul Cut to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	27.00 cy	1.023	82	-	58	-	-	5.19 /cy	140
Foundation Subgrade- Scarify & Recompact	254.00 sf	0.883	77	-	24	-	-	0.40 /sf	101
Place Backfill from Stockpile- Backhoe Loader C466- 7MT- 95HP/1.5cy/Plate Compactor (2ea)	21.00 cy	10.080	879	-	301	-	-	56.18 /cy	1,180
Load & Haul Backfill from Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	10.00 cy	0.379	30	-	22	-	-	5.19 /cy	52
Import Aggregate Base Fill	11.00 cy		-	274	-	80	-	32.19 /cy	354
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	22.00 cy	0.183	18	-	14	-	-	1.44 /cy	32
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	22.00 cy	3.143	244	-	299	-	-	24.64 /cy	542
Concrete: Tank Foundation	11.00 cy	33.000	3,054	4,989	345	-	-	762.47 /cy	8,387
Access Cage & Ladder - SS	18.00 lf	10.286	1,075	3,062	-	-	-	229.82 /lf	4,137
3 Rail-Handrail - SS w/Toe	38.00 lf	9.500	993	5,340	-	-	-	166.65 /lf	6,333
2-1/4x3/16 Press.Lok Type D	76.00 sf	12.920	1,350	5,437	-	-	-	89.30 /sf	6,787
Unload & Protect Fiberglass Tanks	1.00 ea	3.429	330	-	104	-	-	434.30 /ea	434
15,100 Gal. Flat Bottom FRP Storage Tank; WIGEN Mat. Budgetary Pricing	1.00 ea	48.000	4,620	***25,550***	1,460	-	-	31,630.08 /ea	31,630
Install Holdowns < 15,000 Gallons Tank	16.00 ea	91.429	8,517	-		-	-	532.31 /ea	8,517
SS Anchor Bolts/Sleeve 1/2" x 8"	64.00 ea	16.000	1,333	-	-	-	654	31.04 /ea	1,987
Hydro Test Fiberglass Tanks	1.00 ea	8.000	745	-	-	-	-	745.22 /ea	745
13200.50620D TNK-73010 - RO Permeate Flush Tank 15,100 gal, FRP; Ladder, Safety Ca	**1.00 ea**	**253.198**	**23,749**	**44,652**	**3,123**	**80**	**654**	**72,257.19 /ea**	**72,257**
13200 Tanks		**1,405.620**	**131,591**	**468,788**	**16,809**	**386**	**3,071**		**620,645**
067 Storage Tanks		**1,405.620**	**131,591**	**468,788**	**16,809**	**386**	**3,071**		**620,645**
069 Waste Pump Station - Under Design									
02250 Sheeting, Shoring & Bracing									
02250.50540 Sheet Piling 33'-4" Long x 22'-4" Wide x 11'-4" Deep									
Design Shoring System-Average	1.00 ls		-	-	-	2,500	-	2,500.00 /ls	2,500
Survey & Layout Shoring	114.00 lf	11.400	936	-	-	-	-	8.21 /lf	936
Mobilize Pile Driving Equipment	1.00 ea		-	-	-	10,000	-	10,000.00 /ea	10,000
Steel Sheeting 25' x 38psf, left in place	1,288.00 sf	96.600	8,541	43,604	3,790	-	-	43.43 /sf	55,935
Install & Remove Wales/Struts/Connectors	2.44 ton	21.960	1,942	2,494	862	-	-	2,170.89 /ton	5,297
Cut-off Sheet Steel Piles	114.00 lf	22.800	1,898	-	215		-	18.53 /lf	2,113
02250.50540 Sheet Piling 33'-4" Long x 22'-4" Wide x 11'-4" Deep	**1,288.00 sf**	**152.760**	**13,317**	**46,097**	**4,866**	**12,500**		**59.61 /sf**	**76,781**
02250 Sheeting, Shoring & Bracing		**152.760**	**13,317**	**46,097**	**4,866**	**12,500**			**76,781**
02300 Site Preparation									
02300.50540 Excavate, Bedding & Backfill									
Mob / DeMob Earthwork Equip (8hr each way)	1.00 ea	4.000	310	-	426	-	-	735.80 /ea	736

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
02300.50540 Excavate, Bedding & Backfill									
Excav- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	324.00 cy	11.319	1,113	-	848	-	-	6.05 /cy	1,961
Load & Haul Cut to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	324.00 cy	12.273	984	-	697	-	-	5.19 /cy	1,681
Foundation Subgrade- Scarify & Recompact	772.00 sf	2.685	234	-	74	-	-	0.40 /sf	308
Place Backfill from Stockpile- Backhoe Loader C466- 7MT- 95HP/1.5cy/Plate Compactor (2ea)	182.00 cy	87.360	7,617	-	2,607	-	-	56.18 /cy	10,224
Load & Haul Backfill from Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	182.00 cy	6.894	553	-	391	-	-	5.19 /cy	944
Import Aggregate Base Fill	14.00 cy		-	349	-	102	-	32.19 /cy	451
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	146.00 cy	1.217	120	-	91	-	-	1.44 /cy	211
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	146.00 cy	20.857	1,617	-	1,981	-	-	24.64 /cy	3,598
02300.50540 Excavate, Bedding & Backfill	**324.00 cy**	**146.605**	**12,548**	**349**	**7,114**	**102**		**62.08 /cy**	**20,113**
02300 Site Preparation		**146.605**	**12,548**	**349**	**7,114**	**102**			**20,113**
03000 Structures - Equipment Pads									
03000.50540 Concrete Pump Station									
Concrete: Base 2' Thick	35.00 cy	105.000	9,716	15,873	1,098	-	-	762.47 /cy	26,687
Concrete: Wall 1'-6" Thick	54.00 cy	324.000	29,981	26,559	3,136	-	-	1,105.11 /cy	59,676
Concrete: Elevated Slab 1'-2" Thick	17.00 cy	93.500	8,652	8,578	987	-	-	1,071.62 /cy	18,218
03000.50540 Concrete Pump Station	**106.00 cy**	**522.500**	**48,349**	**51,011**	**5,221**			**986.61 /cy**	**104,580**
03000 Structures - Equipment Pads		**522.500**	**48,349**	**51,011**	**5,221**				**104,580**
11217 Submersible Pumps									
11217.50690 Pumps PMP-18010, PMP-18020 & PMP-18030									
Sump Pump Spare Parts	1.00 lot	2.000	163	1,706	-	-	-	1,869.71 /lot	1,870
Furnish Lubricants	10.00 gal		-	-	-	-	569	56.88 /gal	569
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	2.00 ea	8.000	634	-	160	-	-	397.22 /ea	794
Warehouse/Care Submersible Sump Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Sump Pump 5 HP	2.00 ea	4.800	408	4,550	130	-	-	2,544.06 /ea	5,088
Install Guide Rails	2.00 ea	4.000	327	-	-	-	-	163.47 /ea	327
Install Base Elbow	2.00 ea	4.000	327	-	-	-	-	163.47 /ea	327
Grout Equip Base- Non Shrink, Non Metallic	8.00 cf	12.000	861	-	-	-	601	182.66 /cf	1,461
Test & Check	2.00 ea	16.000	1,308	-	-	-	-	653.87 /ea	1,308
Install Equipment- RT Crane 80 MT	8.00 ch	8.000	789	-	1,300	-	-	261.21 /ch	2,090
SS Anchor Bolts/Sleeve 3/4" x 8"	8.00 ea	2.000	147	-	-	-	137	35.46 /ea	284
11217.50690 Pumps PMP-18010, PMP-18020 & PMP-18030	**2.00 ea**	**62.800**	**5,128**	**7,963**	**1,590**		**1,306**	**7,993.45 /ea**	**15,987**
11217 Submersible Pumps		**62.800**	**5,128**	**7,963**	**1,590**		**1,306**		**15,987**
069 Waste Pump Station - Under Design		**884.665**	**79,342**	**105,419**	**18,792**	**12,602**	**1,306**	**/ea**	**217,461**
070 Process Mechanical - Piping									
15112 Butterfly Valves									
15112.00.035.10 BFV for SS Pipe									
Unload Care & Protect SS Butterfly Valves	46.00 ea	3.680	303	-	-	-	523	17.96 /ea	826
SS Butterfly Valve-#150- Flanged- LVR/HW- 2"	1.00 ea	4.900	403	1,297	-	-	-	1,699.96 /ea	1,700
SS Butterfly Valve-#150- Flanged- LVR/HW- 4"	11.00 ea	59.620	4,906	14,377	-	-	-	1,752.98 /ea	19,283
SS Butterfly Valve-#150- Flanged- LVR/HW- 6"	17.00 ea	107.610	8,855	24,191	-	-	-	1,943.88 /ea	33,046
SS Butterfly Valve-#150- Flanged- LVR/HW- 8"	4.00 ea	27.360	2,251	7,235	-	-	-	2,371.46 /ea	9,486
SS Butterfly Valve-#150- Flanged- LVR/HW- 10"	2.00 ea	20.380	1,677	5,310	-	-	-	3,493.42 /ea	6,987
SS Butterfly Valve-#150- Flanged- HW- 12"	10.00 ea	110.300	9,076	30,951	-	-	-	4,002.75 /ea	40,027
SS Butterfly Valve-#150- Flanged- HW- 24"	1.00 ea	19.050	1,568	11,968	-	-	-	13,535.17 /ea	13,535
15112.00.035.10 BFV for SS Pipe	**46.00 ea**	**352.900**	**29,039**	**95,328**			**523**	**2,715.00 /ea**	**124,890**
15112.00.035.20 BFV for ELSP Pipe									
Unload Care & Protect Butterfly Valves	31.00 ea	3.100	255	-	-	-	353	19.60 /ea	608
Butterfly Valve-#150- Flanged- LVR/HW- 6"	3.00 ea	18.990	1,563	1,423	-	-	-	995.21 /ea	2,986
Butterfly Valve-#150- Flanged- LVR/HW- 10"	4.00 ea	40.760	3,354	3,540	-	-	-	1,723.47 /ea	6,894
Butterfly Valve-#150- Flanged- HW- 12"	6.00 ea	66.180	5,446	6,190	-	-	-	1,939.32 /ea	11,636
Butterfly Valve-#150- Flanged- HW- 16"	3.00 ea	41.220	3,392	5,484	-	-	-	2,958.57 /ea	8,876
Butterfly Valve-#150- Flanged- HW- 18"	3.00 ea	46.080	3,792	7,190	-	-	-	3,660.62 /ea	10,982
Butterfly Valve-#150- Flanged- HW- 24"	12.00 ea	228.600	18,811	47,871	-	-	-	5,556.75 /ea	66,681
15112.00.035.20 BFV for ELSP Pipe	**31.00 ea**	**444.930**	**36,611**	**71,698**			**353**	**3,505.22 /ea**	**108,662**
15112.00.035.30 BFV for CPVC Pipe									
Unload Care & Protect PVC Butterfly Valves	115.00 ea	9.200	757	-	-	-	1,308	17.96 /ea	2,065
Butterfly Valve, PVC, Flg, Lever Operated, 3"	2.00 ea	3.720	306	237	-	-	-	271.36 /ea	543
Butterfly Valve, PVC, Flg, Lever Operated, 4"	5.00 ea	16.550	1,362	683	-	-	-	408.86 /ea	2,044
Butterfly Valve, PVC, Flg, Lever Operated, 6"	32.00 ea	119.040	9,795	6,479	-	-	-	508.58 /ea	16,274
Butterfly Valve, PVC, Flg, Lever Operated, 8"	14.00 ea	86.520	7,119	10,288	-	-	-	1,243.35 /ea	17,407
Butterfly Valve, PVC, Flg, Lever Operated, 10"	62.00 ea	417.880	34,386	66,999	-	-	-	1,635.23 /ea	101,384
15112.00.035.30 BFV for CPVC Pipe	**115.00 ea**	**652.910**	**53,725**	**84,685**			**1,308**	**1,214.94 /ea**	**139,718**
15112 Butterfly Valves		**1,450.740**	**119,375**	**251,711**			**2,184**		**373,270**
15114 Check Valves									
15114.00.035.10 Ball Check Valve for SS316 Pipes									

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15114.00.035.10 Ball Check Valve for SS316 Pipes									
Unload Care & Protect Check Valves	11.00 ea	0.880	72	-	-	-	125	17.96 /ea	198
Check Valve, SS, Flg, 4"	2.00 ea	5.440	448	4,197	-	-	-	2,322.33 /ea	4,645
Check Valve, SS, Flg, 6"	5.00 ea	19.650	1,617	18,745	-	-	-	4,072.40 /ea	20,362
Check Valve, SS, Flg, 8"	2.00 ea	7.860	647	9,100	-	-	-	4,873.39 /ea	9,747
Check Valve, SS, Flg, 12"	2.00 ea	7.860	647	13,650	-	-	-	7,148.39 /ea	14,297
15114.00.035.10 Ball Check Valve for SS316 Pipes	**11.00 ea**	**41.690**	**3,430**	**45,692**			**125**	**4,477.07 /ea**	**49,248**
15114.00.035.20 Ball Check Valve for ELSP									
Unload Care & Protect Check Valves	10.00 ea	0.800	66	-	-	-	114	17.96 /ea	180
Check Valve, Ball, Flg, 12"	4.00 ea	36.680	3,018	20,020	-	-	-	5,759.56 /ea	23,038
Check Valve, Ball, Flg, 16"	6.00 ea	82.380	6,779	111,316	-	-	-	19,682.41 /ea	118,094
15114.00.035.20 Ball Check Valve for ELSP	**10.00 ea**	**119.860**	**9,863**	**131,336**			**114**	**14,131.23 /ea**	**141,312**
15114.00.035.30 Ball Check Valve for CPVC Pipes									
Unload Care & Protect Check Valves	14.00 ea	1.120	92	-	-	-	159	17.96 /ea	251
Ball Check Valve, CPVC, True-Union 3"	2.00 ea	2.900	239	1,406	-	-	-	822.29 /ea	1,645
Ball Check Valve, CPVC, True-Union 4"	4.00 ea	7.360	606	5,046	-	-	-	1,412.89 /ea	5,652
Ball Check Valve, CPVC, True-Union 12"	8.00 ea	14.720	1,211	22,750	-	-	-	2,995.16 /ea	23,961
15114.00.035.30 Ball Check Valve for CPVC Pipes	**14.00 ea**	**26.100**	**2,148**	**29,202**			**159**	**2,250.63 /ea**	**31,509**
15114 Check Valves		**187.650**	**15,441**	**206,230**			**398**		**222,069**
15117 Ball Valve									
15117.00.035.10 Ball Valve for SS316 Pipes									
Unload Care & Protect Valves	42.00 ea	3.360	276	-	-	-	478	17.96 /ea	754
Ball Valve, SS, Flg, 2"	7.00 ea	16.170	1,331	6,272	-	-	-	1,086.07 /ea	7,603
Ball Valve, SS, Flg, 4"	10.00 ea	44.500	3,662	23,461	-	-	-	2,712.26 /ea	27,123
Ball Valve, SS, Flg, 6"	7.00 ea	49.350	4,061	28,838	-	-	-	4,699.84 /ea	32,899
Ball Valve, SS, Flg, 8"	4.00 ea	33.800	2,781	34,310	-	-	-	9,272.74 /ea	37,091
Ball Valve, SS, Flg, 12"	11.00 ea	154.000	12,672	118,869	-	-	-	11,958.25 /ea	131,541
Ball Valve, SS, Flg, 24"	3.00 ea	42.000	3,456	42,827	-	-	-	15,427.63 /ea	46,283
15117.00.035.10 Ball Valve for SS316 Pipes	**42.00 ea**	**343.180**	**28,239**	**254,576**			**478**	**6,745.07 /ea**	**283,293**
15117.00.035.20 Ball Valve for ELSP Pipes									
Unload Care & Protect Valves	30.00 ea	2.400	197	-	-	-	341	17.96 /ea	539
Ball Valve, Wrench Operated, Flange, 6"	2.00 ea	6.760	556	4,727	-	-	-	2,641.49 /ea	5,283
Ball Valve, Worm Gear Operated, Flange, 10"	2.00 ea	11.200	922	14,891	-	-	-	7,906.31 /ea	15,813
Ball Valve, Worm Gear Operated, Flange, 12"	9.00 ea	60.840	5,006	97,066	-	-	-	11,341.40 /ea	102,073
Ball Valve, Worm Gear Operated, Flange, 16"	2.00 ea	13.520	1,113	25,025	-	-	-	13,068.75 /ea	26,138
Ball Valve, Worm Gear Operated, Flange, 24"	15.00 ea	101.400	8,344	213,281	-	-	-	14,775.00 /ea	221,625
15117.00.035.20 Ball Valve for ELSP Pipes	**30.00 ea**	**196.120**	**16,138**	**354,990**			**341**	**12,382.32 /ea**	**371,469**
15117.00.035.30 Ball Valve for CPVC Pipes									
Unload Care & Protect Valves	36.00 ea	2.880	237	-	-	-	410	17.96 /ea	646
Ball Valve, CPVC, True Union, 3"	24.00 ea	34.800	2,864	2,183	-	-	-	210.27 /ea	5,046
Ball Valve, CPVC, True Union, 6"	12.00 ea	33.120	2,725		-	-	-	227.11 /ea	2,725
15117.00.035.30 Ball Valve for CPVC Pipes	**36.00 ea**	**70.800**	**5,826**	**2,183**			**410**	**233.84 /ea**	**8,418**
15117 Ball Valve		**610.100**	**50,203**	**611,749**			**1,229**		**663,180**
15119 Special Purpose Valves & Accessories (Solenoid/Relief/et al)									
15405.00.035.40 Backflow Preventer Valve									
Unload Care & Protect Valves	4.00 ea	0.320	26	-	-	-	46	17.96 /ea	72
Reduced Pressure Zone Backflow Preventers (RPZ), Bronze, Threaded, Ball Valves, 3/4"dia	2.00 ea	1.000	101	1,086	-	-	-	593.37 /ea	1,187
Reduced Pressure Zone Backflow Preventers (RPZ), Bronze, Threaded, Ball Valves, 1.00"dia	2.00 ea	1.142	115	1,157	-	-	-	636.31 /ea	1,273
15405.00.035.40 Backflow Preventer Valve	**4.00 ea**	**2.462**	**242**	**2,243**			**46**	**632.80 /ea**	**2,531**
15119 Special Purpose Valves & Accessories (Solenoid/Relief/et al)		**2.462**	**242**	**2,243**			**46**		**2,531**
15212 Epoxy Lined Steel Pipe (ELSP)									
15210.00.035.930 ELSP Pipe from MF to Process Waste Pump Station, 16" dia.									
16-0/0" 150# A307 Steel Bolt Sets	4.00 ea		-	228	-	-	-	56.88 /ea	228
16-0/0" Full Faced Red Rubber (SBR) Gasket 1/8"	4.00 ea		-	49	-	-	-	12.22 /ea	49
Unload Care & Protect Epoxy Lined Flanged DIP & Fittings	45,000.00 lbs	14.850	1,081	-	211	-	-	0.03 /lbs	1,292
Layout Epoxy Lined Flanged DIP & Fitting	200.00 lf	2.000	165	-	-	-	-	0.82 /lf	165
DI, Epoxy Lined, Eccentric Reducer, FL, 16"x 12"	2.00 ea	18.300	1,506	4,992	-	-	-	3,248.82 /ea	6,498
DI Pipe, FLxPE, CL53, Epoxy Lined, 16" x 1'-0"	2.00 ea	16.880	1,389	983	-	-	-	1,186.20 /ea	2,372
DIP Equip- Cat 325 Excavator	4.00 ch	4.000	355	-	479	-	-	208.40 /ch	834
DIP Epoxy Lined, Push-On, Class 50, 16"	200.00 lf	68.000	5,595	14,040	-	-	-	98.18 /lf	19,635
DIP Epoxy Lined, RJ- Flex Ring, 90 Bend, 16"	4.00 ea	23.520	1,935	6,327	-	-	-	2,065.54 /ea	8,262
15210.00.035.930 ELSP Pipe from MF to Process Waste Pump Station, 16" dia.	**200.00 lf**	**147.550**	**12,026**	**26,618**	**690**			**196.67 /lf**	**39,334**
15210.00.035.940 ELSP Pipe fromStrainer to Process Waste Pump Station, 6" dia.									
6-0/0" 150# A307 Steel Bolt Sets	4.00 ea		-	46	-	-	-	11.38 /ea	46
6-0/0" Full Faced Red Rubber (SBR) Gasket 1/8"	4.00 ea		-	10	-	-	-	2.53 /ea	10
Unload Care & Protect Epoxy Lined Flanged DIP & Fittings	20,040.00 lbs	6.613	482	-	94	-	-	0.03 /lbs	576
Layout Epoxy Lined Flanged DIP & Fitting	6.00 lf	0.060	5	-	-	-	-	0.82 /lf	5

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15210.00.035.940 ELSP Pipe fromStrainer to Process Waste Pump Station, 6" dia.									
DI, Epoxy Lined, Eccentric Reducer, FL, 8"x 6"	2.00 ea	7.260	597	1,210	-	-	-	903.56 /ea	1,807
DI Pipe, FLxPE, CL53, Epoxy Lined, 6" x 12'-0"	2.00 ea	10.180	838	1,308	-	-	-	1,072.88 /ea	2,146
DIP Equip- Cat 325 Excavator	2.00 ch	2.000	177	-	239	-	-	208.40 /ch	417
DIP Epoxy Lined, Push-On, Class 50, 6"	6.00 lf	1.260	104	145	-	-	-	41.50 /lf	249
DIP Epoxy Lined, RJ- Flex Ring, 90 Bend, 6"	6.00 ea	14.040	1,155	1,229	-	-	-	397.30 /ea	2,384
15210.00.035.940 ELSP Pipe fromStrainer to Process Waste Pump Station, 6" dia.	**6.00 lf**	**41.413**	**3,358**	**3,947**	**333**			**1,273.09 /lf**	**7,639**
15210.00.070.10 ELSP Pipe from Influent Pump to MF Strainer, 16" dia.									
16-0/0" 150# A307 Steel Bolt Sets	4.00 ea		-	228	-	-	-	56.88 /ea	228
16-0/0" Full Faced Red Rubber (SBR) Gasket 1/8"	4.00 ea		-	49	-	-	-	12.22 /ea	49
Unload Care & Protect Epoxy Lined Flanged DIP & Fittings	1,350.40 lbs	0.446	32	-	6	-	-	0.03 /lbs	39
Layout Epoxy Lined Flanged DIP & Fitting	6.00 lf	0.060	5	-	-	-	-	0.82 /lf	5
DI Pipe, FLxFL, CL53, Epoxy Lined, 16" x 1'-0"	2.00 ea	24.940	2,052	2,187	-	-	-	2,119.68 /ea	4,239
DI, Epoxy Lined, Eccentric Reducer, FL, 16"x 12"	2.00 ea	18.300	1,506	4,992	-	-	-	3,248.82 /ea	6,498
DI Pipe, FLxPE, CL53, Epoxy Lined, 16" x 1'-0"	2.00 ea	16.880	1,389	983	-	-	-	1,186.20 /ea	2,372
DIP Equip- Cat 325 Excavator	0.50 ch	0.500	44	-	60	-	-	208.42 /ch	104
DIP Epoxy Lined, Push-On, Class 50, 16"	6.00 lf	2.040	168	421	-	-	-	98.18 /lf	589
15210.00.070.10 ELSP Pipe from Influent Pump to MF Strainer, 16" dia.	**6.00 lf**	**63.166**	**5,197**	**8,860**	**66**			**2,353.79 /lf**	**14,123**
15210.00.070.20 ELSP Pipe from Influent Pump to MF Strainer, 24" dia.									
Unload Care & Protect Epoxy Lined Push-on DIP & Fittings	18,024.00 lbs	5.948	433	-	85	-	-	0.03 /lbs	518
Layout Epoxy Lined Push-on DIP & Fitting	50.00 lf	0.500	41	-	-	-	-	0.82 /lf	41
DIP Equip- Cat 325 Excavator	4.50 ch	4.500	399	-	539	-	-	208.40 /ch	938
DIP Epoxy Lined, Push-On, Class 50, 24"	50.00 lf	19.500	1,605	5,696	-	-	-	146.00 /lf	7,300
DIP Epoxy Lined, Push-on, 90 Bend, 24"	2.00 ea	18.180	1,496	5,749	-	-	-	3,622.72 /ea	7,245
DIP Epoxy Lined, Push-on, Tee BxB, 16"x 10"	2.00 ea	16.420	1,351	2,634	-	-	-	1,992.34 /ea	3,985
DIP Epoxy Lined, Push-on, Tee BxB, 24"x 16"	2.00 ea	23.080	1,899	4,898	-	-	-	3,398.78 /ea	6,798
DIP Epoxy Lined, Push-on, Tee BxB, 24"x 24"	4.00 ea	46.160	3,798	15,128	-	-	-	4,731.48 /ea	18,926
DIP, Epoxy Lined, Push-on, Reducer BxB, 24"x 14"	1.00 ea	8.050	662	1,228	-	-	-	1,890.84 /ea	1,891
DIP Epoxy Lined, Push-on, Cap, 24"	4.00 ea	25.040	2,060	5,460	-	-	-	1,880.20 /ea	7,521
DIP Epoxy Lined, RJ- Flex Ring, 90 Bend, 24"	2.00 ea	18.180	1,496	7,770	-	-	-	4,633.11 /ea	9,266
15210.00.070.20 ELSP Pipe from Influent Pump to MF Strainer, 24" dia.	**50.00 lf**	**185.558**	**15,241**	**48,564**	**623**			**1,288.56 /lf**	**64,428**
15210.00.070.30 ELSP Pipe from MF Strainer to MF System, 24" dia.									
24-0/0" MegaLug 1700 for DI Push-On Bells (L&M)	2.00 ea	28.000	2,304	3,247	-	-	-	2,775.47 /ea	5,551
Unload Care & Protect Epoxy Lined Push-on DIP & Fittings	18,921.00 lbs	6.244	455	-	89	-	-	0.03 /lbs	543
Layout Epoxy Lined Push-on DIP & Fitting	70.00 lf	0.700	58	-	-	-	-	0.82 /lf	58
DIP Equip- Cat 325 Excavator	6.30 ch	6.300	559	-	754	-	-	208.40 /ch	1,313
DIP Epoxy Lined, Push-On, Class 50, 24"	70.00 lf	27.300	2,246	7,974	-	-	-	146.00 /lf	10,220
DIP Epoxy Lined, Push-on, 90 Bend, 24"	4.00 ea	36.360	2,992	11,499	-	-	-	3,622.72 /ea	14,491
DIP Epoxy Lined, Push-on, Tee BxB, 24"x 16"	3.00 ea	34.620	2,849	7,348	-	-	-	3,398.78 /ea	10,196
DIP Epoxy Lined, Push-on, Cap, 24"	1.00 ea	6.260	515	1,365	-	-	-	1,880.19 /ea	1,880
DIP Epoxy Lined, RJ- Flex Ring, 90 Bend, 24"	2.00 ea	18.180	1,496	7,770	-	-	-	4,633.11 /ea	9,266
15210.00.070.30 ELSP Pipe from MF Strainer to MF System, 24" dia.	**70.00 lf**	**163.964**	**13,473**	**39,203**	**843**			**764.55 /lf**	**53,519**
15210.00.070.40 ELSP Pipe from MF Strainer to MF System, 16" dia.									
16-0/0" 150# A307 Steel Bolt Sets	4.00 ea		-	228	-	-	-	56.88 /ea	228
16-0/0" Full Faced Red Rubber (SBR) Gasket 1/8"	4.00 ea		-	49	-	-	-	12.22 /ea	49
Unload Care & Protect Epoxy Lined Flanged DIP & Fittings	1,350.40 lbs	0.446	32	-	6	-	-	0.03 /lbs	39
Layout Epoxy Lined Flanged DIP & Fitting	6.00 lf	0.060	5	-	-	-	-	0.82 /lf	5
DI, Epoxy Lined, Eccentric Reducer, FL, 16"x 12"	2.00 ea	18.300	1,506	4,992	-	-	-	3,248.82 /ea	6,498
DI Pipe, FLxPE, CL53, Epoxy Lined, 16" x 1'-0"	2.00 ea	16.880	1,389	983	-	-	-	1,186.20 /ea	2,372
DIP Equip- Cat 325 Excavator	0.50 ch	0.500	44	-	60	-	-	208.40 /ch	104
DIP Epoxy Lined, Push-On, Class 50, 16"	6.00 lf	2.040	168	421	-	-	-	98.18 /lf	589
DIP Epoxy Lined, RJ- Flex Ring, 90 Bend, 16"	2.00 ea	11.760	968	3,163	-	-	-	2,065.54 /ea	4,131
15210.00.070.40 ELSP Pipe from MF Strainer to MF System, 16" dia.	**6.00 lf**	**49.986**	**4,112**	**9,836**	**66**			**2,335.74 /lf**	**14,014**
15210.00.070.50 ELSP Pipe from BW Supply Pump to MF System, 12" dia									
12-0/0" 150# A307 Steel Bolt Sets	4.00 ea		-	114	-	-	-	28.44 /ea	114
12-0/0" Full Faced Red Rubber (SBR) Gasket 1/8"	4.00 ea		-	28	-	-	-	7.00 /ea	28
Unload Care & Protect Push-on DIP & Fittings	2,581.00 lbs	0.852	62	-	12	-	-	0.03 /lbs	74
Layout Push-on DIP & Fitting	50.00 lf	0.500	41	-	-	-	-	0.82 /lf	41
DIP Equip- Cat 325 Excavator	1.80 ch	1.800	160	-	215	-	-	208.39 /ch	375
DIP Epoxy Lined, Push-On, Class 50, 12"	50.00 lf	14.500	1,193	2,457	-	-	-	73.00 /lf	3,650
DIP Epoxy Lined, Push-on, 90 Bend, 12"	2.00 ea	9.240	760	1,273	-	-	-	1,016.75 /ea	2,034
DIP Epoxy Lined, Push-on, 45 Bend, 12"	2.00 ea	8.820	726	1,035	-	-	-	880.53 /ea	1,761
DIP Epoxy Lined, Push-on, Cap, 12"	1.00 ea	2.660	219	335	-	-	-	554.12 /ea	554
DIP Epoxy Lined, RJ- Flex Ring, 90 Bend, 12"	4.00 ea	18.480	1,521	2,348	-	-	-	967.11 /ea	3,868
15210.00.070.50 ELSP Pipe from BW Supply Pump to MF System, 12" dia	**50.00 lf**	**56.852**	**4,682**	**7,590**	**228**			**249.99 /lf**	**12,499**
15210.00.070.60 ELSP Pipe from MF System to Filtrate Break Tank, 24" dia.									
24-0/0" MegaLug 1700 for DI Push-On Bells (L&M)	2.00 ea	28.000	2,304	3,247	-	-	-	2,775.48 /ea	5,551
Unload Care & Protect Epoxy Lined Push-on DIP & Fittings	28,381.00 lbs	9.366	682	-	133	-	-	0.03 /lbs	815
Layout Epoxy Lined Push-on DIP & Fitting	100.00 lf	1.000	82	-	-	-	-	0.82 /lf	82

