Appendix A-1

Notice of Preparation

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PASADENA WATER AND POWER

Notice of Preparation of an EIR and Public Scoping Meeting for the Sunset Complex Project

TO:

Responsible and Trustee Agencies,
Organizations, and Interested Parties

FROM:

City of Pasadena
100 North Garfield Avenue
Pasadena, California 91101

DATE:	April 7, 2022
SUBJECT:	Notice of Preparation of an Environmental Impact Report and Public Scoping Meeting
PROJECT TITLE:	Sunset Complex Project
PROJECT APPLICANT:	City of Pasadena Department of Water and Power
PUBLIC REVIEW PERIOD:	April 7, 2022 through May 9, 2022
SCOPING MEETING:	Thursday, April 21, 2022 from 5:00 P.M. to 7:00 P.M. Robinson Park Recreation Center 1081 N. Fair Oaks Avenue, Pasadena, CA 91103

Pursuant to Section 21165 of the California Public Resources Code and Section 15050 of the California Environmental Quality Act (CEQA) Guidelines, the City of Pasadena (City) is the Lead Agency for the preparation of an Environmental Impact Report (EIR) for the proposed Sunset Complex Project (Project). The Project would be implemented by the Pasadena Department of Water and Power (PWP). In accordance with CEQA Guidelines Section 15082, the City has prepared this Notice of Preparation (NOP) to provide responsible and trustee agencies, the Office of Planning and Research, the County Clerk, and interested persons and organizations with sufficient information describing the Project and its potential environmental effects to enable the interested parties to make a meaningful response to this NOP.

For public agencies, the City requests your agency's views on the scope and content of the environmental information related to your agency's statutory responsibilities in connection with the proposed Project, in accordance with CEQA Guidelines Section 15082(b). For other interested organizations and parties, the City requests your comments and concerns regarding the environmental issues associated with construction and operation of the proposed Project, as pursuant to CEQA Guidelines Section 15083, this NOP also serves to facilitate consultation with any persons or organizations that may be concerned with the environmental effects of the Project. Additionally, this NOP also serves as a notice for the public Scoping Meeting, which is held to expedite and facilitate the consultation process.

An Initial Study has been prepared for the proposed Project pursuant to CEQA Guidelines Section 15063 and is available for viewing online at https://ww5.cityofpasadena.net/water-and-power/sunsetcomplex/ or https://www.cityofpasadena.net/planning/environmental-notices/. Hardcopies will be available for viewing at the following four locations in Pasadena:

- PWP Office, 150 South Los Robles Avenue, Suite 200
- La Pintoresca Branch Library, 1355 North Raymond Avenue
- City of Pasadena Office of the City Clerk, 100 North Garfield Avenue, Room S228
- City of Pasadena Permit Center, 175 North Garfield Avenue

PWP is not providing hardcopies of the Initial Study for the public to take for viewing off-site. The hardcopies will only be made available for viewing at the above locations and must be returned when completed.

The Project is proposed by and would be implemented under the direction of the City of Pasadena. Although the Project is being initiated by the City, the Project would be subject to review and approval by City decision makers, who would consider the need for and benefits of the Project in addition to the potential environmental effects of its construction and operation.

PROJECT LOCATION: The Project site is located in western Pasadena at the intersection of Sunset Avenue and West Mountain Street (Assessor's Parcel Number 5728 021 916). The Project site is bordered by residences to the north, Sunset Avenue to the east, West Mountain Street to the south, and City of Pasadena buildings to the west. Surrounding land uses also include Brenner Park to the south, Interstate 210 (I-210) to the west, and residential uses on all sides (See **Figure 1**, *Regional Location,* and **Figure 2**, *Project Vicinity Map*). All proposed Project components under the scope of the Project would be located within the boundary of the existing site, with the exception of pipeline, mechanical and street improvements, and landscaping enhancements that would occur within the public right-of-way on Sunset Avenue and Mountain Street adjacent to the reservoir property.

PROJECT BACKGROUND: PWP currently imports approximately 65 percent of the potable water for the City from Metropolitan Water District of Southern California (MWD) as a member agency. MWD imports water from the Sacramento-San Joaquin Delta (Delta) via the State Water Project (SWP) and from the Colorado River Aqueduct (CRA). The remaining approximately 35 percent of the City's potable water is supplied from the Raymond Basin aquifer. A minimal, varying portion of potable water is purchased from neighboring water agencies, which includes a combination of surface and groundwater. The overall intent of the Project is to replace aging and insufficient water storage and build new treatment infrastructure to ensure that the City can reliably provide safe drinking water.

PROJECT SUMMARY: The Project would construct two replacement reservoirs and associated appurtenances including piping connections through the floor of the tank with concrete encasement beneath the floor, a removable silt stop, exterior and interior ladders with safety devices, two access hatches on the roof of each tank, guardrails at the roof ladder, and a roof center vent. The existing reservoirs (Sunset Reservoir 1 [SR1] and Sunset Reservoir 2 [SR2]) each have several cracks in the walls that leak depending on water levels. Additionally, recent seismic evaluations have identified necessary seismic improvements for the reservoirs' roofing system. Therefore, due to the age and condition of the existing reservoirs, Pasadena Water and Power (PWP) plans to replace these reservoirs with two new prestressed concrete reservoirs in the same location. Prestressed Concrete Tank Reservoir 1 (Reservoir 1) would have a capacity of 4.9 million gallons (MG) and Prestressed Concrete Tank Reservoir 2 (Reservoir 2) would have a capacity of 6.1 MG (See **Figure 3**, *Site Plan*).

In addition, the Project would install a new on-site groundwater treatment plant (GWTP) to be able to treat for perchlorate and volatile organic carbons (VOCs) and utilize the City's local groundwater supply. This would provide PWP with greater water supply reliability and

operational flexibility. The GWTP would be installed in two phases. Phase 1 would allow for a total treatment capacity of up to 3,000 gallons per minute (gpm) and would treat for perchlorate and volatile organic compounds such as 1,2,3 Trichloropropane (TCP). The second phase, Buildout, would increase the total treatment capacity to 4,500 gpm and may include up to 800 gpm of side stream biological nitrate treatment.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED: As identified in the Initial Study, the following topical areas have the potential to result in significant impacts and will be analyzed in the EIR: Aesthetics, Air Quality, Cultural Resources, Energy, Greenhouse Gas Emissions, Noise, and Tribal Cultural Resources. Other topical areas have been assessed through the Initial Study, were determined to have no impacts or less than significant impacts and will not be further evaluated in the EIR.

PUBLIC SCOPING MEETING DATE AND LOCATION: A public Scoping Meeting will be held to share information regarding the Project and the environmental review process and to receive written comments about the scope and content of the environmental analysis to be addressed in the Draft EIR. The Scoping Meeting is an information-gathering meeting, not a public hearing, and no public testimony or recordation of the meeting will occur. Attendees are encouraged to submit all comments in writing, which will be reviewed and considered by PWP as part of the environmental analysis of the Project. No decisions about the Project will be made at the Scoping Meeting. A separate public hearing for entitlement requests and consideration of certification of the EIR will be scheduled after the completion of the final EIR, which will include all public comments received during public review of the draft EIR and the City's corresponding responses. The date, time, and location of the public Scoping Meeting are as follows:

Date: Thursday, April 21, 2022

Time: 5:00 to 7:00 P.M.

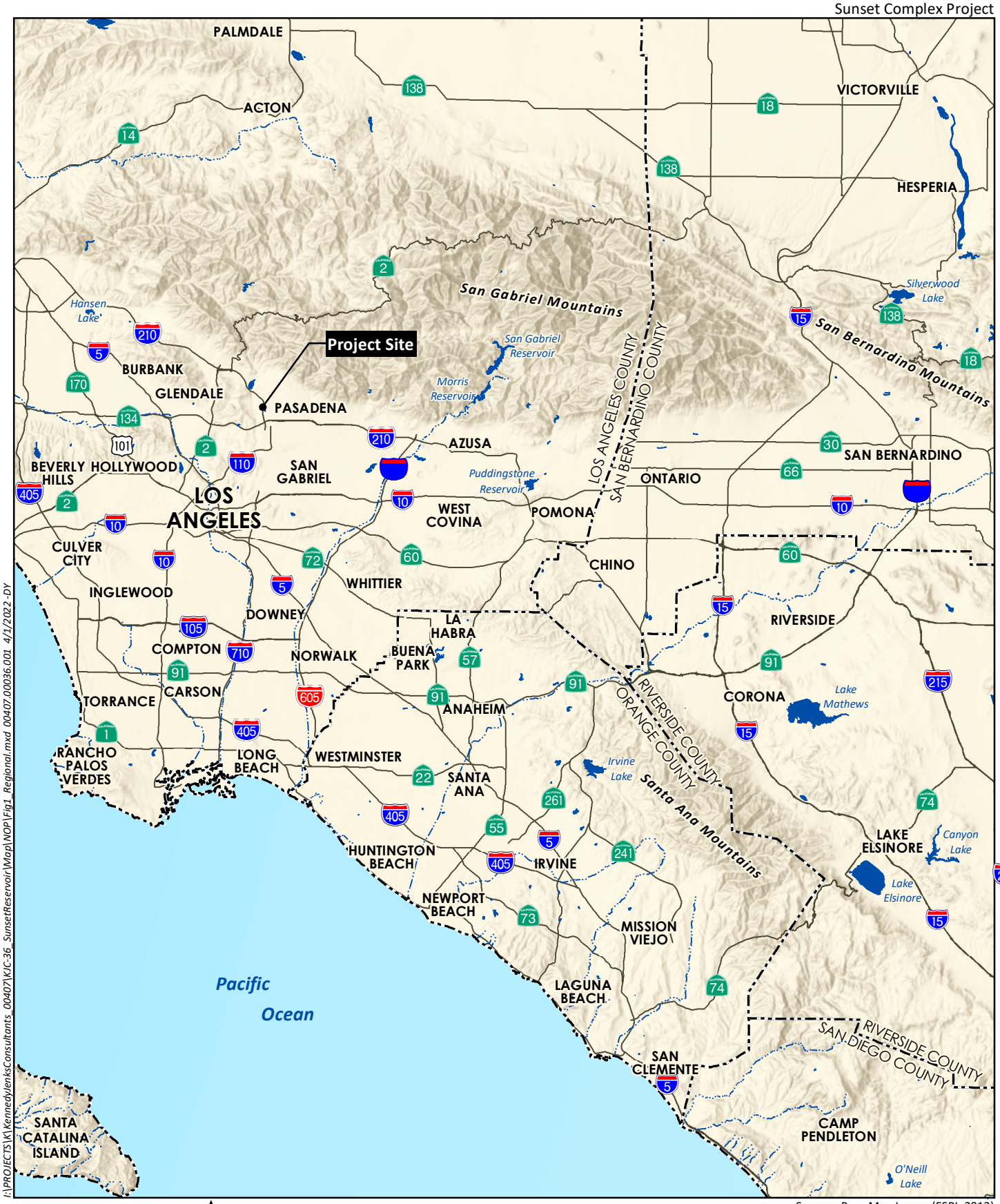
Location: Robinson Park Recreation Center
1081 N. Fair Oaks Avenue
Pasadena, CA 91103
(626) 744-7330

SUBMITTING COMMENTS: A copy of this NOP and the Initial Study may be viewed online at https://ww5.cityofpasadena.net/water-and-power/sunsetcomplex/ or https://www.cityofpasadena.net/planning/environmental-notices/. Hardcopies will be available for viewing at the PWP office, La Pintoresca Branch Library, City Clerk's office, and City Permit Center. The City will consider all written comments regarding the potential environmental effects of the Project received during the public review period. Written comments, including e-mails, must be submitted in writing by 5:00 P.M., May 9, 2022. Written comments will also be accepted at the Scoping Meeting described above. Due to the time limits mandated by State law, your comments must be received by PWP no later than 30 days after receipt of this NOP.

Please direct your written comments via email and/or postal service to:

Mr. Michael Lin, P.E.
City of Pasadena Department of Water and Power
150 South Los Robles Avenue, Suite 200
Pasadena, California 91101
E-mail: mlin@cityofpasadena.net

ATTACHMENTS:
Figure 1: Regional Location
Figure 2: Project Vicinity Map
Figure 3: Site Plan



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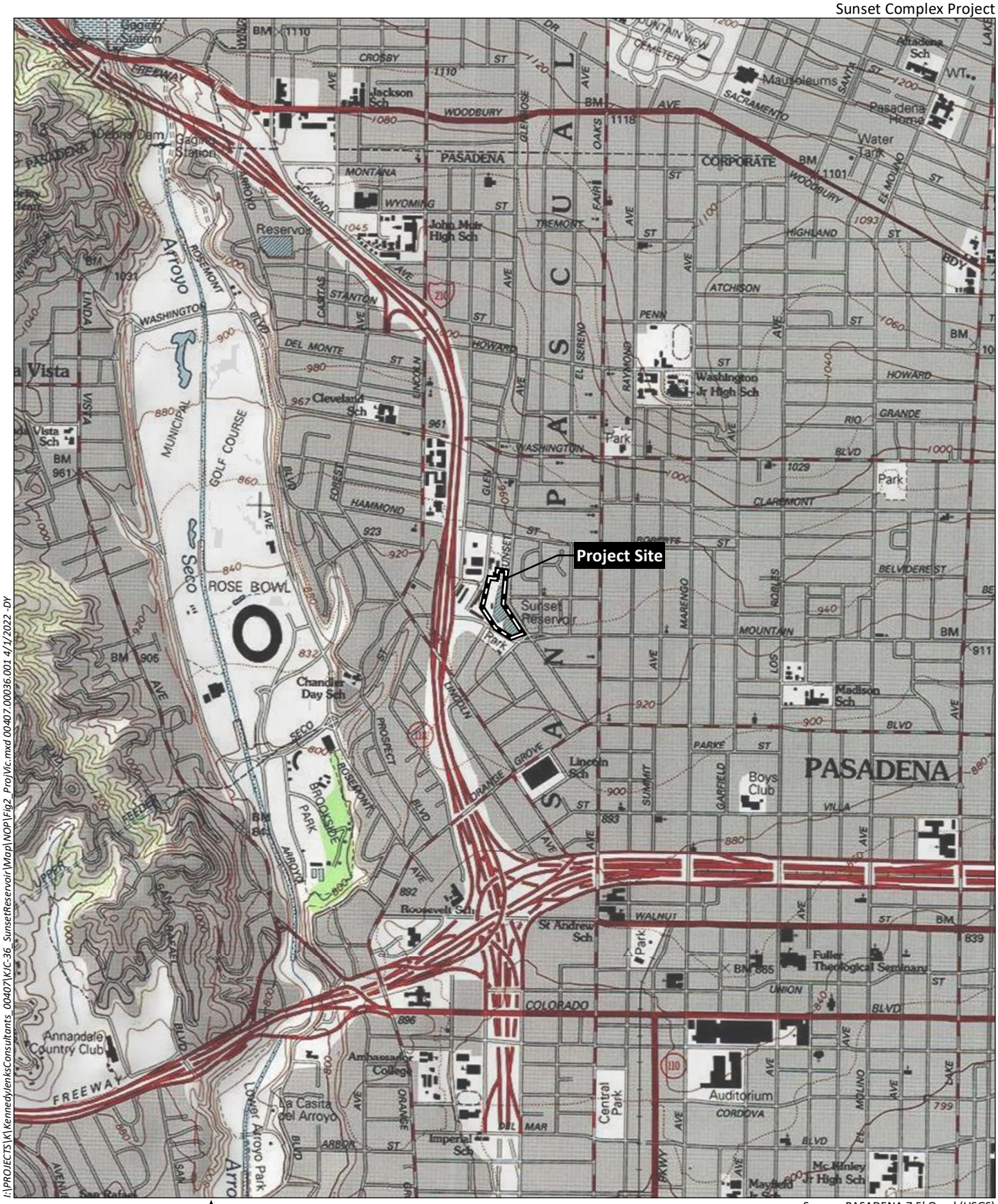
Source: Base Map Layers (ESRI, 2013)