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15210.00.070.60 ELSP Pipe from MF System to Filtrate Break Tank, 24" dia.									
DIP Equip- Cat 325 Excavator	9.45 ch	9.450	838	-	1,131	-	-	208.40 /ch	1,969
DIP Epoxy Lined, Push-On, Class 50, 24"	100.00 lf	39.000	3,209	11,391	-	-	-	146.00 /lf	14,600
DIP Epoxy Lined, Push-on, 90 Bend, 24"	4.00 ea	36.360	2,992	11,499	-	-	-	3,622.72 /ea	14,491
DIP Epoxy Lined, Push-on, Tee BxB, 24"x 16"	3.00 ea	34.620	2,849	7,348	-	-	-	3,398.78 /ea	10,196
DIP Epoxy Lined, RJ- Flex Ring, 90 Bend, 24"	2.00 ea	18.180	1,496	7,770	-	-	-	4,633.11 /ea	9,266
15210.00.070.60 ELSP Pipe from MF System to Filtrate Break Tank, 24" dia.	**100.00 lf**	**175.976**	**14,452**	**41,255**	**1,264**			**569.72 /lf**	**56,971**
15210.00.070.70 ELSP Pipe from Filtrate Break Tank to BW, 16" dia.									
16-0/0" 150# A307 Steel Bolt Sets	4.00 ea		-	228	-	-	-	56.88 /ea	228
16-0/0" Full Faced Red Rubber (SBR) Gasket 1/8"	4.00 ea		-	49	-	-	-	12.22 /ea	49
Unload Care & Protect Epoxy Lined Flanged DIP & Fittings	13,454.00 lbs	4.440	323	-	63	-	-	0.03 /lbs	386
Layout Epoxy Lined Flanged DIP & Fitting	60.00 lf	0.600	49	-	-	-	-	0.82 /lf	49
DIP Equip- Cat 325 Excavator	5.00 ch	5.000	444	-	599	-	-	208.40 /ch	1,042
DIP Epoxy Lined, Push-On, Class 50, 16"	60.00 lf	20.400	1,679	4,212	-	-	-	98.18 /lf	5,891
DIP Epoxy Lined, Push-on, Tee BxB, 16"x 16"	2.00 ea	16.420	1,351	3,740	-	-	-	2,545.57 /ea	5,091
DIP, Epoxy Lined, Push-on, Reducer BxB, 16"x 10"	2.00 ea	10.800	889	1,123	-	-	-	1,006.04 /ea	2,012
15210.00.070.70 ELSP Pipe from Filtrate Break Tank to BW, 16" dia.	**60.00 lf**	**57.660**	**4,735**	**9,352**	**662**			**245.80 /lf**	**14,748**
15210.00.070.910 ELSP Pipe from MF to Process Waste Pump Station, 16" dia.									
16-0/0" 150# A307 Steel Bolt Sets	4.00 ea		-	228	-	-	-	56.88 /ea	228
16-0/0" Full Faced Red Rubber (SBR) Gasket 1/8"	4.00 ea		-	49	-	-	-	12.22 /ea	49
Unload Care & Protect Epoxy Lined Flanged DIP & Fittings	45,000.00 lbs	14.850	1,081	-	211	-	-	0.03 /lbs	1,292
Layout Epoxy Lined Flanged DIP & Fitting	200.00 lf	2.000	165	-	-	-	-	0.82 /lf	165
DI, Epoxy Lined, Eccentric Reducer, FL, 16"x 12"	2.00 ea	18.300	1,506	4,992	-	-	-	3,248.82 /ea	6,498
DI Pipe, FLxPE, CL53, Epoxy Lined, 16" x 1'-0"	2.00 ea	16.880	1,389	983	-	-	-	1,186.20 /ea	2,372
DIP Equip- Cat 325 Excavator	4.00 ch	4.000	355	-	479	-	-	208.40 /ch	834
DIP Epoxy Lined, Push-On, Class 50, 16"	200.00 lf	68.000	5,595	14,040	-	-	-	98.18 /lf	19,635
DIP Epoxy Lined, RJ- Flex Ring, 90 Bend, 16"	4.00 ea	23.520	1,935	6,327	-	-	-	2,065.54 /ea	8,262
15210.00.070.910 ELSP Pipe from MF to Process Waste Pump Station, 16" dia.	**200.00 lf**	**147.550**	**12,026**	**26,618**	**690**			**196.67 /lf**	**39,334**
15210.00.070.920 ELSP Pipe fromStrainer to Process Waste Pump Station, 6" dia.									
6-0/0" 150# A307 Steel Bolt Sets	4.00 ea		-	46	-	-	-	11.38 /ea	46
6-0/0" Full Faced Red Rubber (SBR) Gasket 1/8"	4.00 ea		-	10	-	-	-	2.53 /ea	10
Unload Care & Protect Epoxy Lined Flanged DIP & Fittings	20,040.00 lbs	6.613	482	-	94	-	-	0.03 /lbs	576
Layout Epoxy Lined Flanged DIP & Fitting	200.00 lf	2.000	165	-	-	-	-	0.82 /lf	165
DI, Epoxy Lined, Eccentric Reducer, FL, 8"x 6"	2.00 ea	7.260	597	1,210	-	-	-	903.57 /ea	1,807
DI Pipe, FLxPE, CL53, Epoxy Lined, 6" x 12'-0"	2.00 ea	10.180	838	1,308	-	-	-	1,072.87 /ea	2,146
DIP Equip- Cat 325 Excavator	4.00 ch	4.000	355	-	479	-	-	208.40 /ch	834
DIP Epoxy Lined, Push-On, Class 50, 6"	200.00 lf	42.000	3,456	4,844	-	-	-	41.50 /lf	8,300
DIP Epoxy Lined, RJ- Flex Ring, 90 Bend, 6"	6.00 ea	14.040	1,155	1,229	-	-	-	397.30 /ea	2,384
15210.00.070.920 ELSP Pipe fromStrainer to Process Waste Pump Station, 6" dia.	**200.00 lf**	**86.093**	**7,047**	**8,646**	**573**			**81.33 /lf**	**16,266**
15212 Epoxy Lined Steel Pipe (ELSP)		**1,175.768**	**96,349**	**230,489**	**6,038**				**332,876**
15221 Stainless Steel Pipe									
15221.00.035.02 SS Pipe from Filtrate Break Tank to RO Transfer Pump, 24" dia.									
RJ- Flex Ring, 24" dia	2.00 ea	18.180	1,496	7,770	-	-	-	4,633.11 /ea	9,266
Unload Care & Protect Pipe/Fittings	9,395.12 lbs	3.100	226	-	44	-	-	0.03 /lbs	270
Layout Pipe & Fitting	100.00 lf	1.000	82	-	-	-	-	0.82 /lf	82
SS Pipe Equip- Cat 320 Excavator	9.00 ch	9.000	798	-	811	-	-	178.80 /ch	1,609
Install Fabricated 316L SS Pipe, 24"	100.00 lf	74.000	6,089	-	-	-	-	60.89 /lf	6,089
316L Sch 40s Stainless Pipe, 24"	68.67 lf		-	24,584	-	-	-	358.01 /lf	24,584
316L Sch 40s Stainless 90 Ell, 24"	4.00 ea		-	40,459	-	-	-	10,114.65 /ea	40,459
316L Sch 40s Stainless Tee, 24.00" x 12.00"	2.00 ea		-	12,865	-	-	-	6,432.57 /ea	12,865
316L Sch 40s Stainless Ecc. Reducer, 12.00" x 8.00"	2.00 ea		-	4,183	-	-	-	2,091.72 /ea	4,183
316L Sch 40s Stainless Cap, 24"	1.00 ea		-	2,262	-	-	-	2,262.49 /ea	2,262
15221.00.035.02 SS Pipe from Filtrate Break Tank to RO Transfer Pump, 24" dia.	**100.00 lf**	**105.280**	**8,691**	**92,124**	**855**			**1,016.71 /lf**	**101,671**
15221.00.035.04 SS Pipe from RO Transfer Pumps to Cartridge Filters, 24" dia.									
Unload Care & Protect Pipe/Fittings	2,088.12 lbs	0.689	50	-	10	-	-	0.03 /lbs	60
Layout Pipe & Fitting	20.00 lf	0.200	16	-	-	-	-	0.82 /lf	16
SS Pipe Equip- Cat 320 Excavator	1.80 ch	1.800	160	-	162	-	-	178.80 /ch	322
Install Fabricated 316L SS Pipe, 12"	10.00 lf	5.400	444	-	-	-	-	44.43 /lf	444
Install Fabricated 316L SS Pipe, 14"	10.00 lf	5.600	461	-	-	-	-	46.08 /lf	461
Install Fabricated 316L SS Pipe, 24"	20.00 lf	14.800	1,218	-	-	-	-	60.89 /lf	1,218
316L Sch 40s Stainless 90 Ell, 24"	4.00 ea		-	40,459	-	-	-	10,114.65 /ea	40,459
316L Sch 40s Stainless Tee, 24.00" x 12.00"	4.00 ea		-	25,730	-	-	-	6,432.56 /ea	25,730
316L Sch 40s Stainless Tee, 24.00" x 14.00"	1.00 ea		-	6,433	-	-	-	6,432.56 /ea	6,433
316L Sch 40s Stainless Ecc. Reducer, 12.00" x 6.00"	2.00 ea		-	4,183	-	-	-	2,091.72 /ea	4,183
316L Sch 40s Stainless Ecc. Reducer, 14.00" x 12.00"	1.00 ea		-	1,291	-	-	-	1,290.94 /ea	1,291
316L Sch 40s Stainless Ecc. Reducer, 24.00" x 14.00"	1.00 ea		-	3,438	-	-	-	3,438.09 /ea	3,438
316L Sch 40s Stainless Cap, 24"	3.00 ea		-	6,787	-	-	-	2,262.49 /ea	6,787
15221.00.035.04 SS Pipe from RO Transfer Pumps to Cartridge Filters, 24" dia.	**20.00 lf**	**28.489**	**2,349**	**88,321**	**172**			**4,542.13 /lf**	**90,843**
15221.00.035.10 SS Pipe from RO Cartridge Filters to RO Feed Pump, 24" dia.									

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15221.00.035.10 SS Pipe from RO Cartridge Filters to RO Feed Pump, 24" dia.									
24-0/0" Static Mixer- 316 Stainless	1.00 ea	20.000	1,646	27,300	-	-	-	28,945.72 /ea	28,946
SS Pipe Equip- Cat 320 Excavator	22.50 ch	22.500	1,996	-	2,027	-	-	178.80 /ch	4,023
Unload Care & Protect Pipe/Fittings	23,567.05 lbs	7.777	566	-	111	-	-	0.03 /lbs	677
Layout Pipe & Fitting	250.00 lf	2.500	206	-	-	-	-	0.82 /lf	206
316L Sch 40s Stainless Pipe BW, 24"	250.00 lf	399.600	32,881	89,557	-	-	-	489.75 /lf	122,438
316L Sch 40s Stainless 90 Ell BW, 24"	6.00 ea	295.704	24,332	200,768	-	-	-	37,516.71 /ea	225,100
316L Sch 40s Stainless 45 Ell BW, 24"	4.00 ea	197.146	16,222	38,934	-	-	-	13,788.97 /ea	55,156
316L Sch 40s Stainless Tee BW, 24.00"	2.00 ea	150.288	12,367	19,872	-	-	-	16,119.11 /ea	32,238
316L Sch 40s Stainless Tee BW, 24.00" x 14.00"	2.00 ea	138.793	11,421	35,303	-	-	-	23,361.96 /ea	46,724
316L Sch 40s Stainless Ecc. Reducer BW, 14.00" x 12.00"	2.00 ea	49.720	4,091	7,779	-	-	-	5,935.02 /ea	11,870
316L Sch 40s Stainless Cap BW, 24"	1.00 ea	24.123	1,985	2,662	-	-	-	4,646.61 /ea	4,647
Inert Gas Purge, 24"	29.00 ea	102.370	8,424	104	-	-	-	294.05 /ea	8,528
300 amp Welder for Steel Pipe	22.50 ch		-	-	125	-	-	5.57 /ch	125
15221.00.035.10 SS Pipe from RO Cartridge Filters to RO Feed Pump, 24" dia.	**250.00 lf**	**1,410.521**	**116,136**	**422,278**	**2,263**			**2,162.71 /lf**	**540,677**
15221.00.035.20 SS Pipe from RO Feed Pump to RO Stage 1, 12" dia.									
SS Pipe Equip- Cat 320 Excavator	0.72 ch	0.720	64	-	65	-	-	178.79 /ch	129
Unload Care & Protect Pipe/Fittings	894.91 lbs	0.295	22	-	4	-	-	0.03 /lbs	26
Layout Pipe & Fitting	20.00 lf	0.200	16	-	-	-	-	0.82 /lf	16
316L Sch 40s Stainless Pipe BW, 12"	20.00 lf	22.200	1,827	3,749	-	-	-	278.77 /lf	5,575
316L Sch 40s Stainless 90 Ell BW, 12"	4.00 ea	95.960	7,896	35,222	-	-	-	10,779.65 /ea	43,119
316L Sch 40s Stainless 45 Ell BW, 12"	2.00 ea	46.180	3,800	5,106	-	-	-	4,452.87 /ea	8,906
316L Sch 40s Stainless Tee BW, 12.00" x 10.00"	2.00 ea	70.380	5,791	11,309	-	-	-	8,550.24 /ea	17,100
Inert Gas Purge, 12"	10.00 ea	24.500	2,016	9	-	-	-	202.50 /ea	2,025
300 amp Welder for Steel Pipe	0.72 ch		-	-	4	-	-	5.58 /ch	4
15221.00.035.20 SS Pipe from RO Feed Pump to RO Stage 1, 12" dia.	**20.00 lf**	**260.435**	**21,432**	**55,395**	**73**			**3,845.00 /lf**	**76,900**
15221.00.035.30 SS Pipe from RO Stage 1 to RO Stage 2 Booster Pump, 6" dia.									
SS Pipe Equip- Cat 320 Excavator	0.50 ch	0.500	44	-	45	-	-	178.80 /ch	89
Unload Care & Protect Pipe/Fittings	362.92 lbs	0.120	9	-	2	-	-	0.03 /lbs	10
Layout Pipe & Fitting	20.00 lf	0.200	16	-	-	-	-	0.82 /lf	16
316L Sch 40s Stainless Pipe BW, 6"	20.00 lf	12.000	987	1,434	-	-	-	121.09 /lf	2,422
316L Sch 40s Stainless 90 Ell BW, 6"	4.00 ea	48.720	4,009	6,814	-	-	-	2,705.83 /ea	10,823
316L Sch 40s Stainless 45 Ell BW, 6"	2.00 ea	23.980	1,973	993	-	-	-	1,483.30 /ea	2,967
316L Sch 40s Stainless Tee BW, 6.00"	1.00 ea	18.050	1,485	507	-	-	-	1,992.37 /ea	1,992
Inert Gas Purge, 6"	9.00 ea	15.660	1,289	2	-	-	-	143.40 /ea	1,291
300 amp Welder for Steel Pipe	0.50 ch		-	-	3	-	-	5.56 /ch	3
15221.00.035.30 SS Pipe from RO Stage 1 to RO Stage 2 Booster Pump, 6" dia.	**20.00 lf**	**119.230**	**9,813**	**9,751**	**50**			**980.69 /lf**	**19,614**
15221.00.035.40 SS Pipe from RO Stage 1 to RO Stage 2 Booster Pump, 8" dia.									
SS Pipe Equip- Cat 320 Excavator	0.30 ch	0.300	27	-	27	-	-	178.80 /ch	54
Unload Care & Protect Pipe/Fittings	269.24 lbs	0.089	6	-	1	-	-	0.03 /lbs	8
Layout Pipe & Fitting	10.00 lf	0.100	8	-	-	-	-	0.82 /lf	8
316L Sch 40s Stainless Pipe BW, 8"	10.00 lf	7.700	634	1,079	-	-	-	171.31 /lf	1,713
316L Sch 40s Stainless 90 Ell BW, 8"	2.00 ea	31.000	2,551	6,213	-	-	-	4,382.00 /ea	8,764
316L Sch 40s Stainless Tee BW, 8.00"	1.00 ea	22.790	1,875	1,262	-	-	-	3,137.12 /ea	3,137
316L Sch 40s Stainless Ecc. Reducer BW, 8.00" x 6.00"	1.00 ea	13.110	1,079	794	-	-	-	1,872.28 /ea	1,872
Inert Gas Purge, 8"	5.00 ea	9.900	815	2	-	-	-	163.32 /ea	817
300 amp Welder for Steel Pipe	0.30 ch		-	-	2	-	-	5.57 /ch	2
15221.00.035.40 SS Pipe from RO Stage 1 to RO Stage 2 Booster Pump, 8" dia.	**10.00 lf**	**84.989**	**6,994**	**9,350**	**30**			**1,637.44 /lf**	**16,374**
15221.00.035.50 SS Pipe from RO Stage 1 to RO Permeate, 10" dia.									
SS Pipe Equip- Cat 320 Excavator	1.02 ch	1.020	90	-	92	-	-	178.79 /ch	182
Unload Care & Protect Pipe/Fittings	1,156.51 lbs	0.382	28	-	5	-	-	0.03 /lbs	33
Layout Pipe & Fitting	30.00 lf	0.300	25	-	-	-	-	0.82 /lf	25
316L Sch 40s Stainless Pipe BW, 10"	30.00 lf	28.800	2,370	4,592	-	-	-	232.05 /lf	6,961
316L Sch 40s Stainless 90 Ell BW, 10"	4.00 ea	79.040	6,504	27,400	-	-	-	8,475.87 /ea	33,903
316L Sch 40s Stainless 45 Ell BW, 10"	2.00 ea	38.140	3,138	3,802	-	-	-	3,470.11 /ea	6,940
316L Sch 40s Stainless Tee BW, 10.00"	1.00 ea	28.790	2,369	2,913	-	-	-	5,282.12 /ea	5,282
316L Sch 40s Stainless Tee BW, 10.00" x 6.00"	1.00 ea	28.790	2,369	5,445	-	-	-	7,814.49 /ea	7,814
Inert Gas Purge, 10"	10.00 ea	22.100	1,819	6	-	-	-	182.48 /ea	1,825
300 amp Welder for Steel Pipe	1.02 ch		-	-	6	-	-	5.57 /ch	6
15221.00.035.50 SS Pipe from RO Stage 1 to RO Permeate, 10" dia.	**30.00 lf**	**227.362**	**18,712**	**44,158**	**103**			**2,099.08 /lf**	**62,972**
15221.00.035.60 SS Pipe from RO Stage 2 Booster Pump to RO Stage 2, 8" dia.									
SS Pipe Equip- Cat 320 Excavator	0.60 ch	0.600	53	-	54	-	-	178.83 /ch	107
Unload Care & Protect Pipe/Fittings	538.48 lbs	0.178	13	-	3	-	-	0.03 /lbs	15
Layout Pipe & Fitting	20.00 lf	0.200	16	-	-	-	-	0.82 /lf	16
316L Sch 40s Stainless Pipe BW, 8"	20.00 lf	15.400	1,267	2,159	-	-	-	171.31 /lf	3,426
316L Sch 40s Stainless 90 Ell BW, 8"	4.00 ea	62.000	5,102	12,426	-	-	-	4,382.00 /ea	17,528
316L Sch 40s Stainless Tee BW, 8.00"	2.00 ea	45.580	3,751	2,524	-	-	-	3,137.12 /ea	6,274
Inert Gas Purge, 8"	10.00 ea	19.800	1,629	4	-	-	-	163.32 /ea	1,633
300 amp Welder for Steel Pipe	0.60 ch		-	-	3	-	-	5.57 /ch	3

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15221.00.035.60 SS Pipe from RO Stage 2 Booster Pump to RO Stage 2, 8" dia.	**20.00 lf**	**143.758**	**11,831**	**17,113**	**60**			**1,450.21 /lf**	**29,004**
15221.00.035.70 SS Pipe from RO Stage 2 to Secondary RO Booster Pump, 6" dia.									
SS Pipe Equip- Cat 320 Excavator	0.50 ch	0.500	44	-	45	-	-	178.82 /ch	89
Unload Care & Protect Pipe/Fittings	362.92 lbs	0.120	9	-	2	-	-	0.03 /lbs	10
Layout Pipe & Fitting	20.00 lf	0.200	16	-	-	-	-	0.82 /lf	16
316L Sch 40s Stainless Pipe BW, 6"	20.00 lf	12.000	987	1,434	-	-	-	121.09 /lf	2,422
316L Sch 40s Stainless 90 Ell BW, 6"	4.00 ea	48.720	4,009	6,814	-	-	-	2,705.83 /ea	10,823
316L Sch 40s Stainless 45 Ell BW, 6"	2.00 ea	23.980	1,973	993	-	-	-	1,483.30 /ea	2,967
316L Sch 40s Stainless Tee BW, 6.00"	1.00 ea	18.050	1,485	507	-	-	-	1,992.37 /ea	1,992
316L Sch 40s Stainless Ecc. Reducer BW, 6.00" x 3.00"	2.00 ea	21.880	1,800	1,595	-	-	-	1,697.76 /ea	3,396
Inert Gas Purge, 6"	9.00 ea	15.660	1,289	2	-	-	-	143.40 /ea	1,291
300 amp Welder for Steel Pipe	0.50 ch		-	-	3	-	-	5.58 /ch	3
15221.00.035.70 SS Pipe from RO Stage 2 to Secondary RO Booster Pump, 6" dia.	**20.00 lf**	**141.110**	**11,613**	**11,346**	**50**			**1,150.47 /lf**	**23,009**
15221.00.035.80 SS Pipe from RO Stage 2 to RO Permeate, 6" dia.									
SS Pipe Equip- Cat 320 Excavator	0.50 ch	0.500	44	-	45	-	-	178.82 /ch	89
Unload Care & Protect Pipe/Fittings	181.46 lbs	0.060	4	-	1	-	-	0.03 /lbs	5
Layout Pipe & Fitting	10.00 lf	0.100	8	-	-	-	-	0.82 /lf	8
316L Sch 40s Stainless Pipe BW, 6"	10.00 lf	6.000	494	717	-	-	-	121.09 /lf	1,211
316L Sch 40s Stainless 90 Ell BW, 6"	2.00 ea	24.360	2,004	3,407	-	-	-	2,705.83 /ea	5,412
316L Sch 40s Stainless 45 Ell BW, 6"	2.00 ea	23.980	1,973	993	-	-	-	1,483.30 /ea	2,967
316L Sch 40s Stainless Tee BW, 6.00"	1.00 ea	18.050	1,485	507	-	-	-	1,992.37 /ea	1,992
Inert Gas Purge, 6"	4.50 ea	7.830	644	1	-	-	-	143.40 /ea	645
300 amp Welder for Steel Pipe	0.50 ch		-	-	3	-	-	5.58 /ch	3
15221.00.035.80 SS Pipe from RO Stage 2 to RO Permeate, 6" dia.	**10.00 lf**	**80.880**	**6,658**	**5,626**	**49**			**1,233.25 /lf**	**12,332**
15221.00.035.90 SS Pipe from Primary RO to RO Permeate, 12" dia.									
SS Pipe Equip- Cat 320 Excavator	3.60 ch	3.600	319	-	324	-	-	178.80 /ch	644
Unload Care & Protect Pipe/Fittings	4,989.34 lbs	1.646	120	-	23	-	-	0.03 /lbs	143
Layout Pipe & Fitting	100.00 lf	1.000	82	-	-	-	-	0.82 /lf	82
316L Sch 40s Stainless Pipe BW, 12"	100.00 lf	111.000	9,134	18,743	-	-	-	278.77 /lf	27,877
316L Sch 40s Stainless 90 Ell BW, 12"	4.00 ea	95.960	7,896	35,222	-	-	-	10,779.65 /ea	43,119
316L Sch 40s Stainless 45 Ell BW, 12"	2.00 ea	46.180	3,800	5,106	-	-	-	4,452.87 /ea	8,906
316L Sch 40s Stainless Tee BW, 12.00"	2.00 ea	70.380	5,791	6,366	-	-	-	6,078.53 /ea	12,157
316L Sch 40s Stainless Tee BW, 12.00" x 6.00"	1.00 ea	35.190	2,896	5,655	-	-	-	8,550.24 /ea	8,550
316L Sch 40s Stainless Cap BW, 12"	1.00 ea	11.510	947	788	-	-	-	1,735.15 /ea	1,735
Inert Gas Purge, 12"	16.00 ea	39.200	3,226	14	-	-	-	202.50 /ea	3,240
Clean & Disinfect Pipe, 12"	100.00 lf	1.580	130	1	-	-	-	1.31 /lf	131
300 amp Welder for Steel Pipe	3.60 ch		-	-	20	-	-	5.58 /ch	20
15221.00.035.90 SS Pipe from Primary RO to RO Permeate, 12" dia.	**100.00 lf**	**417.246**	**34,341**	**71,896**	**368**			**1,066.04 /lf**	**106,604**
15221.00.035.910 SS Pipe from RO Stage 2 to Secondary RO Booster Pump, 8" dia.									
SS Pipe Equip- Cat 320 Excavator	0.30 ch	0.300	27	-	27	-	-	178.77 /ch	54
Unload Care & Protect Pipe/Fittings	269.24 lbs	0.089	6	-	1	-	-	0.03 /lbs	8
Layout Pipe & Fitting	10.00 lf	0.100	8	-	-	-	-	0.82 /lf	8
316L Sch 40s Stainless Pipe BW, 8"	10.00 lf	7.700	634	1,079	-	-	-	171.31 /lf	1,713
316L Sch 40s Stainless 90 Ell BW, 8"	2.00 ea	31.000	2,551	6,213	-	-	-	4,382.00 /ea	8,764
316L Sch 40s Stainless Tee BW, 8.00"	1.00 ea	22.790	1,875	1,262	-	-	-	3,137.12 /ea	3,137
316L Sch 40s Stainless Ecc. Reducer BW, 8.00" x 6.00"	2.00 ea	26.220	2,158	1,587	-	-	-	1,872.29 /ea	3,745
Inert Gas Purge, 8"	5.00 ea	9.900	815	2	-	-	-	163.32 /ea	817
300 amp Welder for Steel Pipe	0.30 ch		-	-	2	-	-	5.60 /ch	2
15221.00.035.910 SS Pipe from RO Stage 2 to Secondary RO Booster Pump, 8" dia.	**10.00 lf**	**98.099**	**8,073**	**10,144**	**30**			**1,824.67 /lf**	**18,247**
15221.00.035.920 SS Pipe from Secondary RO Booster Pump to Secondary RO Units, 6" dia.									
SS Pipe Equip- Cat 320 Excavator	0.50 ch	0.500	44	-	45	-	-	178.82 /ch	89
Unload Care & Protect Pipe/Fittings	362.92 lbs	0.120	9	-	2	-	-	0.03 /lbs	10
Layout Pipe & Fitting	20.00 lf	0.200	16	-	-	-	-	0.82 /lf	16
316L Sch 40s Stainless Pipe BW, 6"	20.00 lf	12.000	987	1,434	-	-	-	121.09 /lf	2,422
316L Sch 40s Stainless 90 Ell BW, 6"	4.00 ea	48.720	4,009	6,814	-	-	-	2,705.83 /ea	10,823
316L Sch 40s Stainless 45 Ell BW, 6"	2.00 ea	23.980	1,973	993	-	-	-	1,483.30 /ea	2,967
316L Sch 40s Stainless Tee BW, 6.00"	1.00 ea	18.050	1,485	507	-	-	-	1,992.38 /ea	1,992
Inert Gas Purge, 6"	9.00 ea	15.660	1,289	2	-	-	-	143.40 /ea	1,291
300 amp Welder for Steel Pipe	0.50 ch		-	-	3	-	-	5.58 /ch	3
15221.00.035.920 SS Pipe from Secondary RO Booster Pump to Secondary RO Units, 6" dia.	**20.00 lf**	**119.230**	**9,813**	**9,751**	**50**			**980.69 /lf**	**19,614**
15221.00.035.930 SS Pipe from Secondary RO Train to RO Permeate, 4" dia.									
SS Pipe Equip- Cat 320 Excavator	2.00 ch	2.000	177	-	180	-	-	178.80 /ch	358
Unload Care & Protect Pipe/Fittings	1,089.37 lbs	0.359	26	-	5	-	-	0.03 /lbs	31
Layout Pipe & Fitting	100.00 lf	1.000	82	-	-	-	-	0.82 /lf	82
316L Sch 40s Stainless Pipe BW, 4.00"	100.00 lf	44.000	3,621	4,067	-	-	-	76.87 /lf	7,687
316L Sch 40s Stainless 90 Ell BW, 4.00"	6.00 ea	56.880	4,680	3,103	-	-	-	1,297.15 /ea	7,783
316L Sch 40s Stainless 45 Ell BW, 4.00"	4.00 ea	37.680	3,101	747	-	-	-	961.93 /ea	3,848
316L Sch 40s Stainless Tee BW, 4.00"	5.00 ea	70.950	5,838	859	-	-	-	1,339.37 /ea	6,697
316L Sch 40s Stainless Cap BW, 4.00"	1.00 ea	4.740	390	126	-	-	-	516.31 /ea	516

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15221.00.035.930 SS Pipe from Secondary RO Train to RO Permeate, 4" dia.									
Inert Gas Purge, 4.00"	23.00 ea	30.130	2,479	2	-	-	-	107.90 /ea	2,482
Clean & Disinfect Pipe, 4.00"	100.00 lf	0.180	15	0	-	-	-	0.15 /lf	15
300 amp Welder for Steel Pipe	2.00 ch		-	-	11	-	-	5.58 /ch	11
15221.00.035.930 SS Pipe from Secondary RO Train to RO Permeate, 4" dia.	**100.00 lf**	**247.919**	**20,410**	**8,904**	**196**			**295.10 /lf**	**29,510**
15221.00.035.940 SS pipe from Secondary RO Train to Seconadary CIP Tank, 4" dia.									
SS Pipe Equip- Cat 320 Excavator	2.00 ch	2.000	177	-	180	-	-	178.81 /ch	358
Unload Care & Protect Pipe/Fittings	1,089.37 lbs	0.359	26	-	5	-	-	0.03 /lbs	31
Layout Pipe & Fitting	100.00 lf	1.000	82	-	-	-	-	0.82 /lf	82
316L Sch 40s Stainless Pipe BW, 4.00"	100.00 lf	44.000	3,621	4,067	-	-	-	76.87 /lf	7,687
316L Sch 40s Stainless 90 Ell BW, 4.00"	6.00 ea	56.880	4,680	3,103	-	-	-	1,297.15 /ea	7,783
316L Sch 40s Stainless 45 Ell BW, 4.00"	4.00 ea	37.680	3,101	747	-	-	-	961.93 /ea	3,848
316L Sch 40s Stainless Tee BW, 4.00"	5.00 ea	70.950	5,838	859	-	-	-	1,339.37 /ea	6,697
316L Sch 40s Stainless Cap BW, 4.00"	1.00 ea	4.740	390	126	-	-	-	516.30 /ea	516
Inert Gas Purge, 4.00"	23.00 ea	30.130	2,479	2	-	-	-	107.90 /ea	2,482
Clean & Disinfect Pipe, 4.00"	100.00 lf	0.180	15	0	-	-	-	0.15 /lf	15
300 amp Welder for Steel Pipe	2.00 ch		-	-	11	-	-	5.57 /ch	11
15221.00.035.940 SS pipe from Secondary RO Train to Seconadary CIP Tank, 4" dia.	**100.00 lf**	**247.919**	**20,410**	**8,904**	**196**			**295.10 /lf**	**29,510**
15221.00.035.950 SS Pipe from Secondary RO Train to Flush Waste, 4" dia.									
SS Pipe Equip- Cat 320 Excavator	2.00 ch	2.000	177	-	180	-	-	178.81 /ch	358
Unload Care & Protect Pipe/Fittings	1,089.37 lbs	0.359	26	-	5	-	-	0.03 /lbs	31
Layout Pipe & Fitting	100.00 lf	1.000	82	-	-	-	-	0.82 /lf	82
316L Sch 40s Stainless Pipe BW, 4.00"	100.00 lf	44.000	3,621	4,067	-	-	-	76.87 /lf	7,687
316L Sch 40s Stainless 90 Ell BW, 4.00"	6.00 ea	56.880	4,680	3,103	-	-	-	1,297.15 /ea	7,783
316L Sch 40s Stainless 45 Ell BW, 4.00"	4.00 ea	37.680	3,101	747	-	-	-	961.93 /ea	3,848
316L Sch 40s Stainless Tee BW, 4.00"	5.00 ea	70.950	5,838	859	-	-	-	1,339.37 /ea	6,697
316L Sch 40s Stainless Cap BW, 4.00"	1.00 ea	4.740	390	126	-	-	-	516.29 /ea	516
Inert Gas Purge, 4.00"	23.00 ea	30.130	2,479	2	-	-	-	107.90 /ea	2,482
Clean & Disinfect Pipe, 4.00"	100.00 lf	0.180	15	0	-	-	-	0.15 /lf	15
300 amp Welder for Steel Pipe	2.00 ch		-	-	11	-	-	5.58 /ch	11
15221.00.035.950 SS Pipe from Secondary RO Train to Flush Waste, 4" dia.	**100.00 lf**	**247.919**	**20,410**	**8,904**	**196**			**295.10 /lf**	**29,510**
15221.00.035.960 SS Pipe from Transfer Pump to Flush Tank, 4" dia.									
SS Pipe Equip- Cat 320 Excavator	7.00 ch	7.000	621	-	631	-	-	178.80 /ch	1,252
Unload Care & Protect Pipe/Fittings	3,836.87 lbs	1.266	92	-	18	-	-	0.03 /lbs	110
Layout Pipe & Fitting	350.00 lf	3.500	288	-	-	-	-	0.82 /lf	288
316L Sch 40s Stainless Pipe BW, 4.00"	350.00 lf	154.000	12,672	14,233	-	-	-	76.87 /lf	26,905
316L Sch 40s Stainless 90 Ell BW, 4.00"	8.00 ea	75.840	6,241	4,137	-	-	-	1,297.15 /ea	10,377
316L Sch 40s Stainless 45 Ell BW, 4.00"	4.00 ea	37.680	3,101	747	-	-	-	961.93 /ea	3,848
316L Sch 40s Stainless Tee BW, 4.00"	5.00 ea	70.950	5,838	859	-	-	-	1,339.37 /ea	6,697
316L Sch 40s Stainless Cap BW, 4.00"	2.00 ea	9.480	780	253	-	-	-	516.30 /ea	1,033
Inert Gas Purge, 4.00"	39.00 ea	51.090	4,204	4	-	-	-	107.90 /ea	4,208
Clean & Disinfect Pipe, 4.00"	350.00 lf	0.630	52	1	-	-	-	0.15 /lf	52
300 amp Welder for Steel Pipe	7.00 ch		-	-	39	-	-	5.57 /ch	39
15221.00.035.960 SS Pipe from Transfer Pump to Flush Tank, 4" dia.	**350.00 lf**	**411.436**	**33,888**	**20,233**	**688**			**156.60 /lf**	**54,809**
15221.00.035.970 SS Pipe from RO Flush Tank to RO Flush Pumps, 8" dia.									
SS Pipe Equip- Cat 320 Excavator	3.00 ch	3.000	266	-	270	-	-	178.80 /ch	536
Unload Care & Protect Pipe/Fittings	2,862.52 lbs	0.945	69	-	13	-	-	0.03 /lbs	82
Layout Pipe & Fitting	100.00 lf	1.000	82	-	-	-	-	0.82 /lf	82
316L Sch 40s Stainless Pipe BW, 8"	100.00 lf	77.000	6,336	10,795	-	-	-	171.31 /lf	17,131
316L Sch 40s Stainless 90 Ell BW, 8"	4.00 ea	62.000	5,102	12,426	-	-	-	4,382.00 /ea	17,528
316L Sch 40s Stainless 45 Ell BW, 8"	2.00 ea	30.220	2,487	1,826	-	-	-	2,156.43 /ea	4,313
316L Sch 40s Stainless Tee BW, 8.00"	2.00 ea	45.580	3,751	2,524	-	-	-	3,137.12 /ea	6,274
Inert Gas Purge, 8"	14.00 ea	27.720	2,281	6	-	-	-	163.32 /ea	2,287
Clean & Disinfect Pipe, 8"	100.00 lf	0.700	58	1	-	-	-	0.58 /lf	58
300 amp Welder for Steel Pipe	3.00 ch		-	-	17	-	-	5.57 /ch	17
15221.00.035.970 SS Pipe from RO Flush Tank to RO Flush Pumps, 8" dia.	**100.00 lf**	**248.165**	**20,431**	**27,577**	**300**			**483.08 /lf**	**48,308**
15221.00.035.980 SS Pipe from RO Flush Tank to RO Flush Pumps, 6" dia.									
SS Pipe Equip- Cat 320 Excavator	0.50 ch	0.500	44	-	45	-	-	178.82 /ch	89
Unload Care & Protect Pipe/Fittings	362.92 lbs	0.120	9	-	2	-	-	0.03 /lbs	10
Layout Pipe & Fitting	20.00 lf	0.200	16	-	-	-	-	0.82 /lf	16
316L Sch 40s Stainless Pipe BW, 6"	20.00 lf	12.000	987	1,434	-	-	-	121.09 /lf	2,422
316L Sch 40s Stainless 90 Ell BW, 6"	4.00 ea	48.720	4,009	6,814	-	-	-	2,705.83 /ea	10,823
316L Sch 40s Stainless 45 Ell BW, 6"	2.00 ea	23.980	1,973	993	-	-	-	1,483.30 /ea	2,967
Inert Gas Purge, 6"	9.00 ea	15.660	1,289	2	-	-	-	143.40 /ea	1,291
300 amp Welder for Steel Pipe	0.50 ch		-	-	3	-	-	5.58 /ch	3
15221.00.035.980 SS Pipe from RO Flush Tank to RO Flush Pumps, 6" dia.	**20.00 lf**	**101.180**	**8,328**	**9,244**	**50**			**881.07 /lf**	**17,621**
15221.00.035.990 SS Pipe from RO Flush Pump to RO (1st, 2nd, 3rd stage), 8" dia.									
SS Pipe Equip- Cat 320 Excavator	3.00 ch	3.000	266	-	270	-	-	178.80 /ch	536
Unload Care & Protect Pipe/Fittings	2,862.52 lbs	0.945	69	-	13	-	-	0.03 /lbs	82

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15221.00.035.990 SS Pipe from RO Flush Pump to RO (1st, 2nd, 3rd stage), 8" dia.									
Layout Pipe & Fitting	100.00 lf	1.000	82	-	-	-	-	0.82 /lf	82
316L Sch 40s Stainless Pipe BW, 8"	100.00 lf	77.000	6,336	10,795	-	-	-	171.31 /lf	17,131
316L Sch 40s Stainless 90 Ell BW, 8"	6.00 ea	93.000	7,653	18,639	-	-	-	4,382.00 /ea	26,292
316L Sch 40s Stainless 45 Ell BW, 8"	6.00 ea	90.660	7,460	5,479	-	-	-	2,156.43 /ea	12,939
316L Sch 40s Stainless Tee BW, 8.00"	3.00 ea	68.370	5,626	3,786	-	-	-	3,137.12 /ea	9,411
Inert Gas Purge, 8"	14.00 ea	27.720	2,281	6	-	-	-	163.32 /ea	2,287
Clean & Disinfect Pipe, 8"	100.00 lf	0.700	58	1	-	-	-	0.58 /lf	58
300 amp Welder for Steel Pipe	3.00 ch		-	-	17	-	-	5.58 /ch	17
15221.00.035.990 SS Pipe from RO Flush Pump to RO (1st, 2nd, 3rd stage), 8" dia.	**100.00 lf**	**362.395**	**29,830**	**38,705**	**300**			**688.35 /lf**	**68,835**
15221.00.035.992 SS Pipe from RO Units to Process Waste Pump Station, 12" dia.									
SS Pipe Equip- Cat 320 Excavator	3.60 ch	3.600	319	-	324	-	-	178.80 /ch	644
Unload Care & Protect Pipe/Fittings	4,989.34 lbs	1.646	120	-	23	-	-	0.03 /lbs	143
Layout Pipe & Fitting	100.00 lf	1.000	82	-	-	-	-	0.82 /lf	82
316L Sch 40s Stainless Pipe BW, 12"	100.00 lf	111.000	9,134	18,743	-	-	-	278.77 /lf	27,877
316L Sch 40s Stainless 90 Ell BW, 12"	4.00 ea	95.960	7,896	35,222	-	-	-	10,779.65 /ea	43,119
316L Sch 40s Stainless 45 Ell BW, 12"	2.00 ea	46.180	3,800	5,106	-	-	-	4,452.87 /ea	8,906
316L Sch 40s Stainless Tee BW, 12.00"	2.00 ea	70.380	5,791	6,366	-	-	-	6,078.53 /ea	12,157
316L Sch 40s Stainless Tee BW, 12.00" x 6.00"	1.00 ea	35.190	2,896	5,655	-	-	-	8,550.24 /ea	8,550
316L Sch 40s Stainless Cap BW, 12"	1.00 ea	11.510	947	788	-	-	-	1,735.16 /ea	1,735
Inert Gas Purge, 12"	16.00 ea	39.200	3,226	14	-	-	-	202.50 /ea	3,240
Clean & Disinfect Pipe, 12"	100.00 lf	1.580	130	1	-	-	-	1.31 /lf	131
300 amp Welder for Steel Pipe	3.60 ch		-	-	20	-	-	5.58 /ch	20
15221.00.035.992 SS Pipe from RO Units to Process Waste Pump Station, 12" dia.	**100.00 lf**	**417.246**	**34,341**	**71,896**	**368**			**1,066.04 /lf**	**106,604**
15221.00.035.994 SS Pipe from Second Stage RO to Process Waste Pump Station, 6" dia.									
SS Pipe Equip- Cat 320 Excavator	0.50 ch	0.500	44	-	45	-	-	178.80 /ch	89
Unload Care & Protect Pipe/Fittings	181.46 lbs	0.060	4	-	1	-	-	0.03 /lbs	5
Layout Pipe & Fitting	10.00 lf	0.100	8	-	-	-	-	0.82 /lf	8
316L Sch 40s Stainless Pipe BW, 6"	10.00 lf	6.000	494	717	-	-	-	121.09 /lf	1,211
316L Sch 40s Stainless 90 Ell BW, 6"	2.00 ea	24.360	2,004	3,407	-	-	-	2,705.83 /ea	5,412
316L Sch 40s Stainless 45 Ell BW, 6"	2.00 ea	23.980	1,973	993	-	-	-	1,483.30 /ea	2,967
316L Sch 40s Stainless Tee BW, 6.00"	1.00 ea	18.050	1,485	507	-	-	-	1,992.37 /ea	1,992
Inert Gas Purge, 6"	4.50 ea	7.830	644	1	-	-	-	143.40 /ea	645
300 amp Welder for Steel Pipe	0.50 ch		-	-	3	-	-	5.58 /ch	3
15221.00.035.994 SS Pipe from Second Stage RO to Process Waste Pump Station, 6" dia.	**10.00 lf**	**80.880**	**6,658**	**5,626**	**49**			**1,233.25 /lf**	**12,332**
15221 Stainless Steel Pipe		**5,601.688**	**461,162**	**1,047,244**	**6,495**				**1,514,902**
15241 PVC Pipe & Fittings									
15241.00.035.10 PVC Pipe from RO Flush Pump to RO (1st, 2nd, 3rd stage), 10" dia.									
Pipe Stanchion Saddle/Support (Anvil259/63), 10"	20.00 ea	136.800	11,257	9,396	-	-	-	1,032.62 /ea	20,652
Unload Care & Protect Pipe/Fittings	60.00 lf	0.020	1	-	0	-	-	0.03 /lf	2
Layout Pipe & Fitting	60.00 lf	0.600	49	-	-	-	-	0.82 /lf	49
PVC Schd. 80 Pipe, 10"	60.00 lf	16.200	1,333	3,390	-	-		78.72 /lf	4,723
PVC Sch 80. 90 Ell , 10"	6.00 ea	15.180	1,249	8,535	-	-	-	1,630.64 /ea	9,784
PVC Sch 80. 45 Ell , 10"	6.00 ea	12.180	1,002	5,676	-	-	-	1,112.98 /ea	6,678
PVC Sch 80. Tee , 10.00"	3.00 ea	8.940	736	4,458	-	-	-	1,731.13 /ea	5,193
PVC Joint Primer- Quart	9.00 qrt		-	307	-	-	-	34.12 /qrt	307
PVC Solvent Cement Low VOC- Quart	9.00 qrt		-	358	-	-	-	39.81 /qrt	358
15241.00.035.10 PVC Pipe from RO Flush Pump to RO (1st, 2nd, 3rd stage), 10" dia.	**60.00 lf**	**189.920**	**15,627**	**32,119**	**0**			**795.78 /lf**	**47,747**
15241.00.035.20 PVC Pipe from Secondary RO to Process Wast Pump Station, 4" dia.									
Riser Clamp (Anvil 40), 4"	67.00 ea	100.500	8,270	1,905	-	-	-	151.87 /ea	10,175
Flexible Metal Connector, Bronze w/Threaded Ends, 4"	4.00 ea	3.120	257	864	-	-	-	280.06 /ea	1,120
Unload Care & Protect Pipe/Fittings	200.00 lf	0.066	5	-	1	-	-	0.03 /lf	6
Layout Pipe & Fitting	200.00 lf	2.000	165	-	-	-	-	0.82 /lf	165
PVC Schd. 80 Pipe, 4.00"	200.00 lf	20.000	1,646	2,578	-	-		21.12 /lf	4,223
PVC Sch 80. 90 Ell , 4.00"	6.00 ea	2.640	217	243	-	-	-	76.72 /ea	460
PVC Sch 80. Tee , 4.00"	2.00 ea	1.320	109	114	-	-	-	111.11 /ea	222
PVC Sch 80. Cap , 4.00"	2.00 ea	0.500	41	181	-	-	-	110.96 /ea	222
PVC Joint Primer- Quart	0.83 qrt		-	28	-	-	-	34.12 /qrt	28
PVC Solvent Cement Low VOC- Quart	0.83 qrt		-	33	-	-	-	39.82 /qrt	33
15241.00.035.20 PVC Pipe from Secondary RO to Process Wast Pump Station, 4" dia.	**200.00 lf**	**130.146**	**10,708**	**5,945**	**1**			**83.27 /lf**	**16,655**
15241.00.035.30 PVC Pipe from Sump to Process Waste Pump Station, 3" dia.									
Riser Clamp (Anvil 40), 3.00"	30.00 ea	36.000	2,962	853	-	-	-	127.18 /ea	3,815
Flexible Metal Connector, Bronze w/Threaded Ends, 3"	2.00 ea	1.260	104	374	-	-	-	238.90 /ea	478
Unload Care & Protect Pipe/Fittings	100.00 lf	0.033	2	-	0	-	-	0.03 /lf	3
Layout Pipe & Fitting	100.00 lf	1.000	82	-	-	-	-	0.82 /lf	82
PVC Schd. 80 Pipe, 3.00"	100.00 lf	8.000	658	885	-	-		15.43 /lf	1,543
PVC Sch 80. 90 Ell , 3.00"	3.00 ea	1.020	84	80	-	-	-	54.63 /ea	164
PVC Sch 80. Tee , 3.00"	2.00 ea	1.000	82	98	-	-	-	90.16 /ea	180
PVC Sch 80. Cap , 3.00"	2.00 ea	0.400	33	107	-	-	-	70.05 /ea	140

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15241.00.035.30 PVC Pipe from Sump to Process Waste Pump Station, 3" dia.									
PVC Joint Primer- Quart	0.50 qrt		-	17	-	-	-	34.14 /qrt	17
PVC Solvent Cement Low VOC- Quart	0.50 qrt		-	20	-	-	-	39.80 /qrt	20
15241.00.035.30 PVC Pipe from Sump to Process Waste Pump Station, 3" dia.	**100.00 lf**	**48.713**	**4,008**	**2,434**	**0**			**64.43 /lf**	**6,443**
15241 PVC Pipe & Fittings		**368.779**	**30,344**	**40,499**	**2**				**70,845**
15242 CPVC Pipe & Fittings									
15242.00.035.10 CPVC Pipe from CIP Pump to MF System, 6" dia.									
Unload Care & Protect Pipe/Fittings	50.00 lf	0.017	1	-	0	-	-	0.03 /lf	1
Layout Pipe & Fitting	50.00 lf	0.500	41	-	-	-	-	0.82 /lf	41
CPVC Schd. 80 Pipe, 6"	50.00 lf	7.000	576	4,568	-	-		102.88 /lf	5,144
CPVC Sch 80. 90 Ell , 6"	4.00 ea	3.200	263	1,285	-	-	-	387.09 /ea	1,548
CPVC Sch 80. 45 Ell , 6"	4.00 ea	3.080	253	1,628	-	-	-	470.31 /ea	1,881
CPVC Sch 80. Tee , 6.00"	3.00 ea	3.480	286	1,199	-	-	-	495.27 /ea	1,486
CPVC Sch 80, Coupling , 6"	4.00 ea	2.960	244	750	-	-	-	248.45 /ea	994
CPVC Sch 80. Cap , 6"	1.00 ea	0.410	34	343	-	-	-	376.35 /ea	376
CPVC Joint Primer- Quart	3.08 qrt		-	93	-	-	-	30.03 /qrt	93
CPVC Solvent Cement Low VOC- Quart	3.08 qrt		-	138	-	-	-	44.76 /qrt	138
15242.00.035.10 CPVC Pipe from CIP Pump to MF System, 6" dia.	**50.00 lf**	**20.647**	**1,699**	**10,004**	**0**			**234.06 /lf**	**11,703**
15242.00.035.20 CPVC Pipe from MF System to CIP Return/Pumps, 6" dia.									
Bolted Sleeve (Flex) Coupling (Depend-O-Lok ExE) 6" x 7" Long	2.00 ea	4.120	339	375	-	-	-	357.20 /ea	714
Unload Care & Protect Pipe/Fittings	50.00 lf	0.017	1	-	0	-	-	0.03 /lf	1
Layout Pipe & Fitting	50.00 lf	0.500	41	-	-	-	-	0.82 /lf	41
CPVC Schd. 80 Pipe, 6"	50.00 lf	7.000	576	4,568	-	-		102.88 /lf	5,144
CPVC Sch 80. 90 Ell , 6"	4.00 ea	3.200	263	1,285	-	-	-	387.10 /ea	1,548
CPVC Sch 80. 45 Ell , 6"	4.00 ea	3.080	253	1,628	-	-	-	470.31 /ea	1,881
CPVC Sch 80. Tee , 6.00"	3.00 ea	3.480	286	1,199	-	-	-	495.27 /ea	1,486
CPVC Sch 80, Coupling , 6"	4.00 ea	2.960	244	750	-	-	-	248.46 /ea	994
CPVC Sch 80. Cap , 6"	1.00 ea	0.410	34	343	-	-	-	376.35 /ea	376
CPVC Joint Primer- Quart	3.08 qrt		-	93	-	-	-	30.03 /qrt	93
CPVC Solvent Cement Low VOC- Quart	3.08 qrt		-	138	-	-	-	44.76 /qrt	138
15242.00.035.20 CPVC Pipe from MF System to CIP Return/Pumps, 6" dia.	**50.00 lf**	**24.767**	**2,038**	**10,379**	**0**			**248.35 /lf**	**12,417**
15242.00.035.30 CPVC Pipe from RO/CIP to Process Waste Pump Station, 6" dia.									
Bolted Sleeve (Flex) Coupling (Depend-O-Lok ExE) 6" x 7" Long	4.00 ea	8.240	678	751	-	-	-	357.20 /ea	1,429
Unload Care & Protect Pipe/Fittings	200.00 lf	0.066	5	-	1	-	-	0.03 /lf	6
Layout Pipe & Fitting	200.00 lf	2.000	165	-	-	-	-	0.82 /lf	165
CPVC Schd. 80 Pipe, 6"	200.00 lf	28.000	2,304	18,273	-	-		102.88 /lf	20,577
CPVC Sch 80. 90 Ell , 6"	8.00 ea	6.400	527	2,570	-	-	-	387.09 /ea	3,097
CPVC Sch 80. 45 Ell , 6"	8.00 ea	6.160	507	3,256	-	-	-	470.31 /ea	3,763
CPVC Sch 80. Tee , 6.00"	3.00 ea	3.480	286	1,199	-	-	-	495.27 /ea	1,486
CPVC Sch 80, Coupling , 6"	4.00 ea	2.960	244	750	-	-	-	248.45 /ea	994
CPVC Sch 80. Cap , 6"	1.00 ea	0.410	34	343	-	-	-	376.36 /ea	376
CPVC Joint Primer- Quart	5.00 qrt		-	150	-	-	-	30.03 /qrt	150
CPVC Solvent Cement Low VOC- Quart	5.00 qrt		-	224	-	-	-	44.76 /qrt	224
15242.00.035.30 CPVC Pipe from RO/CIP to Process Waste Pump Station, 6" dia.	**200.00 lf**	**57.716**	**4,749**	**27,516**	**1**			**161.33 /lf**	**32,265**
15242 CPVC Pipe & Fittings		**103.130**	**8,485**	**47,899**	**1**				**56,385**
070 Process Mechanical - Piping		**9,500.317**	**781,602**	**2,438,064**	**12,536**		**3,856**	**/ls**	**3,236,058**
071 Electrical									
02580 Electrical & Communication Structures									
02580.21002 12KV Duct bank From S.Ca. Edison to12KV Swig. Ass.(2X1) 4" (17"X10")									
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	255.49 cy	2.129	209	-	160	-	-	1.44 /cy	369
Haul Spoils/Off Site 18cy Rear Dump 1 Load/Hour	255.49 cy	18.381	1,425	-	1,746	-	-	12.41 /cy	3,170
Ductbank Layout	3,652.00 lf	9.130	760	-	-	-	-	0.21 /lf	760
Ductbank Detectable/Non-Detectable Tape	3,652.00 lf	18.260	1,499	257	-	-	-	0.48 /lf	1,756
Ductbank Excavation Backhoe/Loader	1,405.19 cy	140.519	13,814	-	10,528	-	-	17.32 /cy	24,342
Ductbank Bedding	95.81 cy	23.952	2,089	2,938	656	613	-	65.71 /cy	6,296
Ductbank Backfill & Compaction	1,149.70 cy	246.365	21,482	-	6,752	-	-	24.56 /cy	28,234
Form Oil & Hardware	6,089.03 csf		-	1,225	-	-	-	0.20 /csf	1,225
Ductbank Formwork- 3 Form Uses	6,089.03 sf	487.122	40,575	6,126	-	-	-	7.67 /sf	46,701
Ductbank Reinforcing Steel	16.23 tn	405.625	41,129	23,837	-	-	-	4,004.07 /tn	64,966
Truck Place Ductbank	129.80 cy	64.902	5,270	-	-	-	-	40.60 /cy	5,270
2500 psi Concrete- Red Dye	129.80 cy		-	17,411	-	-	-	134.14 /cy	17,411
Water Base Non-Residual Cure	5,173.67 sf	10.347	862	436	-	-	-	0.25 /sf	1,298
Load & Haul Trenching Spoils to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	255.49 cy	9.678	776	-	549	-	-	5.19 /cy	1,326
4" x 3-0/0" PVC Conduit Base Spacer	914.00 ea		-	1,230	-	-	-	1.35 /ea	1,230
02580.21002 12KV Duct bank From S.Ca. Edison to12KV Swig. Ass.(2X1) 4" (17"X10")		**1,436.410**	**129,890**	**53,460**	**20,392**	**613**		**/lf**	**204,355**
02580.21004 12KV Duct bank From Gen. to SWGR-1 Ass.(2X1) 4" (17"X10")									
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	2.56 cy	0.021	2	-	2	-	-	1.44 /cy	4
Haul Spoils/Off Site 18cy Rear Dump 1 Load/Hour	2.56 cy	0.184	14	-	17	-	-	12.41 /cy	32

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
02580.21004 12KV Duct bank From Gen. to SWGR-1 Ass.(2X1) 4" (17"X10")									
Ductbank Layout	40.00 lf	0.100	8	-	-	-	-	0.21 /lf	8
Ductbank Detectable/Non-Detectable Tape	40.00 lf	0.200	16	3	-	-	-	0.48 /lf	19
Ductbank Excavation Backhoe/Loader	14.05 cy	1.405	138	-	105	-	-	17.32 /cy	243
Ductbank Bedding	0.96 cy	0.240	21	29	7	6	-	65.71 /cy	63
Ductbank Backfill & Compaction	11.50 cy	2.464	215	-	68	-	-	24.56 /cy	282
Form Oil & Hardware	60.89 csf		-	12	-	-	-	0.20 /csf	12
Ductbank Formwork- 3 Form Uses	60.89 sf	4.871	406	61	-	-	-	7.67 /sf	467
Ductbank Reinforcing Steel	0.16 tn	4.050	411	238	-	-	-	4,004.07 /tn	649
Truck Place Ductbank	1.30 cy	0.649	53	-	-	-	-	40.59 /cy	53
2500 psi Concrete- Red Dye	1.30 cy		-	174	-	-	-	134.15 /cy	174
Water Base Non-Residual Cure	51.74 sf	0.103	9	4	-	-	-	0.25 /sf	13
Load & Haul Trenching Spoils to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	2.56 cy	0.097	8	-	5	-	-	5.19 /cy	13
4" x 3-0/0" PVC Conduit Base Spacer	10.00 ea		-	13	-	-	-	1.35 /ea	13
02580.21004 12KV Duct bank From Gen. to SWGR-1 Ass.(2X1) 4" (17"X10")		**14.385**	**1,300**	**536**	**204**	**6**		**/lf**	**2,046**
02580.21012 Duct bank from 2500KVA XFMR to Process Build.Ass. (4X4)4"(31"X17")									
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	3.85 cy	0.032	3	-	2	-	-	1.44 /cy	6
Haul Spoils/Off Site 18cy Rear Dump 1 Load/Hour	3.85 cy	0.277	21	-	26	-	-	12.41 /cy	48
Ductbank Layout	21.00 lf	0.053	4	-	-	-	-	0.21 /lf	4
Ductbank Detectable/Non-Detectable Tape	21.00 lf	0.105	9	1	-	-	-	0.48 /lf	10
Ductbank Excavation Backhoe/Loader	13.18 cy	1.318	130	-	99	-	-	17.32 /cy	228
Ductbank Bedding	1.01 cy	0.251	22	31	7	6	-	65.71 /cy	66
Ductbank Backfill & Compaction	9.33 cy	2.000	174	-	55	-	-	24.56 /cy	229
Form Oil & Hardware	66.82 csf		-	13	-	-	-	0.20 /csf	13
Ductbank Formwork- 3 Form Uses	66.82 sf	5.346	445	67	-	-	-	7.67 /sf	512
Ductbank Reinforcing Steel	0.27 tn	6.750	684	397	-	-	-	4,004.07 /tn	1,081
Truck Place Ductbank	2.16 cy	1.080	88	-	-	-	-	40.59 /cy	88
2500 psi Concrete- Red Dye	2.16 cy		-	290	-	-	-	134.14 /cy	290
Water Base Non-Residual Cure	54.25 sf	0.109	9	5	-	-	-	0.25 /sf	14
Load & Haul Trenching Spoils to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	3.85 cy	0.146	12	-	8	-	-	5.19 /cy	20
4" x 3-0/0" PVC Conduit Intermediate Spacer	36.00 ea		-	45	-	-	-	1.25 /ea	45
4" x 3-0/0" PVC Conduit Base Spacer	12.00 ea		-	16	-	-	-	1.35 /ea	16
02580.21012 Duct bank from 2500KVA XFMR to Process Build.Ass. (4X4)4"(31"X17")		**17.466**	**1,602**	**865**	**197**	**6**		**/lf**	**2,670**
02580 Electrical & Communication Structures		**1,468.261**	**132,792**	**54,860**	**20,793**	**626**			**209,071**
13700 Security Access & Survailence									
13700.21002 Security System									
Allowances for Security System at Site	1.00 ls	120.000	9,382	38,325	6,388	10,000	-	64,094.82 /ls	64,095
Allowances for Security System inside process Building	1.00 ls	120.000	9,382	25,550	-	10,000	-	44,932.32 /ls	44,932
13700.21002 Security System		**240.000**	**18,765**	**63,875**	**6,388**	**20,000**		**/ls**	**109,027**
13700 Security Access & Survailence		**240.000**	**18,765**	**63,875**	**6,388**	**20,000**			**109,027**
13850 Detection & Alarm									
13850.21002 Allowances for Fire alarm System									
Allowances for Fire alarm System	1.00 ls	100.000	7,819	25,550	-	5,000	-	38,368.60 /ls	38,369
13850.21002 Allowances for Fire alarm System		**100.000**	**7,819**	**25,550**		**5,000**		**/ls**	**38,369**
13850 Detection & Alarm		**100.000**	**7,819**	**25,550**		**5,000**			**38,369**
16055 Manholes and Handholes									
16055.21002 Electric Handhole and Manholes									
Precast Conc Elect Handhole 4' x 4' x 4'	1.00 ea	36.000	3,136	3,176	1,095	-	-	7,407.35 /ea	7,407
Precast Conc Elect Manhole 6' x 6' x 6'	2.00 ea	96.000	8,363	11,850	2,920	-	-	11,567.02 /ea	23,134
16055.21002 Electric Handhole and Manholes		**132.000**	**11,500**	**15,026**	**4,016**			**/ea**	**30,541**
16055 Manholes and Handholes		**132.000**	**11,500**	**15,026**	**4,016**				**30,541**
16060 Grounding & Lightning Protection									
16060.21006 New Grounding System (Duct banks/ /XFMR's/ Generator)									
4/0 Bare Copper Grounding Conductors -Buried Outdoors	9,988.00 lf	349.580	27,332	43,563	-	-	-	7.10 /lf	70,895
3/4" x 10'- Copper Ground Rod w/Clamp	20.00 ea	32.000	2,502	690	-	-	-	159.59 /ea	3,192
14 x 23 -Ground Rod Inspection Well	3.00 ea	9.000	704	1,629	-	-	-	777.43 /ea	2,332
1/4" x 4" x 36" Ground Bus Assembly	8.00 ea	20.000	1,564	767	-	-	-	291.28 /ea	2,330
4/0 Conductor to Steel - Cadweld	5.00 ea	7.500	586	639	-	-	-	245.03 /ea	1,225
#4/0 Cadweld To Ground Rod	5.00 ea	7.000	547	479	-	-	-	205.27 /ea	1,026
16060.21006 New Grounding System (Duct banks/ /XFMR's/ Generator)		**425.080**	**33,235**	**47,766**				**/ls**	**81,001**
16060.21008 Grounding system- Process Building									
4/0 Bare Copper Grounding Conductors -Buried Outdoors	620.00 lf	21.700	1,697	2,704	-	-	-	7.10 /lf	4,401
3/4" x 10'- Copper Ground Rod w/Clamp	8.00 ea	12.800	1,001	276	-	-	-	159.59 /ea	1,277
14 x 23 -Ground Rod Inspection Well	1.00 ea	3.000	235	543	-	-	-	777.45 /ea	777
1/4" x 4" x 36" Ground Bus Assembly	2.00 ea	5.000	391	192	-	-	-	291.28 /ea	583
4/0 Conductor to Steel - Cadweld	2.00 ea	3.000	235	256	-	-	-	245.04 /ea	490
#4/0 Cadweld To Ground Rod	2.00 ea	2.800	219	192	-	-	-	205.27 /ea	411

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
16060.21008 Grounding system- Process Building		**48.300**	**3,776**	**4,162**				**/lf**	**7,938**
16060 Grounding & Lightning Protection		**473.380**	**37,012**	**51,927**					**88,939**
16070 Hangers / Supports/ Hardwares									
16070.21002 Conduit supports / hardwares									
Allowances for Hangers and Supports / Siesmic materials	1.00 ls	1,191.326	93,145	3,039	-	-	-	96,184.42 /ls	96,184
16070.21002 Conduit supports / hardwares		**1,191.326**	**93,145**	**3,039**				**/ls**	**96,184**
16070 Hangers / Supports/ Hardwares		**1,191.326**	**93,145**	**3,039**					**96,184**
16075 Electrical Identifications									
16075.21002 Electrical Identifications									
1" Black ID Tape (60 yard Roll)	25.00 roll		-	160	-	-	-	6.39 /roll	160
3" CAUTION High Voltage- Barricade Tape (1000' Roll)	25.00 roll		-	1,821	-	-	-	72.86 /roll	1,821
10 Roll Dispenser- Number Markers (Marked 0-9)	30.00 ea		-	1,617	-	-	-	53.90 /ea	1,617
16075.21002 Electrical Identifications				**3,598**				**/ls**	**3,598**
16075 Electrical Identifications				**3,598**					**3,598**
16080 Electrical Testing									
16080.21002 Electrical system Studies and Testing									
Arc Flash Study	1.00 ls			-	-	15,000	-	15,000.00 /ls	15,000
Short Circuit Study	1.00 ls			-	-	15,000	-	15,000.00 /ls	15,000
Protective Device Coordination Study	1.00 ls			-	-	15,000	-	15,000.00 /ls	15,000
Harmonic Study	1.00 ls			-	-	15,000	-	15,000.00 /ls	15,000
HI-Pot Test	40.00 ea	40.000	3,127	-	-	10,000	-	328.19 /ea	13,127
Manufacture Rep. at Site for Start Up / Commissioning	30.00 day			-	-	45,000	-	1,500.00 /day	45,000
16080.21002 Electrical system Studies and Testing		**40.000**	**3,127**			**115,000**		**/ls**	**118,127**
16080 Electrical Testing		**40.000**	**3,127**			**115,000**			**118,127**
16125 Cables									
16125.21002 Site Conductors and wires									
#12 XHHW Black	1,350.00 lf	10.800	844	286	-	-	-	0.84 /lf	1,131
#10 XHHW Black	14,163.00 lf	141.630	11,073	4,444	-	-	-	1.10 /lf	15,517
#4/0 XHHW Green	200.00 lf	7.200	563	1,094	-	-	-	8.29 /lf	1,657
400 kcmil XHHW Green	200.00 lf	9.600	751	1,915	-	-	-	13.33 /lf	2,665
600 kcmil XHHW Black	536.00 lf	31.088	2,431	7,797	-	-	-	19.08 /lf	10,227
15 KV Cable # 6-1C Cu XLP-Shielded	1,069.00 lf	21.380	1,672	3,933	-	-	-	5.24 /lf	5,605
15 KV Cable # 3-1C Cu XLP-Shielded	3,692.00 lf	95.992	7,505	18,253	-	-	-	6.98 /lf	25,758
15 KV Cable #1/0-1C Cu XLP-Shielded	3,207.00 lf	96.210	7,522	21,222	-	-	-	8.96 /lf	28,744
15 KV Cable #4/0-1C Cu XLP-Shielded	11,076.00 lf	420.888	32,908	116,027	-	-	-	13.45 /lf	148,934
16125.21002 Site Conductors and wires		**834.788**	**65,269**	**174,970**				**/ls**	**240,239**
16125 Cables		**834.788**	**65,269**	**174,970**					**240,239**
16130 Feeders									
16130.21002 Duct bank Conduits									
1-0/0" PVC-Schd 40	4,721.00 lf	247.853	19,379	2,166	-	-	-	4.56 /lf	21,544
4" PVC-Schd 40	10,486.00 lf	1,677.760	131,177	27,010	-	-	-	15.09 /lf	158,187
1-0/0" PVC 90 Deg Elbow	12.00 ea	3.000	235	9	-	-	-	20.32 /ea	244
4" PVC 90 Deg Elbow	14.00 ea	16.800	1,314	147	-	-	-	104.32 /ea	1,460
4" PVC End Cap	10.00 ea	3.100	242	129	-	-	-	37.13 /ea	371
Pull Strings	2.00 pk	4.000	313	1,150	-	-	-	731.25 /pk	1,462
16130.21002 Duct bank Conduits		**1,952.513**	**152,659**	**30,611**				**/ls**	**183,270**
16130.21004 Allowances for Conduits and conductors									
Allowances for Conduits and conductors For Power system Assumed (81 FeederX168' Ava.X $9/lf)	1.00 ls	489.486	38,271	116,993	-	-	-	155,264.40 /ls	155,264
Allowances for Conduits and conductors Controls System Assumed (300 FeederX100' Ava.X $9/lf)	1.00 ls	1,101.343	86,110	253,254	-	-	-	339,363.76 /ls	339,364
Allowances for Conduits and conductors panel Boards (QTY.6) Assumed (6X 30 FeederX50' Ava.X $9/lf)	1.00 ls	330.402	25,833	75,976	-	-	-	101,809.11 /ls	101,809
16130.21004 Allowances for Conduits and conductors		**1,921.231**	**150,213**	**446,224**				**/ls**	**596,437**
16130 Feeders		**3,873.744**	**302,872**	**476,835**					**779,707**
16140 Devices									
16140.21002 Lighting Switches / Recepatcles / Control Stations									
Lighting Switches / Recepatcles / Control Stations	1.00 ls	26.908	2,104	2,870	-	-	-	4,974.16 /ls	4,974
16140.21002 Lighting Switches / Recepatcles / Control Stations		**26.908**	**2,104**	**2,870**				**/ls**	**4,974**
16140 Devices		**26.908**	**2,104**	**2,870**					**4,974**
16230 Generator Sets									
16230.21002 12.4KV , 400KW Generator set									
400 KW Generator 12.4KV	1.00 ea	43.500	3,401	485,450	1,916	-	-	490,767.34 /ea	490,767
200KW Load Banks	1.00 ea	20.000	1,564	51,100	1,916	-	-	54,579.97 /ea	54,580
16230.21002 12.4KV , 400KW Generator set		**63.500**	**4,965**	**536,550**	**3,833**			**/ls**	**545,347**
16230 Generator Sets		**63.500**	**4,965**	**536,550**	**3,833**				**545,347**
16270 Transformers									
16270.21002 Meduim Voltage Transformers									