HELIX Environmental Planning

Regional Location

Figure 1



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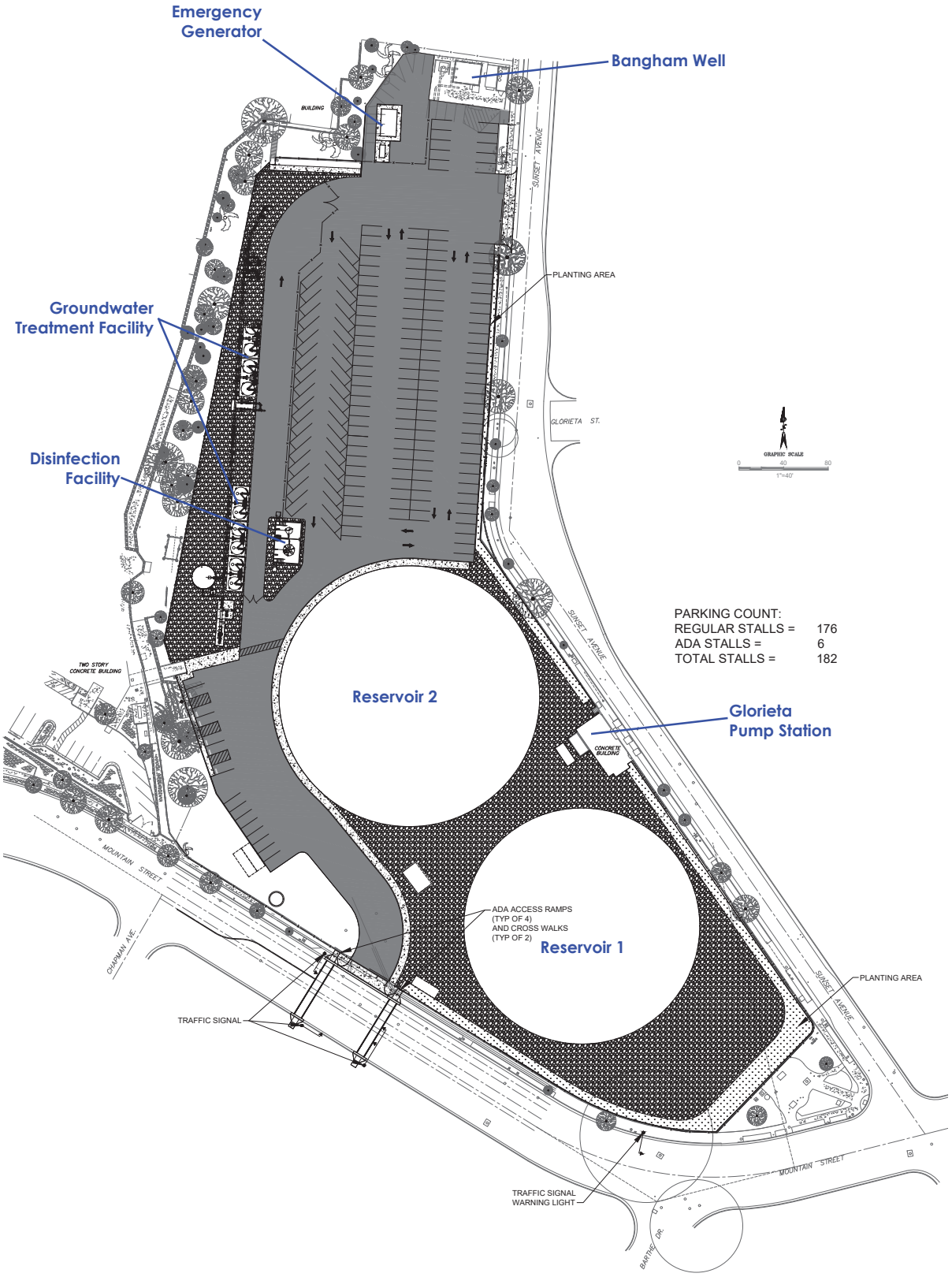
Source: PASADENA 7.5' Quad (USGS)

HELIX Environmental Planning

Project Vicinity Map

Figure 2



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Source: City of Pasadena (2021)

Appendix A-2

Public Review Draft Initial Study

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Initial Study

Sunset Complex Project

Prepared for

City of Pasadena
Water and Power Department
150 South Los Robles Avenue, Suite 200
Pasadena, California 91101

Prepared by

HELIX Environmental Planning, Inc.
16485 Laguna Canyon Road, Suite 150
Irvine, California 92618

April 2022

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B Cultural Resources Assessment Report
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SECTION 1.0 INTRODUCTION

1.1 PURPOSE OF INITIAL STUDY

The California Environmental Quality Act (CEQA) (*California Public Resources Code* §21000 et seq.) and the State CEQA Guidelines (*California Code of Regulations,* Title 14, §15000 et seq.) require that local government agencies, prior to taking action on projects requiring discretionary approval, consider the environmental consequences of such projects. Pursuant to Section 15367 of the State CEQA Guidelines, the City of Pasadena (City) is the Lead Agency for the proposed Sunset Complex Project (Project). As the Lead Agency, the City has the principal responsibility for carrying out the Project and has the authority for approving the Project and its accompanying environmental documentation.

The City has prepared this Initial Study (IS) to determine the potential environmental impacts of the proposed Project, prior to preparation of an Environmental Impact Report (EIR). The analysis contained in this IS identifies the environmental factors that will have no impact, a less than significant impact, a less than significant impact with mitigation, or a potentially significant impact as a result of Project implementation. The topics which are not found to have a potentially significant impact have been addressed within this IS and will be scoped out of the EIR. This will allow the EIR to focus the analysis on those environmental factors identified herein for which the Project would have a potentially significant impact.

As the Lead Agency, the City has commissioned the preparation of this IS and has reviewed and revised, as necessary, all submitted drafts and technical studies to reflect its independent judgment, including reliance on City staff for the review of all technical reports. Data for this IS was obtained from on-site field observations; discussions with affected agencies; review of available technical studies, reports, guidelines, and data; and review of specialized environmental assessments prepared for the Project.

1.2 PROJECT SUMMARY

The proposed Project would construct two replacement reservoirs and associated appurtenances including piping connections through the floor of the tank with concrete encasement beneath the floor, a removable silt stop, exterior and interior ladders with safety devices, two access hatches on the roof of each tank, guardrails at the roof ladder, and a roof center vent. The existing reservoirs (Sunset Reservoir 1 [SR1] and Sunset Reservoir 2 [SR2] totaling 15.5 MG of storage) each have several cracks in the walls that leak depending on water levels. Additionally, recent seismic evaluations have identified necessary seismic improvements for the reservoirs' roofing system. Therefore, due to the age and condition of the existing reservoirs, Pasadena Water and Power (PWP) plans to replace these reservoirs with two new prestressed concrete circular reservoirs in the same location. Prestressed Concrete Tank Reservoir 1 (Reservoir 1) would have a capacity of 4.9 million gallons (MG) and Prestressed Concrete Tank Reservoir 2 (Reservoir 2) would have a capacity of 6.1 MG.

In addition, the Project would install a new on-site groundwater treatment plant (GWTP) to be able to treat for perchlorate and volatile organic compounds (VOCs) and utilize their local groundwater supply. This would provide PWP with greater water supply reliability and operational flexibility. The GWTP would be installed in two phases. Phase 1 would allow for a total treatment capacity of up to 3,000 gallons per minute (gpm) and would treat for perchlorate and 1,2,3-Trichloropropane (TCP). The second phase, Buildout, would increase the total

treatment capacity to 4,500 gpm and may include up to 800 gpm of side stream for nitrate removal using biological treatment.

1.3 SUMMARY OF ENVIRONMENTAL IMPACTS

Section 1.0 of this IS provides the purpose of the IS, a summary of the Project, and a summary of the Project's environmental impacts; Section 2.0 discusses the existing environmental setting, and Section 3.0 provides a discussion of the improvements proposed as part of the Project. Section 4.0 of this IS evaluates the impacts that would occur with Project implementation. As analyzed, no impacts on Agriculture and Forest Resources, Land Use and Planning, Mineral Resources, Population and Housing, Public Services, Recreation, and Wildfire would result with Project implementation. Through compliance with existing regulations, the Project would have less than significant impacts on Biological Resources, Cultural Resources (Archaeological Resources), Geology and Soils, Hazards and Hazardous Materials, Hydrology and Water Quality, Transportation, and Utilities and Service Systems, and no mitigation measures (MMs) would be required.

Potentially significant impacts may result to Aesthetics, Air Quality, Cultural Resources (Historical Resources), Energy, Greenhouse Gas Emissions, Noise, and Tribal Cultural Resources. These issue areas will be further analyzed in the EIR, and MMs will be developed as appropriate.

SECTION 2.0 ENVIRONMENTAL SETTING

2.1 PROJECT LOCATION

The Project site is located in western Pasadena at the intersection of Sunset Avenue and West Mountain Street (Assessor's Parcel Number 5728-021-916), as shown on **Exhibit 2-1**, *Regional Location*, and **Exhibit 2-2**, *Project Vicinity Map*. The Project site is bordered by residences to the north, Sunset Avenue to the east, West Mountain Street to the south, and City of Pasadena buildings to the west. Surrounding land uses also include Brenner Park to the south, Interstate 210 (I-210) to the west, and residential uses on all sides. All proposed Project components under the scope of the Project would be located within the boundary of the existing site, with the exception of pipeline, mechanical and street improvements and site enhancements that would occur within the public right-of-way on Sunset Avenue and Mountain Street adjacent to the reservoir property.

The Project site can be accessed via I-210 by exiting on Mountain Street immediately west of the Project site. The site can also be accessed via West Mountain Street and from the north along Sunset Avenue.

2.2 PROJECT BACKGROUND AND NEED

PWP currently imports approximately 65 percent of its potable water from Metropolitan Water District of Southern California (MWD) of which the City is a member agency. MWD imports water from the Sacramento-San Joaquin Delta (Delta) via the State Water Project (SWP) and from the Colorado River Aqueduct (CRA). The remaining approximately 35 percent of the City's potable water is supplied from the Raymond Basin aquifer (PWP 2020a). A minimal, varying portion of potable water is purchased from neighboring water agencies, which includes a combination of surface and groundwater. The overall intent of the Project is to replace aging and deficient water storage and treatment infrastructure to ensure that the City can continue to provide reliable and clean drinking water.

2.3 EXISTING CONDITIONS

2.3.1 LAND USE

The Project site is zoned as Public and Semi-Public (PS) in the City's Zoning Map and designated as Institutional in the City's Land Use Plan diagram (City of Pasadena 2018a, 2015a). The site is owned, operated, and maintained by the City. The Project site is bordered by residences to the north, Sunset Avenue to the east, West Mountain Street to the south, and City of Pasadena buildings to the west. Surrounding land uses also include Brenner Park to the south, I-210 to the west, and residential uses on all sides.

2.3.2 EXISTING FACILITIES

As part of PWP's critical water supply infrastructure, PWP owns and operates Sunset Reservoir, located at the corner of Sunset Avenue and West Mountain Street. This facility consists of two partially buried, concrete lined reservoirs totaling 15.5 MG of storage (SR1 can store 5.6 MG and SR2 can store 9.9 MG), two well facilities (Bangham Well and Sunset Well) with a total capacity of 4.4 MG, a disinfection facility, the Glorieta Pump Station (PS), and the Sheldon Building housing electronic controls for the existing MWD point of interconnection (POI). The reservoirs are fed a blend of local well supplies and MWD import supplies to meet their water

quality standards due to key constituents found in the local well supplies. These constituents include perchlorate, TCP, and nitrate. The Glorieta PS pumps from the Sunset pressure zone (including SR1 and SR2) to the Calaveras and Sheldon pressure zones. The combination of local groundwater and MWD-imported water that is delivered to the existing reservoirs is blended in an inlet structure referred to as the A-Basin. The layout of the existing facilities is shown on **Exhibit 2-3**, *Existing Sunset Reservoir Facilities*.

The original Sunset Reservoirs were open earth embankment structures first constructed in the late 1800s and early 1900s. The reservoirs were lined with concrete in the 1890s/1900s and were also covered with wood-framed roofs and corrugated steel deck. Four-foot concrete walls were constructed around the reservoirs in the 1930s to increase the storage capacity.

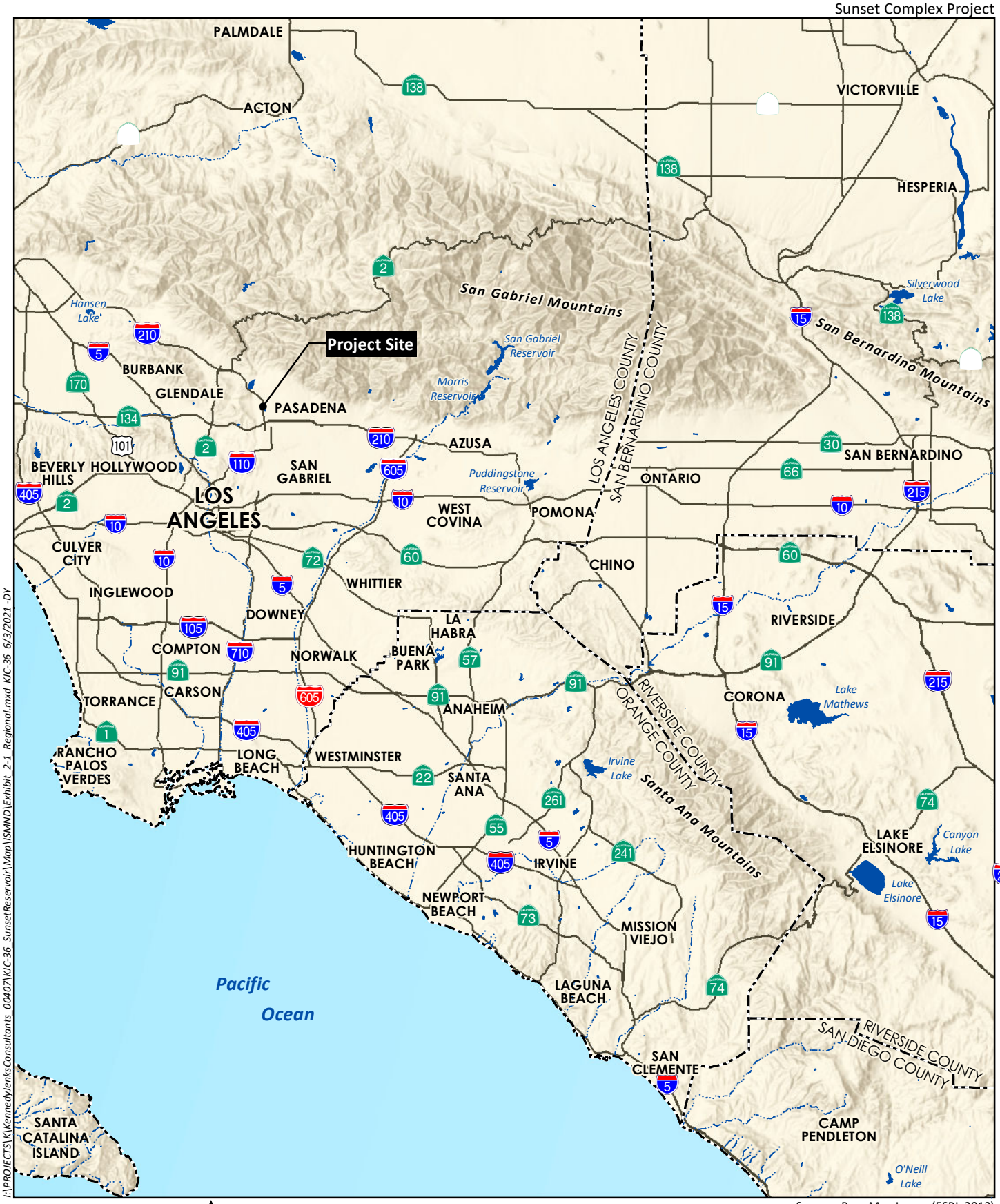
Dive inspections discovered the presence of several cracks in the walls of both SR1 and SR2 that leak depending on water levels. To minimize losses, PWP deliberately operates the reservoirs at a lower high-water level, reducing PWP's overall storage capacity. Recent seismic evaluations also identified necessary seismic improvements for the reservoirs' roofing system. Therefore, due to the age and condition of the existing reservoirs, the reservoirs are in need of replacement.

2.4 CEQA REVIEW PROCESS

This IS has been prepared to analyze the impacts associated with construction and operation of the proposed Project. The City of Pasadena is the Lead Agency for the CEQA environmental review process and has submitted a Notice of Preparation (NOP) and IS to responsible and trustee agencies, as well as other potentially affected agencies. The NOP and relevant attachments are available online at https://ww5.cityofpasadena.net/water-and-power/sunsetcomplex/ and https://www.cityofpasadena.net/planning/environmental-notices/. The NOP and associated technical reports can also be viewed in person at the PWP office (150 South Los Robles Avenue, Suite 200), La Pintoresca Branch Library (1355 North Raymond Avenue), City of Pasadena Office of the City Clerk (100 North Garfield Avenue, Room S228), and City of Pasadena Permit Center (175 North Garfield Avenue). Notices were also posted at the site and in the surrounding neighborhood.

In accordance with Section 15082 of the State CEQA Guidelines, a NOP is subject to a 30-day public review period and will be submitted to the State Clearinghouse for review by State agencies. Accordingly, the public review period for this NOP and IS has been set from **April 7, 2022 to May 9, 2022.** In accordance with Section 15082 of the State CEQA Guidelines, the EIR will include environmental information related to a responsible or trustee agency's area of responsibility as requested during the public review period.

In reviewing the IS, the reviewer should focus on the sufficiency of the document in identifying and analyzing the potential impacts on the environment and whether these issues require further analysis in an EIR. Comments should be sent in writing and postmarked by 5:00 pm on **May 9, 2022**, by mail or email to Mr. Michael Lin of the City of Pasadena at the address below.



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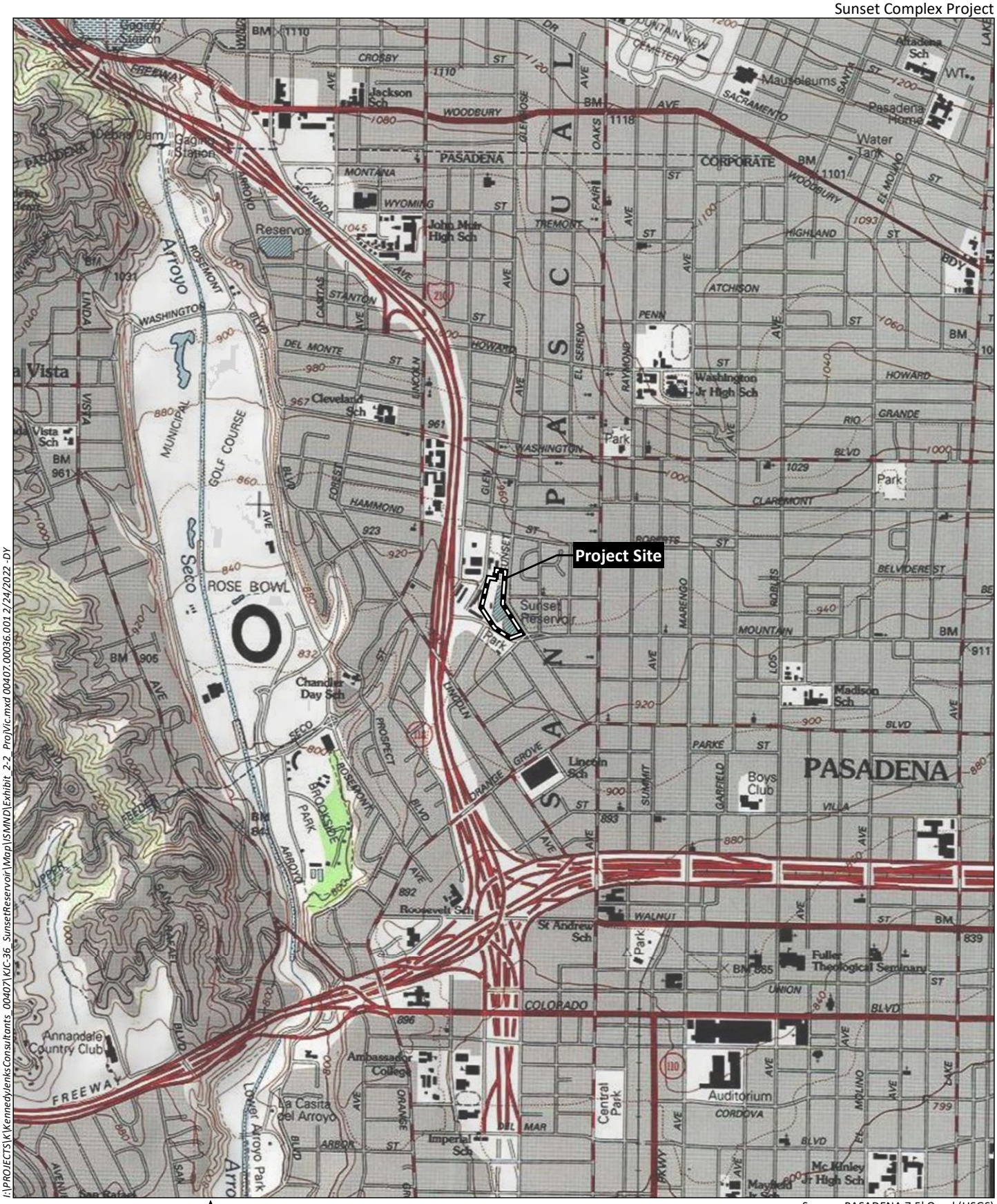
Source: Base Map Layers (ESRI, 2013)

HELIX Environmental Planning

Regional Location

Exhibit 2-1



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Source: PASADENA 7.5' Quad (USGS)

HELIX Environmental Planning

Project Vicinity Map

Exhibit 2-2



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Source: Aerial (Nearmap, 2020)

HELIX Environmental Planning

Existing Sunset Reservoir Facilities

Exhibit 2-3

City of Pasadena
Water and Power Department
150 South Los Robles Avenue, Suite 200
Pasadena, California 91101-4613
Attn: Michael Lin
phone: (626) 744-4468
email: mlin@cityofpasadena.net

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SECTION 3.0 PROJECT DESCRIPTION

Information for this Project Description is based primarily on the Sunset Complex Final Basis of Design Report (BODR), prepared by Kennedy Jenks for PWP dated March 9, 2021 and information provided by PWP staff. The Project site plan is provided in **Exhibit 3-1**, *Site Plan*, of this IS.

3.1 PROJECT COMPONENTS

3.1.1 REPLACEMENT RESERVOIRS

Tanks

The Project would construct two new reservoirs at the site, herein referred to as Reservoir 1 and Reservoir 2. Reservoir 1 would be constructed to have an internal diameter of approximately 210 feet and a capacity of 4.9 MG. Reservoir 2 would be constructed to have an internal diameter of approximately 224 feet and a capacity of 6.1 MG. The reservoirs would be constructed at different sizes due to the geometry of the existing site, which narrows at the south end of the site. By installing the smaller reservoir (Reservoir 1) in the south end of the site, the Project would be able to preserve more space for the GWTP and parking at the north end of the site. Collectively, the two reservoirs would provide a total capacity of 11.0 MG.

The two proposed reservoirs would be circular, prestressed concrete tanks with a height of approximately 12 feet above finished grade on the north side of Reservoir 2 and 18 feet above finish grade on the south side of Reservoir 1, which would be designed and constructed in accordance with the American Water Works Association (AWWA). The tanks would have Type I cast-in-place concrete core walls with vertical prestressed reinforcement and circumferential strand prestressing. The floors, wall footings, column footings, core walls, and two-way column supported flat slab roofs would be constructed of concrete. The joints between the wall footings and the core walls and the roof slabs would be anchored flexible joints with minimum restraint of radial movement. After circumferential prestressing strand is applied to the core walls, the strands would be covered with pneumatically applied concrete (shotcrete) as embedment and corrosion protection of the circumferential wall reinforcement. The circumferential strand and vertical tendons for prestressing would be galvanized for corrosion protection.

The two structures would have 6-inch-thick membrane floors, and concrete core walls between 10 and 14 inches thick. The roofs would consist of two-way spanning flat slab approximately 12 inches thick that are supported by concrete columns with square column footings above the membrane floor slab and square drop panels recessed beneath the underside of the roof slab. The 12-inch-thick roof would support potential future installation of photovoltaic solar panels that could be mounted to the roofs of the reservoirs. A waterproofing system would be incorporated into the roofs of the reservoirs to protect the drinking water from rainwater intrusion associated with future cracks. The roofs would be provided with roof scuppers and downspouts to direct rainwater from the roof to the site drainage facilities. The tanks would also include polyvinyl chloride (PVC) waterstops placed in joints and between the floors, walls, and roofs to prevent the passage of water through a construction of expansion joint between adjacent elements of concrete construction. The tank walls would receive a natural gun shotcrete finish in an earth tone color and roof would receive a smooth trowel finish.

The perimeter and floor of the proposed tanks would contain drainage systems to limit hydrostatic pressures on the exterior face of the tank walls and floors. The automated

circumferential prestressing and shotcrete for the wall of the tanks would require 10 feet of clearance outside of the wall of the tanks for the prestressing wrapping machinery.

Depending on the site grading differential, backfill may be placed around both reservoirs. The depth of the backfill is dependent on the sliding stability of the empty tanks. Where possible, the tanks would be backfilled approximately 12 feet above the base of the walls all around the tanks to restore grades to their original levels or higher to provide positive drainage away from the new tanks. If the backfill depth is less than 12 feet, sliding calculations and the appropriate design modifications would be provided as part of the final design.

Piping

The inlet, outlet, and drain pipelines for each of the reservoirs would enter the tanks through the floors of the tanks and would be completely encased in concrete beneath the floor and footings of the tanks. Concrete encasement of all piping placed under the foundation and/or floor slab would be used for added corrosion protection. It also reduces the potential for leakage of the piping during the useful life of the structure. Concrete encasement provides a uniform, dense, stiff backfill around the pipes that eliminates potential problems with inadequate compaction of soil under and around the pipes. Flexible couplings would be provided outside the wall footings to accommodate movement caused by differential settlement or seismic activity on piping connections.