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
16270.21002 Meduim Voltage Transformers									
1600 KVA-Outdoor, 3P, 480V Transformer w/ relays	1.00 ea	24.000	1,876	104,755	1,916	-	-	108,547.72 /ea	108,548
2500 KVA-Outdoor, 3P, 480V Transformer w/ relays	1.00 ea	29.000	2,267	127,750	1,916	-	-	131,933.65 /ea	131,934
16270.21002 Meduim Voltage Transformers		**53.000**	**4,144**	**232,505**	**3,833**			**/ls**	**240,481**
16270.21004 Low Voltage Transformers									
30 KVA-Indoor, 3P, 480V Transformer -K13 Rated	5.00 ea	45.000	3,518	43,462	-	-	-	9,396.04 /ea	46,980
16270.21004 Low Voltage Transformers		**45.000**	**3,518**	**43,462**				**/ea**	**46,980**
16270 Transformers		**98.000**	**7,662**	**275,967**	**3,833**				**287,462**
16310 Meduim Voltage Switchgear									
16310.21002 Meduim Voltage Switchgear code SWGR-1									
1200A Breaker -15 kV, 500 MVA - Structure with 3 CTs & DT3K	5.00 ea			236,120	-	-	-	47,224.07 /ea	236,120
15 kV - 800 A max Fuse Assembly with 3 RBA fuses	1.00 ea			13,880	-	-	-	13,880.04 /ea	13,880
1-PT - 5 kV / 15 kV (Potential Transformer)	9.00 ea			31,043	-	-	-	3,449.25 /ea	31,043
15 kV Current Potential Transformer	12.00 ea			35,259	-	-	-	2,938.25 /ea	35,259
Metal Clad Sheet Enclosures NEMA 3R	3.00 ea			13,414	-	-	-	4,471.25 /ea	13,414
Multifunction Protection Relay w/ (50,51,86,27/59, 81, 40,65,&90)	4.00 ea			26,572	-	-	-	6,643.00 /ea	26,572
Automatic Transfer Switch / PLC Control circuit	1.00 ea			6,388	-	-	-	6,387.50 /ea	6,388
Lightning arrestor	4.00 ea			15,330	-	-	-	3,832.50 /ea	15,330
Installation at site	1.00 ea	24.000	1,876		1,278	-	-	3,153.97 /ea	3,154
Digital Circuit Meter w/-sag/swell Detection- (includes I/O card, ethernet card, LCD & 12' cable)	4.00 ea			30,916	-	-	-	7,728.88 /ea	30,916
16310.21002 Meduim Voltage Switchgear code SWGR-1		**24.000**	**1,876**	**408,921**	**1,278**			**/ls**	**412,075**
16310 Meduim Voltage Switchgear		**24.000**	**1,876**	**408,921**	**1,278**				**412,075**
16410 Free Standing Switches and Breakers									
16410.21002 Disconnect switches									
30 Amp-Disconnect Safety Switches - Nonfused 3-Pole NEMA 1	42.00 ea	84.000	6,568	4,437	-	-	-	262.01 /ea	11,004
60 Amp-Disconnect Safety Switches - Nonfused 3-Pole NEMA 1	2.00 ea	6.000	469	369	-	-	-	418.94 /ea	838
100 Amp-Disconnect Safety Switches - Nonfused 3-Pole NEMA 1	8.00 ea	32.000	2,502	2,482	-	-	-	623.05 /ea	4,984
200 Amp-Disconnect Safety Switches - Nonfused 3-Pole NEMA 1	7.00 ea	49.000	3,831	3,415	-	-	-	1,035.09 /ea	7,246
400 Amp-Disconnect Safety Switches - Nonfused 3-Pole NEMA 1	1.00 ea	10.000	782	1,109	-	-	-	1,890.89 /ea	1,891
100 Amp-Disconnect Safety Switches - Nonfused 3-Pole Stainless Steel	2.00 ea	9.600	751	5,146	-	-	-	2,948.44 /ea	5,897
16410.21002 Disconnect switches		**190.600**	**14,902**	**16,958**				**/ea**	**31,860**
16410 Free Standing Switches and Breakers		**190.600**	**14,902**	**16,958**					**31,860**
16420 Variable Frequency Drives									
16420.21002 350HP VFD's									
480 VAC/ 350 H.P. Variable Frequency A.C. Panel w/ Disconnect/ Circuit breaker/ Filter/ Heater	1.00 ea	24.500	1,916	57,488	1,278	-	-	60,680.56 /ea	60,681
16420.21002 350HP VFD's	**1.00 ea**	**24.500**	**1,916**	**57,488**	**1,278**			**60,680.56 /ea**	**60,681**
16420 Variable Frequency Drives		**24.500**	**1,916**	**57,488**	**1,278**				**60,681**
16430 Low Voltage Switchboards									
16430.21002 Main Switchboard code MSBD-1									
1600AT/16000AF Power Break Circuit Breaker 3 pole -Drawout type	2.00 ea			87,728	-	-	-	43,864.24 /ea	87,728
700AT/ 800AF Power Break Circuit Breaker 3 pole -Drawout type	2.00 ea			68,234	-	-	-	34,116.92 /ea	68,234
Sheet Metal Enclosure / Copper Bus Bars	5.00 ea			25,582	-	-	-	5,116.39 /ea	25,582
Installation at Site	1.00 ea	20.000	1,564		1,278	-	-	2,841.22 /ea	2,841
Metering device w/ Current and Potential Transformers	1.00 set			12,136	-	-	-	12,136.25 /set	12,136
Control PLC / Relays	1.00 ea			5,685	-	-	-	5,684.88 /ea	5,685
2500AT/2500AF Power Break Circuit Breaker 3 pole -Drawout type	1.00 ea			84,816	-	-	-	84,815.78 /ea	84,816
Digital Circuit Meter w/-sag/swell Detection- (includes I/O card, ethernet card, LCD & 12' cable)	1.00 ea			7,729	-	-	-	7,728.87 /ea	7,729
16430.21002 Main Switchboard code MSBD-1		**20.000**	**1,564**	**291,910**	**1,278**			**/ls**	**294,751**
16430 Low Voltage Switchboards		**20.000**	**1,564**	**291,910**	**1,278**				**294,751**
16435 Low Voltage Motor Control Center									
16435.21002 Low voltage Panel Boards									
20AT/100AF Circuit Breaker , 3pole	34.00 ea			40,759	-	-	-	1,198.81 /ea	40,759
150AT/150AF Circuit Breaker , 3pole	3.00 ea			12,279	-	-	-	4,093.11 /ea	12,279
200AT/225AF Circuit Breaker , 3pole	2.00 ea			8,186	-	-	-	4,093.11 /ea	8,186
1600AT/1600AF Circuit Breaker , 3pole	1.00 ea			40,577	-	-	-	40,576.59 /ea	40,577
Power quality Meter	1.00 ea			2,555	-	-	-	2,555.00 /ea	2,555
Current Transformers / Potential Transformers	6.00 ea			9,198	-	-	-	1,533.00 /ea	9,198
Installation MCC at site	1.00 ea	60.000	4,691		1,278	-	-	5,968.66 /ea	5,969
Active Harmonic Filter	1.00 ea			12,264	-	-	-	12,264.00 /ea	12,264
Motor Control Center (MCC) 9- Section	2.00 ea			115,895	-	-	-	57,947.40 /ea	115,895
NEMA 1-Motor Starters Mounted in MCC's Single Speed Non-Reversing 3-Pole	14.00 ea			12,904	-	-	-	921.69 /ea	12,904
NEMA 3-Motor Starters Mounted in MCC's Single Speed Non-Reversing 3-Pole	1.00 ea			2,747	-	-	-	2,747.29 /ea	2,747
480 VAC/ 5 H.P.-Drive Units - Variable Frequency A.C. (Unload, Inspect, Handle, Install)	4.00 ea			24,356	-	-	-	6,089.08 /ea	24,356
480 VAC/ 15 H.P.-Drive Units - Variable Frequency A.C. (Unload, Inspect, Handle, Install)	1.00 ea			5,991	-	-	-	5,991.17 /ea	5,991
480 VAC/ 20 H.P.-Drive Units - Variable Frequency A.C. (Unload, Inspect, Handle, Install)	1.00 ea			7,475	-	-	-	7,474.83 /ea	7,475
480 VAC/ 30 H.P.-Drive Units - Variable Frequency A.C. (Unload, Inspect, Handle, Install)	1.00 ea			11,812	-	-	-	11,811.62 /ea	11,812

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
16435.21002 Low voltage Panel Boards									
480 VAC/ 50 H.P.-Drive Units - Variable Frequency A.C. (Unload, Inspect, Handle, Install)	2.00 ea			33,188	-	-	-	16,594.02 /ea	33,188
480 VAC/ 60 H.P.-Drive Units - Variable Frequency A.C. (Unload, Inspect, Handle, Install)	2.00 ea			37,619	-	-	-	18,809.49 /ea	37,619
480 VAC/100 H.P.-Drive Units - Variable Frequency A.C. (Unload, Inspect, Handle, Install)	1.00 ea			32,291	-	-	-	32,290.55 /ea	32,291
480 VAC/ 175 H.P.-Drive Units - Variable Frequency A.C. (Unload, Inspect, Handle, Install)	1.00 ea			46,832	-	-	-	46,832.32 /ea	46,832
16435.21002 Low voltage Panel Boards		**60.000**	**4,691**	**456,928**	**1,278**			**/ls**	**462,897**
16435.21004 Motor Control Center code MCC-2									
20AT/100AF Circuit Breaker , 3pole	28.00 ea			33,567	-	-	-	1,198.81 /ea	33,567
150AT/150AF Circuit Breaker , 3pole	2.00 ea			8,186	-	-	-	4,093.11 /ea	8,186
250AT/250AF Circuit Breaker , 3pole	2.00 ea			8,432	-	-	-	4,215.75 /ea	8,432
1600AT/1600AF Circuit Breaker , 3pole	1.00 ea			40,577	-	-	-	40,576.60 /ea	40,577
Power quality Meter	1.00 ea			2,555	-	-	-	2,555.00 /ea	2,555
Current Transformers / Potential Transformers	6.00 ea			9,198	-	-	-	1,533.00 /ea	9,198
Installation MCC at site	1.00 ea	60.000	4,691		1,278	-	-	5,968.66 /ea	5,969
Active Harmonic Filter	1.00 ea			12,264	-	-	-	12,264.00 /ea	12,264
Motor Control Center (MCC) 9- Section	2.00 ea			115,895	-	-	-	57,947.40 /ea	115,895
NEMA 1-Motor Starters Mounted in MCC's Single Speed Non-Reversing 3-Pole	14.00 ea			12,904	-	-	-	921.69 /ea	12,904
NEMA 3-Motor Starters Mounted in MCC's Single Speed Non-Reversing 3-Pole	1.00 ea			2,747	-	-	-	2,747.28 /ea	2,747
480 VAC/ 5 H.P.-Drive Units - Variable Frequency A.C. (Unload, Inspect, Handle, Install)	2.00 ea			12,178	-	-	-	6,089.08 /ea	12,178
480 VAC/ 15 H.P.-Drive Units - Variable Frequency A.C. (Unload, Inspect, Handle, Install)	1.00 ea			5,991	-	-	-	5,991.16 /ea	5,991
480 VAC/ 20 H.P.-Drive Units - Variable Frequency A.C. (Unload, Inspect, Handle, Install)	1.00 ea			7,475	-	-	-	7,474.84 /ea	7,475
480 VAC/ 30 H.P.-Drive Units - Variable Frequency A.C. (Unload, Inspect, Handle, Install)	1.00 ea			11,812	-	-	-	11,811.61 /ea	11,812
480 VAC/ 50 H.P.-Drive Units - Variable Frequency A.C. (Unload, Inspect, Handle, Install)	2.00 ea			33,188	-	-	-	16,594.03 /ea	33,188
480 VAC/ 60 H.P.-Drive Units - Variable Frequency A.C. (Unload, Inspect, Handle, Install)	2.00 ea			37,619	-	-	-	18,809.48 /ea	37,619
480 VAC/100 H.P.-Drive Units - Variable Frequency A.C. (Unload, Inspect, Handle, Install)	1.00 ea			32,291	-	-	-	32,290.55 /ea	32,291
480 VAC/ 175 H.P.-Drive Units - Variable Frequency A.C. (Unload, Inspect, Handle, Install)	1.00 ea			46,832	-	-	-	46,832.32 /ea	46,832
16435.21004 Motor Control Center code MCC-2		**60.000**	**4,691**	**433,709**	**1,278**			**/ls**	**439,678**
16435 Low Voltage Motor Control Center		**120.000**	**9,382**	**890,637**	**2,555**				**902,575**
16438 Low voltage Panel Boards									
16438.21002 Low voltage Panel Boards									
36 Circuit-3PH 240v MCB Panelboard-Surface Mounted-100a	5.00 ea	15.000	1,173	19,999	-	-	-	4,234.41 /ea	21,172
42 Circuit-3PH 480v MCB Panelboard-Surface Mounted-400a	1.00 ea	5.600	438	5,943	-	-	-	6,380.77 /ea	6,381
16438.21002 Low voltage Panel Boards		**20.600**	**1,611**	**25,942**				**/ea**	**27,553**
16438 Low voltage Panel Boards		**20.600**	**1,611**	**25,942**					**27,553**
16510 Interior Lighting									
16510.21002 Allowances for lighting Process / Control Building									
Allowances for lighting Process / Control Building	1.00 ls	120.000	9,382	51,100	-	-	-	60,482.32 /ls	60,482
16510.21002 Allowances for lighting Process / Control Building		**120.000**	**9,382**	**51,100**				**/ls**	**60,482**
16510 Interior Lighting		**120.000**	**9,382**	**51,100**					**60,482**
16520 Exterior Lighting									
16520.21002 Allowances for Site Lighting Fixtures w/ Parking Area									
Lighting pole Foundation- (Excavation & Concrete)	30.00 ea	110.000	8,251	16,163	3,233	-	-	921.53 /ea	27,646
15' Aluminum Pole w/Factory Brackets	30.00 ea	300.000	23,456	20,504	7,665	-	-	1,720.82 /ea	51,625
LED Pole mounted	30.00 ea	60.000	4,691	22,995	-	-	-	922.87 /ea	27,686
Lighting Control Panels w/ Photocell	2.00 ea	8.000	625	12,775	-	-	-	6,700.25 /ea	13,400
16520.21002 Allowances for Site Lighting Fixtures w/ Parking Area		**478.000**	**37,023**	**72,436**	**10,898**			**/ls**	**120,357**
16520 Exterior Lighting		**478.000**	**37,023**	**72,436**	**10,898**				**120,357**
071 Electrical		**9,539.606**	**764,688**	**3,500,460**	**56,146**	**140,626**			**4,461,920**
072 Measurment &Ctrl Instr. I &C									
13420 I&C Instruments									
13420.21002 Influent Pump Station									
Systems Analyze Instrument Ultra Violet AE/AIT uv	1.00 ea	10.000	782	6,388	-	-	128	7,297.11 /ea	7,297
24" Magnetic Flow Meter FE/FIT	3.00 ea	65.310	6,084	41,391	-	-	-	15,824.95 /ea	47,475
Ultrasonic Level Instrument w/Transmitter LE/LIT	1.00 ea	8.000	625	4,471	-	-	128	5,224.49 /ea	5,224
Float Level Switch LSLL	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Float Level Switch LSHH	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Pressure Indicator PI-	2.00 ea	4.200	328	1,278	-	-	256	930.69 /ea	1,861
Pressure Switch PSH	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
Temperature Gauge TE	2.00 ea	7.400	579	767	-	-	256	800.29 /ea	1,601
Vibration Switches VE	2.00 ea	8.800	688	767	-	-		727.27 /ea	1,455
Position Switches ZS	2.00 ea	4.000	313	767	-	-		539.62 /ea	1,079
13420.21002 Influent Pump Station		**114.510**	**9,931**	**59,148**			**1,278**	**/ls**	**70,356**
13420.21004 MF Strainers									
Systems Analyze Instrument Ultra Violet AE/AIT uv	2.00 ea	20.000	1,564	12,775	-	-	256	7,297.11 /ea	14,594
Flow Meter FI	2.00 ea	6.000	559	6,388	-	-	-	3,473.22 /ea	6,946
Differential Pressure Switch High PDSH- Vendor Package	2.00 ea	16.200	1,267		-	-		633.31 /ea	1,267
Pressure Transmitter PIT-	3.00 ea	14.700	1,149	4,599	-	-	383	2,043.86 /ea	6,132

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
13420.21004 MF Strainers									
Temperature Indicating Transmitter TIT	1.00 ea	11.100	868	1,916	-	-	128	2,911.87 /ea	2,912
Local Control Panel - Vendor supplied	3.00 ea	6.000	469		-	-		156.37 /ea	469
Position Switches ZS / ZSO- Vendor package	4.00 ea	8.000	625		-	-		156.37 /ea	625
13420.21004 MF Strainers		**82.000**	**6,501**	**25,678**			**767**	**/ls**	**32,945**
13420.21006 Plant Process Waste pump Station									
24" Magnetic Flow Meter FE/FIT	1.00 ea	21.770	2,028	13,797	-	-	-	15,824.95 /ea	15,825
Ultrasonic Level Instrument w/Transmitter LE/LIT	1.00 ea	8.000	625	4,471	-	-	128	5,224.49 /ea	5,224
Float Level Switch LSH	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Float Level Switch LSL	1.00 ea	1.700	133	511	-	-	128	771.67 /ea	772
Pressure Indicator PI-	3.00 ea	6.300	493	1,916	-	-	383	930.69 /ea	2,792
Pressure Transmitter PIT-	1.00 ea	4.900	383	1,533	-	-	128	2,043.86 /ea	2,044
Pressure Switch PSH	3.00 ea	5.100	399	3,449	-	-	383	1,410.42 /ea	4,231
13420.21006 Plant Process Waste pump Station		**49.470**	**4,194**	**26,189**			**1,278**	**/ls**	**31,660**
13420.21008 Sump Pump Station									
Flow Meter FSL	1.00 ea	3.000	279	3,194	-	-	-	3,473.21 /ea	3,473
Float Level Switch LSHH	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Float Level Switch LSH	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Float Level Switch LSL	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Float Level Switch LSLL	1.00 ea	1.700	133	511	-	-	128	771.67 /ea	772
13420.21008 Sump Pump Station		**9.800**	**811**	**5,238**			**511**	**/ls**	**6,560**
13420.21010 MF Unit Detail - Feed End									
10" Magnetic Flow Meter FE/FIT	1.00 ea	8.770	817	5,749	-	-	-	6,565.71 /ea	6,566
Pressure Indicator PI-	1.00 ea	2.100	164	639	-	-	128	930.69 /ea	931
Pressure Transmitter PIT-	1.00 ea	4.900	383	1,533	-	-	128	2,043.86 /ea	2,044
Position Switches ZS / ZSO	20.00 ea	40.000	3,127	7,665	-	-		539.62 /ea	10,792
13420.21010 MF Unit Detail - Feed End		**55.770**	**4,492**	**15,586**			**256**	**/ls**	**20,333**
13420.21012 MF Unit Detail - Filtrate End									
Systems Analyze Instrument Ultra Violet AE/AIT uv	1.00 ea	10.000	782	6,388	-	-	128	7,297.11 /ea	7,297
Flow Meter FI	1.00 ea	3.000	279	3,194	-	-	-	3,473.21 /ea	3,473
Pressure Indicator PI-	2.00 ea	4.200	328	1,278	-	-	256	930.69 /ea	1,861
Pressure Transmitter PIT-	1.00 ea	4.900	383	1,533	-	-	128	2,043.86 /ea	2,044
Pressure Switch PSL	1.00 ea	1.700	133	1,150	-	-	128	1,410.41 /ea	1,410
Position Switches ZS / ZSO	22.00 ea	44.000	3,440	8,432	-	-		539.62 /ea	11,872
13420.21012 MF Unit Detail - Filtrate End		**67.800**	**5,346**	**21,973**			**639**	**/ls**	**27,958**
13420.21014 MF Compressed Air System									
Differential Pressure Indicator & Transmitter PDIT	4.00 ea	32.400	2,533	8,176	-	-	511	2,805.06 /ea	11,220
Pressure Indicator PI-	4.00 ea	8.400	657	2,555	-	-	511	930.69 /ea	3,723
Pressure Transmitter PIT-	2.00 ea	9.800	766	3,066	-	-	256	2,043.87 /ea	4,088
Pressure Switch PSL	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
13420.21014 MF Compressed Air System		**54.000**	**4,222**	**16,097**			**1,533**	**/ls**	**21,852**
13420.21016 MF Air Scour System									
3" Magnetic Flow Meter FE/FIT	1.00 ea	4.560	425	3,449	-	-	-	3,874.03 /ea	3,874
Differential Pressure Indicator & Transmitter PDIT	1.00 ea	8.100	633	2,044	-	-	128	2,805.06 /ea	2,805
Pressure Indicator PI- Vendor Package	2.00 ea	4.200	328		-	-		164.19 /ea	328
Pressure Transmitter PIT-	1.00 ea	4.900	383	1,533	-	-	128	2,043.86 /ea	2,044
Temperature Gauge TI - Vendor Package	2.00 ea	7.400	579		-	-		289.29 /ea	579
Temperature Switch TSH - Vendor Package	4.00 ea	17.600	1,376		-	-		344.02 /ea	1,376
13420.21016 MF Air Scour System		**46.760**	**3,724**	**7,026**			**256**	**/ls**	**11,006**
13420.21018 MF Acid CIP Tank									
Systems Analyze Instrument Ultra Violet AE/AIT uv	2.00 ea	20.000	1,564	12,775	-	-	256	7,297.11 /ea	14,594
Ultrasonic Level Instrument w/Transmitter LE/LIT	2.00 ea	16.000	1,251	8,943	-	-	256	5,224.49 /ea	10,449
Float Level Switch LSH	2.00 ea	3.400	266	1,022	-	-	256	771.67 /ea	1,543
Float Level Switch LSL	2.00 ea	3.400	266	1,022	-	-	256	771.67 /ea	1,543
Temperature Gauge TC	2.00 ea	7.400	579	767	-	-	256	800.29 /ea	1,601
Temperature Switch TSH	2.00 ea	8.800	688	767	-	-	256	855.02 /ea	1,710
Position Switches ZS / ZSO	32.00 ea	64.000	5,004	12,264	-	-		539.62 /ea	17,268
13420.21018 MF Acid CIP Tank		**123.000**	**9,617**	**37,559**			**1,533**	**/ls**	**48,708**
13420.21020 MF CIP Pumps									
Systems Analyze Instrument Ultra Violet AE/AIT uv	2.00 ea	20.000	1,564	12,775	-	-	256	7,297.11 /ea	14,594
6" Magnetic Flow Meter FE/FIT	1.00 ea	5.830	543	3,449	-	-	-	3,992.34 /ea	3,992
Flow Meter FSL	2.00 ea	6.000	559	6,388	-	-	-	3,473.21 /ea	6,946
Pressure Indicator PI-	4.00 ea	8.400	657	2,555	-	-	511	930.69 /ea	3,723
Pressure Switch PSH	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
Position Switches ZS / ZSO	16.00 ea	32.000	2,502	6,132	-	-		539.62 /ea	8,634
13420.21020 MF CIP Pumps		**75.630**	**6,090**	**33,598**			**1,022**	**/ls**	**40,711**
13420.21022 MF Break Tank									
Systems Analyze Instrument Ultra Violet AE/AIT uv	2.00 ea	20.000	1,564	12,775	-	-	256	7,297.11 /ea	14,594

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
13420.21022 MF Break Tank									
24" Magnetic Flow Meter FE/FIT	1.00 ea	21.770	2,028	13,797	-	-	-	15,824.95 /ea	15,825
Flow Meter FI	2.00 ea	6.000	559	6,388	-	-	-	3,473.21 /ea	6,946
Ultrasonic Level Instrument w/Transmitter LE/LIT	1.00 ea	8.000	625	4,471	-	-	128	5,224.49 /ea	5,224
Float Level Switch LSLL	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Float Level Switch LSH	1.00 ea	1.700	133	511	-	-	128	771.67 /ea	772
Float Level Switch LSL	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
13420.21022 MF Break Tank		**60.870**	**5,175**	**38,964**			**767**	**/ls**	**44,905**
13420.21024 RO Transfer Pumps									
12" Magnetic Flow Meter FE/FIT	1.00 ea	9.760	909	6,899	-	-	-	7,807.68 /ea	7,808
Pressure Indicator PI-	2.00 ea	4.200	328	1,278	-	-	256	930.69 /ea	1,861
Pressure Switch PSH	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
Temperature Gauge TE	2.00 ea	7.400	579	767	-	-	256	800.29 /ea	1,601
Vibration Switches VE	2.00 ea	8.800	688	767	-	-		727.27 /ea	1,455
13420.21024 RO Transfer Pumps		**33.560**	**2,770**	**12,009**			**767**	**/ls**	**15,545**
13420.21026 Backwash Supply Pumps									
12" Magnetic Flow Meter FE/FIT	1.00 ea	9.760	909	6,899	-	-	-	7,807.68 /ea	7,808
Pressure Indicator PI-	4.00 ea	8.400	657	2,555	-	-	511	930.69 /ea	3,723
Pressure Transmitter PIT-	1.00 ea	4.900	383	1,533	-	-	128	2,043.86 /ea	2,044
Pressure Switch PSH	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
Pressure Switch PSL	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
Local Control Panel - Vendor supplied	2.00 ea	4.000	313		-	-		156.37 /ea	313
13420.21026 Backwash Supply Pumps		**33.860**	**2,793**	**15,586**			**1,150**	**/ls**	**19,529**
13420.21028 Primary Cartidge Filters									
Pressure Transmitter PIT-	1.00 ea	4.900	383	1,533	-	-	128	2,043.87 /ea	2,044
13420.21028 Primary Cartidge Filters		**4.900**	**383**	**1,533**			**128**	**/ls**	**2,044**
13420.21030 SODIUM HYPOCHLORITE STORAGE TANK									
Ultrasonic Level Instrument w/Transmitter LE/LIT	1.00 ea	8.000	625	4,471	-	-	128	5,224.48 /ea	5,224
Float Level Switch LSHH	1.00 ea	1.700	133	511	-	-	128	771.67 /ea	772
Float Level Switch LSH	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Float Level Switch LSLL	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Level Gauge LG	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Local Control Panel - Vendor supplied	2.00 ea	4.000	313		-	-		156.38 /ea	313
Position Switches ZS / ZSO	4.00 ea	8.000	625	1,533	-	-		539.62 /ea	2,158
13420.21030 SODIUM HYPOCHLORITE STORAGE TANK		**26.800**	**2,095**	**8,048**			**639**	**/ls**	**10,782**
13420.21032 SODIUM HYPOCHLORITE METERING PUMPS									
Flow Meter FSL	1.00 ea	3.000	279	3,194	-	-	-	3,473.21 /ea	3,473
Pressure Indicator PI-	2.00 ea	4.200	328	1,278	-	-	256	930.69 /ea	1,861
Pressure Switch PSH	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
13420.21032 SODIUM HYPOCHLORITE METERING PUMPS		**10.600**	**874**	**6,771**			**511**	**/ls**	**8,155**
13420.21034 SODIUM HYPOCHLORITE TRANSFER PUMPS									
Pressure Indicator PI-	2.00 ea	4.200	328	1,278	-	-	256	930.69 /ea	1,861
Pressure Switch PSH	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
Pressure Switch PSL	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
13420.21034 SODIUM HYPOCHLORITE TRANSFER PUMPS		**11.000**	**860**	**5,877**			**767**	**/ls**	**7,503**
13420.21036 SULFURIC ACID STORAGE TANK									
Flow Meter FSL	4.00 ea	12.000	1,118	12,775	-	-	-	3,473.21 /ea	13,893
Ultrasonic Level Instrument w/Transmitter LE/LIT	1.00 ea	8.000	625	4,471	-	-	128	5,224.48 /ea	5,224
Float Level Switch LSH	1.00 ea	1.700	133	511	-	-	128	771.67 /ea	772
Float Level Switch LSHH	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Float Level Switch LSLL	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Level Gauge LG	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Local Control Panel - Vendor supplied	1.00 ea	2.000	156		-	-		156.37 /ea	156
Position Switches ZS / ZSO	4.00 ea	8.000	625	1,533	-	-		539.62 /ea	2,158
13420.21036 SULFURIC ACID STORAGE TANK		**36.800**	**3,057**	**20,823**			**639**	**/ls**	**24,519**
13420.21038 SULFURIC ACID METERING PUMPS (Primary & Secondary RO)									
Pressure Indicator PI-	4.00 ea	8.400	657	2,555	-	-	511	930.69 /ea	3,723
13420.21038 SULFURIC ACID METERING PUMPS (Primary & Secondary RO)		**8.400**	**657**	**2,555**			**511**	**/ls**	**3,723**
13420.21040 THRESHOLD INHIBITOR STORAGE TOTE									
Flow Meter FSL	3.00 ea	9.000	838	9,581	-	-	-	3,473.21 /ea	10,420
Float Level Switch LSH	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Position Switches ZS / ZSO	2.00 ea	4.000	313	767	-	-		539.63 /ea	1,079
Weight Sensor WE	1.00 ea	4.400	344	4,471	-	-		4,815.26 /ea	4,815
13420.21040 THRESHOLD INHIBITOR STORAGE TOTE		**19.100**	**1,628**	**15,330**			**128**	**/ls**	**17,086**
13420.21042 THRESHOLD INHIBITOR METERING PUMPS (Primary & Secondary RO)									
3/4" Magnetic Flow Meter FE/FIT	4.00 ea	18.240	1,699	5,110	-	-	-	1,702.28 /ea	6,809
Pressure Indicator PI-	4.00 ea	8.400	657	2,555	-	-	511	930.69 /ea	3,723

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
13420.21042 THRESHOLD INHIBITOR METERING PUMPS (Primary & Secondary RO)		**26.640**	**2,356**	**7,665**			**511**	**/ls**	**10,532**
13420.21044 CITRIC ACID STORAGE TOTE									
Flow Meter FSL	3.00 ea	9.000	838	9,581	-	-	-	3,473.21 /ea	10,420
Float Level Switch LSH	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Position Switches ZS / ZSO	2.00 ea	4.000	313	767	-	-		539.63 /ea	1,079
Weight Sensor WE	1.00 ea	4.400	344	4,471	-	-		4,815.26 /ea	4,815
13420.21044 CITRIC ACID STORAGE TOTE		**19.100**	**1,628**	**15,330**			**128**	**/ls**	**17,086**
13420.21046 CITRIC ACID TRANSFER PUMPS									
Pressure Indicator PI-	4.00 ea	8.400	657	2,555	-	-	511	930.69 /ea	3,723
Pressure Switch PSH	4.00 ea	6.800	532	4,599	-	-	511	1,410.42 /ea	5,642
Pressure Switch PSL	4.00 ea	6.800	532	4,599	-	-	511	1,410.42 /ea	5,642
13420.21046 CITRIC ACID TRANSFER PUMPS		**22.000**	**1,720**	**11,753**			**1,533**	**/ls**	**15,006**
13420.21048 SODIUM BISULFITE STORAGE TANK									
Flow Meter FSL	3.00 ea	9.000	838	9,581	-	-	-	3,473.21 /ea	10,420
Ultrasonic Level Instrument w/Transmitter LE/LIT	1.00 ea	8.000	625	4,471	-	-	128	5,224.49 /ea	5,224
Float Level Switch LSH	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Float Level Switch LSHH	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Float Level Switch LSLL	1.00 ea	1.700	133	511	-	-	128	771.67 /ea	772
Level Gauge LG	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Local Control Panel - Vendor supplied	1.00 ea	2.000	156		-	-		156.37 /ea	156
Position Switches ZS / ZSO	4.00 ea	8.000	625	1,533	-	-		539.62 /ea	2,158
13420.21048 SODIUM BISULFITE STORAGE TANK		**33.800**	**2,777**	**17,630**			**639**	**/ls**	**21,046**
13420.21050 SODIUM BISULFITE METERING PUMPS									
Pressure Indicator PI-	4.00 ea	8.400	657	2,555	-	-	511	930.69 /ea	3,723
Pressure Switch PSH	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
Pressure Switch PSL	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
13420.21050 SODIUM BISULFITE METERING PUMPS		**15.200**	**1,188**	**7,154**			**1,022**	**/ls**	**9,364**
13420.21052 SODIUM HYDROXIDE STORAGE TANK									
Flow Meter FSL	3.00 ea	9.000	838	9,581	-	-	-	3,473.21 /ea	10,420
Ultrasonic Level Instrument w/Transmitter LE/LIT	1.00 ea	8.000	625	4,471	-	-	128	5,224.49 /ea	5,224
Float Level Switch LSH	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Float Level Switch LSHH	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Float Level Switch LSLL	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Level Gauge LG	1.00 ea	1.700	133	511	-	-	128	771.67 /ea	772
Local Control Panel - Vendor supplied	1.00 ea	2.000	156		-	-		156.37 /ea	156
Position Switches ZS / ZSO	4.00 ea	8.000	625	1,533	-	-		539.62 /ea	2,158
13420.21052 SODIUM HYDROXIDE STORAGE TANK		**33.800**	**2,777**	**17,630**			**639**	**/ls**	**21,046**
13420.21054 SODIUM HYDROXIDE METERING AND TRANSFER PUMPS									
Flow Meter FSL	1.00 ea	3.000	279	3,194	-	-	-	3,473.20 /ea	3,473
Pressure Indicator PI-	6.00 ea	12.600	985	3,833	-	-	767	930.69 /ea	5,584
Pressure Switch PSH	4.00 ea	6.800	532	4,599	-	-	511	1,410.42 /ea	5,642
Pressure Switch PSL	4.00 ea	6.800	532	4,599	-	-	511	1,410.42 /ea	5,642
13420.21054 SODIUM HYDROXIDE METERING AND TRANSFER PUMPS		**29.200**	**2,328**	**16,224**			**1,789**	**/ls**	**20,341**
13420.21060 AQUEOUS AMMONIA STORAGE TANK									
Flow Meter FSL	3.00 ea	9.000	838	9,581	-	-	-	3,473.21 /ea	10,420
Ultrasonic Level Instrument w/Transmitter LE/LIT	1.00 ea	8.000	625	4,471	-	-	128	5,224.49 /ea	5,224
Float Level Switch LSH	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Float Level Switch LSHH	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Float Level Switch LSLL	1.00 ea	1.700	133	511	-	-	128	771.67 /ea	772
Level Gauge LG	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Local Control Panel - Vendor supplied	1.00 ea	2.000	156		-	-		156.37 /ea	156
Position Switches ZS / ZSO	4.00 ea	8.000	625	1,533	-	-		539.62 /ea	2,158
13420.21060 AQUEOUS AMMONIA STORAGE TANK		**33.800**	**2,777**	**17,630**			**639**	**/ls**	**21,046**
13420.21062 AQUEOUS AMMONIA METERING PUMPS									
Pressure Indicator PI-	2.00 ea	4.200	328	1,278	-	-	256	930.69 /ea	1,861
13420.21062 AQUEOUS AMMONIA METERING PUMPS		**4.200**	**328**	**1,278**			**256**	**/ls**	**1,861**
13420.21064 PRIMARY RO FEED PANEL									
Systems Analyze Instrument Ultra Violet AE/AIT uv	7.00 ea	70.000	5,473	44,713	-	-	894	7,297.11 /ea	51,080
Flow Meter FE	4.00 ea	12.000	1,118	12,775	-	-	-	3,473.21 /ea	13,893
Local Control Panel - Vendor supplied	1.00 ea	16.000	1,251		-	-		1,250.97 /ea	1,251
13420.21064 PRIMARY RO FEED PANEL		**98.000**	**7,842**	**57,488**			**894**	**/ls**	**66,224**
13420.21066 PRIMARY RO FEED PUMP UNIT I									
Pressure Transmitter PIT-	2.00 ea	9.800	766	3,066	-	-	256	2,043.87 /ea	4,088
Pressure Switch PSH	1.00 ea	1.700	133	1,150	-	-	128	1,410.41 /ea	1,410
Temperature Gauge TE	1.00 ea	3.700	289	383	-	-	128	800.28 /ea	800
Position Switches ZS / ZSO	2.00 ea	4.000	313	767	-	-		539.63 /ea	1,079

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
13420.21066 PRIMARY RO FEED PUMP UNIT I		**19.200**	**1,501**	**5,366**			**511**	**/ls**	**7,378**
13420.21068 PRIMARY RO MEMBRANE AND CONCENTRATE UNIT I									
Systems Analyze Instrument Ultra Violet AE/AIT uv	3.00 ea	30.000	2,346	19,163	-	-	383	7,297.11 /ea	21,891
6" Magnetic Flow Meter FE/FIT	2.00 ea	11.660	1,086	6,899	-	-	-	3,992.33 /ea	7,985
12" Magnetic Flow Meter FE/FIT	1.00 ea	9.760	909	6,899	-	-	-	7,807.68 /ea	7,808
Flow Meter FE	1.00 ea	3.000	279	3,194	-	-	-	3,473.21 /ea	3,473
Pressure Transmitter PIT-	4.00 ea	19.600	1,532	6,132	-	-	511	2,043.86 /ea	8,175
Pressure Switch PSH	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
Position Switches ZS / ZSO	10.00 ea	20.000	1,564	3,833	-	-		539.62 /ea	5,396
13420.21068 PRIMARY RO MEMBRANE AND CONCENTRATE UNIT I		**97.420**	**7,982**	**48,417**			**1,150**	**/ls**	**57,549**
13420.21072 PRIMARY RO CIP SYSTEM									
Systems Analyze Instrument Ultra Violet AE/AIT uv	1.00 ea	10.000	782	6,388	-	-	128	7,297.11 /ea	7,297
8" Magnetic Flow Meter FE/FIT	1.00 ea	6.530	608	4,599	-	-	-	5,207.30 /ea	5,207
Ultrasonic Level Instrument w/Transmitter LE/LIT	2.00 ea	16.000	1,251	8,943	-	-	256	5,224.49 /ea	10,449
Float Level Switch LSH	2.00 ea	3.400	266	1,022	-	-	256	771.67 /ea	1,543
Float Level Switch LSL	2.00 ea	3.400	266	1,022	-	-	256	771.67 /ea	1,543
Pressure Indicator PI-	1.00 ea	2.100	164	639	-	-	128	930.70 /ea	931
Pressure Transmitter PIT-	4.00 ea	19.600	1,532	6,132	-	-	511	2,043.86 /ea	8,175
Pressure Switch PSH	4.00 ea	6.800	532	4,599	-	-	511	1,410.42 /ea	5,642
Pressure Switch PSL	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
Temperature Sensor TC	4.00 ea	14.800	1,157	1,533	-	-	511	800.29 /ea	3,201
Temperature Gauge TI	1.00 ea	3.700	289	383	-	-	128	800.29 /ea	800
Temperature Switch TSH	3.00 ea	13.200	1,032	1,150	-	-	383	855.02 /ea	2,565
Position Switches ZS / ZSO	18.00 ea	36.000	2,815	6,899	-	-		539.62 /ea	9,713
13420.21072 PRIMARY RO CIP SYSTEM		**138.930**	**10,960**	**45,607**			**3,322**	**/ls**	**59,888**
13420.21074 SECONDARY RO FEED PUMP									
Systems Analyze Instrument Ultra Violet AE/AIT uv	1.00 ea	10.000	782	6,388	-	-	128	7,297.11 /ea	7,297
Flow Meter FE	1.00 ea	3.000	279	3,194	-	-	-	3,473.21 /ea	3,473
Pressure Transmitter PIT-	2.00 ea	9.800	766	3,066	-	-	256	2,043.86 /ea	4,088
Pressure Switch PSH	1.00 ea	1.700	133	1,150	-	-	128	1,410.41 /ea	1,410
Pressure Switch PSL	1.00 ea	1.700	133	1,150	-	-	128	1,410.42 /ea	1,410
Position Switches ZS / ZSO	4.00 ea	8.000	625	1,533	-	-		539.62 /ea	2,158
13420.21074 SECONDARY RO FEED PUMP		**34.200**	**2,719**	**16,480**			**639**	**/ea**	**19,837**
13420.21076 SECONDARY RO UNIT 1									
Systems Analyze Instrument Ultra Violet AE/AIT uv	1.00 ea	10.000	782	6,388	-	-	128	7,297.11 /ea	7,297
Flow Meter FE	1.00 ea	3.000	279	3,194	-	-	-	3,473.21 /ea	3,473
Pressure Transmitter PIT-	2.00 ea	9.800	766	3,066	-	-	256	2,043.86 /ea	4,088
Position Switches ZS / ZSO	26.00 ea	52.000	4,066	9,965	-	-		539.62 /ea	14,030
13420.21076 SECONDARY RO UNIT 1		**74.800**	**5,893**	**22,612**			**383**	**/ea**	**28,888**
13420.21078 SECONDARY RO PERMEATE AND CONCENTRATE									
4" Magnetic Flow Meter FE/FIT	2.00 ea	9.120	850	6,899	-	-	-	3,874.03 /ea	7,748
Position Switches ZS / ZSO	8.00 ea	16.000	1,251	3,066	-	-		539.62 /ea	4,317
13420.21078 SECONDARY RO PERMEATE AND CONCENTRATE		**25.120**	**2,101**	**9,965**				**/ea**	**12,065**
13420.21080 SECONDARY RO CIP SYSTEM									
Systems Analyze Instrument Ultra Violet AE/AIT uv	1.00 ea	10.000	782	6,388	-	-	128	7,297.11 /ea	7,297
8" Magnetic Flow Meter FE/FIT	1.00 ea	6.530	608	4,599	-	-	-	5,207.29 /ea	5,207
Ultrasonic Level Instrument w/Transmitter LE/LIT	2.00 ea	16.000	1,251	8,943	-	-	256	5,224.49 /ea	10,449
Float Level Switch LSH	2.00 ea	3.400	266	1,022	-	-	256	771.67 /ea	1,543
Float Level Switch LSL	2.00 ea	3.400	266	1,022	-	-	256	771.67 /ea	1,543
Pressure Indicator PI-	1.00 ea	2.100	164	639	-	-	128	930.69 /ea	931
Pressure Transmitter PIT-	4.00 ea	19.600	1,532	6,132	-	-	511	2,043.86 /ea	8,175
Pressure Switch PSH	4.00 ea	6.800	532	4,599	-	-	511	1,410.42 /ea	5,642
Pressure Switch PSL	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
Temperature Sensor TC	4.00 ea	14.800	1,157	1,533	-	-	511	800.29 /ea	3,201
Temperature Gauge TI	1.00 ea	3.700	289	383	-	-	128	800.29 /ea	800
Temperature Switch TSH	3.00 ea	13.200	1,032	1,150	-	-	383	855.02 /ea	2,565
Position Switches ZS / ZSO	18.00 ea	36.000	2,815	6,899	-	-		539.62 /ea	9,713
13420.21080 SECONDARY RO CIP SYSTEM		**138.930**	**10,960**	**45,607**			**3,322**	**/ls**	**59,888**
13420.21082 PRODUCT WATER PUMP STATION									
18" Magnetic Flow Meter FE/FIT	1.00 ea	15.140	1,410	10,348	-	-	-	11,758.10 /ea	11,758
Ultrasonic Level Instrument w/Transmitter LE/LIT	1.00 ea	8.000	625	4,471	-	-	128	5,224.49 /ea	5,224
Float Level Switch LSHH	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Float Level Switch LSLL	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Pressure Indicator PI-	2.00 ea	4.200	328	1,278	-	-	256	930.69 /ea	1,861
Pressure Transmitter PIT-	1.00 ea	4.900	383	1,533	-	-	128	2,043.87 /ea	2,044
Pressure Switch PSH	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
Temperature Gauge TE	2.00 ea	7.400	579	767	-	-	256	800.29 /ea	1,601
Vibration Switches VE	2.00 ea	8.800	688	767	-	-		727.27 /ea	1,455

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
13420.21082 PRODUCT WATER PUMP STATION		**55.240**	**4,546**	**22,484**			**1,278**	**/ls**	**28,307**
13420.21084 FLUSH TRANSFER PUMPS AND FLUSH TANK									
Ultrasonic Level Instrument w/Transmitter LE/LIT	1.00 ea	8.000	625	4,471	-	-	128	5,224.49 /ea	5,224
Float Level Switch LSH	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Float Level Switch LSHH	1.00 ea	1.700	133	511	-	-	128	771.67 /ea	772
Float Level Switch LSL	1.00 ea	1.700	133	511	-	-	128	771.66 /ea	772
Pressure Transmitter PIT-	4.00 ea	19.600	1,532	6,132	-	-	511	2,043.86 /ea	8,175
Position Switches ZS / ZSO	4.00 ea	8.000	625	1,533	-	-		539.62 /ea	2,158
13420.21084 FLUSH TRANSFER PUMPS AND FLUSH TANK		**40.700**	**3,182**	**13,669**			**1,022**	**/ls**	**17,873**
13420.21086 RO FLUSH PUMPS									
Pressure Indicator PI-	2.00 ea	4.200	328	1,278	-	-	256	930.69 /ea	1,861
Pressure Switch PSH	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
Pressure Switch PSL	2.00 ea	3.400	266	2,300	-	-	256	1,410.42 /ea	2,821
13420.21086 RO FLUSH PUMPS		**11.000**	**860**	**5,877**			**767**	**/ea**	**7,503**
13420 I&C Instruments		**1,875.910**	**151,647**	**781,447**			**35,515**		**968,608**
13422 I&C Hardware/Servers/PLC									
13422.21002 Electrical Building UPS									
UPS- 10KVA	2.00 ea	4.000	313	24,273	-	3,000	-	13,792.62 /ea	27,585
Battery Tower	2.00 ea	2.000	156	2,555	-		-	1,355.69 /ea	2,711
External Bypass Switch	2.00 ea	2.000	156	6,388	-		-	3,271.94 /ea	6,544
13422.21002 Electrical Building UPS		**8.000**	**625**	**33,215**		**3,000**		**/ea**	**36,840**
13422.21008 Allowances for PLC Programming and Testing									
PLC Programming	1.00 ls				-	100,000	-	100,000.00 /ls	100,000
Software	1.00 ls				-	20,000	-	20,000.00 /ls	20,000
Connection to the Ex. SCADA	1.00 ls				-	5,000	-	5,000.00 /ls	5,000
Integrating system	1.00 ls				-	50,000	-	50,000.00 /ls	50,000
Training and Testing	15.00 day				-	22,500	-	1,500.00 /day	22,500
13422.21008 Allowances for PLC Programming and Testing						**197,500**		**/ls**	**197,500**
13422.21010 System Architecture									
HMI/Computer Workstation	2.00 ea	8.000	625	7,665	-	-	-	4,145.25 /ea	8,290
Server Rack/Console	2.00 ea	16.000	1,251	51,100	-	1,600	-	26,975.49 /ea	53,951
Ethernet Switch	1.00 ea	1.500	117	2,555	-	1,200	-	3,872.27 /ea	3,872
SCADA Network Switch	3.00 ea	4.500	352	7,665	-	3,600	-	3,872.28 /ea	11,617
Security Network Switch	1.00 ea	1.500	117	2,555	-	1,200	-	3,872.28 /ea	3,872
Printer	1.00 ea	1.200	94	2,300	-		-	2,393.33 /ea	2,393
Fiber Optic Patchpanel- - Not in PLC	2.00 ea	3.000	235	3,833	-	200	-	2,133.53 /ea	4,267
RTU Control Panel	1.00 ea	32.000	2,502	40,880	-	-	-	43,381.95 /ea	43,382
Omni Antenna	1.00 ea	8.000	625	383	-	-	-	1,008.74 /ea	1,009
13422.21010 System Architecture		**75.700**	**5,919**	**118,935**		**7,800**		**/ls**	**132,654**
13422.21012 Plant Main PLC									
Large Control Panel PLC Configuration- Chassis/Racks & Modules (Power Supply, Ethernet, I/O etc.)- No Cabinet	1.00 ea	80.000		102,200	-	-	-	102,200.00 /ea	102,200
Control Panel Cabinet 48"w x 48"h x 30"d (Includes Terminal Blocks & Accessories)	1.00 ea	8.000	625	17,885	-	-	-	18,510.49 /ea	18,510
13422.21012 Plant Main PLC		**88.000**	**625**	**120,085**				**/ls**	**120,710**
13422 I&C Hardware/Servers/PLC		**171.700**	**7,170**	**272,235**		**208,300**			**487,705**
072 Measurment &Ctrl Instr. I &C		**2,047.610**	**158,816**	**1,053,682**		**208,300**	**35,515**		**1,456,313**
001 Contract No. 1 - Advanced Water Purification Facility (AWPF)	**1.00 ls**	**56,611.127**	**4,793,611**	**16,193,919**	**684,293**	**1,837,094**	**175,789**	**23,684,706.34 /ls**	**23,684,706**

CDM Smith

Eastern Municipal Water District
IPR Project - Brine Ponds Contract - Phase I

OPCC - No Optional Items - 30% Design - February 2018

Project name	Indirect Potable Reuse San Jacinto CA Riverside
Estimator	RM, NC, SY
Labor rate table	CA17 Riverside
Equipment rate table	00 17 Equip Rate BF
Bid date	2/22/2018 5:00 PM
Notes	Opinion of Probable Construction Cost (OPCC) This is an Opinion of Probable Construction Cost only, as defined by the documents provided at the level of design indicated above. CDM has no control over the cost of labor, materials, equipment, or services furnished, over schedules, over contractor's methods of determining prices, competitive bidding, market conditions or negotiating terms. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids. There are not any costs provided for: Change Orders, Design Engineering, Construction Oversight, Client Costs, Finance or Funding Costs, Legal Fees, Land Acquisition or temporary/permanent Easements, Operations, or any other costs associated with this project that are not specifically part of the bidding contractor's proposed scope. Clarifications: 1. This OPCC is for Phase I only based on 30% Design Submittal. Phase II is excluded 2. AACE Class 3 Estimate, Engineering from 10% to 40% complete, -10% to -20% on the low side, and +10% to +30% on the high side 3. Contingency at 20% 4. Escalation at midpoint of construction - Not in Cost
Report format	Sorted by 'Bid Item/Area/95CSI Sctn/Element' 'Detail' summary Allocate addons

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
002 Contract No. 2 - Brine Ponds									
005 General Requirements									
01590 Safety/Traffic/Pollution Control									
01590.50100 SWPPP									
Gravel @ Construction Entrance	100.00 sy	1.200	91	-	81	-	808	9.81 /sy	981
Roads, Parking & Laydown, Gravel Fill 6" deep	2,500.00 sy	15.000	1,142	-	1,017	-	10,775	5.17 /sy	12,934
Storm Water Discharge Plan & NPDS Permit	1.00 ea		-	-	-	-	2,694	2,693.75 /ea	2,694
Maintain Silt Fence	12.00 mo	192.000	13,063	-	-	-	-	1,088.54 /mo	13,063
Silt Fence - Wire Reinforced 3' Tall	4,800.00 lf	96.000	7,198	4,616	3,033	-	-	3.09 /lf	14,847
Remove Erosion Control	1.00 ls	40.000	2,721	-	-	-	-	2,721.36 /ls	2,721
01590.50100 SWPPP	**1.00 ls**	**344.200**	**24,215**	**4,616**	**4,132**		**14,277**	**47,239.88 /ls**	**47,240**
01590 Safety/Traffic/Pollution Control	**1.00 ls**	**344.200**	**24,215**	**4,616**	**4,132**		**14,277**	**47,239.88 /ls**	**47,240**
005 General Requirements	**1.00 ls**	**344.200**	**24,215**	**4,616**	**4,132**		**14,277**	**47,239.88 /ls**	**47,240**
010 Site Work - Brine Ponds									
02300 Site Preparation									
02300.50400 Remove Topsoil 6" Deep; Stockpile Topsoil for Fill									
Mob / DeMob Earthwork Equip (2hr each way)	3.00 ea	12.000	930	-	1,277	-	-	735.80 /ea	2,207
Topsoil Strip- Dozer D8	24,318.00 cy	277.920	27,321	-	60,936	-	-	3.63 /cy	88,257
Load Spoils from Stockpile Cat 325 Excavator-32MT- 180hp	24,318.00 cy	202.650	20,349	-	27,243	-	-	1.96 /cy	47,591
Haul Spoils/Off Site 18cy Rear Dump 1 Load/Hour	24,318.00 cy	1,749.496	135,600	-	166,171	-	-	12.41 /cy	301,771
02300.50400 Remove Topsoil 6" Deep; Stockpile Topsoil for Fill	**24,318.00 cy**	**2,242.066**	**184,200**		**255,627**			**18.09 /cy**	**439,827**
02300.50410 Cut / Excavate Bottom of Pond; Stockpile Cut for Fill									
Mob / DeMob Earthwork Equip (2hr each way)	12.00 ea	48.000	3,720	-	5,109	-	-	735.80 /ea	8,830
Cut to Stockpile- Dozer D8	85,229.00 cy	1,363.664	134,055	-	298,993	-	-	5.08 /cy	433,049
Cut to Stockpile- Excavator C325- 30MT-186HP/1.5cy	85,229.00 cy	1,704.580	171,163	-	229,149	-	-	4.70 /cy	400,312
Fine Grade- Grader G12	1,313,185.00 sf	1,050.548	103,274	-	74,230	-	-	0.14 /sf	177,505
02300.50410 Cut / Excavate Bottom of Pond; Stockpile Cut for Fill	**170,458.00 cy**	**4,166.792**	**412,213**		**607,482**			**5.98 /cy**	**1,019,695**
02300.50420 Fill / Berm; Fill from Stockpile									
Mob / DeMob Earthwork Equip (2hr each way)	5.00 ea	20.000	1,550	-	2,129	-	-	735.80 /ea	3,679
Place Fill from Stockpile- Excavator C325-33MT- 186HP/1.5cy/CP323 Compactor	170,458.00 cy	4,090.992	377,224	-	317,390	-	-	4.08 /cy	694,614
Load & Haul Fill From Stockpile- Excavator C325- 30MT-186HP/1.5cy (2ea)	146,140.00 cy	3,507.360	298,628	-	379,257	-	-	4.64 /cy	677,885
02300.50420 Fill / Berm; Fill from Stockpile	**170,458.00 cy**	**7,618.352**	**677,402**		**698,776**			**8.07 /cy**	**1,376,178**
02300 Site Preparation	**365,234.00 cy**	**14,027.210**	**1,273,815**		**1,561,884**			**7.76 /cy**	**2,835,699**
02315 Earthwork									
02315.50111 I&C / Electrical Building									
Mob / DeMob Earthwork Equip (2hr each way)	1.00 ea	4.000	310	-	426	-	-	735.80 /ea	736
Excav- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	37.00 cy	1.293	127	-	97	-	-	6.05 /cy	224
Load & Haul Cut to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	37.00 cy	1.402	112	-	80	-	-	5.19 /cy	192
Foundation Subgrade- Scarify & Recompact	663.00 sf	2.306	201	-	63	-	-	0.40 /sf	264
Place Backfill from Stockpile- Backhoe Loader C466- 7MT- 95HP/1.5cy/Plate Compactor (2ea)	26.00 cy	12.480	1,088	-	372	-	-	56.18 /cy	1,461
Load & Haul Backfill from Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	26.00 cy	0.985	79	-	56	-	-	5.19 /cy	135
Import Aggregate Base Fill	13.00 cy		-	324	-	95	-	32.19 /cy	418
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	28.00 cy	0.233	23	-	17	-	-	1.44 /cy	40
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	28.00 cy	4.000	310	-	380	-	-	24.64 /cy	690
02315.50111 I&C / Electrical Building	**37.00 cy**	**26.699**	**2,251**	**324**	**1,491**	**95**		**112.44 /cy**	**4,160**
02315 Earthwork	**37.00 cy**	**26.699**	**2,251**	**324**	**1,491**	**95**		**112.44 /cy**	**4,160**
02580 Electrical & Communication Structures									
02580.21006 12KV Duct bank From SWGR-1 to XFMR 1600KVA Ass.(2X1) 4" (17"X10")									
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	68.30 cy	0.569	56	-	43	-	-	1.44 /cy	99
Haul Spoils/Off Site 18cy Rear Dump 1 Load/Hour	68.30 cy	4.913	381	-	467	-	-	12.41 /cy	847
Ductbank Layout	1,069.20 lf	2.673	223	-	-	-	-	0.21 /lf	223
Ductbank Detectable/Non-Detectable Tape	1,069.20 lf	5.346	439	75	-	-	-	0.48 /lf	514
Ductbank Excavation Backhoe/Loader	375.61 cy	37.561	3,692	-	2,814	-	-	17.32 /cy	6,507
Ductbank Bedding	25.61 cy	6.402	558	785	175	164	-	65.71 /cy	1,683
Ductbank Backfill & Compaction	307.32 cy	65.853	5,742	-	1,805	-	-	24.56 /cy	7,547
Form Oil & Hardware	1,627.59 csf		-	327	-	-	-	0.20 /csf	327
Ductbank Formwork- 3 Form Uses	1,627.59 sf	130.207	10,846	1,637	-	-	-	7.67 /sf	12,483
Ductbank Reinforcing Steel	4.33 tn	108.250	10,976	6,361	-	-	-	4,004.07 /tn	17,338
Truck Place Ductbank	34.70 cy	17.348	1,409	-	-	-	-	40.60 /cy	1,409
2500 psi Concrete- Red Dye	34.70 cy		-	4,654	-	-	-	134.14 /cy	4,654
Water Base Non-Residual Cure	1,382.93 sf	2.766	230	117	-	-	-	0.25 /sf	347
Load & Haul Trenching Spoils to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	68.30 cy	2.587	207	-	147	-	-	5.19 /cy	354
4" x 3-0/0" PVC Conduit Base Spacer	267.30 ea		-	360	-	-	-	1.35 /ea	360
02580.21006 12KV Duct bank From SWGR-1 to XFMR 1600KVA Ass.(2X1) 4" (17"X10")	**1,069.20 lf**	**384.475**	**34,760**	**14,317**	**5,451**	**164**		**51.15 /lf**	**54,691**
02580.21010 Duct bank from 1600KVA XFMR to Brine Build.Ass.(2X2)4"(17"X17")									
Load Spoils from Stockpile- Backhoe Loader C446 9MT-17+/30" Bucket-1.5cy Loader	1.01 cy	0.008	1	-	1	-	-	1.44 /cy	1
Haul Spoils/Off Site 18cy Rear Dump 1 Load/Hour	1.01 cy	0.072	6	-	7	-	-	12.40 /cy	12

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
02580.21010 Duct bank from 1600KVA XFMR to Brine Build.Ass.(2X2)4"(17"X17")									
Ductbank Layout	10.00 lf	0.025	2	-	-	-	-	0.21 /lf	2
Ductbank Detectable/Non-Detectable Tape	10.00 lf	0.050	4	1	-	-	-	0.48 /lf	5
Ductbank Excavation Backhoe/Loader	4.59 cy	0.459	45	-	34	-	-	17.32 /cy	79
Ductbank Bedding	0.26 cy	0.066	6	8	2	2	-	65.80 /cy	17
Ductbank Backfill & Compaction	3.58 cy	0.767	67	-	21	-	-	24.56 /cy	88
Form Oil & Hardware	32.35 csf		-	7	-	-	-	0.20 /csf	7
Ductbank Formwork- 3 Form Uses	32.35 sf	2.588	216	33	-	-	-	7.67 /sf	248
Ductbank Reinforcing Steel	0.07 tn	1.800	183	106	-	-	-	4,004.17 /tn	288
Truck Place Ductbank	0.58 cy	0.290	24	-	-	-	-	40.60 /cy	24
2500 psi Concrete- Red Dye	0.58 cy		-	78	-	-	-	134.14 /cy	78
Water Base Non-Residual Cure	14.17 sf	0.028	2	1	-	-	-	0.25 /sf	4
Load & Haul Trenching Spoils to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	1.01 cy	0.038	3	-	2	-	-	5.19 /cy	5
4" x 3-0/0" PVC Conduit Intermediate Spacer	4.00 ea		-	5	-	-	-	1.25 /ea	5
4" x 3-0/0" PVC Conduit Base Spacer	4.00 ea		-	5	-	-	-	1.35 /ea	5
02580.21010 Duct bank from 1600KVA XFMR to Brine Build.Ass.(2X2)4"(17"X17")	**10.00 lf**	**6.191**	**557**	**243**	**67**	**2**		**86.88 /lf**	**869**
02580 Electrical & Communication Structures	**1,069.20 lf**	**390.667**	**35,317**	**14,560**	**5,518**	**166**		**51.96 /lf**	**55,560**
02820 Fencing									
02820.50111 Fencing Around Brine Ponds									
6' Chain Link Fence	4,800.00 lf		-	-	-	96,000	-	20.00 /lf	96,000
6' Chain Link Fence Vehicle Gate 20' Wide	1.00 ea		-	-	-	730	-	730.00 /ea	730
02820.50111 Fencing Around Brine Ponds	**4,800.00 lf**					**96,730**		**20.15 /lf**	**96,730**
02820 Fencing	**4,800.00 lf**					**96,730**		**20.15 /lf**	**96,730**
010 Site Work - Brine Ponds	**1,313,185.00 sf**	**14,444.576**	**1,311,382**	**14,884**	**1,568,893**	**96,990**		**2.28 /sf**	**2,992,149**
020 Site Work - AWPF									
02300 Site Preparation									
02300.50100 Remove Topsoil 6" Deep; Stockpile for Fill									
Mob / DeMob Earthwork Equip (2hr each way)	2.00 ea	8.000	620	-	852	-	-	735.80 /ea	1,472
Topsoil Strip- Dozer D8	7,167.00 cy	81.909	8,052	-	17,959	-	-	3.63 /cy	26,011
Load Spoils from Stockpile Cat 325 Excavator-32MT- 180hp	7,167.00 cy	59.725	5,997	-	8,029	-	-	1.96 /cy	14,026
Haul Spoils/Off Site 18cy Rear Dump 2 Load/Hour	7,167.00 cy	258.736	20,054	-	24,575	-	-	6.23 /cy	44,629
02300.50100 Remove Topsoil 6" Deep; Stockpile for Fill	**5,902.00 cy**	**408.370**	**34,723**		**51,415**			**14.60 /cy**	**86,138**
02300.50105 Cut Existing Grade to Required Site Building FFL; Stockpile Cut for Fi									
Mob / DeMob Earthwork Equip (2hr each way)	2.00 ea	8.000	620	-	852	-	-	735.80 /ea	1,472
Cut to Stockpile- Dozer D8	22,910.00 cy	86.128	8,467	-	18,884	-	-	1.19 /cy	27,351
Fine Grade- Grader G12	247,430.00 sf	79.178	7,784	-	5,595	-	-	0.05 /sf	13,378
Load Spoils from Stockpile Cat 325 Excavator-32MT- 180hp	22,910.00 cy	190.917	19,171	-	25,665	-	-	1.96 /cy	44,836
Haul Spoils/Off Site 18cy Rear Dump 2 Load/Hour	22,910.00 cy	827.076	64,105	-	78,557	-	-	6.23 /cy	142,662
02300.50105 Cut Existing Grade to Required Site Building FFL; Stockpile Cut for Fi	**22,910.00 cy**	**1,191.298**	**100,146**		**129,553**			**10.03 /cy**	**229,699**
02300.50110 Cut Existing Grade to Required Access Road FFL; Stockpile Cut for Fill									
Mob / DeMob Earthwork Equip (2hr each way)	3.00 ea	12.000	930	-	1,277	-	-	735.80 /ea	2,207
Cut to Stockpile- Dozer D8	2,329.00 cy	8.756	861	-	1,920	-	-	1.19 /cy	2,780
Fine Grade- Grader G12	125,723.00 sf	40.231	3,955	-	2,843	-	-	0.05 /sf	6,798
Load Spoils from Stockpile Cat 325 Excavator-32MT- 180hp	2,329.00 cy	19.408	1,949	-	2,609	-	-	1.96 /cy	4,558
Haul Spoils/Off Site 18cy Rear Dump 2 Load/Hour	2,329.00 cy	84.079	6,517	-	7,986	-	-	6.23 /cy	14,503
02300.50110 Cut Existing Grade to Required Access Road FFL; Stockpile Cut for Fill	**2,329.00 cy**	**164.475**	**14,211**		**16,635**			**13.24 /cy**	**30,846**
02300.50115 Cut Existing Grade to Required Parking FFL; Stockpile Cut for Fill									
Mob / DeMob Earthwork Equip (2hr each way)	1.00 ea	4.000	310	-	426	-	-	735.80 /ea	736
Cut to Stockpile- Dozer D8	257.00 cy	0.966	95	-	212	-	-	1.19 /cy	307
Fine Grade- Grader G12	13,883.00 sf	4.443	437	-	314	-	-	0.05 /sf	751
Load Spoils from Stockpile Cat 325 Excavator-32MT- 180hp	257.00 cy	2.142	215	-	288	-	-	1.96 /cy	503
Haul Spoils/Off Site 18cy Rear Dump 2 Load/Hour	257.00 cy	9.278	719	-	881	-	-	6.23 /cy	1,600
02300.50115 Cut Existing Grade to Required Parking FFL; Stockpile Cut for Fill	**257.00 cy**	**20.828**	**1,776**		**2,121**			**15.16 /cy**	**3,897**
02300 Site Preparation	**31,398.00 cy**	**1,784.971**	**150,857**		**199,723**			**11.17 /cy**	**350,580**
020 Site Work - AWPF	**387,036.00 sf**	**1,784.971**	**150,857**		**199,723**			**0.91 /sf**	**350,580**
040 Brine Pond									
02150 Membrane Liners									
02150.50400 Primary HDPE Pond Liner									
Mobilization/Demobilization	1.00 ls		-	-	-	10,364	-	10,364.01 /ls	10,364
HDPE Dual Liner 60 mils; Ponds Horizontal & Slope Surfaces	1,080,000.00 sf		-	-	-	1,198,784	-	1.11 /sf	1,198,784
HDPE Dual Liner Hand Weld	1,000.00 lf		-	-	-	8,291	-	8.29 /lf	8,291
Contractor Assist- Wheel Loader & 2 Labor	1,080,000.00 sf	10,745.422	936,954	-	224,212	-	-	1.08 /sf	1,161,166
02150.50400 Primary HDPE Pond Liner	**1,080,000.00 sf**	**10,745.422**	**936,954**		**224,212**	**1,217,439**		**2.20 /sf**	**2,378,605**
02150.50410 Vadose Zone Monitoring System (VZMS)									
Mobilization/Demobilization	1.00 ls		-	-	-	5,669	-	5,668.98 /ls	5,669
HDPE Liner 40 mils	7,200.00 sf		-	-	-	2,873	-	0.40 /sf	2,873
HDPE Liner Hand Weld	10.00 lf		-	-	-	45	-	4.54 /lf	45