Inlet and Outlet

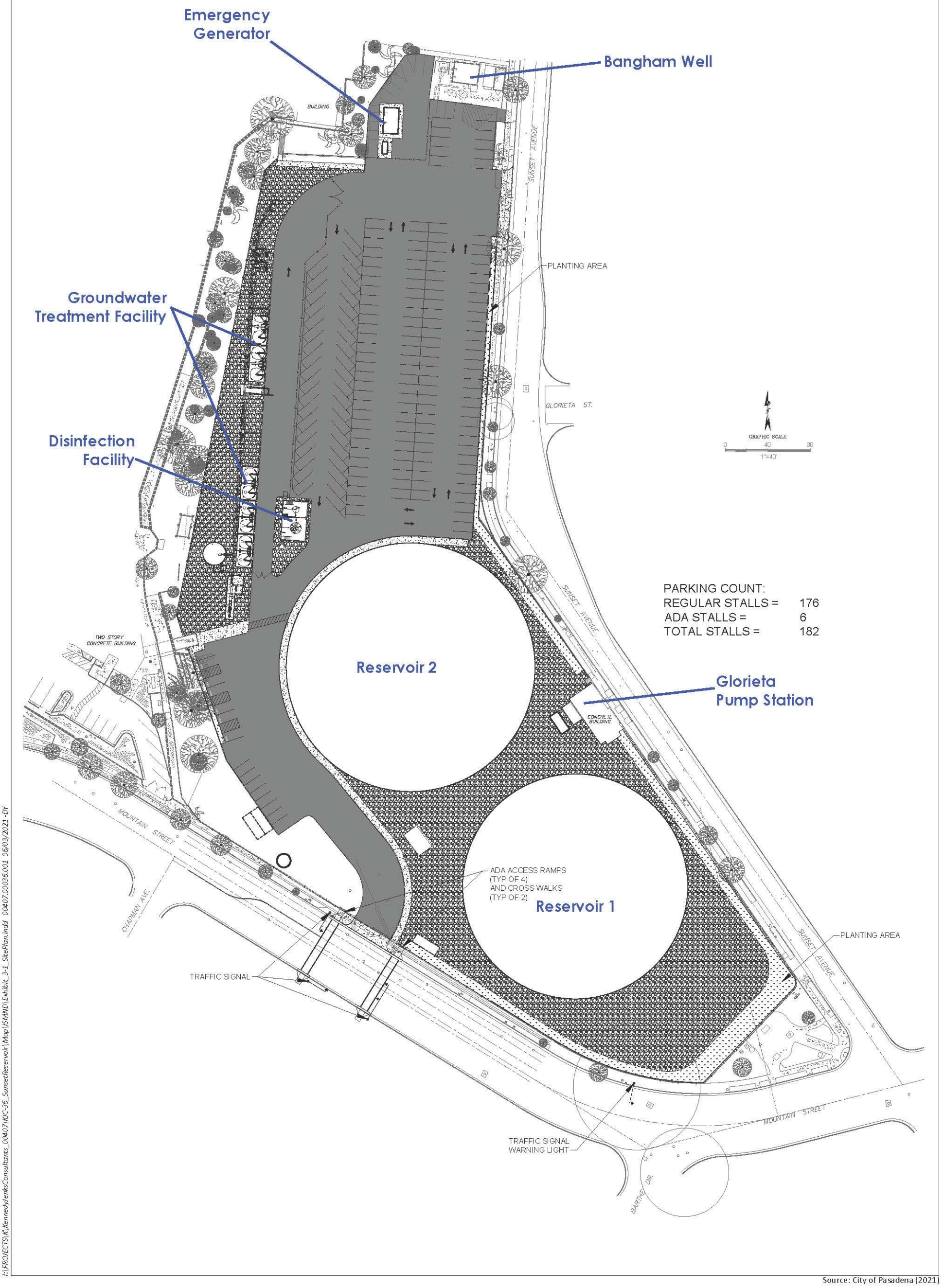
For the reservoirs, separate 36-inch diameter inlet and outlet pipes would penetrate the tank floor slab and pass beneath the perimeter footing. The inlet and outlet points in the reservoirs would be separated by approximately 180 degrees to minimize water from short circuiting. The pipes would be encased in concrete starting where they pass under the perimeter footing and continue under the floor. Both pipes would be oriented vertically and would extend above the floor a minimum of 6 inches to prevent sediment on the floor from entering the distribution system. Buried, manually operated isolation valves on the inlet and outlet pipes would be provided just outside the tank perimeter.

Reservoir Seismic Isolation Valve System

PWP may implement a seismic isolation valve system in the new reservoir design to prevent the reservoirs from excessively draining during a recorded seismic event coupled with an unusually large increase in downstream system demand (indicative of a water main break). One option is the FLOSAFE Flow Monitoring Safety System by FLOLOC, which only shuts valves when a break in the pipeline is detected in the minutes after a serious seismic event, eliminating the possibility of an unnecessary shutdown. This system has been successfully implemented for several other Southern California water agencies/districts. If implemented, the FLOSAFE system would be installed on the downstream isolation valve of one of the reservoirs so that the other is still available to the distribution system in case fire suppression is required following the seismic event and maintain minimum system pressure.

Reservoir Mixing

The design of the circular prestressed concrete reservoirs reduces the likelihood for creation of any mixing “dead zones” in the reservoirs. Given that these reservoirs serve PWP’s largest



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Source: City of Pasadena (2021)

pressure zone, the reservoirs are expected to cycle regularly, reducing concerns for water age and residual management.

Overflow and Drain

The overflow pipe for each reservoir would be designed for a 9,500-gpm flowrate. The overflow weir, reducing inlet, and vortex breaker would be sized to pass the design flow at the maximum static water surface permitted. The overflow discharge pipes would extend beneath the floor and perimeter wall footing and be piped to the drain vault structure where an air gap would be provided. The termination point of the overflow pipes would include reinforced elastomeric check valves or flap valves to prevent small animals from accessing the tanks through the overflow pipe. The discharge point would include an air gap to prevent contamination between the tank and the discharge point. The overflows on each tank would include a 48-inch diameter overflow weir cone reducing to a 24-inch diameter overflow pipe that would extend beneath the floor and perimeter wall footing and would then be piped to the drain vault structure.

A 6-inch diameter drain pipeline valve outside the tanks would be provided to facilitate draining each of the reservoirs and dispose of washdown water during inspection and cleaning. The drain pipeline would be separate from the outlet pipeline for each tank. The drain pipelines would typically be located on west sides of the tanks and discharge to the drain vault located west of the tanks where an air gap would be provided before discharge to the storm drain system in West Mountain Street.

Underdrain

While not necessary to prevent hydrostatic uplift, a separate underdrain system would be provided for each reservoir to monitor each of the tanks for leakage from the tank floors, joints in the tank floors, and the joints between the tank foundations and walls. The underdrain systems would consist of a geomembrane liner placed beneath the aggregate base subgrade material beneath the floor of each of the tanks that would direct any water from beneath the tanks to a perimeter drain consisting of drain rock and a 6-inch diameter perforated foundation drain pipeline. The underdrain pipelines would discharge to a daylight point at the ground surface or in the drain vault for observation and monitoring.

Roof Ventilators

A single roof vent located near the center of each reservoir would be provided to admit air at a flow rate equal to the maximum tank outflow rate. The exhaust capacity of the ventilator would be at least equal to the 9,500-gpm design fill rate of the reservoirs. Ventilator screens would be protected from vandalism, but would also be accessible for inspection, screen replacement, and cleaning to remove insects or airborne lint, pollen, or dust. Vents would be designed to prevent the entry of rainwater, runoff, birds, insects, rodents, or other animals. The roof vent would be 48 inches in diameter.

Roof Hatches

Two hatches would be provided on the roof of each reservoir: one 42-inch square hatch for personnel entry and a second 4-foot by 8-foot hatch for equipment. Roof hatches would be designed to prevent leakage into the tank and would be locked to resist unauthorized entry and vandalism. Roof hatches would be set on curbs at least 9 inches high. All covers would turn down at least 1.5-inch over the curbs or contain a gutter system to carry water away from the

roof opening. All frames and covers would consist of aluminum. Roof hatches would be specified to include a channel to collect drain water, compression spring operators, hold-open arms, fall protection grating, debris gasket, and recessed hasp for padlock. Hatches would include intrusion alarms to signal unauthorized entry.

Exterior and Interior Ladders and Guardrail

One exterior ladder and one interior ladder would be provided for access to each reservoir. Ladders would conform to Occupational Safety and Health Administration (OSHA) requirements and would be constructed of corrosion resistant materials. Ladders would be provided with OSHA-compliant stainless-steel fall prevention devices. A limited amount of guardrail would be provided on the roof of the tanks directly adjacent to the exterior ladders and access hatches. All guardrail posts, rails, and toe boards would be of aluminum construction in accordance with California Building Code (CBC) and OSHA requirements.

3.1.2 GROUNDWATER TREATMENT PLANT

The proposed GWTP would provide treatment for the removal of perchlorate and VOCs, with space reserved for a future biological nitrate treatment system. The initial phase, Phase 1, would consist of ion exchange for perchlorate removal and granular activated carbon for VOCs removal, with a treatment capacity of up to 3,000 gpm, which equates to the capacity of two wells. Space would be reserved on-site for a future phase (Buildout) to increase the treatment capacity up to 4,500 gpm for VOC and perchlorate with a side stream nitrate treatment system capable of producing 800 gpm of nitrate treated effluent. Nitrate analyzers would be provided with Phase 1.

Treatment Process

The treatment process would remove perchlorate and VOCs, with a space reserved for a future nitrate treatment system. Ion exchange (IX) would be used for treating perchlorate, and liquid phase granular activated carbon vessels (GAC) would be used for TCP removal. Each of these elements of the GWTP is explained below.

Ion Exchange Pre-Filtration Treatment System

The first step of the treatment process is pre-filtration which provides supplemental protection for the IX treatment system by minimizing fouling, clogging, or general damage caused by particulates and debris that may be present. The GWTP's pre-filtration system would filter raw groundwater from the wells upstream of the IX system using cartridge filters.

Cartridge filters are depth-type filters in which particles and contaminants are captured throughout the total thickness of the filter. Standard diameter cartridge filters can be manufactured as pleated, string wound, or melt-blown, with pleated cartridge filters offering the largest surface area and solids holding capacity. Large diameter cartridge filters are utilized for large flow applications as fewer elements are needed for treatment, reducing the labor effort required to perform a filter change out. As a result of the high system flows, large diameter filters would be required. The pre-filtration system would consist of a horizontal, carbon steel pressure vessel housing a bank of cylindrical wound depth polypropylene or string wound cartridge filter elements. Two cartridge filters would be required for the Phase 1 flow, and one additional filter would be required for Buildout flow.

Ion Exchange Treatment System

In drinking water treatment applications, IX is typically applied to selectively remove a specific contaminant ion (such as perchlorate, nitrate, or arsenate) and exchange it with a less harmful species (such as sodium or chlorine). The IX process utilizes a resin that has an affinity for the targeted contaminant ion, in this case, perchlorate.

Single-use IX is an adsorption treatment process in which the feed water (e.g., groundwater) is passed over a resin bed. After the resin capacity is exhausted, the resin is sent for disposal rather than being regenerated on-site. The resin is either placed in a landfill or thermally destroyed. Therefore, no waste brines are generated. This configuration is used at sites where brine disposal is expensive or prohibited for regulatory or other purposes. Single-use IX is commonly used to remove perchlorate with perchlorate-specific resins.

The Project's single-use IX system would consist of a fixed bed in a lead-lag configuration. In Phase 1, the IX system would consist of two pairs of IX vessels (4 total) each filled with perchlorate-specific resin. In Phase 2, a single pair of IX vessels would be added raising the total to three pairs. Each vessel would be 12 feet in diameter and approximately 16 feet in height. Each vessel in a pair would be joined by a series of pipes and valves (header) and the treated water would be piped to a collector main.

During the production cycle, pumped groundwater would be passed through a resin bed in the lead vessel that selectively removes perchlorate and exchanges the constituent for chloride. The treated water would then flow into the lag vessel as a polishing step or as an additional protection barrier for perchlorate break through. Each vessel would contain approximately 424 cubic feet of resin. When the resin in the lead vessel would become exhausted, the single pair would be taken offline and the exhausted resin would then be removed from the lead vessel and replaced with new resin. This pair would return to service but the prior vessel in the lag position would rotate to the lead position and the vessel with the new virgin resin would operate in the lag position. The exhausted resin would then be disposed of off-site.

Liquid Phase Granular Activated Carbon Vessel Treatment System

GAC treatment would be implemented for the removal of VOCs such as TCP, a human- made chlorinated hydrocarbon typically used for cleaning and degreasing or as part of pesticide products. GAC treatment has been identified by the State Water Resources Control Board Division of Drinking Water (DDW) as the best available technology (BAT) for TCP removal. GAC treatment typically consists of a fixed-bed of granular activated carbon in steel vessels either in a parallel or lead-lag configuration. GAC removes contaminants through adsorption. When GAC media is no longer able to adsorb contaminants, the media must be replaced with new carbon.

The GAC treatment system would consist of three trains of 12-foot diameter adsorber vessels in a lead-lag configuration. Each pair of vessels is equipped with a centrally located valve manifold and interconnecting piping. Each vessel would be approximately 24 feet in height. The centrally located valve manifold allows isolation of each pair of vessels for removing/filling of GAC or backwash operations. Each vessel is sized to hold up to 40,000 pounds of GAC. The amount of GAC media per vessel would remain the same in Phase 1 and Buildout. For Phase 2 an additional two trains (4 vessels) would be added. In a lead lag configuration, when the carbon in the lead vessel becomes exhausted the pair of vessels is removed from service. Similar to the IX system, the exhausted carbon is removed from the lead vessel and replaced with virgin or reactivated carbon and prepared for backwashing operation. When completed the lead vessel is

rotated into the lag position, and the former lag vessel is rotated into the lead position. The pair is returned to service. All valves are located at low elevations for ease of operation and maintenance. The water in this system is applied in a down flow mode. The GAC vessels are occasionally backwashed to remove clogging of the columns by suspended particles.

Backwash Storage Tanks

When the new GAC media would be installed, a backwash would be required to remove any carbon fines. A backwash would also occur every three months to remove clogging of the media bed by suspended particles. Potable water from the distribution system would be used to backwash the vessels.

After backwashing, the wastewater would be stored in the backwash waste tank and then gravity fed from a weighted floating suction strainer to disposal in the sanitary sewer. Pulling water from the surface of the tank would reduce the solids loading on the sanitary sewer and promote settling of the fines at the bottom of the tank. The float would automatically shut off a few feet above the bottom of the tank to prevent suctioning fines. Cleanout would have a frequency of once per year or when the depths of solids reach one foot, whichever comes first. Fines would be periodically removed from the tank by a vacuum truck.

Backflow preventors would be installed along the disposal pipeline to prevent backflows from the sanitary sewer. In addition, an air gap would be installed prior to the backwash waste tanks to prevent any backwash wastewater from coming back into the GAC vessels and to prevent a cross connection with the sanitary sewer.

Buildout Nitrate System

A future buildout phase would include biological treatment for nitrate removal by denitrification. Provisions are included in the Phase 1 design to ensure the Buildout nitrate treatment system can be installed and integrated without major modifications to the main process. First, adequate space has been identified on the site for the system based on a nitrate system design flow of 800 gpm. Second, mechanical fittings would be installed for future connections and for balancing flow between the main treatment system and the future side stream system.

Waste Streams

Operation of the GWTP would produce several process residuals that would be collected and managed in accordance with state and local requirements. Well flush water would be directed to the nearby storm drain on West Mountain Street and GAC backwash waste and instrumentation waste would be directed to the sanitary sewer, located along Sunset Avenue.