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
02150.50410 Vadose Zone Monitoring System (VZMS)									
Contractor Assist- Wheel Loader & 2 Labor	7,200.00 sf	39.184	3,417	-	818	-	-	0.59 /sf	4,234
02150.50410 Vadose Zone Monitoring System (VZMS)	**7,200.00 sf**	**39.184**	**3,417**		**818**	**8,587**		**1.78 /sf**	**12,821**
02150 Membrane Liners	**1,080,000.00 sf**	**10,784.606**	**940,370**		**225,030**	**1,226,026**		**2.21 /sf**	**2,391,426**
02371 Geosynthetic Clay Liner (GCL)									
02371.50410 Geosynthetic Clay Liner (GCL)									
Geosynthetic Clay Liner (GCL)	120,000.00 sy	1,443.178	129,516	956,132	32,467	-	-	9.32 /sy	1,118,115
02371.50410 Geosynthetic Clay Liner (GCL)	**120,000.00 sy**	**1,443.178**	**129,516**	**956,132**	**32,467**			**9.32 /sy**	**1,118,115**
02371 Geosynthetic Clay Liner (GCL)	**120,000.00 sy**	**1,443.178**	**129,516**	**956,132**	**32,467**			**9.32 /sy**	**1,118,115**
03000 Equipment Pads									
03000.50440 Equipment Pads									
Concrete: Equipment Riser / Splash Pads	10.00 ea	59.170	5,475	5,518	687	-	-	1,168.04 /ea	11,680
Concrete: Building Foundation	12.00 cy	60.000	5,552	5,595	697	-	-	987.03 /cy	11,844
Concrete: Equipment Pad	3.00 cy	15.000	1,388	1,399	174	-	-	987.03 /cy	2,961
03000.50440 Equipment Pads	**1.00 ls**	**134.170**	**12,415**	**12,512**	**1,558**			**26,485.87 /ls**	**26,486**
03000 Equipment Pads	**1.00 ls**	**134.170**	**12,415**	**12,512**	**1,558**			**26,485.87 /ls**	**26,486**
11211 Centrifugal Pumps									
11211.50400 LCRS Pumps 5 GPM, 1 HP									
Horiz End Suction Centrifugal Pump Spare Parts	1.00 lot		-	1,138	-	-	-	1,137.50 /lot	1,138
Furnish Lubricants	25.00 gal		-	711	-	-	-	28.44 /gal	711
Pump Manuf.Rep.	2.00 day		-	-	-	-	3,413	1,706.25 /day	3,413
Unload/Protect Equip - Medium Equip	5.00 ea	20.000	1,585	-	401	-	-	397.22 /ea	1,986
Warehouse & Care Horiz End Suction Centrifugal Pumps	1.00 u/mo	2.000	163	-	-	-	-	163.46 /u/mo	163
Horiz End Suction Centrifugal Pump 1 HP	5.00 ea	30.000	2,452	8,531	-	-	-	2,196.65 /ea	10,983
Set VFD Control	5.00 ea	60.000	4,904	-	-	-	-	980.80 /ea	4,904
Grout Equip Base- Non Shrink, Non Metallic	13.00 cf	19.500	1,399	-	-	-	976	182.66 /cf	2,375
Test & Check Horiz Centrifugal Split Case Pumps	5.00 ea	40.000	3,269	-	-	-	-	653.87 /ea	3,269
Remove/Realign Drive Coupling to Bump Motor < 1-1/2"	5.00 ea	10.000	817	-	-	-	-	163.47 /ea	817
Install Equipment- RT Crane 80 MT	10.00 ch	10.000	987	-	1,625	-	-	261.21 /ch	2,612
SS Anchor Bolts/Sleeve 3/4" x 8"	20.00 ea	5.000	368	-	-	-	341	35.46 /ea	709
11211.50400 LCRS Pumps 5 GPM, 1 HP	**5.00 ea**	**196.500**	**15,945**	**10,380**	**2,026**		**4,730**	**6,616.04 /ea**	**33,080**
11211 Centrifugal Pumps	**5.00 ea**	**196.500**	**15,945**	**10,380**	**2,026**		**4,730**	**6,616.04 /ea**	**33,080**
11245 Mechanical Evaporators									
11245.50440 Evaporate 155,200 Gal per Day									
Evaporator Shore Anchoring	20.00 ea	37.647	3,091	2,555	-	-	-	282.32 /ea	5,646
Install Equipment- RT Crane 40 MT	40.00 ch	40.000	3,947	-	3,937	-	-	197.11 /ch	7,884
Equipment Manuf.Rep.	2.00 day		-	3,413	-	-	-	1,706.25 /day	3,413
Unload/Protect Equip - Medium Equip	3.00 ea	12.000	951	-	240	-	-	397.22 /ea	1,192
SMI 420F by SMI Evaporative Solutions; Quote daed 08/24/2017	21.00 ea	84.000	6,866	876,671	-	-	-	42,073.18 /ea	883,537
Prefabricated Building for Electrical Room 32'-10" x 10'	328.00 sf	8.000	625	155,037	-	0	0	474.58 /sf	155,663
11245.50440 Evaporate 155,200 Gal per Day	**20.00 ea**	**181.647**	**15,481**	**1,037,676**	**4,177**			**52,866.73 /ea**	**1,057,335**
11245 Mechanical Evaporators	**20.00 ea**	**181.647**	**15,481**	**1,037,676**	**4,177**			**52,866.73 /ea**	**1,057,335**
13420 I&C Instruments									
13420.21088 EVAPORATION PONDS									
Ultrasonic Level Instrument w/Transmitter LE/LIT	10.00 ea	80.000	6,255	44,713	-	-	1,278	5,224.49 /ea	52,245
Local Control Panel - Vendor supplied	4.00 ea	64.000	5,004		-	-		1,250.98 /ea	5,004
Position Switches ZS / ZSO	5.00 ea	10.000	782	1,916	-	-		539.62 /ea	2,698
13420.21088 EVAPORATION PONDS	**1.00 ls**	**154.000**	**12,041**	**46,629**			**1,278**	**59,946.89 /ls**	**59,947**
13420 I&C Instruments	**1.00 ls**	**154.000**	**12,041**	**46,629**			**1,278**	**59,946.89 /ls**	**59,947**
13700 Security Access & Survailence									
13700.21002 Security System									
Allowances for Security System	1.00 ls	30.000	2,346	7,665	-	1,500	-	11,510.58 /ls	11,511
13700.21002 Security System	**1.00 ls**	**30.000**	**2,346**	**7,665**		**1,500**		**11,510.58 /ls**	**11,511**
13700 Security Access & Survailence	**1.00 ls**	**30.000**	**2,346**	**7,665**		**1,500**		**11,510.58 /ls**	**11,511**
13850 Detection & Alarm									
13850.21002 Allowances for Fire alarm System									
Allowances for Fire alarm System	1.00 ls	40.000	3,127	5,749	-	0	-	8,876.19 /ls	8,876
13850.21002 Allowances for Fire alarm System	**1.00 ls**	**40.000**	**3,127**	**5,749**				**8,876.19 /ls**	**8,876**
13850 Detection & Alarm	**1.00 ls**	**40.000**	**3,127**	**5,749**				**8,876.19 /ls**	**8,876**
15116 Pinch Valve									
15110.00.040.10 PCHV for 4" dia. PVC Pipes									
Unload Care & Protect Valves	5.00 ea	0.400	33	-	-	-	57	17.96 /ea	90
Pinch Valve, EMO, flg, 4"	5.00 ea	16.000	1,317	14,219	-	-	-	3,107.07 /ea	15,535
15110.00.040.10 PCHV for 4" dia. PVC Pipes	**5.00 ea**	**16.400**	**1,349**	**14,219**			**57**	**3,125.02 /ea**	**15,625**

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15116 Pinch Valve	**5.00 ea**	**16.400**	**1,349**	**14,219**			**57**	**3,125.02 /ea**	**15,625**
15241 PVC Pipe & Fittings									
15241.00.040.10 PVC Pipes and Fittings									
Unload Care & Protect Pipe/Fittings	2,400.00 lf	0.792	58	-	11	-	-	0.03 /lf	69
Layout Pipe & Fitting	2,400.00 lf	24.000	1,975	-	-	-	-	0.82 /lf	1,975
PVC Schd. 80 Pipe, 4.00" Feed Pump	3,000.00 lf	300.000	24,686	38,664	-	-		21.12 /lf	63,349
PVC Sch 80. 90 Ell , 4.00" Feed Pump	16.00 ea	7.040	579	648	-	-	-	76.72 /ea	1,228
PVC Sch 80. Tee , 4.00" Feed Pump	8.00 ea	5.280	434	454	-	-	-	111.11 /ea	889
PVC Sch 80. Cap , 4.00" Feed Pump	2.00 ea	0.500	41	181	-	-	-	110.96 /ea	222
PVC Joint Primer- Quart	4.00 qrt		-	137	-	-	-	34.13 /qrt	137
PVC Solvent Cement Low VOC- Quart	4.00 qrt		-	159	-	-	-	39.81 /qrt	159
15241.00.040.10 PVC Pipes and Fittings	**2,400.00 lf**	**337.612**	**27,773**	**40,243**	**11**			**28.35 /lf**	**68,027**
15241.50400 Access Pipe for Monitoring LCRS and VZMS									
Layout & Stake Pipe Excavation	180.00 lf	0.900	84	23	-	-	-	0.59 /lf	107
Trenching- Backhoe/Loader 95HP Average Exc.	47.00 cy	3.133	308	-	235	-	-	11.55 /cy	543
Trench Fill -Backhoe/Loader C446 95HP	46.50 cy	9.300	811	-	278	-	-	23.41 /cy	1,088
3/8 Stone Bedding/Zone/Engineered Fill Material	46.50 cy		-	1,838	-	339	-	46.81 /cy	2,176
Load & Haul Trenching Spoils to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	0.50 cy	0.019	2	-	1	-	-	5.20 /cy	3
Pipe Detectable/Non-Detectable Tape	180.00 lf	0.900	74	13	-	-	-	0.48 /lf	87
Pipe Test	180.00 lf	9.000	838	184	-	-	-	5.68 /lf	1,022
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	0.50 cy	0.071	6	-	7	-	-	24.64 /cy	12
Unload Care & Protect Pipe/Fittings	180.00 lf	0.059	4	-	1	-	-	0.03 /lf	5
Layout Pipe & Fitting	180.00 lf	1.800	148	-	-	-	-	0.82 /lf	148
PVC Schd. 80 Pipe, 4.00"	180.00 lf	18.000	1,481	2,320	-	-		21.12 /lf	3,801
PVC Sch 80. 90 Ell , 4.00"	2.00 ea	0.880	72	81	-	-	-	76.73 /ea	153
PVC Joint Primer- Quart	0.28 qrt		-	10	-	-	-	34.10 /qrt	10
PVC Solvent Cement Low VOC- Quart	0.28 qrt		-	11	-	-	-	39.82 /qrt	11
15241.50400 Access Pipe for Monitoring LCRS and VZMS	**180.00 lf**	**44.063**	**3,828**	**4,479**	**521**	**339**		**50.93 /lf**	**9,167**
15241.50410 Access Pipe for Monitoring LCRS and VZMS									
Layout & Stake Pipe Excavation	2,100.00 lf	10.500	978	268	-	-	-	0.59 /lf	1,246
Trenching- Backhoe/Loader 95HP Average Exc.	583.00 cy	38.867	3,821	-	2,912	-	-	11.55 /cy	6,733
Trench Fill-Backhoe/Loader C446 95HP	568.00 cy	113.600	9,905	-	3,390	-	-	23.41 /cy	13,295
3/8 Stone Bedding/Zone/Engineered Fill Material	568.00 cy		-	22,451	-	4,135	-	46.81 /cy	26,586
Load & Haul Trenching Spoils to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	15.00 cy	0.568	46	-	32	-	-	5.19 /cy	78
Pipe Detectable/Non-Detectable Tape	2,100.00 lf	10.500	862	148	-	-	-	0.48 /lf	1,010
Pipe Test	2,100.00 lf	105.000	9,781	2,146	-	-	-	5.68 /lf	11,927
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	15.00 cy	2.143	166	-	204	-	-	24.64 /cy	370
Unload Care & Protect Pipe/Fittings	2,100.00 lf	0.693	50	-	10	-	-	0.03 /lf	60
Layout Pipe & Fitting	2,100.00 lf	21.000	1,728	-	-	-	-	0.82 /lf	1,728
PVC Schd. 80 Pipe, 6"	2,100.00 lf	294.000	24,192	51,764	-	-		36.17 /lf	75,956
PVC Sch 80. 90 Ell , 6"	20.00 ea	16.000	1,317	2,306	-	-	-	181.15 /ea	3,623
PVC Joint Primer- Quart	12.00 qrt		-	410	-	-	-	34.13 /qrt	410
PVC Solvent Cement Low VOC- Quart	12.00 qrt		-	478	-	-	-	39.81 /qrt	478
15241.50410 Access Pipe for Monitoring LCRS and VZMS	**2,100.00 lf**	**612.871**	**52,846**	**79,971**	**6,547**	**4,135**		**68.33 /lf**	**143,499**
15241.50420 Access Pipe for Monitoring LCRS and VZMS									
Layout & Stake Pipe Excavation	120.00 lf	0.600	56	15	-	-	-	0.59 /lf	71
Trenching- Backhoe/Loader 95HP Average Exc.	40.00 cy	2.667	262	-	200	-	-	11.55 /cy	462
Trench Fill -Backhoe/Loader C446 95HP	36.00 cy	7.200	628	-	215	-	-	23.41 /cy	843
3/8 Stone Bedding/Zone/Engineered Fill Material	36.00 cy		-	1,423	-	262	-	46.81 /cy	1,685
Load & Haul Trenching Spoils to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	4.00 cy	0.152	12	-	9	-	-	5.19 /cy	21
Pipe Detectable/Non-Detectable Tape	120.00 lf	0.600	49	8	-	-	-	0.48 /lf	58
Pipe Test	120.00 lf	6.000	559	123	-	-	-	5.68 /lf	682
Haul Spoils/Off Site 18cy Rear Dump 2.00 Hour/Load	4.00 cy	0.571	44	-	54	-	-	24.64 /cy	99
Unload Care & Protect Pipe/Fittings	120.00 lf	0.040	3	-	1	-	-	0.03 /lf	3
Layout Pipe & Fitting	120.00 lf	1.200	99	-	-	-	-	0.82 /lf	99
PVC Schd. 80 Pipe, 12"	120.00 lf	36.000	2,962	9,272	-	-		101.96 /lf	12,235
PVC Sch 80. 90 Ell , 12"	3.00 ea	8.940	736	5,563	-	-	-	2,099.48 /ea	6,298
PVC Joint Primer- Quart	7.00 qrt		-	239	-	-	-	34.12 /qrt	239
PVC Solvent Cement Low VOC- Quart	7.00 qrt		-	279	-	-	-	39.81 /qrt	279
15241.50420 Access Pipe for Monitoring LCRS and VZMS	**120.00 lf**	**63.970**	**5,410**	**16,922**	**478**	**262**		**192.27 /lf**	**23,072**
15241 PVC Pipe & Fittings	**4,800.00 lf**	**1,058.515**	**89,858**	**141,615**	**7,558**	**4,736**		**50.78 /lf**	**243,766**
16060 Grounding & Lightning Protection									
16060.21008 Grounding system- Process Building									
4/0 Bare Copper Grounding Conductors -Buried Outdoors	100.00 lf	3.500	274	436	-	-	-	7.10 /lf	710
3/4" x 10'- Copper Ground Rod w/Clamp	4.00 ea	6.400	500	138	-	-	-	159.59 /ea	638
14 x 23 -Ground Rod Inspection Well	1.00 ea	3.000	235	543	-	-	-	777.44 /ea	777
1/4" x 4" x 36" Ground Bus Assembly	2.00 ea	5.000	391	192	-	-	-	291.28 /ea	583
4/0 Conductor to Steel - Cadweld	1.00 ea	1.500	117	128	-	-	-	245.03 /ea	245
#4/0 Cadweld To Ground Rod	1.00 ea	1.400	109	96	-	-	-	205.27 /ea	205

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
16060.21008 Grounding system- Process Building	**100.00 lf**	**20.800**	**1,626**	**1,532**				**31.59 /lf**	**3,158**
16060 Grounding & Lightning Protection	**100.00 lf**	**20.800**	**1,626**	**1,532**				**31.59 /lf**	**3,158**
16130 Feeders									
16130.21004 Allowances for Conduits and conductors									
Allowances for Conduits and conductors For Power system Assumed (74 FeederX200' Ava.X $9/lf)	1.00 ls	543.330	42,481	124,939	-	-	-	167,419.47 /ls	167,419
Allowances for Conduits and conductors Controls System Assumed (56 FeederX200' Ava.X $9/lf)	1.00 ls	411.168	32,148	94,548	-	-	-	126,695.77 /ls	126,696
Allowances for Conduits and conductors panel PNBD-6 Assumed (30 FeederX50' Ava.X $9/lf)	1.00 ls	55.067	4,305	12,663	-	-	-	16,968.18 /ls	16,968
16130.21004 Allowances for Conduits and conductors	**1.00 ls**	**1,009.565**	**78,934**	**232,150**				**311,083.42 /ls**	**311,083**
16130 Feeders	**1.00 ls**	**1,009.565**	**78,934**	**232,150**				**311,083.42 /ls**	**311,083**
16140 Devices									
16140.21002 Lighting Switches / Recepatcles / Control Stations									
Lighting Switches / Recepatcles / Control Stations	1.00 ls	14.799	1,157	1,579	-	-	-	2,735.74 /ls	2,736
16140.21002 Lighting Switches / Recepatcles / Control Stations	**1.00 ls**	**14.799**	**1,157**	**1,579**				**2,735.74 /ls**	**2,736**
16140 Devices	**1.00 ls**	**14.799**	**1,157**	**1,579**				**2,735.74 /ls**	**2,736**
16270 Transformers									
16270.21004 Low Voltage Transformers									
30 KVA-Indoor, 3P, 480V Transformer -K13 Rated	1.00 ea	9.000	704	8,692	-	-	-	9,396.04 /ea	9,396
16270.21004 Low Voltage Transformers	**1.00 ea**	**9.000**	**704**	**8,692**				**9,396.04 /ea**	**9,396**
16270 Transformers	**1.00 ea**	**9.000**	**704**	**8,692**				**9,396.04 /ea**	**9,396**
16410 Free Standing Switches and Breakers									
16410.21002 Disconnect switches									
30 Amp-Disconnect Safety Switches - Nonfused 3-Pole NEMA 1	14.00 ea	28.000	2,189	1,479	-	-	-	262.01 /ea	3,668
60 Amp-Disconnect Safety Switches - Nonfused 3-Pole NEMA 1	13.00 ea	39.000	3,049	2,397	-	-	-	418.94 /ea	5,446
16410.21002 Disconnect switches	**27.00 ea**	**67.000**	**5,238**	**3,876**				**337.57 /ea**	**9,114**
16410 Free Standing Switches and Breakers	**27.00 ea**	**67.000**	**5,238**	**3,876**				**337.57 /ea**	**9,114**
16430 Low Voltage Switchboards									
16430.21004 Main Switchboard code MSBD-3									
1600AT/16000AF Power Break Circuit Breaker 3 pole -Drawout type	1.00 ea			43,864	-	-	-	43,864.24 /ea	43,864
800AT/ 800AF Power Break Circuit Breaker 3 pole -Drawout type	1.00 ea			34,117	-	-	-	34,116.92 /ea	34,117
Sheet Metal Enclosure / Copper Bus Bars	4.00 ea			20,466	-	-	-	5,116.39 /ea	20,466
Installation at Site	1.00 ea	20.000	1,564		1,278	-	-	2,841.22 /ea	2,841
Metering device w/ Current and Potential Transformers	1.00 set			12,136	-	-	-	12,136.25 /set	12,136
Control PLC / Relays	1.00 ea			5,685	-	-	-	5,684.87 /ea	5,685
400AT/ 400AF Power Break Circuit Breaker 3 pole -Drawout type	3.00 ea			47,906	-	-	-	15,968.75 /ea	47,906
Digital Circuit Meter w/-sag/swell Detection- (includes I/O card, ethernet card, LCD & 12' cable)	1.00 ea			7,729	-	-	-	7,728.88 /ea	7,729
16430.21004 Main Switchboard code MSBD-3	**1.00 ls**	**20.000**	**1,564**	**171,903**	**1,278**			**174,744.18 /ls**	**174,744**
16430 Low Voltage Switchboards	**1.00 ls**	**20.000**	**1,564**	**171,903**	**1,278**			**174,744.18 /ls**	**174,744**
16435 Low Voltage Motor Control Center									
16435.21006 Motor Control Center code MCC-5									
100AT/100AF Circuit Breaker , 3pole	27.00 ea			32,368	-	-	-	1,198.81 /ea	32,368
Power quality Meter	1.00 ea			2,555	-	-	-	2,555.00 /ea	2,555
Current Transformers / Potential Transformers	6.00 ea			9,198	-	-	-	1,533.00 /ea	9,198
Installation MCC at site	1.00 ea	60.000	4,691		1,278	-	-	5,968.66 /ea	5,969
Motor Control Center (MCC) 5- Section	3.00 ea			80,483	-	-	-	26,827.50 /ea	80,483
NEMA 1-Motor Starters Mounted in MCC's Single Speed Non-Reversing 3-Pole	13.00 ea			11,982	-	-	-	921.69 /ea	11,982
NEMA 3-Motor Starters Mounted in MCC's Single Speed Non-Reversing 3-Pole	13.00 ea			35,715	-	-	-	2,747.28 /ea	35,715
800A Circuit Breaker 3 pole	1.00 ea			10,859	-	-	-	10,858.75 /ea	10,859
16435.21006 Motor Control Center code MCC-5	**1.00 ls**	**60.000**	**4,691**	**183,159**	**1,278**			**189,127.19 /ls**	**189,127**
16435 Low Voltage Motor Control Center	**1.00 ls**	**60.000**	**4,691**	**183,159**	**1,278**			**189,127.19 /ls**	**189,127**
16438 Low voltage Panel Boards									
16438.21002 Low voltage Panel Boards									
36 Circuit-3PH 240v MCB Panelboard-Surface Mounted-100a	1.00 ea	3.000	235	4,000	-	-	-	4,234.41 /ea	4,234
16438.21002 Low voltage Panel Boards	**1.00 ea**	**3.000**	**235**	**4,000**				**4,234.41 /ea**	**4,234**
16438 Low voltage Panel Boards		**3.000**	**235**	**4,000**					**4,234**
16510 Interior Lighting									
16510.21004 Allowances for lighting Brine Pond Control Building									
Allowances for lighting Brine Pond Control Building	1.00 ls	20.000	1,564	6,388	-	0	-	7,951.22 /ls	7,951
16510.21004 Allowances for lighting Brine Pond Control Building	**1.00 ls**	**20.000**	**1,564**	**6,388**				**7,951.22 /ls**	**7,951**
16510 Interior Lighting		**20.000**	**1,564**	**6,388**					**7,951**
040 Brine Pond	**1,313,185.00 sf**	**15,263.180**	**1,318,161**	**2,845,854**	**275,371**	**1,232,262**	**6,064**	**4.32 /sf**	**5,677,712**
002 Contract No. 2 - Brine Ponds	**1,313,185.00 sf**	**31,836.927**	**2,804,615**	**2,865,353**	**2,048,119**	**1,329,252**	**20,341**	**6.91 /sf**	**9,067,681**

CDM Smith

Eastern Municipal Water District

IPR Project - Brine Ponds Contract - Phase I

OPCC - Pump Optional Item - 30% Design - February 2018

Project name	Indirect Potable Reuse San Jacinto CA Riverside
Estimator	RM, NC, SY
Labor rate table	CA17 Riverside
Equipment rate table	00 17 Equip Rate BF
Bid date	3/30/2018 5:00 PM
Notes	Opinion of Probable Construction Cost (OPCC) This is an Opinion of Probable Construction Cost only, as defined by the documents provided at the level of design indicated above. CDM has no control over the cost of labor, materials, equipment, or services furnished, over schedules, over contractor's methods of determining prices, competitive bidding, market conditions or negotiating terms. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids. There are not any costs provided for: Change Orders, Design Engineering, Construction Oversight, Client Costs, Finance or Funding Costs, Legal Fees, Land Acquisition or temporary/permanent Easements, Operations, or any other costs associated with this project that are not specifically part of the bidding contractor's proposed scope. Clarifications: 1. This OPCC is for Phase I only based on 30% Design Submittal. Phase II is excluded 2. AACE Class 3 Estimate, Engineering from 10% to 40% complete, -10% to -20% on the low side, and +10% to +30% on the high side 3. Contingency at 20% 4. Escalation at midpoint of construction - Not in Cost
Report format	Sorted by 'Bid Item/Area/95CSI Sctn/Element' 'Detail' summary Allocate addons

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
002 Contract No. 2 - Brine Ponds									
100 Optional Items									
11217 Submersible Pumps									
11217.50400 Transfer Pumps 1,000 GPM, 30 HP									
Sump Pump Spare Parts	1.00 lot	2.000	163	1,706	-	-	-	1,869.71 /lot	1,870
Furnish Lubricants	25.00 gal		-	-	-	-	1,422	56.88 /gal	1,422
Pump Manuf.Rep.	1.00 day		-	1,706	-	-	-	1,706.25 /day	1,706
Unload/Protect Equip - Medium Equip	5.00 ea	20.000	1,585	-	401	-	-	397.22 /ea	1,986
Warehouse/Care Submersible Sump Pumps	5.00 u/mo	10.000	817	-	-	-	-	163.47 /u/mo	817
Sump Pump 30 HP	5.00 ea	36.000	3,061	39,812	975	-	-	8,769.66 /ea	43,848
Install Guide Rails	5.00 ea	10.000	817	-	-	-	-	163.47 /ea	817
Install Base Elbow	5.00 ea	10.000	817	-	-	-	-	163.47 /ea	817
Grout Equip Base- Non Shrink, Non Metallic	13.00 cf	19.500	1,399	-	-	-	976	182.66 /cf	2,375
Test & Check	5.00 ea	40.000	3,269	-	-	-	-	653.87 /ea	3,269
Install Equipment- RT Crane 80 MT	9.00 ch	9.000	888	-	1,463	-	-	261.21 /ch	2,351
SS Anchor Bolts/Sleeve 3/4" x 8"	20.00 ea	5.000	368	-	-	-	341	35.46 /ea	709
11217.50400 Transfer Pumps 1,000 GPM, 30 HP	**5.00 ea**	**161.500**	**13,186**	**43,225**	**2,839**		**2,739**	**12,397.62 /ea**	**61,988**
11217 Submersible Pumps	**3.00 ea**	**161.500**	**13,186**	**43,225**	**2,839**		**2,739**	**20,662.71 /ea**	**61,988**
15114 Check Valves									
15114.00.040.10 Check Valve for 8" HDPE									
Unload Care & Protect Check Valves	5.00 ea	0.400	33	-	-	-	57	17.96 /ea	90
Check Valve, Ball, Flg, 8"	5.00 ea	28.100	2,312	9,384	-	-	-	2,339.32 /ea	11,697
15114.00.040.10 Check Valve for 8" HDPE	**5.00 ea**	**28.500**	**2,345**	**9,384**			**57**	**2,357.28 /ea**	**11,786**
15114 Check Valves	**5.00 ea**	**28.500**	**2,345**	**9,384**			**57**	**2,357.28 /ea**	**11,786**
15116 Pinch Valve									
15116.040.20 PCHV for 8" HDPE Pipes									
Unload Care & Protect Valves	10.00 ea	0.800	66	-	-	-	114	17.96 /ea	180
Pinch Valve, Handwheel Oper, Flange, 8"	10.00 ea	33.000	2,715	28,438	-	-	-	3,115.29 /ea	31,153
15116.040.20 PCHV for 8" HDPE Pipes	**10.00 ea**	**33.800**	**2,781**	**28,438**			**114**	**3,133.25 /ea**	**31,333**
15116 Pinch Valve	**10.00 ea**	**33.800**	**2,781**	**28,438**			**114**	**3,133.25 /ea**	**31,333**
15245 Polyethylene Pipe									
15245.00.040.10 HDPE Pipes and Fittings Transfer Pipe									
Unload Care & Protect HDPE Pipe & Fittings	3,100.00 lf	1.023	74	-	15	-	-	0.03 /lf	89
Layout HDPE Pipe & Fitting	3,100.00 lf	31.000	2,551	-	-	-	-	0.82 /lf	2,551
Plastic Pipe Equipment- Cat 320 Excavator	65.00 ch	65.000	5,765	-	5,857	-	-	178.80 /ch	11,622
HDPE IPS, Butt-Fused Pipe, DR 13.5, 8" Transfer Pipe	3,100.00 lf	465.000	38,263	29,621	-	-		21.90 /lf	67,883
HDPE IPS, Butt-Fused, 90 Bnd, DR 13.5, 8" Transfer Pipe	13.00 ea	42.770	3,519	1,288	-	-		369.81 /ea	4,807
HDPE IPS, Butt-Fused Tee, DR 13.5, 8" Transfer Pipe	17.00 ea	82.110	6,756	3,685	-	-		614.21 /ea	10,442
HDPE IPS, Butt-Fused Cap, DR 13.5, 8" Transfer Pipe	3.00 ea	6.270	516	67	-	-		194.16 /ea	582
Mileage & Per Diem for Tech	2.00 trip		-	-	-	900	683	791.25 /trip	1,583
HDPE Fusion Machine & Tech 2"- 8" Transfer Pipe	8.00 day		-	-	1,820	3,200	-	627.50 /day	5,020
15245.00.040.10 HDPE Pipes and Fittings Transfer Pipe	**3,100.00 lf**	**693.173**	**57,445**	**34,660**	**7,691**	**4,100**	**683**	**33.74 /lf**	**104,579**
15245 Polyethylene Pipe	**3,100.00 lf**	**693.173**	**57,445**	**34,660**	**7,691**	**4,100**	**683**	**33.74 /lf**	**104,579**
100 Optional Items	**1.00 ls**	**916.973**	**75,757**	**115,707**	**10,530**	**4,100**	**3,592**	**209,686.35 /ls**	**209,686**
002 Contract No. 2 - Brine Ponds	**1,313,185.00 sf**	**916.973**	**75,757**	**115,707**	**10,530**	**4,100**	**3,592**	**0.16 /sf**	**209,686**

OPCC - Pond A Optional Item - 30% Design - February 2018

Project name	Indirect Potable Reuse San Jacinto CA Riverside
Estimator	RM, NC, SY
Labor rate table	CA17 Riverside
Equipment rate table	00 17 Equip Rate BF
Bid date	3/30/2018 5:00 PM
Notes	Opinion of Probable Construction Cost (OPCC) This is an Opinion of Probable Construction Cost only, as defined by the documents provided at the level of design indicated above. CDM has no control over the cost of labor, materials, equipment, or services furnished, over schedules, over contractor's methods of determining prices, competitive bidding, market conditions or negotiating terms. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids. There are not any costs provided for: Change Orders, Design Engineering, Construction Oversight, Client Costs, Finance or Funding Costs, Legal Fees, Land Acquisition or temporary/permanent Easements, Operations, or any other costs associated with this project that are not specifically part of the bidding contractor's proposed scope. Clarifications: 1. This OPCC is for Phase I only based on 30% Design Submittal. Phase II is excluded 2. AACE Class 3 Estimate, Engineering from 10% to 40% complete, -10% to -20% on the low side, and +10% to +30% on the high side 3. Contingency at 20% 4. Escalation at midpoint of construction - Not in Cost
Report format	Sorted by 'Bid Item/Area/95CSI Sctn/Element' 'Detail' summary Allocate addons

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
002 Contract No. 2 - Brine Ponds									
200 Optional Items									
02340 Soil Cement Pond Liner									
02340.50400 Pond A									
Mobilize/Demobilize Soil Stabilization Crew	1.00 ea		-	-	-	5,650	-	5,650.00 /ea	5,650
9" Roller Compacted Concrete on Top of Geotextile Liner	13,400.00 sy	922.944	82,361	-	120,671	-	-	15.15 /sy	203,032
Cement Material	201.00 ton		-	43,524	-	-	-	216.54 /ton	43,524
02340.50400 Pond A	**13,400.00 sy**	**922.944**	**82,361**	**43,524**	**120,671**	**5,650**		**18.82 /sy**	**252,206**
02340 Soil Cement Pond Liner	**13,400.00 sy**	**922.944**	**82,361**	**43,524**	**120,671**	**5,650**		**18.82 /sy**	**252,206**
02370 Geotextile Fabric Pond Liner									
02370.50400A Pond A									
20 oz Non-Woven Geotextile Fabric Between Primary HDPE Liner and Concete Layer	13,400.00 sy	181.081	15,762	16,477	2,716	-	-	2.61 /sy	34,954
02370.50400A Pond A	**13,400.00 sy**	**181.081**	**15,762**	**16,477**	**2,716**			**2.61 /sy**	**34,954**
02370 Geotextile Fabric Pond Liner	**13,400.00 sy**	**181.081**	**15,762**	**16,477**	**2,716**			**2.61 /sy**	**34,954**
200 Optional Items		**1,104.025**	**98,123**	**60,000**	**123,387**	**5,650**			**287,160**
002 Contract No. 2 - Brine Ponds		**1,104.025**	**98,123**	**60,000**	**123,387**	**5,650**			**287,160**

CDM Smith

Eastern Municipal Water District
IPR Project - Brine Ponds Contract - Phase I

OPCC - Pond B Optional Item - 30% Design - February 2018

Project name	Indirect Potable Reuse San Jacinto CA Riverside
Estimator	RM, NC, SY
Labor rate table	CA17 Riverside
Equipment rate table	00 17 Equip Rate BF
Bid date	3/30/2018 5:00 PM
Notes	Opinion of Probable Construction Cost (OPCC) This is an Opinion of Probable Construction Cost only, as defined by the documents provided at the level of design indicated above. CDM has no control over the cost of labor, materials, equipment, or services furnished, over schedules, over contractor's methods of determining prices, competitive bidding, market conditions or negotiating terms. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids. There are not any costs provided for: Change Orders, Design Engineering, Construction Oversight, Client Costs, Finance or Funding Costs, Legal Fees, Land Acquisition or temporary/permanent Easements, Operations, or any other costs associated with this project that are not specifically part of the bidding contractor's proposed scope. Clarifications: 1. This OPCC is for Phase I only based on 30% Design Submittal. Phase II is excluded 2. AACE Class 3 Estimate, Engineering from 10% to 40% complete, -10% to -20% on the low side, and +10% to +30% on the high side 3. Contingency at 20% 4. Escalation at midpoint of construction - Not in Cost
Report format	Sorted by 'Bid Item/Area/95CSI Sctn/Element' 'Detail' summary Allocate addons

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
002 Contract No. 2 - Brine Ponds									
300 Optional Items									
02370 Geotextile Fabric Pond Liner									
02370.50400A Pond B									
9" Roller Compacted Concrete on Top of Geotextile Liner	22,200.00 sy	1,529.057	136,448	-	199,918	-	-	15.15 /sy	336,366
Cement Material	333.00 ton		-	72,107	-	-	-	216.54 /ton	72,107
02370.50400A Pond B		**1,529.057**	**136,448**	**72,107**	**199,918**			**/sy**	**408,473**
02370.50400B Pond B									
20 oz Non-Woven Geotextile Fabric Between Primary HDPE Liner and Concete Layer	22,200.00 sy	300.000	26,113	27,297	4,499	-	-	2.61 /sy	57,909
02370.50400B Pond B	**22,200.00 sy**	**300.000**	**26,113**	**27,297**	**4,499**			**2.61 /sy**	**57,909**
02370 Geotextile Fabric Pond Liner	**22,200.00 sy**	**1,829.057**	**162,561**	**99,404**	**204,417**			**21.01 /sy**	**466,382**
300 Optional Items		**1,829.057**	**162,561**	**99,404**	**204,417**				**466,382**
002 Contract No. 2 - Brine Ponds		**1,829.057**	**162,561**	**99,404**	**204,417**				**466,382**