Chemical Storage and Handling

Water supplied to PWP from MWD uses chloramines for disinfection. To match the MWD disinfection strategy, PWP currently produces chloramines by the combination of sodium hypochlorite and aqueous ammonia before storing the treated water in the existing reservoir. The new facility would use liquid ammonium sulfate instead of aqueous ammonia. The existing chemical equipment would be relocated to a canopy shade structure and the existing canopy would be demolished.

Due to the hazardous nature of sodium hypochlorite and ammonium sulfate, secondary containment would be required for each material. The secondary storage for each tank would be concrete with a cover to reduce direct sunlight and protection from rainwater. Each containment would be sized to contain 110 percent of the storage tank volume. The containment would be equipped with a sump and level limit controls set to alarm at the detection of liquid in the sump. This would prevent the discharge of incompatible liquids into the same area and allow for rapid response in the case of leaks.

Adequate safety provisions would be implemented including stairs in and out of the containment areas, eye wash stations in each containment area, and eye wash stations at the chemical fill connections. Additionally, a full height wall would be installed between the sodium hypochlorite, ammonium sulfate, and electrical areas.

Product Water Storage

Water treated by the Project would be discharged directly from the GWTP to the two proposed reservoirs. There would be no intermittent storage or product water pumps between the final treatment stage (GAC) and the reservoirs.

3.1.3 CIVIL/SITE IMPROVEMENTS

Site Ingress/Egress

The main ingress/egress would be located at the northeast corner of the site. The existing employee entrance to the north along Sunset Avenue would be widened to allow for safety and ease of traffic flow. The existing site entrance along West Mountain Street would also be maintained but would be modified to meet the new finished grade of the proposed site and may also include the construction of a new traffic signal in order to provide safe ingress and egress to vehicles accessing the site at this location. An access road would run from the West Mountain Street entrance up to the GWTP site. The expanded parking lot directly to the north would also be accessible from this access road. Delivery and service trucks would enter the site from the south via Mountain Street, following the service road along the GWTP at the northwest edge of the site, and would exit the site to the north onto Sunset Avenue. The service road would be sized to accommodate large service and delivery vehicles entering and exiting the site and would maintain space for offloading. The GWTP facility would be accessible via key-actuated motorized gates.

The reservoirs would be sized and located such that a 10-foot vehicle lane would be maintained around the entirety of all site facilities to allow for regular inspections and maintenance activities. The 10-foot lane width is based on coordination with PWP based on the maintenance vehicles PWP plans on using to maintain on-site facilities.

Site Grading, Drainage and Paving

To handle the load of the delivery and service trucks, the service roads would consist of a 4-inch thick layer of asphalt over 6 inches of aggregate base (to be confirmed by the site geotechnical investigation). The rest of the site would be paved to match the existing asphalt and base aggregate thicknesses in the existing site parking lot and access roads. Any asphalt repairs would be done in accordance with PWP's most current Water Construction Standards.

With exception to the concrete equipment pads, the site would be graded to direct runoff from the high side of the site along Sunset Avenue to the southeast towards West Mountain Street. The design of the grading plan is aimed to reduce as much required exported fill as possible and to provide adequate driveway grades for delivery and maintenance vehicle access. The current grading plan shown results in an approximate net export of 3,700 cubic yards (CY). The grading plan would be refined during Final Design and would aim to balance the site. A site survey would be conducted as part of the final design to confirm final elevations of the proposed site.

Site Stormwater Treatment

The site design would incorporate Low Impact Development (LID) features in accordance with the Los Angeles County stormwater requirements, including the 2014 Low Impact Development (LID) Standards Manual, the MS4 Permit, and the Hydraulic Design Manual. The sizing of treatment would be based on the total area impacted by the Project (approximately 6.3 acres) and the 85th percentile 24-hour rainfall depth of 1.1 inches. Stormwater is planned to be treated by bioretention because infiltration would likely be infeasible due to proximity to slopes, resulting in a required treatment volume 1.5 x Stormwater Design Volume that equates to approximately 0.9 acre-feet (AF). Treatment type would be confirmed during final design. The bioretention facility would include an overflow and underdrain system, which would either discharge to the drain vault in the southwest corner of the site, or, if necessary, to the existing storm drain system(s) within West Mountain Street. Stormwater facilities would be kept as far away from existing wells as possible. When possible, self-treating areas would be used to decrease the required quantity of LID features, which would be coordinated with the landscape architect during final design. Grading would be adjusted to accommodate Los Angeles County LID requirements during final design.

The Project is exempt from Hydromodification Controls because it would discharge to the existing storm drain system, which in turn discharges to Arroyo Seco and the Los Angeles River, both of which are armored channels not susceptible to the impacts of hydromodification.

On-Site Parking

The Sunset Reservoir site currently provides parking for City employees who work at the adjacent maintenance building. The Project aims to provide, at a minimum, the same number of parking spaces post construction as preconstruction. While several existing parking spaces at the south end of the site would be removed to accommodate the new reservoir configuration, space towards the north end of the site would be used to provide additional parking spaces. It should be noted that during construction activities PWP employees that currently park on-site would be required to park off-site at a nearby parking lot. Employees would park at the off-site location and be shuttled to and from the PWP offices immediately west of the reservoir complex facility.

3.2 PROJECT CONSTRUCTION

Based on the age of the structures on the Project site and the historical usage of environmentally sensitive materials (i.e., Asbestos Containing Materials [ACM] and Lead-Based Paint [LBP]) in construction practices and supplied materials of the early 1900s, PWP would perform a pre-demolition survey to determine the potential extent of impacts where potentially hazardous materials may be present. The pre-demolition survey would consist of a review of

available reservoir construction information, and a visual inspection of the water reservoirs and any visual connecting appurtenances.

The objective of the pre-demolition survey would be to observe, locate, and evaluate the condition of suspected ACM, LBP, wood construction materials formerly treated with Creosote, and any other identifiable materials. The survey would provide information that could be used to potentially implement a program of removal prior to initiating demolition activities, should specific conditions apply. The survey would also provide the demolition contractor with information so that measures, procedures, and unit costs may be agreed upon with PWP for the removal of environmentally sensitive materials as part of the demolition contract should materials be encountered during demolition work.

Should the survey result in findings of environmentally sensitive materials, based on the recommendations provided by the pre-demolition survey professional, PWP may elect to perform a Pre-Demolition Environmental Assessment Removal (PDER) activity of selected materials to mitigate specific health and safety hazards at the site prior to construction of the new reservoir facility. Following completion of the pre-demolition survey work activities, the survey professional would prepare a Summary Report to document the work activities performed and any variations from their work plan.

The estimated construction duration for the Project would be 24 months. Based on the proposed facility layout, Reservoir 1 would be constructed first. Reservoir 1 would be the southernmost facility on the site, which would allow the construction contractor to have access to the remaining contiguous site to construct the remaining facilities. Reservoir 1 would be constructed in 12 months, and Reservoir 2 would follow approximately 6 months behind Reservoir 1's construction schedule. The GWTP facilities would be constructed simultaneously with the reservoirs.

3.3 PROJECT OPERATION

The proposed reservoirs would be hydraulically connected to one another on the inlet side via the valve vault between the reservoirs, as well as on the outlet side via their connection to the 36-inch main that runs along Sunset Avenue. Since the reservoirs would be directly connected to the Sunset Pressure Zone (PZ), water levels in the reservoirs would "float" with the PZ, meaning that it would operate at the same hydraulic grade line (HGL) at which the Sunset PZ operates.

Under normal operations (at full design capacity), raw water from the wells would flow to the pre-filters followed by the GWTP for removal of perchlorate and VOC followed by disinfection. After being treated and disinfected, the treated water would be conveyed to the reservoirs. Variable flow from P-1 (MWD imported water turnout) would enter through the inlet piping and combine with the treated product water as it moves up through the valve vault to Reservoir 1 and Reservoir 2.

In 2021, PWP began drilling of the Garfield Replacement Well in Villa Park, located approximately, 0.80-mile southeast of the project site. The new well is to replace a 100-year-old well that has exceeded its useful life and was experiencing mechanical issues. The replacement well will be completed in 2023. The existing discharge pipe from the Garfield Well will be utilized for the replacement well. The existing discharge pipe terminates near P-1. The Project would extend the existing discharge pipe to the influent of the GWTP and combine with the discharge of Bangham Well. If the Garfield Replacement Well does not require treatment, it would bypass

the GWTP and combine with treated water upstream of the disinfection system. Under this configuration Phase 1 for the project would treat approximately 1,500 gpm. Future phases may increase treatment capacity up to 4,500 as new wells come online.

If Reservoir 1 or Reservoir 2 need to be isolated for maintenance or repairs, each reservoir would be able to be individually separated from the system by closing the corresponding isolation valve in the inlet valve vault and closing the outlet isolation valve on the reservoir. The inlet/outlet piping would be sized so that each reservoir could operate independently at design flow rates without incurring excessive headloss.

Power would be provided by PWP and any design considerations necessary for compliance with PWP service requirements will be considered during the final design phase. Emergency standby generator power would be provided at the site via an automatic transfer switch (ATS). The ATS would receive main (primary) power from a 480-volt, 3-phase utility service disconnect within the switchboard. The backup (secondary) power source for the ATS would be a 1000kW, 480-volt, 3 phase natural gas generator to provide 24 hours runtime. The generator and its accessories would be housed in a sound attenuated enclosure and comply with air quality emission standards.

Maintenance associated with the project would not be substantially different than existing operations. Staff would access the site daily for to ensure there are no issues that need to be immediately addressed. About once each week a water quality sample would be taken. Once each month, the disinfection facility would receive a chemical delivery and once every three months the filter media in the GWTP would be changed by a service provider.

3.4 AGENCY APPROVALS AND PERMITS

This Initial Study is intended to serve as a preliminary analysis of the Sunset Complex Project prior to the preparation of an EIR, which will serve as the primary environmental document, pursuant to CEQA including discretionary approvals requested or required to implement the Project.

Table 3-1, *Agency Approvals and Requirements*, lists all the agencies that are known or expected to have permit or approval authority over the Project. Moreover, the EIR will identify all federal, State, local government, and quasi-government approvals that may be needed to construct, implement, or operate the Project, whether or not they are specifically identified in Table 3-1 or elsewhere in this IS.

TABLE 3-1
AGENCY APPROVALS AND REQUIREMENTS

Agency	Approval/Permit Required	Purpose
City of Pasadena	Conditional Use Permit	Project approval.
City of Pasadena	Design Review	Project approval.
City of Pasadena	Occupancy Permit	Permit installation of backwash connection pipelines and water main in Sunset Avenue.
State Water Resources Control Board, Division of Drinking Water (DDW)	Permit Amendment Application	Allow for reservoir and treatment system for public drinking water systems.
Pasadena Department of Public Works	Sanitary Sewer Discharge Permit	Permit discharge of backwash to the sanitary sewer.
Regional Water Quality Control Board	Order No R8-2013-0031	Permit wellhead treatment
Regional Water Quality Control Board	NPDES Permit No, CAS004001	Approve discharge of overflow, underdrain, and collected stormwater flow to storm sewer system.
South Coast Air Quality Management District	Permit to Construct/Operate	Allow construction and operation of the emergency generator

The Project is proposed by and would be implemented under the direction of the City of Pasadena. Although the Project is being initiated by the City, the Project would be subject to review and approval by City decision makers which would consider the need for and benefits of the Project in addition to the potential environmental effects of its construction and operation.

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SECTION 4.0 ENVIRONMENTAL ASSESSMENT

This section includes the completed CEQA Environmental Checklist Form, as provided in Appendix G of the State CEQA Guidelines, as well as substantiation and clarification for each checklist response. The checklist form is used to assist in evaluating the potential environmental impacts of the Sunset Complex Project and identifies whether the Project is expected to have potentially significant adverse impacts that would be analyzed in the EIR.

1. **Project Title:** Sunset Complex Project

2. **Lead Agency Name and Address:** City of Pasadena
   Water and Power Department
   150 South Los Robles Avenue, Suite 200
   Pasadena California 91101-4613

3. **Contact Person and Phone Number:** Michael Lin
   (626) 744-4468

4. **Project Location:** At the intersection of Sunset Avenue and West Mountain Street in the City of Pasadena, Los Angeles County, California 91103

5. **Project Sponsor's Name and Address:** City of Pasadena
   Pasadena Water and Power
   150 South Los Robles Avenue, Suite 200
   Pasadena, California 91101

6. **General Plan Designation:** Institutional

7. **Zoning:** Public and Semi-Public (PS)

8. **Description of Project:** The proposed Project includes replacement of two existing reservoirs (SR1 and SR2) with two new prestressed concrete reservoirs and associated appurtenances at the site. The Project would also construct a new on-site GWTP. Proposed Reservoir 1 would have a capacity of 4.9 MG, Reservoir 2 of 6.1 MG, for a total water storage capacity of 11.0 MG. The GWTP would allow for a total treatment capacity of 3,000 gpm and would treat for perchlorate and TCP. The GWTP would be designed to allow for future expansion to increase the total treatment capacity to 4,500 gpm and to add 800 gpm of sidestream for biological treatment for nitrate removal.

9. **Surrounding land uses and setting:** The Project site is surrounded by City buildings, residential uses, and a park.

10. **Other public agencies whose approval is required:** State Water Resources Control Board, Division of Drinking Water (DDW), Regional Water Quality Control Board, South Coast Air Quality Management District.

11. **Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1? If so, has consultation begun?** Yes, one tribe, the Gabrieleno Band of Mission Indians – Kizh Nation, has requested government-to-government consultation and consultation has begun. See Section 4.18, Tribal Cultural Resources, for more information. The EIR will discuss the outcome of the consultation process.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this Project, involving at least one impact that is a "Potentially Significant Impact", as indicated on the following pages.

- ☒ Aesthetics
- ☒ Air Quality
- ☒ Cultural Resources
- ☐ Geology and Soils
- ☐ Hazards and Hazardous Materials
- ☐ Land Use and Planning
- ☒ Noise
- ☐ Public Services
- ☐ Transportation
- ☐ Utilities and Service Systems
- ☒ Mandatory Findings of Significance
- ☐ Agriculture and Forest Resources
- ☐ Biological Resources
- ☒ Energy
- ☒ Greenhouse Gas Emissions
- ☐ Hydrology and Water Quality
- ☐ Mineral Resources
- ☐ Population and Housing
- ☐ Recreation
- ☒ Tribal Cultural Resources
- ☐ Wildfire

DETERMINATION:

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☒ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature of Lead Agency Representative

4/5/22
Date

Michael Lin
Printed name

City of Pasadena
Agency

EVALUATION OF ENVIRONMENTAL IMPACTS:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact' is appropriate if there is substantial evidence that an effect is significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Unless Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less than Significant Impact." The Lead Agency must describe the mitigation measures and briefly explain how they reduce the effect to a less than significant level (mitigation measures from Section 21, "Earlier Analysis," may be cross-referenced).

5) Earlier analysis may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. See CEQA Guidelines Section 15063(c)(3)(D). Earlier analyses are discussed in Section 21 at the end of the checklist.

    a) Earlier Analysis Used. Identify and state where they are available for review.

    b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

    c) Mitigation Measures. For effects that are "less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier documents and the extent to which address site-specific conditions for the project.

6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8) The explanation of each issue should identify:

    a) The significance criteria or threshold, if any, used to evaluate each question; and

    b) The mitigation measure identified, if any, to reduce the impact to less than significant

4.1 AESTHETICS	**Potentially Significant Impact**	**Less than Significant with Mitigation**	**Less than Significant Impact**	**No Impact**
Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☒	☐	☐	☐
c) In non-urbanized areas, 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 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?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

4.1.1 EXISTING CONDITIONS

Visual Character

The Project site is currently developed with the existing Sunset Reservoir facility and does not include any designated scenic resources; however, as discussed further in Section 4.5, Cultural Resources, below, the existing reservoir complex is considered eligible for listing as a historic district and local historic landmark. The Project site is located in an urbanized area and is surrounded by City buildings, a neighborhood park, and residential units. Distant views of the San Gabriel Mountains are partially available from the site.

Scenic Resources

The California Department of Transportation (Caltrans) manages the State Scenic Highway Program, which includes several freeways and highways as “Officially Designated Scenic Highways” or “Eligible State Scenic Highways”. The nearest Officially Designated Scenic Highway to the Project site is State Route 2 (SR-2), which runs through the San Gabriel Mountains from I-210 in La Cañada Flintridge to the San Bernardino County line (Caltrans 2021a). SR-2 is located approximately 4.8 miles northwest of the Project site at its nearest point and does not have views of the Project site due to distance and intervening buildings, slopes, and vegetation.

The California Scenic Highway Program also designates I-210 as an Eligible Scenic Highway from I-5 to SR-134 (Caltrans 2021a). I-210 is located approximately 700 feet (0.13-mile) west of the Project site at its nearest point but does not have direct views of the Project site due to intervening buildings, slopes, and vegetation.

4.1.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project have a substantial adverse effect on a scenic vista?

No Impact.

A scenic vista is defined as a viewpoint that provides panoramic or focused views of a highly valued landscape or scenic resource for the benefit of the general public. The Environmental Impact Report (EIR) for the Pasadena General Plan provides the following description of the existing scenic features and visual resources in the City: "The City of Pasadena affords a variety of views of scenic landscapes and built environments. The San Gabriel Mountains, near the north City boundary, dominate the skyline from most of the City. The San Rafael Hills are along the western City boundary, and the Verdugo Mountains are further to the west. In addition, the Arroyo Seco corridor and Eaton Canyon traverse the western and eastern portions of the City, respectively. The City also offers scenic views of distinct architecture in the built environment, such as the Old Pasadena Historic District, Pasadena City Hall, Castle Green, St. Andrew Catholic Church bell tower, and Bungalow Heaven" (City of Pasadena 2015b).

The Project site is in an urbanized area and is not itself a scenic vista or scenic resource. Distant views of the San Gabriel Mountains are available from certain positions at the Project site. The replacement of two existing reservoirs and the construction of a GWTP, which would be the primary visible Project components, would lead to a minor change in visual character of the Project site. However, the Project would not block the existing partial views of the San Gabriel Mountains or any other scenic vista in the City. Therefore, given that the Project is not a scenic resource nor is it located within a scenic vista, there would be no impact, and no further analysis in the EIR is required.

b) Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

Potentially Significant Impact.

The Project site is not located within the viewsheds of SR-2 (an Officially Designated Scenic Highway) or I-210 (an Eligible Scenic Highway), and the proposed improvements at the Project site would not be visible from SR-2 or I-210 (Caltrans 2021a). Thus, no impacts to scenic resources along these scenic highways would occur.

There are no official City-designated Scenic Corridors. The Project site itself is an eligible historic district and local landmark, so changes to the site may affect unofficial scenic corridors or the City's traditional urban design form and historic character. Potential impacts to this historic resource are discussed further in Section 4.5.2. Impacts are potentially significant and will be further analyzed in the EIR.

c) Would the project, in non-urbanized areas, 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 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?

Less than Significant Impact.

During construction, the visual character of the Project site would be adversely affected by construction activities and the presence of construction equipment and materials. However, this would be a short-term and temporary impact, which would be restored upon completion of construction. This would include restoring any landscaping impacted by construction activities and implementing new landscaping at the site. Therefore, construction activities would be temporary and would not result in permanent adverse effects to the visual character of the site.

During operation, the site would be similar to existing conditions. The Project involves the replacement of two reservoirs and construction of GTWP. The proposed land uses are similar to existing uses and are consistent with the existing zoning of Public and Semi Public (PS). Therefore, Project implementation would not result in significant adverse impacts to the site and no mitigation is required.

d) Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Less than Significant Impact.

The proposed Project is the replacement of two existing reservoirs and construction of an on-site GWTP. The Project would not introduce new land uses and the site would be similar to existing conditions. While the specific placement and type of lighting under the Project may vary from existing conditions, all lighting would be shielded and directed onto the Project site such that no additional sources of off-site light trespass would occur. As such, the Project would not result in additional lighting or substantial lighting beyond the present levels at the site that would spill over onto surrounding uses. Additionally, the Project would not include any surfaces that would create glare impacting the surrounding uses or motorists on the adjacent roadways. Therefore, the potential impacts would be less than significant, and no mitigation is required.

4.1.3 MITIGATION MEASURES

Mitigation measures will be developed and presented in the EIR, if applicable, for impacts that are determined to be potentially significant.

4.2 AGRICULTURE AND FOREST RESOURCES	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) 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?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220[g]), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104[g])?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) 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?	☐	☐	☐	☒

4.2.1 EXISTING CONDITIONS

The California Department of Conservation administers the Farmland Mapping and Monitoring Program (FMMP) pursuant to Section 65570 of the *California Government Code.* According to the California Department of Conservation's California Important Farmland Finder, the Project site and surrounding areas are designated as Urban and Built-Up Land (California Department of Conservation 2018). There are no designated farmlands in or near the Project site. Also, there are no existing or ongoing agricultural activities in or near the Project site.

The Project site is zoned as Public and Semi-Public (PS) in the City's Zoning Map and designated as Commercial – Institutional in the City's Land Use Plan diagram (City of Pasadena 2018a, 2015a).

There are no forest lands, timberlands, or any Timberland Production Zones in the City.

4.2.2 IMPACT ANALYSIS

Impact Discussion

a) Would the 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 non-agricultural use?

b) Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?

e) Would the 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?

No Impact.

As discussed above, there are no designated Prime Farmland, Unique Farmland, or Farmland of Statewide Importance within the Project site or surrounding area. As such the Project would not result in conversion of these resources to non-agricultural use. Additionally, the Project site is not zoned for agricultural use, and there are no Williamson Act contracts in the City. Therefore, the Project would not conflict with existing zoning for agricultural use. Also, there are no agricultural activities on the Project site, and no farmland conversion or impacts to agricultural uses would occur because of the Project. Therefore, no impacts on agricultural resources would occur, and no further analysis in the EIR is required.

c) Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code, Section 12220[g]), timberland (as defined by Public Resources Code, Section 4526), or timberland zoned Timberland Production (as defined by Government Code, Section 51104[g])?

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

e) Would the 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?

No Impact.

The Project site has a land use designation of Institutional, which is characterized by facilities owned and operated by the City or other public and/or private institutions such as corporate yards, schools, libraries, and hospitals (City of Pasadena 2016). There are no timberland or timberland production zones resources that have been identified in the City of Pasadena Comprehensive General Plan. Thus, the Project would not result in conflict with existing zoning for forest land and timberland and would not cause rezoning of such resources.

No loss of forest resources or conversion of forest land to non-forest use would occur with the Project. Long-term operation and maintenance activities at the Project site would not adversely affect forest resources. Therefore, no impacts on forest resources would occur, and no further analysis in the EIR is required.

4.2.3 MITIGATION MEASURES

There would be no impacts on agriculture and forest resources; therefore, no mitigation measures are required.

4.3 AIR QUALITY	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☒	☐	☐	☐
b Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard?	☒	☐	☐	☐
c) Expose sensitive receptors to substantial pollutant concentrations?	☒	☐	☐	☐
d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?	☐	☐	☒	☐

4.3.1 EXISTING CONDITIONS

The Project site is located in the Los Angeles County portion of the South Coast Air Basin (SCAB), and for air quality regulation and permitting, the site is under the jurisdiction of the South Coast Air Quality Management District (SCAQMD). Both the State of California (State) and the U.S. Environmental Protection Agency (USEPA) have established health-based Ambient Air Quality Standards (AAQS) for air pollutants, which are known as “criteria pollutants”. The AAQS are designed to protect the health and welfare of the populace within a reasonable margin of safety.

The effects from air pollution can be significant, both in the short-term during smog alerts, but also from long-term exposure to pollutants. While the majority of the populace can overcome short-term air quality health concerns, selected segments of the population are more vulnerable to its effects. Specifically, young children, the elderly, and persons with existing health problems are most susceptible to respiratory complications.

The nearest sensitive receptors to the Project site include numerous residences located on all sides of the site, in addition to Brenner Park located to the south.

4.3.2 IMPACT ANALYSIS

Impact Discussion

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

Potentially Significant Impact.

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. It is directly responsible for reducing emissions from stationary (area and point), mobile, and indirect sources and has prepared an Air Quality Management Plan (AQMP) that establishes a program of rules and regulations directed at attaining the National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS).

On March 3, 2017, the SCAQMD adopted the 2016 AQMP, which is a regional and multi-agency effort (SCAQMD, CARB, Southern California Association of Governments [SCAG], and USEPA). The 2016 AQMP incorporates the latest scientific and technical information and planning assumptions, including the 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS); updated emission inventory methodologies for various source categories; and SCAG's latest growth forecasts.

The main purpose of an AQMP is to bring an area into compliance with the requirements of federal and State air quality standards. For a project to be consistent with the AQMP, the pollutants emitted from the project should not (1) exceed the SCAQMD CEQA air quality significance thresholds or (2) conflict with or exceed the assumptions in the AQMP. As discussed in Threshold 4.3(b) below, pollutant emissions from the proposed Project will be compared to the SCAQMD thresholds in the EIR and may result in a significant impact.

The Project is consistent with the Zoning and General Plan Land Use designations for the site and is therefore consistent with the growth expectations for the region (City of Pasadena 2015b). Further, the proposed Project would not directly result in population growth or development or new land uses that have not been anticipated in the AQMP. More detailed analysis is needed to determine if project emissions would conflict with the AQMP. Therefore, impacts are potentially significant and further analysis in the EIR is required.

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

Potentially Significant Impact.

The SCAQMD has adopted significance thresholds to assess the regional impact of air pollutant emissions in the SCAB. A project with emissions rates above these thresholds is considered to have a significant impact on air quality. The Project would generate criteria pollutants in the short-term during construction and the long-term during operation, which may have a significant impact. An analysis of the Project's construction and operation emissions in relation to the SCAQMD thresholds will be provided in the EIR based on air quality models prepared for the Project.

c) Would the project expose sensitive receptors to substantial pollutant concentrations?

Potentially Significant Impact.

The closest sensitive receptors are the single-family residences located adjacent to the northern and eastern boundaries of the Project site. Other residences surround all sides of the Project site and Brenner Park is located to the south. Construction and operation of the proposed

project have the potential to expose sensitive receptors to criteria pollutant and toxic air contaminant (TAC) emissions. Impacts are potentially significant and further analysis of this issue will be included in the EIR.

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

Less than Significant Impact.

According to the SCAQMD's *CEQA Air Quality Handbook,* land uses associated with odor complaints typically include agricultural uses, wastewater treatment plants, food processing plants, chemical plants, composting, refineries, landfills, dairies, and fiberglass molding (SCAQMD 1993). The Project does not propose any of these land uses and would not otherwise produce objectionable long-term operational odors. The two reservoirs would be replacing similar existing structures, and therefore would not result in an increase in other emissions such as those leading to odors over existing conditions. The proposed GWTP would treat groundwater, not wastewater, and therefore would not result in the generation of substantial odors during operation. It should be noted that the proposed backup power generator would be tested monthly to ensure proper operation when needed; the generator, aside from testing activities, would only operate during a power outage in order to maintain water service in the area, including fire hydrant service. The temporary use of the backup generator would not result in substantial odor generation given that it would be fueled by natural gas, which creates substantially less exhaust odors compared to diesel fuel, and would be designed and permitted in compliance with SCAQMD rules and requirements. In addition, the existing disinfection facilities and processes would be modified under the proposed project but would not generate additional odors associated with the disinfection process compared to existing conditions. As such, odors associated with temporary backup generator operation and continued water disinfection activities would be less than significant.

Short-term construction equipment and activities would generate odors, such as diesel exhaust emissions from construction activities. There may be situations where construction activity odors would have an olfactory presence, but these odors would not be unfamiliar or necessarily objectionable. The odors would be temporary and would dissipate rapidly from the source with an increase in distance. The Project use is also regulated from nuisance odors or other objectionable emissions by SCAQMD Rule 402. Rule 402 prohibits discharge from any source of air contaminants or other material, which would cause injury, detriment, nuisance, or annoyance to people or the public. Therefore, the impacts would be short-term; would not be objectionable to a substantial number of people; and would be less than significant. All Project-related odors would be construction related and short term in nature; no long-term operational odors would result. As such, the proposed Project would have less than significant impact in regard to other emissions, and no further analysis in the EIR is required.

4.3.3 MITIGATION MEASURES

Mitigation measures will be developed and presented in the EIR, if applicable, for impacts that are determined to be potentially significant.

4.4 BIOLOGICAL RESOURCES	Potentially Significant Impact	Less Than Significant With Mitigation	Less Than Significant Impact	No Impact
Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modification, 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 Wildlife or U.S. Fish and Wildlife Service?	☐	☐	☒	☐
b) Have 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 Wildlife or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
c) 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?	☐	☐	☐	☒
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 any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☒	☐
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

4.4.1 EXISTING CONDITIONS

The Project site is currently developed with the existing Sunset Reservoir facility. Vegetation on the existing Project site is limited to minimal amounts of ornamental vegetation, as shown on Exhibit 2-3.

4.4.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project have a substantial adverse effect, either directly or through habitat modification, 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 Wildlife or U.S. Fish and Wildlife Service?

Less than Significant Impact.