OPCC - Pond C Optional Item - 30% Design - February 2018

Project name	Indirect Potable Reuse San Jacinto CA Riverside
Estimator	RM, NC, SY
Labor rate table	CA17 Riverside
Equipment rate table	00 17 Equip Rate BF
Bid date	3/30/2018 5:00 PM
Notes	Opinion of Probable Construction Cost (OPCC) This is an Opinion of Probable Construction Cost only, as defined by the documents provided at the level of design indicated above. CDM has no control over the cost of labor, materials, equipment, or services furnished, over schedules, over contractor's methods of determining prices, competitive bidding, market conditions or negotiating terms. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids. There are not any costs provided for: Change Orders, Design Engineering, Construction Oversight, Client Costs, Finance or Funding Costs, Legal Fees, Land Acquisition or temporary/permanent Easements, Operations, or any other costs associated with this project that are not specifically part of the bidding contractor's proposed scope. Clarifications: 1. This OPCC is for Phase I only based on 30% Design Submittal. Phase II is excluded 2. AACE Class 3 Estimate, Engineering from 10% to 40% complete, -10% to -20% on the low side, and +10% to +30% on the high side 3. Contingency at 20% 4. Escalation at midpoint of construction - Not in Cost
Report format	Sorted by 'Bid Item/Area/95CSI Sctn/Element' 'Detail' summary Allocate addons

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
002 Contract No. 2 - Brine Ponds									
400 Optional Items									
02340 Soil Cement Pond Liner									
02340.50400B Pond C									
9" Roller Compacted Concrete on Top of Geotextile Liner	10,300.00 sy	709.427	63,307	-	92,755	-	-	15.15 /sy	156,062
Cement Material	155.00 ton		-	33,563	-	-	-	216.54 /ton	33,563
02340.50400B Pond C	**10,300.00 sy**	**709.427**	**63,307**	**33,563**	**92,755**			**18.41 /sy**	**189,625**
02340 Soil Cement Pond Liner	**10,300.00 sy**	**709.427**	**63,307**	**33,563**	**92,755**			**18.41 /sy**	**189,625**
02370 Geotextile Fabric Pond Liner									
02370.50400C Pond C									
20 oz Non-Woven Geotextile Fabric Between Primary HDPE Liner and Concete Layer	10,300.00 sy	139.189	12,115	12,665	2,088	-	-	2.61 /sy	26,868
02370.50400C Pond C	**10,300.00 sy**	**139.189**	**12,115**	**12,665**	**2,088**			**2.61 /sy**	**26,868**
02370 Geotextile Fabric Pond Liner	**10,300.00 sy**	**139.189**	**12,115**	**12,665**	**2,088**			**2.61 /sy**	**26,868**
400 Optional Items		**848.616**	**75,423**	**46,228**	**94,842**				**216,493**
002 Contract No. 2 - Brine Ponds		**848.616**	**75,423**	**46,228**	**94,842**				**216,493**

CDM Smith

Eastern Municipal Water District
IPR Project - Brine Ponds Contract - Phase I

OPCC - Pond D Optional Item - 30% Design - February 2018

Project name	Indirect Potable Reuse San Jacinto CA Riverside
Estimator	RM, NC, SY
Labor rate table	CA17 Riverside
Equipment rate table	00 17 Equip Rate BF
Bid date	3/30/2018 5:00 PM
Notes	Opinion of Probable Construction Cost (OPCC) This is an Opinion of Probable Construction Cost only, as defined by the documents provided at the level of design indicated above. CDM has no control over the cost of labor, materials, equipment, or services furnished, over schedules, over contractor's methods of determining prices, competitive bidding, market conditions or negotiating terms. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids. There are not any costs provided for: Change Orders, Design Engineering, Construction Oversight, Client Costs, Finance or Funding Costs, Legal Fees, Land Acquisition or temporary/permanent Easements, Operations, or any other costs associated with this project that are not specifically part of the bidding contractor's proposed scope. Clarifications: 1. This OPCC is for Phase I only based on 30% Design Submittal. Phase II is excluded 2. AACE Class 3 Estimate, Engineering from 10% to 40% complete, -10% to -20% on the low side, and +10% to +30% on the high side 3. Contingency at 20% 4. Escalation at midpoint of construction - Not in Cost
Report format	Sorted by 'Bid Item/Area/95CSI Sctn/Element' 'Detail' summary Allocate addons

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
002 Contract No. 2 - Brine Ponds									
500 Optional Items									
02340 Soil Cement Pond Liner									
02340.50400C Pond D									
9" Roller Compacted Concrete on Top of Geotextile Liner	20,500.00 sy	1,411.967	126,000	-	184,609	-	-	15.15 /sy	310,608
Cement Material	308.00 ton		-	66,693	-	-	-	216.54 /ton	66,693
02340.50400C Pond D	**20,500.00 sy**	**1,411.967**	**126,000**	**66,693**	**184,609**			**18.41 /sy**	**377,302**
02340 Soil Cement Pond Liner	**20,500.00 sy**	**1,411.967**	**126,000**	**66,693**	**184,609**			**18.41 /sy**	**377,302**
02370 Geotextile Fabric Pond Liner									
02370.50400D Pond D									
20 oz Non-Woven Geotextile Fabric Between Primary HDPE Liner and Concete Layer	20,500.00 sy	277.027	24,113	25,207	4,155	-	-	2.61 /sy	53,475
02370.50400D Pond D	**20,500.00 sy**	**277.027**	**24,113**	**25,207**	**4,155**			**2.61 /sy**	**53,475**
02370 Geotextile Fabric Pond Liner	**20,500.00 sy**	**277.027**	**24,113**	**25,207**	**4,155**			**2.61 /sy**	**53,475**
500 Optional Items		**1,688.994**	**150,113**	**91,900**	**188,764**				**430,776**
002 Contract No. 2 - Brine Ponds		**1,688.994**	**150,113**	**91,900**	**188,764**				**430,776**

OPCC - Pond E Optional Item - 30% Design - February 2018

Project name	Indirect Potable Reuse San Jacinto CA Riverside
Estimator	RM, NC, SY
Labor rate table	CA17 Riverside
Equipment rate table	00 17 Equip Rate BF
Bid date	3/30/2018 5:00 PM
Notes	Opinion of Probable Construction Cost (OPCC) This is an Opinion of Probable Construction Cost only, as defined by the documents provided at the level of design indicated above. CDM has no control over the cost of labor, materials, equipment, or services furnished, over schedules, over contractor's methods of determining prices, competitive bidding, market conditions or negotiating terms. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids. There are not any costs provided for: Change Orders, Design Engineering, Construction Oversight, Client Costs, Finance or Funding Costs, Legal Fees, Land Acquisition or temporary/permanent Easements, Operations, or any other costs associated with this project that are not specifically part of the bidding contractor's proposed scope. Clarifications: 1. This OPCC is for Phase I only based on 30% Design Submittal. Phase II is excluded 2. AACE Class 3 Estimate, Engineering from 10% to 40% complete, -10% to -20% on the low side, and +10% to +30% on the high side 3. Contingency at 20% 4. Escalation at midpoint of construction - Not in Cost
Report format	Sorted by 'Bid Item/Area/95CSI Sctn/Element' 'Detail' summary Allocate addons

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
002 Contract No. 2 - Brine Ponds									
600 Optional Items									
02340 Soil Cement Pond Liner									
02340.50400D Pond E									
9" Roller Compacted Concrete on Top of Geotextile Liner	26,100.00 sy	1,797.675	160,419	-	235,038	-	-	15.15 /sy	395,457
Cement Material	392.00 ton		-	84,882	-	-	-	216.54 /ton	84,882
02340.50400D Pond E	**26,100.00 sy**	**1,797.675**	**160,419**	**84,882**	**235,038**			**18.40 /sy**	**480,340**
02340 Soil Cement Pond Liner	**26,100.00 sy**	**1,797.675**	**160,419**	**84,882**	**235,038**			**18.40 /sy**	**480,340**
02370 Geotextile Fabric Pond Liner									
02370.50400E Pond E									
20 oz Non-Woven Geotextile Fabric Between Primary HDPE Liner and Concete Layer	26,100.00 sy	352.703	30,700	32,092	5,290	-	-	2.61 /sy	68,082
02370.50400E Pond E	**26,100.00 sy**	**352.703**	**30,700**	**32,092**	**5,290**			**2.61 /sy**	**68,082**
02370 Geotextile Fabric Pond Liner	**26,100.00 sy**	**352.703**	**30,700**	**32,092**	**5,290**			**2.61 /sy**	**68,082**
600 Optional Items		**2,150.378**	**191,119**	**116,975**	**240,328**				**548,422**
002 Contract No. 2 - Brine Ponds		**2,150.378**	**191,119**	**116,975**	**240,328**				**548,422**

OPCC - Inside Access Roads Optional Item - 30% Design - February 2018

Project name	Indirect Potable Reuse San Jacinto CA Riverside
Estimator	RM, NC, SY
Labor rate table	CA17 Riverside
Equipment rate table	00 17 Equip Rate BF
Bid date	3/30/2018 5:00 PM
Notes	Opinion of Probable Construction Cost (OPCC) This is an Opinion of Probable Construction Cost only, as defined by the documents provided at the level of design indicated above. CDM has no control over the cost of labor, materials, equipment, or services furnished, over schedules, over contractor's methods of determining prices, competitive bidding, market conditions or negotiating terms. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids. There are not any costs provided for: Change Orders, Design Engineering, Construction Oversight, Client Costs, Finance or Funding Costs, Legal Fees, Land Acquisition or temporary/permanent Easements, Operations, or any other costs associated with this project that are not specifically part of the bidding contractor's proposed scope. Clarifications: 1. This OPCC is for Phase I only based on 30% Design Submittal. Phase II is excluded 2. AACE Class 3 Estimate, Engineering from 10% to 40% complete, -10% to -20% on the low side, and +10% to +30% on the high side 3. Contingency at 20% 4. Escalation at midpoint of construction - Not in Cost
Report format	Sorted by 'Bid Item/Area/95CSI Sctn/Element' 'Detail' summary Allocate addons

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
002 Contract No. 2 - Brine Ponds									
700 Optional Items									
02340 Soil Cement Pond Liner									
02340.50400E Inside Access Roads and Berms									
9" Roller Compacted Concrete on Top of Geotextile Liner	7,700.00 sy	530.349	47,327	-	69,341	-	-	15.15 /sy	116,668
Cement Material	116.00 ton		-	25,118	-	-	-	216.54 /ton	25,118
02340.50400E Inside Access Roads and Berms	**7,700.00 sy**	**530.349**	**47,327**	**25,118**	**69,341**			**18.41 /sy**	**141,786**
02340 Soil Cement Pond Liner	**7,700.00 sy**	**530.349**	**47,327**	**25,118**	**69,341**			**18.41 /sy**	**141,786**
02370 Geotextile Fabric Pond Liner									
02370.50400F Inside Access Roads and Berms									
20 oz Non-Woven Geotextile Fabric Between Primary HDPE Liner and Concete Layer	7,700.00 sy	104.054	9,057	9,468	1,561	-	-	2.61 /sy	20,086
02370.50400F Inside Access Roads and Berms	**7,700.00 sy**	**104.054**	**9,057**	**9,468**	**1,561**			**2.61 /sy**	**20,086**
02370 Geotextile Fabric Pond Liner	**7,700.00 sy**	**104.054**	**9,057**	**9,468**	**1,561**			**2.61 /sy**	**20,086**
700 Optional Items		**634.403**	**56,384**	**34,586**	**70,901**				**161,871**
002 Contract No. 2 - Brine Ponds		**634.403**	**56,384**	**34,586**	**70,901**				**161,871**

CDM Smith

Eastern Municipal Water District
IPR Project - Brine Ponds Contract - Phase I

OPCC - Outside Access Road Optional Item - 30% Design - February 2018

Project name	Indirect Potable Reuse San Jacinto CA Riverside
Estimator	RM, NC, SY
Labor rate table	CA17 Riverside
Equipment rate table	00 17 Equip Rate BF
Bid date	3/30/2018 5:00 PM
Notes	Opinion of Probable Construction Cost (OPCC) This is an Opinion of Probable Construction Cost only, as defined by the documents provided at the level of design indicated above. CDM has no control over the cost of labor, materials, equipment, or services furnished, over schedules, over contractor's methods of determining prices, competitive bidding, market conditions or negotiating terms. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids. There are not any costs provided for: Change Orders, Design Engineering, Construction Oversight, Client Costs, Finance or Funding Costs, Legal Fees, Land Acquisition or temporary/permanent Easements, Operations, or any other costs associated with this project that are not specifically part of the bidding contractor's proposed scope. Clarifications: 1. This OPCC is for Phase I only based on 30% Design Submittal. Phase II is excluded 2. AACE Class 3 Estimate, Engineering from 10% to 40% complete, -10% to -20% on the low side, and +10% to +30% on the high side 3. Contingency at 20% 4. Escalation at midpoint of construction - Not in Cost
Report format	Sorted by 'Bid Item/Area/95CSI Sctn/Element' 'Detail' summary Allocate addons

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
002 Contract No. 2 - Brine Ponds									
800 Optional Items									
02340 Soil Cement Pond Liner									
02340.50400F Outside Access Roads									
9" Roller Compacted Concrete on Top of Geotextile Liner	8,400.00 sy	578.562	51,629	-	75,645	-	-	15.15 /sy	127,274
Cement Material	126.00 ton		-	27,284	-	-	-	216.54 /ton	27,284
02340.50400F Outside Access Roads	**8,400.00 sy**	**578.562**	**51,629**	**27,284**	**75,645**			**18.40 /sy**	**154,557**
02340 Soil Cement Pond Liner	**8,400.00 sy**	**578.562**	**51,629**	**27,284**	**75,645**			**18.40 /sy**	**154,557**
02370 Geotextile Fabric Pond Liner									
02370.50400G Outside Access Roads									
20 oz Non-Woven Geotextile Fabric Between Primary HDPE Liner and Concete Layer	8,400.00 sy	113.514	9,881	10,329	1,702	-	-	2.61 /sy	21,912
02370.50400G Outside Access Roads	**8,400.00 sy**	**113.514**	**9,881**	**10,329**	**1,702**			**2.61 /sy**	**21,912**
02370 Geotextile Fabric Pond Liner	**8,400.00 sy**	**113.514**	**9,881**	**10,329**	**1,702**			**2.61 /sy**	**21,912**
800 Optional Items		**692.076**	**61,510**	**37,612**	**77,347**				**176,469**
002 Contract No. 2 - Brine Ponds		**692.076**	**61,510**	**37,612**	**77,347**				**176,469**

CDM Smith

Eastern Municipal Water District
IPR Project - Conveyance Pipelines Contract - Phase I

OPCC - 30% Design - December 2017

Project name	Indirect Potable Reuse San Jacinto CA Riverside
Estimator	NC
Labor rate table	CA17 Riverside
Equipment rate table	00 17 Equip Rate BF
Bid date	3/30/2018 5:00 PM
Notes	Opinion of Probable Construction Cost (OPCC) This is an Opinion of Probable Construction Cost only, as defined by the documents provided at the level of design indicated above. CDM has no control over the cost of labor, materials, equipment, or services furnished, over schedules, over contractor's methods of determining prices, competitive bidding, market conditions or negotiating terms. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids. There are not any costs provided for: Change Orders, Design Engineering, Construction Oversight, Client Costs, Finance or Funding Costs, Legal Fees, Land Acquisition or temporary/permanent Easements, Operations, or any other costs associated with this project that are not specifically part of the bidding contractor's proposed scope. Clarifications: 1. This OPCC is for Phase I only based on 30% Design Submittal. Phase II is excluded 2. AACE Class 3 Estimate, Engineering from 10% to 40% complete, -10% to -20% on the low side, and +10% to +30% on the high side 3. Contingency at 20% 4. Escalation at midpoint of construction - Not in Cost.
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Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
003 Contract No. 3 - Conveyance Pipelines									
005 General Requirements									
01590 Safety/Traffic/Pollution Control									
01590.50100 SWPPP									
Gravel @ Construction Entrance	100.00 sy	1.200	91	-	81	-	808	9.81 /sy	981
Roads, Parking & Laydown, Gravel Fill 6" deep	2,500.00 sy	15.000	1,142	-	1,017	-	10,775	5.17 /sy	12,934
Road Sweeping	100.00 wk	200.000	13,607	-	5,228	-	-	188.35 /wk	18,835
Storm Water Discharge Plan & NPDS Permit	1.00 ea		-	-	-	-	2,694	2,693.75 /ea	2,694
Maintain Silt Fence	24.00 mo	384.000	26,125	-	-	-	-	1,088.54 /mo	26,125
Silt Fence - Wire Reinforced 3' Tall	5,000.00 lf	100.000	7,498	4,808	3,160	-	-	3.09 /lf	15,466
01590.50100 SWPPP	**1.00 ls**	**700.200**	**48,463**	**4,808**	**9,486**		**14,277**	**77,034.52 /ls**	**77,035**
01590 Safety/Traffic/Pollution Control		**700.200**	**48,463**	**4,808**	**9,486**		**14,277**		**77,035**
005 General Requirements		**700.200**	**48,463**	**4,808**	**9,486**		**14,277**		**77,035**
020 ROP Conveyance Pipeline									
02220 Demolition									
02220.00.020.10 Demo Asphalt Sidewalk									
Steel Road Plates	320.00 sfmo		-	-	-	694	-	2.17 /sfmo	694
Saw Cut Asphalt Pavement, 6"thk	80.00 lf	1.000	98	99	89	-	-	3.57 /lf	286
Saw Cut Asphalt Pavement, 6"thk	80.00 lf	1.000	98	99	89	-	-	3.57 /lf	286
Demo Asphalt Sidewalks	100.00 sf	6.000	490	-	46	-	-	5.35 /sf	535
Demo Bituminous Pavement	120.00 sf	2.880	252	-	121	-	-	3.11 /sf	373
Load Demo to Stockpile Cat 325 Excavator	3.70 cy	0.031	3	-	4	-	-	1.94 /cy	7
Haul Demo/On Site 8cy Rear Dump	3.70 cy	0.370	29	-	19	-	-	12.98 /cy	48
Load Off-site Haul Cat 325 Excavator 140hp	3.70 cy	0.031	3	-	4	-	-	1.94 /cy	7
Haul Demo/Off Site 20cy Rear Dump 2 Load/Hour	0.41 load	0.206	16	-	19	-	-	85.29 /load	35
DemoTipping Fees- Concrete/Masonry	3.70 cy		-	-	-	232	-	62.62 /cy	232
02220.00.020.10 Demo Asphalt Sidewalk	**220.00 sf**	**11.518**	**989**	**198**	**391**	**926**		**11.38 /sf**	**2,504**
02220 Demolition		**11.518**	**989**	**198**	**391**	**926**			**2,504**
02300 Trench/Earthwork									
02300.00.020.10 Earthwork for 16" dia. HDPE Pipes (Open Cut)									
Layout & Stake Pipe Excavation	190.00 lf	0.950	89	24	-	-	-	0.59 /lf	113
Trenching- Excavator C320-20MT- 140HP/1.25cy- Average Exc.	125.70 cy	3.142	316	-	318	-	-	5.04 /cy	634
Trench Bedding-Excavator C320-20MT- 140HP/1.25cy	8.36 cy	0.836	73	-	32	-	-	12.65 /cy	106
Trench Pipe Zone Excavator C320-20MT- 140HP/1.25cy	6.27 cy	1.003	88	-	39	-	-	20.24 /cy	127
Trench Native Backfill- Loader C938 3cy	105.85 cy	7.939	692	-	226	-	-	8.68 /cy	919
Sand Bedding/Zone/Engineered Fill Material	8.36 cy		-	333	-	70	-	48.18 /cy	403
Sand Bedding/Zone/Engineered Fill Material	6.27 cy		-	250	-	52	-	48.18 /cy	302
Load & Haul Trenching Spoils to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	19.85 cy	0.752	60	-	43	-	-	5.19 /cy	103
Pipe Detectable/Non-Detectable Tape	190.00 lf	0.950	78	13	-	-	-	0.48 /lf	91
Pipe Interferences @ Trench Excavation	1.00 ea	4.000	360	128	150	-	-	637.49 /ea	637
Pipe Test	190.00 lf	9.500	885	194	-	-	-	5.68 /lf	1,079
Pipe Locates (Pot Hole)	1.00 ea	4.000	360	64	150	-	-	573.62 /ea	574
Concrete Thrust Block, 16"	2.00 ea	8.000	745	84	-	-	-	414.78 /ea	830
Load Spoils from Stockpile Cat 325 Excavator-32MT- 180hp	19.85 cy	0.165	17	-	22	-	-	1.96 /cy	39
Haul Spoils/Off Site 18cy Rear Dump 2 Load/Hour	19.85 cy	0.716	56	-	68	-	-	6.23 /cy	124
02300.00.020.10 Earthwork for 16" dia. HDPE Pipes (Open Cut)	**190.00 lf**	**41.954**	**3,818**	**1,091**	**1,048**	**122**		**31.99 /lf**	**6,078**
02300.00.020.20 Earthwork for 18" dia HDPE Pipe (Open Cut)									
Layout & Stake Pipe Excavation	167.00 lf	0.835	78	21	-	-	-	0.59 /lf	99
Trenching- Excavator C320-20MT- 140HP/1.25cy- Average Exc.	164.75 cy	4.119	414	-	417	-	-	5.04 /cy	830
Trench Bedding-Excavator C320-20MT- 140HP/1.25cy	10.95 cy	1.095	96	-	42	-	-	12.65 /cy	139
Trench Pipe Zone Excavator C320-20MT- 140HP/1.25cy	44.13 cy	7.061	621	-	273	-	-	20.24 /cy	893
Trench Native Backfill- Loader C938 3cy	98.12 cy	7.359	642	-	210	-	-	8.68 /cy	851
Sand Bedding/Zone/Engineered Fill Material	10.95 cy		-	437	-	91	-	48.18 /cy	528
Sand Bedding/Zone/Engineered Fill Material	44.13 cy		-	1,759	-	367	-	48.18 /cy	2,126
Load & Haul Trenching Spoils to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	66.63 cy	2.524	202	-	143	-	-	5.19 /cy	346
Pipe Detectable/Non-Detectable Tape	167.00 lf	0.835	69	12	-	-	-	0.48 /lf	80
Pipe Interferences @ Trench Excavation	2.00 ea	8.000	720	256	300	-	-	637.49 /ea	1,275
Pipe Test	167.00 lf	8.350	778	171	-	-	-	5.68 /lf	949
Pipe Locates (Pot Hole)	2.00 ea	8.000	720	128	300	-	-	573.62 /ea	1,147
Concrete Thrust Block, 18"	5.00 ea	20.000	1,863	281	-	-	-	428.82 /ea	2,144
Load Spoils from Stockpile Cat 325 Excavator-32MT- 180hp	66.63 cy	0.555	56	-	75	-	-	1.96 /cy	130
Haul Spoils/Off Site 18cy Rear Dump 2 Load/Hour	66.63 cy	2.405	186	-	228	-	-	6.23 /cy	415
02300.00.020.20 Earthwork for 18" dia HDPE Pipe (Open Cut)	**167.00 lf**	**71.138**	**6,444**	**3,064**	**1,987**	**458**		**71.57 /lf**	**11,953**
02300 Trench/Earthwork		**113.093**	**10,262**	**4,154**	**3,035**	**580**			**18,031**
02446 Slip Lining									
02445.00.020.10 Slip Line Existing 18" dia. RW with New 16" dia. HDPE									
Mob/Demob Directional Drilling Equip	2.00 ea		-	-	-	5,000	-	2,500.00 /ea	5,000
Install 16" HDPE Pipe	22,650.00 lf		-	-	-	2,083,800	-	92.00 /lf	2,083,800

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
02445.00.020.10 Slip Line Existing 18" dia. RW with New 16" dia. HDPE									
Horiz Directional Drilling - 26"	250.00 lf		-	-	-	107,500	-	430.00 /lf	107,500
Grout Casing	311.00 cy	155.500	12,626	59,595		-	-	232.22 /cy	72,221
Excavate Jacking Pit	3,200.00 cy	160.000	16,066	-	21,509	-	-	11.74 /cy	37,575
Excavate Recieving Pit	3,200.00 cy	160.000	16,066	-	21,509	-	-	11.74 /cy	37,575
Shore Jacking/Receiving Pits	20,480.00 bsf		-	-	-	307,200	-	15.00 /bsf	307,200
Backfill Jacking/Receiving Pits	3,200.00 cy	1,600.000	136,719	-	43,018	-	-	56.17 /cy	179,737
Jacking Slab & Reaction Block	10.00 cy	100.000	8,330	2,555	-	-	-	1,088.46 /cy	10,885
Carrier Spacer/Isolators 18	25.00 ea		-	2,044	-	-	-	81.76 /ea	2,044
02445.00.020.10 Slip Line Existing 18" dia. RW with New 16" dia. HDPE	**22,650.00 lf**	**2,175.500**	**189,806**	**64,194**	**86,036**	**2,503,500**		**125.54 /lf**	**2,843,537**
02446 Slip Lining		**2,175.500**	**189,806**	**64,194**	**86,036**	**2,503,500**			**2,843,537**
02530 Concrete Manhole									
02530.00.020.10 Concrete Manhole									
Manhole 4' Flat Cover	23.00 ea	115.000	9,827	6,611	3,092	-	-	849.11 /ea	19,530
Place & Shape Manhole Base & Inverts- 48"	23.00 ea	276.000	25,710	-	-	-	4,137	1,297.72 /ea	29,847
Manhole 48" x 8' Deep	23.00 ea	460.000	39,307	29,676	12,368	-	-	3,536.98 /ea	81,351
Manhole Steps	184.00 ea		-	4,701	-	-	-	25.55 /ea	4,701
02530.00.020.10 Concrete Manhole	**23.00 ea**	**851.000**	**74,844**	**40,989**	**15,460**		**4,137**	**5,888.21 /ea**	**135,429**
02530 Concrete Manhole		**851.000**	**74,844**	**40,989**	**15,460**		**4,137**		**135,429**
02950 Site Restoration & Rehabilitation									
02950.00.020.10 Site Restoration									
Asphalt Pavement Reclaim Utility Trench (Roadways)	500.00 sy	34.286	3,098	-	2,102	-	-	10.40 /sy	5,200
Native Seeding	500.00 sf		-	-	-	21	-	0.04 /sf	21
02950.00.020.10 Site Restoration	**500.00 sy**	**34.286**	**3,098**		**2,102**	**21**		**10.44 /sy**	**5,221**
02950 Site Restoration & Rehabilitation		**34.286**	**3,098**		**2,102**	**21**			**5,221**
15119 Special Purpose Valves & Accessories (Solenoid/Relief/et al)									
15119.00.020.10 Air Release Valve									
Unload Care & Protect Valves	23.00 ea	1.840	151	-	-	-	262	17.96 /ea	413
Air Release Valve- 4"	23.00 ea	69.690	5,734	3,140	-	-	-	385.83 /ea	8,874
15119.00.020.10 Air Release Valve	**23.00 ea**	**71.530**	**5,886**	**3,140**			**262**	**403.78 /ea**	**9,287**
15119 Special Purpose Valves & Accessories (Solenoid/Relief/et al)		**71.530**	**5,886**	**3,140**			**262**		**9,287**
15121 Isolation Valve									
15121.00.020.10 Isolation Valve									
Unload Care & Protect Gate Valves	23.00 ea	1.840	151	-	-	-	262	17.96 /ea	413
Isolation Valve, 16"	23.00 ea	307.970	25,342	99,418	-	-	-	5,424.31 /ea	124,759
15121.00.020.10 Isolation Valve	**23.00 ea**	**309.810**	**25,493**	**99,418**			**262**	**5,442.26 /ea**	**125,172**
15121 Isolation Valve		**309.810**	**25,493**	**99,418**			**262**		**125,172**
15245 Polyethylene Pipe									
15245.00.020.05 HDPE Butt-Fused Pipe, 16" dia. (Open Cut)									
Unload Care & Protect HDPE Pipe & Fittings	190.00 lf	0.063	5	-	1	-	-	0.03 /lf	5
Layout HDPE Pipe & Fitting	190.00 lf	1.900	156	-	-	-	-	0.82 /lf	156
Plastic Pipe Equipment- Cat 325 Excavator	14.62 ch	14.616	1,296	-	1,750	-	-	208.40 /ch	3,046
HDPE IPS, Butt-Fused Pipe, DR 13.5, 16"	190.00 lf	49.400	4,065	6,300	-	-		54.55 /lf	10,365
HDPE IPS, Butt-Fused 45 Bend, DR 13.5, 16"	4.00 ea	23.680	1,949	1,163	-	-		777.83 /ea	3,111
Mileage & Per Diem for Tech	1.00 trip		-	-	-	450	341	791.25 /trip	791
HDPE Fusion Machine & Tech 6"-18"	1.83 day		-	-	727	731	-	798.12 /day	1,458
15245.00.020.05 HDPE Butt-Fused Pipe, 16" dia. (Open Cut)	**190.00 lf**	**89.659**	**7,471**	**7,463**	**2,478**	**1,181**	**341**	**99.65 /lf**	**18,933**
15245.00.020.20 HDPE Butt-Fused Pipe 18" dia. (Open Cut)									
Unload Care & Protect HDPE Pipe & Fittings	167.00 lf	0.055	4	-	1	-	-	0.03 /lf	5
Layout HDPE Pipe & Fitting	167.00 lf	1.670	137	-	-	-	-	0.82 /lf	137
Plastic Pipe Equipment- Cat 320 Excavator	18.05 ch	18.052	1,601	-	1,627	-	-	178.80 /ch	3,228
HDPE IPS, Butt-Fused Pipe, DR 13.5, 18"	167.00 lf	45.090	3,710	6,951	-	-		63.84 /lf	10,661
HDPE IPS, Butt-Fused, 90 Bnd, DR 13.5, 18"	3.00 ea	21.210	1,745	1,957	-	-		1,234.01 /ea	3,702
HDPE IPS, Butt-Fused 45 Bend, DR 13.5, 18"	2.00 ea	13.460	1,108	766	-	-		936.77 /ea	1,874
HDPE IPS, Butt-Fused Tee, DR 13.5, 18"	1.00 ea	10.500	864	877	-	-		1,741.16 /ea	1,741
Mileage & Per Diem for Tech	1.00 trip		-	-	-	450	341	791.25 /trip	791
HDPE Fusion Machine & Tech 6"-18"	2.26 day		-	-	899	903	-	798.12 /day	1,801
15245.00.020.20 HDPE Butt-Fused Pipe 18" dia. (Open Cut)	**167.00 lf**	**110.037**	**9,170**	**10,551**	**2,526**	**1,353**	**341**	**143.36 /lf**	**23,940**
15245 Polyethylene Pipe		**199.696**	**16,641**	**18,013**	**5,004**	**2,534**	**683**		**42,874**
020 ROP Conveyance Pipeline		**3,766.433**	**327,018**	**230,106**	**112,027**	**2,507,561**	**5,343**		**3,182,055**
030 Recycled Water Conveyance Pipeline									
02220 Demolition									
02220.00.030.10 Demo Asphalt Sidewalk									
Steel Road Plates	320.00 sfmo		-	-	-	694	-	2.17 /sfmo	694
Saw Cut Asphalt Pavement, 6"thk	80.00 lf	1.000	98	99	89	-	-	3.57 /lf	286
Saw Cut Asphalt Pavement, 6"thk	80.00 lf	1.000	98	99	89	-	-	3.57 /lf	286

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
02220.00.030.10 Demo Asphalt Sidewalk									
Demo Asphalt Sidewalks	100.00 sf	6.000	490	-	46	-	-	5.35 /sf	535
Demo Bituminous Pavement	120.00 sf	2.880	252	-	121	-	-	3.11 /sf	373
Load Demo to Stockpile Cat 325 Excavator	3.70 cy	0.031	3	-	4	-	-	1.94 /cy	7
Haul Demo/On Site 8cy Rear Dump	3.70 cy	0.370	29	-	19	-	-	12.98 /cy	48
Load Off-site Haul Cat 325 Excavator 140hp	3.70 cy	0.031	3	-	4	-	-	1.94 /cy	7
Haul Demo/Off Site 20cy Rear Dump 2 Load/Hour	0.41 load	0.206	16	-	19	-	-	85.34 /load	35
DemoTipping Fees- Concrete/Masonry	3.70 cy		-	-	-	232	-	62.62 /cy	232
02220.00.030.10 Demo Asphalt Sidewalk	**220.00 sf**	**11.518**	**989**	**198**	**391**	**926**		**11.38 /sf**	**2,504**
02220 Demolition		**11.518**	**989**	**198**	**391**	**926**			**2,504**
02300 Trench/Earthwork									
02300.00.030.10 Trench									
Layout & Stake Pipe Excavation	15,365.00 lf	76.825	7,157	1,963	-	-	-	0.59 /lf	9,119
Trenching- Excavator C320-20MT- 140HP/1.25cy- Average Exc.	21,577.89 cy	539.447	54,168	-	54,587	-	-	5.04 /cy	108,755
Trench Bedding-Excavator C320-20MT- 140HP/1.25cy	1,434.54 cy	143.454	12,609	-	5,536	-	-	12.65 /cy	18,146
Trench Pipe Zone Excavator C320-20MT- 140HP/1.25cy	7,460.81 cy	1,193.730	104,927	-	46,070	-	-	20.24 /cy	150,997
Trench Native Backfill- Loader C938 3cy	8,547.47 cy	641.060	55,898	-	18,276	-	-	8.68 /cy	74,174
3/8 Stone Bedding/Zone/Engineered Fill Material	1,434.54 cy		-	56,701	-	10,443	-	46.81 /cy	67,145
3/8 Stone Bedding/Zone/Engineered Fill Material	7,460.81 cy		-	294,895	-	54,315	-	46.81 /cy	349,210
Load & Haul Trenching Spoils to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	13,030.41 cy	493.576	39,589	-	28,023	-	-	5.19 /cy	67,611
Trench Shield- 8x20	4.00 u/mo		-	-	8,912	-	-	2,227.96 /u/mo	8,912
Pipe Detectable/Non-Detectable Tape	15,365.00 lf	76.825	6,309	1,080	-	-	-	0.48 /lf	7,388
Pipe Interferences @ Trench Excavation	2.00 ea	8.000	720	256	300	-	-	637.50 /ea	1,275
Pipe Test	15,365.00 lf	768.250	71,565	15,703	-	-	-	5.68 /lf	87,268
Pipe Locates (Pot Hole)	20.00 ea	80.000	7,198	1,278	2,997	-	-	573.62 /ea	11,472
Concrete Thrust Block, 36"	5.00 ea	27.500	2,562	1,859	-	-	-	884.10 /ea	4,420
Load Spoils from Stockpile Cat 325 Excavator-32MT- 180hp	13,030.41 cy	108.587	10,904	-	14,597	-	-	1.96 /cy	25,501
Haul Spoils/Off Site 18cy Rear Dump 2 Load/Hour	13,030.41 cy	470.412	36,461	-	44,681	-	-	6.23 /cy	81,141
02300.00.030.10 Trench	**15,365.00 lf**	**4,627.666**	**410,064**	**373,734**	**223,979**	**64,758**		**69.80 /lf**	**1,072,535**
02300 Trench/Earthwork		**4,627.666**	**410,064**	**373,734**	**223,979**	**64,758**			**1,072,535**
02530 Concrete Manhole									
02530.00.030.10 Concrete Manhole									
Manhole 4' Flat Cover	16.00 ea	80.000	6,836	4,599	2,151	-	-	849.12 /ea	13,586
Place & Shape Manhole Base & Inverts- 48"	16.00 ea	192.000	17,885	-	-	-	2,878	1,297.72 /ea	20,763
Manhole 48" x 8' Deep	16.00 ea	320.000	27,344	20,644	8,604	-	-	3,536.98 /ea	56,592
Manhole 48" x 8' Deep	16.00 ea	320.000	27,344	20,644	8,604	-	-	3,536.98 /ea	56,592
Manhole Steps	128.00 ea		-	3,270	-	-	-	25.55 /ea	3,270
02530.00.030.10 Concrete Manhole	**16.00 ea**	**912.000**	**79,409**	**49,158**	**19,358**		**2,878**	**9,425.20 /ea**	**150,803**
02530 Concrete Manhole		**912.000**	**79,409**	**49,158**	**19,358**		**2,878**		**150,803**
02950 Site Restoration & Rehabilitation									
02950.00.030.10 Site Restoration									
Asphalt Pavement Reclaim Utility Trench (Roadways)	500.00 sy	34.286	3,098	-	2,102	-	-	10.40 /sy	5,200
Native Seeding	500.00 sf		-	-	-	21	-	0.04 /sf	21
02950.00.030.10 Site Restoration	**500.00 sy**	**34.286**	**3,098**		**2,102**	**21**		**10.44 /sy**	**5,221**
02950 Site Restoration & Rehabilitation		**34.286**	**3,098**		**2,102**	**21**			**5,221**
15119 Special Purpose Valves & Accessories (Solenoid/Relief/et al)									
15119.00.030.10 Air Release Valve									
Unload Care & Protect Valves	16.00 ea	1.280	105	-	-	-	182	17.96 /ea	287
Air Release Valve- 6"	16.00 ea	48.480	3,989	2,184	-	-	-	385.83 /ea	6,173
15119.00.030.10 Air Release Valve	**16.00 ea**	**49.760**	**4,095**	**2,184**			**182**	**403.78 /ea**	**6,461**
15119 Special Purpose Valves & Accessories (Solenoid/Relief/et al)		**49.760**	**4,095**	**2,184**			**182**		**6,461**
15121 Isolation Valve									
15112.00.030.10 Isolation Valve									
Unload Care & Protect Gate Valves	16.00 ea	1.280	105	-	-	-	182	17.96 /ea	287
Isolation Valve, 36"	16.00 ea	416.000	34,231	400,400	-	-	-	27,164.43 /ea	434,631
15112.00.030.10 Isolation Valve	**16.00 ea**	**417.280**	**34,336**	**400,400**			**182**	**27,182.39 /ea**	**434,918**
15121 Isolation Valve		**417.280**	**34,336**	**400,400**			**182**		**434,918**
15245 Polyethylene Pipe									
15245.00.030.10 HDPE Pipe, 36" dia.									
Unload Care & Protect HDPE Pipe & Fittings	15,365.00 lf	5.070	369	-	72	-	-	0.03 /lf	441
Layout HDPE Pipe & Fitting	15,365.00 lf	153.650	12,643	-	-	-	-	0.82 /lf	12,643
Plastic Pipe Equipment- Cat 320 Excavator	1,352.12 ch	1,352.120	119,931	-	121,828	-	-	178.80 /ch	241,759
HDPE IPS, Butt-Fused Pipe, DR 13.5, 36"	15,365.00 lf	6,760.600	556,301	2,707,119	-	-		212.39 /lf	3,263,420
HDPE IPS, Butt-Fused, 90 Bnd, DR 13.5, 36"	4.00 ea	64.920	5,342	22,623	-	-		6,991.12 /ea	27,964
HDPE IPS, Butt-Fused 45 Bend, DR 13.5, 36"	4.00 ea	57.000	4,690	11,517	-	-		4,051.86 /ea	16,207
HDPE IPS, Butt-Fused 22.5 Bend, DR 13.5, 36"	8.00 ea	114.000	9,381	14,175	-	-		2,944.44 /ea	23,556
HDPE IPS, Butt-Fused Tee, DR 13.5, 36"	1.00 ea	21.370	1,758	5,328	-	-		7,086.93 /ea	7,087

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15245.00.030.10 HDPE Pipe, 36" dia.									
HDPE IPS, Butt-Fused Branch Saddle, DR 13.5, 6"	16.00 ea	44.800	3,686	323	-	-		250.57 /ea	4,009
HDPE IPS, Butt-Fused Cap, DR 13.5, 36"	2.00 ea	23.580	1,940	1,512	-	-		1,726.33 /ea	3,453
Mileage & Per Diem for Tech	35.00 trip		-	-	-	15,750	11,944	791.25 /trip	27,694
HDPE Fusion Machine & Tech 12"-36"	169.02 day		-	-	153,804	67,606	-	1,310.00 /day	221,410
15245.00.030.10 HDPE Pipe, 36" dia.	**15,365.00 lf**	**8,597.110**	**716,042**	**2,762,597**	**275,704**	**83,356**	**11,944**	**250.55 /lf**	**3,849,643**
15245 Polyethylene Pipe		**8,597.110**	**716,042**	**2,762,597**	**275,704**	**83,356**	**11,944**		**3,849,643**
030 Recycled Water Conveyance Pipeline		**14,649.620**	**1,248,033**	**3,588,271**	**521,534**	**149,061**	**15,186**		**5,522,085**
032 Flow Control Facility									
02300 Trench/Earthwork									
02300.00.032.10 Trench/Earthwork for 24" dia. RW-HDPE									
Layout & Stake Pipe Excavation	60.00 lf	0.300	28	8	-	-	-	0.59 /lf	36
Trenching- Excavator C320-20MT- 140HP/1.25cy- Average Exc.	58.57 cy	1.464	147	-	148	-	-	5.04 /cy	295
Trench Bedding-Excavator C320-20MT- 140HP/1.25cy	4.49 cy	0.449	39	-	17	-	-	12.65 /cy	57
Trench Pipe Zone Excavator C320-20MT- 140HP/1.25cy	20.04 cy	3.207	282	-	124	-	-	20.24 /cy	406
Trench Native Backfill- Loader C938 3cy	26.76 cy	2.007	175	-	57	-	-	8.68 /cy	232
3/8 Stone Bedding/Zone/Engineered Fill Material	4.49 cy		-	178	-	33	-	46.80 /cy	210
3/8 Stone Bedding/Zone/Engineered Fill Material	20.04 cy		-	792	-	146	-	46.81 /cy	938
Load & Haul Trenching Spoils to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	31.81 cy	1.205	97	-	68	-	-	5.19 /cy	165
Trench Shield- 8x20	3.00 u/mo		-	-	6,684	-	-	2,227.96 /u/mo	6,684
Pipe Detectable/Non-Detectable Tape	60.00 lf	0.300	25	4	-	-	-	0.48 /lf	29
Pipe Test	60.00 lf	3.000	279	61	-	-	-	5.68 /lf	341
Concrete Thrust Block, 24"	2.00 ea	9.000	838	220	-	-	-	529.06 /ea	1,058
Load Spoils from Stockpile Cat 325 Excavator-32MT- 180hp	31.81 cy	0.265	27	-	36	-	-	1.96 /cy	62
Haul Spoils/Off Site 18cy Rear Dump 2 Load/Hour	31.81 cy	1.148	89	-	109	-	-	6.23 /cy	198
02300.00.032.10 Trench/Earthwork for 24" dia. RW-HDPE	**60.00 lf**	**22.346**	**2,026**	**1,263**	**7,243**	**179**		**178.51 /lf**	**10,711**
02300.00.032.20 Trench/Erthwork for 18" dia. RW-HDPE									
Layout & Stake Pipe Excavation	75.00 lf	0.375	35	10	-	-	-	0.59 /lf	45
Trenching- Excavator C320-20MT- 140HP/1.25cy- Average Exc.	64.15 cy	1.604	161	-	162	-	-	5.04 /cy	323
Trench Bedding-Excavator C320-20MT- 140HP/1.25cy	4.92 cy	0.492	43	-	19	-	-	12.65 /cy	62
Trench Pipe Zone Excavator C320-20MT- 140HP/1.25cy	19.82 cy	3.171	279	-	122	-	-	20.24 /cy	401
Trench Native Backfill- Loader C938 3cy	34.23 cy	2.567	224	-	73	-	-	8.68 /cy	297
3/8 Stone Bedding/Zone/Engineered Fill Material	4.92 cy		-	194	-	36	-	46.81 /cy	230
3/8 Stone Bedding/Zone/Engineered Fill Material	19.82 cy		-	783	-	144	-	46.81 /cy	928
Load & Haul Trenching Spoils to Stockpile-C446 Backhoe Loader- 85hp/1.37CY/Dump Truck 8cy (4ea)	29.92 cy	1.133	91	-	64	-	-	5.19 /cy	155
Trench Shield- 8x20	3.00 u/mo		-	-	6,684	-	-	2,227.96 /u/mo	6,684
Pipe Detectable/Non-Detectable Tape	75.00 lf	0.375	31	5	-	-	-	0.48 /lf	36
Pipe Test	75.00 lf	3.750	349	77	-	-	-	5.68 /lf	426
Concrete Thrust Block, 18"	3.00 ea	12.000	1,118	169	-	-	-	428.83 /ea	1,286
Load Spoils from Stockpile Cat 325 Excavator-32MT- 180hp	29.92 cy	0.249	25	-	34	-	-	1.96 /cy	59
Haul Spoils/Off Site 18cy Rear Dump 2 Load/Hour	29.92 cy	1.080	84	-	103	-	-	6.23 /cy	186
02300.00.032.20 Trench/Erthwork for 18" dia. RW-HDPE	**75.00 lf**	**26.796**	**2,439**	**1,238**	**7,261**	**180**		**148.25 /lf**	**11,119**
02300 Trench/Earthwork		**49.142**	**4,466**	**2,501**	**14,505**	**359**			**21,829**
15112 Butterfly Valves									
15112.032.10 Butterfly Valves - 24" dia. MO									
Unload Care & Protect Butterfly Valves	2.00 ea	1.000	82	-	-	-	23	52.52 /ea	105
Butterfly Valve-#150- Flanged- MO- 24"	2.00 ea	33.600	2,765	16,396	-	-	-	9,580.37 /ea	19,161
15112.032.10 Butterfly Valves - 24" dia. MO	**2.00 ea**	**34.600**	**2,847**	**16,396**			**23**	**9,632.89 /ea**	**19,266**
15112 Butterfly Valves		**34.600**	**2,847**	**16,396**			**23**		**19,266**
15119 Special Purpose Valves & Accessories (Solenoid/Relief/et al)									
15119.032.10 Special Purpose Valves and Accessories									
Unload Care & Protect Valves	5.00 ea	1.000	82	-	-	-	57	27.83 /ea	139
Pressure Reducing Valve, Flanged- 18"	1.00 ea	23.610	1,943	7,849	-	-	-	9,791.52 /ea	9,792
Valve N.O.C. 18" - Overflow Valve	2.00 ea	29.200	2,403	20,475	-	-	-	11,438.87 /ea	22,878
Valve N.O.C. 24" - Overflow Valve	2.00 ea	37.320	3,071	27,300	-	-	-	15,185.45 /ea	30,371
15119.032.10 Special Purpose Valves and Accessories	**5.00 ea**	**91.130**	**7,499**	**55,624**			**57**	**12,635.86 /ea**	**63,179**
15119 Special Purpose Valves & Accessories (Solenoid/Relief/et al)		**91.130**	**7,499**	**55,624**			**57**		**63,179**
15212 Epoxy Lined Steel Pipe (ELSP)									
15210.00.032.10 RW-ELSP - 36" dia.									
36-0/0" 150# A307 Steel Bolt Sets	5.00 ea		-	2,275	-	-	-	455.00 /ea	2,275
36-0/0" Full Faced Red Rubber (SBR) Gasket 1/8"	5.00 ea		-	167	-	-	-	33.44 /ea	167
Unload Care & Protect Epoxy Lined Flanged DIP & Fittings	8,430.30 lbs	2.782	203	-	40	-	-	0.03 /lbs	242
Layout Epoxy Lined Flanged DIP & Fitting	14.00 lf	0.140	12	-	-	-	-	0.82 /lf	12
DI, Epoxy Lined, 90 Short Radius Bend, FL, 36"	1.00 ea	20.730	1,706	17,971	-	-	-	19,677.14 /ea	19,677
DI, Epoxy Lined, Tee, FL, 36"x 24"	2.00 ea	48.480	3,989	40,425	-	-	-	22,207.31 /ea	44,415
DI, Epoxy Lined, Eccentric Reducer, FL, 20"x 18"	1.00 ea	12.890	1,061	5,023	-	-	-	6,083.50 /ea	6,084
DI, Epoxy Lined, Eccentric Reducer, FL, 36"x 20"	1.00 ea	22.840	1,879	19,564	-	-	-	21,443.28 /ea	21,443
DI Pipe, FLxPE, CL53, Epoxy Lined, 36" x 1'-0"	1.00 ea	10.800	889	1,600	-	-	-	2,488.40 /ea	2,488

Spreadsheet Level	Takeoff Quantity	Labor Man Hrs	Labor Amount	Material Amount	Equip Amount	Sub Amount	Other Amount	Total Cost/Unit	Total Amount
15210.00.032.10 RW-ELSP - 36" dia.	**14.00 lf**	**118.662**	**9,738**	**87,025**	**40**			**6,914.49 /lf**	**96,803**
15212 Epoxy Lined Steel Pipe (ELSP)		**118.662**	**9,738**	**87,025**	**40**				**96,803**
15245 Polyethylene Pipe									
15245.00.032.10 RW-HDPE - 24" dia.									
24-0/0" 150# A307 Steel Bolt Sets	12.00 ea		-	1,775	-	-	-	147.88 /ea	1,775
24-0/0" Full Faced Red Rubber (SBR) Gasket 1/8"	12.00 ea		-	235	-	-	-	19.59 /ea	235
Unload Care & Protect HDPE Pipe & Fittings	30.00 lf	4.091	298	-	58	-	-	11.87 /lf	356
Layout HDPE Pipe & Fitting	30.00 lf	1.364	112	-	-	-	-	3.74 /lf	112
Plastic Pipe Equipment- Cat 320 Excavator	47.79 ch	47.790	4,239	-	4,306	-	-	178.80 /ch	8,545
HDPE IPS, Butt-Fused Pipe, DR 13.5, 24"	30.00 lf	9.600	790	2,331	-	-		104.03 /lf	3,121
HDPE IPS, Butt-Fused Tee, DR 13.5, 24"	2.00 ea	29.860	2,457	2,964	-	-		2,710.62 /ea	5,421
HDPE IPS, Butt-Fused Cap, DR 13.5, 24"	1.00 ea	8.190	674	474	-	-		1,147.80 /ea	1,148
HDPE IPS, Butt-Fused Flange Adapter, DR 13.5, 28"	12.00 ea	114.600	9,430	7,078	-	-		1,375.64 /ea	16,508
HDPE IPS Backing Ring, DI, 24"	12.00 ea		-	3,276	-	-		273.00 /ea	3,276
Flange Bolt-up, 24 "	12.00 ea	173.520	14,278	-	-	-	-	1,189.85 /ea	14,278
HDPE IPS, MJ Adapter, 24"	4.00 ea	52.440	4,315	4,537	-	-		2,213.03 /ea	8,852
Mileage & Per Diem for Tech	1.00 trip		-	-	-	450	341	791.25 /trip	791
HDPE Fusion Machine & Tech 8"-24"	2.00 day		-	-	1,593	800	-	1,196.25 /day	2,393
15245.00.032.10 RW-HDPE - 24" dia.	**30.00 lf**	**441.455**	**36,593**	**22,670**	**5,957**	**1,250**	**341**	**2,227.02 /lf**	**66,810**
15245.00.032.20 RW-HDPE - 24" dia. with Trench									
Unload Care & Protect HDPE Pipe & Fittings	60.00 lf	3.001	218	-	43	-	-	4.35 /lf	261
Layout HDPE Pipe & Fitting	60.00 lf	1.000	82	-	-	-	-	1.37 /lf	82
Plastic Pipe Equipment- Cat 320 Excavator	17.82 ch	17.816	1,580	-	1,605	-	-	178.80 /ch	3,186
HDPE IPS, Butt-Fused Pipe, DR 13.5, 24"	60.00 lf	19.200	1,580	4,662	-	-		104.03 /lf	6,242
HDPE IPS, Butt-Fused, 90 Bnd, DR 13.5, 24"	2.00 ea	20.200	1,662	2,857	-	-		2,259.44 /ea	4,519
HDPE IPS, Butt-Fused 45 Bend, DR 13.5, 24"	2.00 ea	18.520	1,524	1,763	-	-		1,643.29 /ea	3,287
HDPE Butt-Fused Lateral Wye, DR 13.5, 36 x 36	1.00 ea	14.930	1,229	6,256	-	-		7,484.78 /ea	7,485
HDPE IPS, Butt-Fused Concentric Reducer, DR 13.5, 30 x 24	1.00 ea	10.230	842	2,056	-	-		2,898.16 /ea	2,898
HDPE IPS, Butt-Fused Concentric Reducer, DR 13.5, 36 x 30	1.00 ea	11.710	964	3,046	-	-		4,009.07 /ea	4,009
HDPE IPS, Butt-Fused Cap, DR 13.5, 24"	1.00 ea	8.190	674	474	-	-		1,147.79 /ea	1,148
Mileage & Per Diem for Tech	1.00 trip		-	-	-	450	341	791.25 /trip	791
HDPE Fusion Machine & Tech 8"-24"	2.00 day		-	-	1,593	800	-	1,196.25 /day	2,393
15245.00.032.20 RW-HDPE - 24" dia. with Trench	**60.00 lf**	**124.797**	**10,355**	**21,114**	**3,240**	**1,250**	**341**	**605.00 /lf**	**36,300**
15245.00.032.25 RW-HDPE - 18" dia.									
18-0/0" 150# A307 Steel Bolt Sets	4.00 ea		-	341	-	-	-	85.31 /ea	341
18-0/0" Full Faced Red Rubber (SBR) Gasket 1/8"	4.00 ea		-	53	-	-	-	13.28 /ea	53
Unload Care & Protect HDPE Pipe & Fittings	20.00 lf	3.000	218	-	43	-	-	13.06 /lf	261
Layout HDPE Pipe & Fitting	20.00 lf	1.000	82	-	-	-	-	4.11 /lf	82
Plastic Pipe Equipment- Cat 320 Excavator	12.05 ch	12.048	1,069	-	1,086	-	-	178.80 /ch	2,154
HDPE IPS, Butt-Fused Pipe, DR 13.5, 18"	20.00 lf	5.400	444	832	-	-		63.84 /lf	1,277
HDPE IPS, Butt-Fused, 90 Bnd, DR 13.5, 18"	2.00 ea	14.140	1,164	1,305	-	-		1,234.02 /ea	2,468
HDPE IPS, Butt-Fused Tee, DR 13.5, 18"	1.00 ea	10.500	864	877	-	-		1,741.15 /ea	1,741
HDPE IPS, Butt-Fused Cap, DR 13.5, 18"	1.00 ea	6.040	497	222	-	-		718.82 /ea	719
HDPE IPS, Butt-Fused Flange Adapter, DR 13.5, 18"	4.00 ea	24.160	1,988	665	-	-		663.36 /ea	2,653
HDPE IPS Backing Ring, DI, 18"	4.00 ea		-	614	-	-		153.56 /ea	614
Flange Bolt-up, 18"	4.00 ea	38.080	3,133	-	-	-	-	783.36 /ea	3,133
HDPE IPS, MJ Adapter, 18"	3.00 ea	30.060	2,474	1,996	-	-		1,489.94 /ea	4,470
Mileage & Per Diem for Tech	1.00 trip		-	-	-	450	341	791.25 /trip	791
HDPE Fusion Machine & Tech 6"-18"	2.00 day		-	-	796	800	-	798.13 /day	1,596
15245.00.032.25 RW-HDPE - 18" dia.	**20.00 lf**	**144.428**	**11,933**	**6,906**	**1,924**	**1,250**	**341**	**1,117.76 /lf**	**22,355**
15245.00.032.30 RW-HDPE - 18" dia. with Trench									
Unload Care & Protect HDPE Pipe & Fittings	75.00 lf	2.999	218	-	43	-	-	3.48 /lf	261
Layout HDPE Pipe & Fitting	75.00 lf	1.000	82	-	-	-	-	1.10 /lf	82
Plastic Pipe Equipment- Cat 320 Excavator	10.98 ch	10.984	974	-	990	-	-	178.80 /ch	1,964
HDPE IPS, Butt-Fused Pipe, DR 13.5, 18"	75.00 lf	20.250	1,666	3,122	-	-		63.84 /lf	4,788
HDPE IPS, Butt-Fused, 90 Bnd, DR 13.5, 18"	3.00 ea	21.210	1,745	1,957	-	-		1,234.01 /ea	3,702
HDPE IPS, Butt-Fused 45 Bend, DR 13.5, 18"	2.00 ea	13.460	1,108	766	-	-		936.77 /ea	1,874
Mileage & Per Diem for Tech	1.00 trip		-	-	-	450	341	791.25 /trip	791
HDPE Fusion Machine & Tech 6"-18"	1.37 day		-	-	547	549	-	798.12 /day	1,096
15245.00.032.30 RW-HDPE - 18" dia. with Trench	**75.00 lf**	**69.903**	**5,794**	**5,844**	**1,579**	**999**	**341**	**194.10 /lf**	**14,558**
15245 Polyethylene Pipe		**780.582**	**64,675**	**56,534**	**12,700**	**4,749**	**1,365**		**140,023**
032 Flow Control Facility		**1,074.116**	**89,224**	**218,079**	**27,245**	**5,108**	**1,445**		**341,101**
003 Contract No. 3 - Conveyance Pipelines		**20,190.369**	**1,712,739**	**4,041,265**	**670,292**	**2,661,730**	**36,250**		**9,122,275**

Operation and Maintenance Costs

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AWTF O&M Costs - Phase 1

Capacity	**2**	**mgd**
Power cost	0.15	$/kWh
AWPF Online Factor	90%	

1) Equipment/Building Operations Power Cost							
#	**Process Equipment**	**BHP for VFDs or HP for Constant**	**kW**	**# Operating**	**Demand**	**Annual Power (kWh/yr)**	**Annual Cost ($/yr)**
1	Influent Pump Station	36	27	1	90%	190,815	$28,700
2	MF Automatic Strainers	0.5	0	1	100%	2,945	$450
3	MF Backwash Pumps	60	45	1	5%	17,668	$2,700
4	MF CIP Pumps	15	11	1	15%	12,883	$2,000
5	MF CIP Tank Heater		72	2	15%	165,564	$24,900
6	MF Air Compressors	7.5	6	1	5%	2,209	$340
7	MF Blowers	15	11	1	5%	4,417	$670
8	RO Transfer Pumps	54	40	1	100%	318,025	$47,800
9	Primary RO Pumps	217	162	1	100%	1,277,989	$191,700
10	2nd Stage Booster Pumps	15	11	1	100%	88,340	$13,300
11	Primary RO CIP Pumps	40	30	1	0.02%	54	$10
12	Primary RO CIP Tank Heaters		175	2	0.02%	630	$100
13	RO Flush Pumps	30	22	1	1%	1,767	$270
14	Secondary RO Pumps	7	5	1	100.00%	41,225	$6,200
15	Secondary RO CIP Pumps	7	5	1	0.05%	19	$10
16	Secondary RO CIP Tank Heaters		175	2	0.05%	1,260	$190
17	Flush Transfer Pumps	1.5	1	1	1%	88	$20
18	Product Water Pumps	115	86	1	100%	677,275	$101,600
19	Ammonium Sulfate Metering Pumps	1	1	1	100%	5,889	$890
20	Sodium Hypo Metering Pumps	1	1	1	100%	5,889	$890
21	Sodium Hypo Transfer Pumps	1	1	1	1%	59	$10
22	Sodium Bisulfite Metering Pumps	1	1	1	100%	5,889	$890
23	Sodium Bisulfite Transfer Pumps	1	1	1	13%	736	$120
24	Sulfuric Acid Metering Pumps	1	1	2	100%	11,779	$1,800
25	Threshold Inhibitor Metering Pumps	1	1	2	100%	11,779	$1,800
26	Sodium Hydroxide Metering Pumps	1	1	1	100%	5,889	$890
27	Sodium Hydroxide Transfer Pumps	1	1	2	13%	1,472	$230
28	Citric Acid Transfer Pumps	1	1	2	2%	210	$40
29	Sump pumps	5	4	7	5.0%	10,306	$1,600
30	Plant Waste Pumps	5	4	1	20.0%	5,889	$890
31	Sample Pumps	5	4	5	1.0%	1,472	$230
#	**HVAC and Plumbing Load**	**HP**	**kW**	**# Operating**	**Demand**	**Annual Power (kWh/yr)**	**Annual Cost ($/yr)**
32	VRVO-1 VRV Outdoor Unit - Circuit 1		8	1	20.0%	12,614	$1,900
33	VRVO-1 VRV Outdoor Unit - Circuit 2		11.4	1	20.0%	17,976	$2,700
34	MS-1 Mini Split Server Room Back-up		0.9	1	20.0%	1,419	$220
35	CU-1, CU-2 Serves Electrical Room		32.2	1	20.0%	50,773	$7,700
36	AHU-1, AHU-2 Serves Electrical Room	5	4	2	20.0%	11,779	$1,767
37	OAF-1 Outdoor Air Fan	1	1	1	20.0%	1,178	$200
38	EF-1 Toilet/Break Room Exhaust	0.5	0	1	20.0%	589	$90
39	EF-2, EF-3	2	1	2	20.0%	4,711	$710
	10% Contingency						*$45,000*
	Power Cost Subtotal						**$492,000**

2) Chemical Costs							
#	**Chemical***	**Usage (gal/day)**		**Usage (gal/yr)**	**Demand**	**Unit Cost ($/gal)**	**Annual Cost ($)**
1	Ammonium Sulfate (AS)	23.8		8,687	100%	$ 2.72	$21,300
2	Sodium Hypochlorite (SHC)	128		46,738	100%	$ 1.27	$53,500
3	Sodium Bisulfite (SBS)	139		50,735	100%	$ 1.96	$89,500
4	Threshold Inhibitor (TI)	5		1,825	100%	$ 10.00	$16,500
5	Sulfuric Acid (SA)	25		9,125	100%	$ 1.99	$16,400
6	Sodium Hydroxide (SH)	114		41,610	100%	$ 3.53	$132,200
7	Citric Acid	6		2,190	100%	$ 6.35	$12,600
	10% Contingency						*$35,000*
	Chemical Cost Subtotal						**$377,000**

*cost for pripriotory RO CIP chemicals is not included at this design phase.

AWTF O&M Costs - Phase 1

3) Major Equipment Replacement Cost

#	Equipment	Total No. of Modules or Units	Unit Cost ($/unit)	Replacement (#/year)			Annual Cost ($)
1	MF Membrane Replacement	189	$3,750	0.14			$91,200
2	Cartridge Filter Replacement	1					$11,500
3	RO Element Replacement	418	$625	0.20			$47,100
	Major Equipment Replacement Cost Subtotal						**$150,000**

4) Compliance/Monitoring Cost

#	Equipment						Annual Cost ($)
1	Compliance/Monitoring Cost						$200,000
	Compliance/Monitoring Cost Subtotal						**$200,000**

5) Maintenance Cost

#	Equipment	Percentage	Construction Cost				Annual Cost ($)
1	Maintenance Cost	1.0%	$28,000,000				$280,000
	Maintenance Cost Subtotal						**$280,000**

6) Labor Cost

#	Personnel	#				Max. Labor Cost ($)	Annual Labor Cost ($)
1	POTABLE WATER TREATMENT OPERATOR I	0.5				$65,437	$32,800
2	POTABLE WATER TREATMENT OPERATOR II	1				$72,134	$72,200
3	POTABLE WATER TREATMENT OPERATOR III	0.5				$83,366	$41,700
4	POTABLE WATER TREATMENT OPERATOR IV	1				$89,565	$89,600
5	POTABLE WATER TREATMENT OPERATOR V					$98,485	
6	ELECTRICIAN	0.5				$68,702	$34,400
7	CONTROL & COMMUNICATION ANALYST I					$83,366	
8	CONTROL & COMMUNICATION ANALYST II	0.5				$96,325	$48,200
9							
10							
	Labor Cost Subtotal	4					**$319,000**

	Phase 1 Total Annual O&M Cost						**$1,820,000**

Brine Ponds O&M Costs - Phase 1

Power cost	0.15	$/kWh
Hours of operation per day	24	hours
Days of operation per year	365	days
AWPF Online Factor	90%	

1) Equipment/Building Operations Power Cost

#	Process Equipment	BHP for VFDs or HP for Constant	kW	# Operating	Demand	Annual Power (kWh/yr)	Annual Cost ($/yr)
1	Evaporators- submersible pumps	2	1	18	44%	93,287	$14,000
2	Evaporators- blowers	25	19	18	44%	1,166,091	$175,000
3	Inter-pond converyance pumps	30	22	5	5%	44,170	$6,700
4	LCRS Sample Pumps	1	1	5	1%	294	$50
	10% Contingency						*$20,000*
	Power Cost Subtotal						**$216,000**

2) Major Equipment Replacement Cost

#	Equipment	Total No. of Modules or Units	Unit Cost ($/unit)	Replacement (#/year)			Annual Cost ($)
1	Evaporators	21	$35,000	0.10			$66,200
2	Liners	1	$3,435,917	0.03			$11,500
3							
4							
	Major Equipment Replacement Cost Subtotal						**$78,000**

3) Compliance/Monitoring Cost

#	Equipment						Annual Cost ($)
1	Compliance/Monitoring Cost						$25,000
	Compliance/Monitoring Cost Subtotal						**$25,000**

4) Maintenance Cost

#	Equipment	Percentage	Construction Cost				Annual Cost ($)
1	Maintenance Cost	0.25%	$11,500,000				$28,800
	Maintenance Cost Subtotal						**$29,000**

5) Labor Cost

#	Personnel	#				Max. Labor Cost ($)	Annual Labor Cost ($)
1	POTABLE WATER TREATMENT OPERATOR I					$65,437	$0
2	POTABLE WATER TREATMENT OPERATOR II	0.50				$72,134	$36,100
3	POTABLE WATER TREATMENT OPERATOR III					$83,366	$0
4	POTABLE WATER TREATMENT OPERATOR IV					$89,565	$0
5	POTABLE WATER TREATMENT OPERATOR V					$98,485	$0
6	ELECTRICIAN					$68,702	$0
7	CONTROL & COMMUNICATION ANALYST I					$83,366	$0
8	CONTROL & COMMUNICATION ANALYST II					$96,325	$0
9							$0
10							$0
	Labor Cost Subtotal	1					**$37,000**

	Phase 1 Total Annual O&M Cost	**$385,000**

Conveyance O&M Costs - Phase 1

Power cost	0.15	$/kWh
AWPF Online Factor	90%	

1) Equipment/Building Operations Power Cost

#	Process Equipment	BHP for VFDs or HP for Constant	kW	# Operating	Demand	Annual Power (kWh/yr)	Annual Cost ($/yr)
1	Flow Meters			1	90%	0	$0
2	Motor Operated Valves			1	100%	0	$0
3				1	5%	0	$0
4				1	15%	0	$0
5				2	15%	0	$0
6				1	5%	0	$0
	Power Cost Subtotal						**$0**

3) Major Equipment Replacement Cost

#	Equipment	Annual Cost ($)
1	Flow Meters and Valves	$15,000
	Major Equipment Replacement Cost Subtotal	**$15,000**

4) Maintenance Cost

#	Equipment	Percentage	Construction Cost	Annual Cost ($)
1	Maintenance Cost	0.25%	$10,600,000	$26,500
	Maintenance Cost Subtotal			**$27,000**

5) Labor Cost

#	Personnel	#	Max. Labor Cost ($)	Annual Labor Cost ($)
1	DISTRIBUTION OPERATOR I		$62,338	$0
2	DISTRIBUTION OPERATOR II		$68,702	$0
3	DISTRIBUTION OPERATOR III		$77,563	$0
4				$0
	Labor Cost Subtotal	0		**$0**

	Phase 1 Total Annual O&M Cost	**$42,000**



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