The Project site is located within an urban area and surrounded by recreational and residential uses, in addition to City buildings. As a result of urbanization of the land, the entire Project site

and immediate surrounding areas are developed and no longer support undeveloped land. The vegetation on the Project site is limited to minimal amounts of ornamental plant species.

No fish, amphibian, or hydrogeomorphic features (e.g., perennial creeks, ponds, lakes, reservoirs) that would provide suitable habitat for fish or amphibians are at the Project site. Therefore, no fish are expected to occur and are presumed absent from the Project site. Due to the high level of anthropogenic disturbances on-site, and surrounding development, no special-status mammal or reptilian species are expected to occur within the Project site. The Project site provides minimal foraging habitat for bird species that have adapted to human disturbance.

However, the existing landscaping includes trees that have the potential to have nesting birds or raptors protected under the Migratory Bird Treaty Act (MBTA). If the Project requires the removal or trimming of trees during the general bird nesting season (January 15 to September 15), the Project may impact nesting birds. If the activities cannot avoid the general bird breeding season, to comply with the MBTA and CFG Code, a qualified biologist would be retained to conduct a pre-activity nesting bird survey within seven days prior to the activities to confirm the presence or absence of active bird nests. If no active bird nests are found by the qualified biologist, then the activities may proceed with the reassurance that no violation to the MBTA and CFG Code would occur. If an active bird nest is found by the qualified biologist, to ensure compliance with the MBTA and CFG Code, vegetation removal and/or trimming activities at the nest location would not occur until the qualified biologist has determined that the nest is no longer active with avoidance buffers established at the discretion of the qualified biologist depending on the bird species and Project activities in the vicinity of the active nest. Implementation with the required compliance with the MBTA and CFG Code, the Project's potential impacts on candidate, sensitive, or special status species, would be less than significant. No further analysis in the EIR is required.

b) Would the project have 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 Wildlife or U.S. Fish and Wildlife Service?

c) Would the 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?

No Impact.

The Project site is currently developed, and on-site vegetation is limited to ornamental landscaping at scattered locations. The site does not contain any riparian habitat, protected wetlands, or other sensitive natural community. There would be no impact to riparian habitats or sensitive natural vegetation communities, and no further analysis in the EIR is required. No discernible jurisdictional drainage features occur within the Project site disturbance area. Therefore, no impacts on jurisdictional drainages would occur, and no further analysis in the EIR is required.

d) 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 wildlife corridors, or impede the use of native wildlife nursery sites?

Less than Significant Impact.

Wildlife corridors connect isolated habitat and allow movement or dispersal of plant materials and animals. Local wildlife corridors allow access to resources such as food, water, and shelter within the framework of the wildlife's daily routine and life history. Regional corridors provide these functions over a larger scale and link two or more large habitat areas, allowing the dispersal of organisms and the consequent mixing of genes between populations. A corridor is a specific route that is used for the movement and migration of species; it may be different from a linkage in that it represents a smaller or narrower avenue for movement. A linkage is an area of land that supports or contributes to the long-term movement of animals and genetic exchange by providing live-in habitat that connects to other habitat areas. Many linkages occur as stepping-stone linkages that are made up of a fragmented archipelago arrangement of habitat over a linear distance. The Project site likely does not currently function as a wildlife corridor due to its developed nature and location within a region developed with urbanized uses.

There is the potential for birds and raptors to use the trees on the site, but compliance with regulations would reduce any impacts related to nesting birds and raptors to a less than significant level. To prevent direct impacts to nesting birds protected under the federal MBTA and CFG Code, project activities requiring the removal and/or trimming of vegetation suitable for nesting birds would occur outside of the general bird breeding season (January 15 to September 15) to the extent feasible. If the activities cannot avoid the general bird breeding season, to comply with the MBTA and CFG Code, a qualified biologist would be retained to conduct a pre-activity nesting bird survey within seven days prior to the activities to confirm the presence or absence of active bird nests. If no active bird nests are found by the qualified biologist, then the activities may proceed with the reassurance that no violation to the MBTA and CFG Code would occur. If an active bird nest is found by the qualified biologist, to ensure compliance with the MBTA and CFG Code vegetation removal and/or trimming activities at the nest location would not be allowed to occur until the qualified biologist has determined that the nest is no longer active, with avoidance buffers should established at the discretion of the qualified biologist depending on the bird species and Project activities required in the vicinity of the active nest. Compliance with these processes would reduce potential impacts to wildlife movement and nursery sites to less than significant levels. No further analysis in the EIR is required.

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

Less than Significant Impact.

The City of Pasadena tree protection ordinance states that all public trees are afforded protection and it is a violation to prune, remove, injure, or plant a public tree without a City permit. Disturbance in the root zone of a protected tree may be considered a potential injury. A tree protection assessment was prepared for the Project and is attached to this Initial Study as Appendix A. The assessment inventoried the 32 trees within the project limits and assessed their condition. It recommended that six trees be removed due to structural instability issues. Twelve trees would have root conflict with the proposed work while the remaining 14 trees would be sufficiently protected through implementation of the recommendations in the assessment. Protection recommendations include monitoring by an arborist to oversee fencing, tree pruning, and root pruning activities. The City would have final discretion to adjust the assessment's recommendations. With implementation of the appropriate protection measures included in the tree protection assessment, as agreed to by the City, the Project would not conflict with the City's ordinance or significantly impact public trees. Impacts would be less than significant.

f) 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?

No Impact.

There is no adopted Habitat Conservation Plan (HCP); Natural Community Conservation Plan (NCCP); or other approved State, regional, or local habitat conservation plans that would apply to the Project site. No impacts would occur, and no further analysis in the EIR is required.

4.4.3 MITIGATION MEASURES

There would be no significant impacts pertaining to biological resources; therefore, no mitigation measures would be required

4.5 CULTURAL RESOURCES	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	☒	☐	☐	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	☐	☐	☒	☐
c) Disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☐	☒	☐

Information in this section is based on information obtained from the Cultural Resources Assessment Report (HELIX 2021b; Appendix B). The Cultural Resources Assessment Report included a records search, Sacred Lands File search, Native American outreach, a review of historic aerial photographs and maps, and a pedestrian survey for the Project area.

4.5.1 EXISTING CONDITIONS

Archaeological Resources

HELIX staff requested a records search of the California Historical Resources Information System (CHRIS) at the South Central Coastal Information Center (SCCIC) on April 5, 2021 covering a 0.5-mile radius around the Project area. The results of the records search received from SCCIC on May 10, 2021, identified six previous cultural resource studies within the half-mile record search limits, none of which occurred within the Project site. Five of the studies were archaeological surveys or site visits, one of which included a historic resources survey; the remaining report title does not indicate the type of study but appears to have been a site visit/survey as well. The SCCIC has a record of 84 previously recorded cultural resources within a 0.5-mile radius of the Project, but none have been recorded within the Project area. All the resources recorded within the 0.5-mile search radius consist of historic built environment resources, including historic buildings and structures, districts and their contributing elements, and a park. This includes the Bungalow Courts of Pasadena, a historic district, and 82 other historic buildings with addresses on the OHP Historic Property list.

HELIX contacted the Native American Heritage Commission (NAHC) on April 6, 2021, for a Sacred Lands File search and a list of Native American contacts for the Project area. The NAHC indicated in a response dated April 21, 2021, that no known sacred lands or Native American cultural resources are within the Project area, but that the absence of specific site information in the Sacred Lands File does not indicate the absence of cultural resources in the Project area. Letters were sent on May 17, 2021, to the eight Native American representatives and interested parties identified by the NAHC. The only response received to date is from the Gabrieleno Band of Mission Indians - Kizh Nation, requesting contact information for the lead agency. PWP is undertaking AB 52 notifications to those Tribes who have requested notification and will initiate consultation if requested by those Tribes. Information resulting from these consultations will be used to help assess Project impacts and will be incorporated into the EIR, as appropriate.

A pedestrian survey of the Project site was conducted on June 3, 2021, by HELIX Archaeologist Kassie Sugimoto. No archaeological sites have been previously documented within the Project area, and the survey did not identify any new cultural resources within the Project area.

Historical Resources

As noted above, HELIX staff requested a record search of CHRIS at the SCCIC on April 5, 2021. No previously documented historic resources within the Area of Potential Effect (APE) were on file with the SCCIC. A previous Historic Resource Assessment report was prepared for the Sunset Reservoir Complex by Jenna Snow in 2017 and concluded that the Sunset Reservoir Complex appears eligible for listing in the California Register of Historical Resources (CRHR) and a City of Pasadena local landmark.

4.5.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?

Potentially Significant Impact.

The National Register of Historic Places (NRHP) is a federal guide to significant properties at the national, state and local levels based on specific criteria. At the state level, the CRHR includes those sites recognized by the NRHP as well as additional sites under its own criteria. The City of Pasadena Municipal Code Section 17.62.010 outlines criteria for City-designated historic resources and defines all eligible resources as meeting the CEQA definition for historical resources, as defined in Section 15064.5. The Project site is eligible as a historic district under NRHP Criterion A and CRHR Criterion 1 and as a City of Pasadena Landmark under Criterion A. As contributors to the Sunset Reservoir Complex Historic District, removal of the existing SR1 and SR2 may create a substantial adverse change to a historical resource. Therefore, this impact is potentially significant and will be further analyzed in the EIR.

b) Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?

Less than Significant Impact.

There are no known archaeological cultural resources located within the Project site. As discussed above, a records search of the CHRIS at the SCCIC identified 6 previous cultural resource studies and 84 previously identified cultural resources within 0.5 mile of the Project site; however, none occur within the boundaries of the Project site. Additionally, no archaeological cultural resources were identified during the pedestrian survey of the Project site completed on June 3, 2021 by HELIX Archaeologist Kassie Sugimoto.

In a letter dated April 21, 2021, the NAHC indicated that no known sacred lands or Native American cultural resources are within the Project area, but that the absence of specific site information in the Sacred Lands File does not indicate the absence of cultural resources in the Project area. Letters were sent on May 17, 2021, to the eight Native American representatives and interested parties identified by the NAHC. The only response received to date is from the Gabrieleno Band of Mission Indians - Kizh Nation, requesting contact information for the lead agency. PWP is undertaking AB 52 notifications to those Tribes who have requested notification and will initiate consultation if requested by those Tribes. Currently, Native American outreach has not resulted in identification of cultural resources within the Project site.

No archaeological sites have been previously documented within the Project area, and the Cultural Resources Assessment did not identify any new cultural resources within the Project area. Due to the results of the Cultural Resources Assessment, in addition to the extensive disturbances to the Project site, the potential for subsurface cultural resources is considered to be low. In accordance with the City's Mitigation Monitoring and Reporting Program for the General Plan EIR (Mitigation Measure 4-1), in the event that cultural material is encountered during construction, ground-disturbing activities in the immediate area of the find would be halted until a qualified archaeologist is notified and assesses the resources. If significant cultural material is encountered, the qualified archaeologist would coordinate with the Consulting Tribe(s) and PWP staff to develop and implement appropriate construction techniques to avoid and/or protect the resource. Construction monitoring is not recommended. Impacts to archaeological cultural resources would be less than significant, and no further analysis in the EIR is required.

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

Less than Significant Impact.

There are no known human remains within the Project site. In the unlikely event that human remains are discovered, the County Coroner would be contacted. If the remains are determined to be of Native American origin, the Most Likely Descendant, as identified by the NAHC, shall be contacted in order to determine proper treatment and disposition of the remains. All requirements of Health & Safety Code §7050.5 and PRC §5097.98 would be followed. Compliance with such regulations would ensure that impacts to human remains would be less than significant, and no further analysis in the EIR is required.

4.5.3 MITIGATION MEASURES

There would be no significant impacts related to archaeological resources; therefore, no mitigation measures are required for these impacts. Mitigation measures will be developed and presented in the EIR, if applicable, for impacts to historical resources that are determined to be potentially significant.

4.6 ENERGY	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Result in potentially significant environmental impacts due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☒	☐	☐	☐
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☒	☐	☐	☐

4.6.1 EXISTING CONDITIONS

The Project site would be developed within and adjacent to the existing Sunset Reservoir facility, which requires routine maintenance trips. The replacement reservoirs, once operational, would function similarly to the existing reservoirs.

4.6.2 IMPACT ANALYSIS

Impact Discussion

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

Potentially Significant Impact.

The proposed Project would involve the consumption of energy primarily related to transportation and ongoing reservoir operations. The addition of the GWTP to existing reservoir functions would increase the energy demands during operation of the Project from the current baseline. This increase in energy demand may result in a significant environmental impact. Further analysis of the energy necessary to construct and operate the proposed project will be included in the EIR.

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

Potentially Significant Impact.

The City's Energy Element of the 1983 General Plan was replaced by the City's Open Space and Conservation Element in 2012 (City of Pasadena 2012). The purpose of the Open Space and Conservation Element is to develop policies that promote the conservation of energy, air,

water, and natural resources to enhance the overall quality of life in Pasadena. In terms of energy, the City seeks to improve energy conservation, expand renewable energy production, and promote sustainability. As discussed in the "Existing Utility Conditions and Urban Planning" Section of this Element, the City will increase conservation, efficiency, and sustainability.

As discussed above the Project may result in an increase in energy usage with the implementation of the GWTP, which could conflict with a state or local plan for renewable energy or energy efficiency. The Project's conflict with such plans is a potentially significant impact and will be further evaluated in the EIR.

4.6.3 MITIGATION MEASURES

Mitigation measures will be developed and presented in the EIR, if applicable, for impacts that are determined to be potentially significant.

4.7 GEOLOGY AND SOILS	**Potentially Significant Impact**	**Less than Significant with Mitigation**	**Less than Significant Impact**	**No Impact**
Would the project:				
a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☒	☐
ii) Strong seismic ground shaking?	☐	☐	☒	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
iv) Landslides?	☐	☐	☒	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☒	☐
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?	☐	☐	☒	☐
e) 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?	☐	☐	☐	☒
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒

Information in this section is derived from the Seismic Vulnerability Assessment (G&E Engineering Systems, Inc. 2006), Geotechnical Investigation (Diaz Yourman & Associates 2009), Sunset Reservoir No. 1 Seismic Evaluation (Carollo 2015), and Geotechnical Investigation (Ninyo & Moore 2021) prepared for the proposed Project site, all of which are included in Appendix C of this IS. The paleontological resources analysis is based on the findings contained in Appendix E of the City of Pasadena General Plan EIR (City of Pasadena 2015b).

4.7.1 EXISTING CONDITIONS

The Geotechnical Investigations prepared for the Project site found groundwater to be present at a depth of approximately 150 below ground surface (bgs), with limited perched water encountered at 35 feet bgs in one portion of the site (Diaz Yourman & Associates 2009). The upper 10 feet of soil consisted of moist, loose to medium dense, fine- to coarse-grained sand with little gravel. The deeper soils consisted of medium dense to very dense sands. Due to the geologic conditions at the site, the Geotechnical Investigation determined the potential for liquefaction to be very low to remote (Diaz Yourman & Associates 2009). The 2021 Geotechnical Evaluation indicates that liquefaction and liquefaction-related seismic hazards (e.g., dynamic settlement, ground subsidence, and/or lateral spreading) are not design considerations for the Project (Ninyo & Moore 2021).

According to the California Geological Survey (CGS), there are no active earthquake faults located on or near the Project site. The nearest earthquake fault is the Raymond Fault located within the Los Angeles Fault Zone, approximately three miles south of the Project site (CGS 2021). The Seismic Vulnerability Assessment provided the City with a seismic improvement program identifying seismic improvements for all components of PWP's water infrastructure, including several improvements for SR1 and SR2. Specifically, the analysis identified issues regarding the structural integrity of the reservoirs' roofing system (G&E Engineering Systems, Inc. 2006). The Seismic Evaluation prepared for SR1 also identified a risk associated with the failure of SR1 as a result of a seismic event (Carollo 2015).

According to Figure 6, Paleontological Sensitivity, in Appendix E of the Pasadena General Plan EIR, the Project site has no sensitivity for paleontological resources based on the geology of the site and the surrounding area (City of Pasadena 2015b).

4.7.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:

- **i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.**
- **ii) Strong seismic ground shaking?**

Less than Significant Impact.

According to the CGS, there are no active earthquake faults located on or near the Project site. The nearest earthquake fault is the Raymond Fault located within the Los Angeles Fault Zone, approximately three miles south of the Project site (CGS 2021). Consistent with its location in a seismically active region, the site may be subject to strong ground shaking resulting from a major earthquake on one or more faults in the area within the lifetime of the Project. Seismic ground shaking from major earthquakes in the region is not anticipated to be greater than at any other sites in Southern California. The potential for strong ground shaking is an existing seismic hazard that affects the site, and the Project would not exacerbate this condition. The Project includes the replacement of several existing facilities that currently do not meet seismic requirements, so implementation of the Project would lessen existing risks associated with seismic ground shaking. Also, the Project would not involve construction of habitable structures or structures whose height, mass, or materials would pose a hazard in the event of an earthquake. In addition, the Project would be designed in compliance with applicable building code regulations. Grading, excavation, and construction is required to comply with the City's Building Code (Title 14 of the Pasadena Municipal Code, which incorporates the California Building Code), as it relates to site preparation and construction; alteration; moving; demolition; repair; use and occupancy of buildings; structures and building service equipment within the City. Impacts related to Alquist-Priolo fault zones and seismic ground shaking would be less than significant, and no further analysis in the EIR is required.

iii) Seismic-related ground failure, including liquefaction?

iv) Landslides?

Less than Significant Impact.

As discussed above, the 2009 Geotechnical Investigation prepared for the Project site encountered moist, loose to medium dense, fine- to coarse-grained sand with little gravel in the upper 10 feet of soil, and medium dense to very dense sands in deeper soils. The investigation also found groundwater to be present at a depth of 150 feet bgs. Due to the geologic conditions at the site, the Geotechnical Investigation determined the potential for liquefaction to be very low to remote (Diaz Yourman & Associates 2009). The 2021 Geotechnical Evaluation supports this finding, noting that liquefaction and associated seismic hazards do not present notable risks at the Project site (Ninyo & Moore 2021).

According to the Deep-Seated Landslide Susceptibility Map prepared by CGS, the majority of the Project site is considered to have marginal susceptibility for landslide, with only a small portion of the site labeled as having a low to moderate susceptibility (CGS 2015). Additionally, the Project does not include any habitable structures or structures whose height, mass, or materials would pose a hazard in the event of a landslide. The Project would be constructed in compliance with applicable building code regulations (Title 14 of the Pasadena Municipal Code, which incorporates the California Building Code, as described above) which would ensure that the structural integrity of the proposed improvements can withstand seismic hazards. Impacts related to seismic hazards such as liquefaction and landslides would be less than significant. No further analysis is required in the EIR.

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

Less than Significant Impact.

Construction of the Project would involve grading and would require cut and fill soil. Soils exposed by construction activities could be subject to erosion if exposed to heavy rain, winds, or

other storm events. However, the Project would implement erosion control and sediment control Best Management Practices (BMPs) to minimize the occurrence of soil erosion or loss of topsoil. Additionally, a large portion of the Project area would be paved. Therefore, impacts related to soil erosion or the loss of topsoil would be less than significant, and no further analysis in the EIR is required.

c) Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?

d) Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?

Less than Significant Impact.

Liquefaction and landslides are addressed under Thresholds 4.7(a)(iii) and 4.7 (a)(iv) above, and there would be a less than significant impact associated with these conditions. The Project involves the replacement of two existing reservoirs, construction of a new on-site GWTP, and mainline work on Sunset Avenue and the Sunset Avenue/Mountain Street intersection. The Project would not substantially increase the potential for lateral spreading, subsidence, or collapse at the site. Additionally, no significant regional subsidence has occurred in the City. Further, the engineering design of the proposed Project has been created in a manner to minimize potential adverse effects to local hydrologic or geologic conditions.

Expansive soils are soils that swell when they absorb water and shrink as they dry, such as pure clay soils and claystone. The hazard associated with expansive soils is that they can overstress and cause damage to the foundation of buildings set on top of them. The Project would not construct a building; however, the Project would include several aboveground appurtenances. Based on data from the Geotechnical Investigation, subsurface materials at the proposed well drilling location are expected to consist of sand and gravel, which are not expansive soils (Diaz Yourman & Associates 2009). There would be a less than significant impact related to the presence of unstable geologic units and expansive soils, and no further analysis in the EIR is required.

e) Would the 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?

No Impact.

There are no proposed sanitary facilities associated with the Project, as all backwash operations and waste streams would utilize the existing sanitary sewer system. Therefore, no impacts related to the use of septic tanks or alternative wastewater disposal systems would occur with the Project, and no further evaluation in the EIR is required.

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

No Impact.

As stated above, the Pasadena General Plan EIR determined that the majority of the City of Pasadena, including the Project site, has no sensitivity for paleontological resources. As such, the potential for Project implementation to result in direct or indirect adverse impacts to paleontological resources or unique geologic features would be negligible. No impact would occur and no further analysis in the EIR is required.

4.7.3 MITIGATION MEASURES

There would be no significant impacts pertaining to geology and soils; therefore, no mitigation measures are required.

4.8 GREENHOUSE GAS EMISSIONS	**Potentially Significant Impact**	**Less Than Significant With Mitigation**	**Less Than Significant Impact**	**No Impact**
Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☒	☐	☐	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☒	☐	☐	☐

4.8.1 EXISTING CONDITIONS

Climate change refers to any significant change in temperature, precipitation, or wind patterns over a period of time. Climate change may result from natural factors, natural processes, and human activities that change the composition of the atmosphere and alter the surface and features of the land. Significant changes in global climate patterns have recently been associated with global warming, which is an average increase in the temperature of the atmosphere near the Earth's surface; this is attributed to an accumulation of greenhouse gas (GHG) emissions in the atmosphere. GHGs trap heat in the atmosphere which, in turn, increases the Earth's surface temperature. Some GHGs occur naturally and are emitted to the atmosphere through natural processes, while others are created and emitted solely through human activities. The emission of GHGs through fossil fuel combustion in conjunction with other human activities are closely associated with global warming. GHGs, as defined under California's Assembly Bill (AB) 32, include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

State of California Regulations and Legislation

Assembly Bill 32 – the California Global Warming Solutions Act of 2006 (AB 32) recognizes that California is the source of substantial amounts of GHG emissions. The statute states that:

> Global warming poses a serious threat to the economic wellbeing, public health, natural resources, and the environment of California. The potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural

environment, and an increase in the incidences of infectious diseases, asthma, and other human health-related problems.

To avert these consequences, AB 32 establishes a State goal of reducing GHG emissions to 1990 levels by the year 2020, which is a reduction of approximately 16 percent from forecasted emission levels, with further reductions to follow (CARB 2011). Executive Order B-30-15 establishes an interim GHG reduction goal of 40 percent less than 1990 levels by the year 2030. Executive Order S-3-05 establishes a GHG reduction goal of 80 percent less than 1990 levels by the year 2050.

California Executive Order B-30-15 (April 29, 2015) sets an "interim" statewide emission target to reduce GHG emissions to 40 percent below 1990 levels by 2030 and directed State agencies with jurisdiction over GHG emissions to implement measures pursuant to statutory authority to achieve this 2030 target and the 2050 target of 80 percent below 1990 levels.

On September 8, 2016, Governor Edmund G. "Jerry" Brown signed Senate Bill (SB) 32 to codify the GHG reduction goals of EO B-30-15, requiring the State to reduce GHG emissions by 40 percent below 1990 levels by 2030 (Health and Safety Code Section 38566). This goal is expected to keep the State on track to meeting the goal set by EO S-3-05 of reducing GHG emissions by 80 percent below 1990 levels by 2050. SB 32's findings state that CARB will "achieve the state's more stringent greenhouse gas emission reductions in a manner that benefits the state's most disadvantaged communities and is transparent and accountable to the public and the Legislature."

Local

The City of Pasadena has prepared and adopted a Climate Action Plan (CAP) (City of Pasadena 2018b). The City's CAP includes the following components: a summary of existing state and local initiatives addressing climate change; community-wide GHG inventory and emissions forecasts; GHG reduction goals, measures, and actions; plans of implementation and monitoring of the plan; and adaptation strategies and climate change preparedness. This document builds upon the City's existing sustainability efforts, such as the Green City Action Plan and provides a framework to further reduce GHG emissions throughout the City. It is accepted as very unlikely that any individual development project such as the size and character of the proposed Project would have GHG emissions of a magnitude to directly impact global climate change; therefore, any impact would be considered on a cumulative basis. The analysis of the Project's impacts is based on consistency with applicable GHG reduction plans, regulations, and programs, as discussed below.

4.8.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Potentially Significant Impact.

The Project has the potential to generate GHG emissions during construction and operation that would have a significant impact on the environment. Further analysis will be prepared regarding the Project's greenhouse gas emissions and conclusions will be discussed in the EIR.

b) Would the project conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Potentially Significant Impact.

As discussed above, there are multiple plans, policies, and regulations that aim to reduce greenhouse gas emissions and would apply to the Project. The Project has the potential to emit significant greenhouse gases per Threshold 4.8(a). In order to determine the Project's consistency with the applicable plans, policies, and regulations, further analysis of greenhouse gas emissions will be conducted. This impact is potentially significant and will be analyzed further in the EIR.

4.8.3 MITIGATION MEASURES

Mitigation measures will be developed and presented in the EIR, if applicable, for impacts that are determined to be potentially significant.

4.9 HAZARDS AND HAZARDOUS MATERIALS	**Potentially Significant Impact**	**Less than Significant with Mitigation**	**Less than Significant Impact**	**No Impact**
Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) 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?	☐	☐	☒	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter-mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) 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 project result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☐	☐	☒
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires?	☐	☐	☐	☒

4.9.1 EXISTING CONDITIONS

The Project involves the demolition of existing structures that were originally constructed and/or modified in the late 1800s and early 1900s, when the use of ACM and LBP was prevalent. Therefore, there is potential for hazardous materials to be present within the existing structures.

The Department of Toxic Substances Control (DTSC) EnviroStor program maintains a database of sites of environmental cleanups and permitted facilities. The State of California Water Resources Control Board (SWRCB) GeoTracker program maintains a database for sites that may impact water quality in California. Neither the Project site nor properties within 1,000 feet are listed within either of these databases.

The Project site is not located within a Very High Fire Hazard Severity Zone (VHFHSZ) at the local, State, or federal designation (California Department of Forestry and Fire Protection [CAL FIRE] 2011).

4.9.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

b) Would the 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?

Less than Significant Impact.

Due to the age of the existing structures at the site, there is potential for ACM and LBP to be present within the existing structures. PWP would perform a pre-demolition survey to identify the potential for potentially hazardous materials to be presently accessible. If such environmentally sensitive materials are discovered, remediation would be required to minimize specific relevant health and safety hazards at the site prior to construction of the new reservoir facility. Demolition activities would adhere to all applicable federal, state, and local requirements related to hazardous materials. As such, demolition impacts would be less than significant.

Construction activities associated with the Project would require transportation and use of limited quantities of fuel, oil, sealants, and other hazardous materials related to construction. Operation of the proposed Project would continue the use of chloramines through the combination of sodium hypochlorite and liquid ammonium sulfate to treat water for secondary disinfection. The IX treatment process would utilize resin that would need to be sent for disposal at a landfill or through thermal destruction. Spent GAC media would also need to be sent to a landfill; however, a regeneration process would reduce the frequency of disposal by landfill. Hazardous materials would be used at the Project site during both construction and operation. However, the Project would handle such materials as required by existing rules and regulations and in accordance with manufacturers' specifications.

Due to the hazardous nature of sodium hypochlorite and liquid ammonium sulfate, secondary containment would be utilized by the Project. The secondary storage for each material would be concrete, sized to contain 110 percent of the storage tank volume. The containment would be equipped with a sump and level limit controls set to alarm at the detection of liquid in the sump.

This would prevent the discharge of incompatible liquids into the same area and allow for rapid response in the case of leaks. Adequate safety provisions would be implemented including stairs in and out of the containment areas, eye wash stations in each containment area, and eye wash stations at the chemical fill connections. Also, a separation wall would be installed between the sodium hypochlorite, aqueous ammonia, and electrical areas.

In addition, the Project would comply with all federal, state, and local requirements related to the transport, use, storage, and release of hazardous materials during construction and operation. These include, but are not limited to, regulations set forth by the U.S. Environmental Protection Agency; U.S. Department of Transportation (CFR Title 49, Hazardous Materials Transportation Act; and Title 40 261.31, 261.21, and 261.24); Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (40 CFR parts 300, 311, 355, 370, and 373); Resource Conservation and Recovery Act (RCRA) (40 CFR parts 240-299); Toxic Substances Control Act (40 CFR parts 745, 761 and 763); California Department of Toxic Substances Control (DTSC); California Department of Transportation (Caltrans); California Division of Drinking Water; and the California Occupational Safety and Health Administration (CalOSHA). Therefore, impacts would be less than significant and further analysis in the EIR would not be required.

c) Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter-mile of an existing or proposed school?

No Impact.

There are no schools located within one-quarter-mile of the Project site. The nearest school is Chandler School at 1005 Armada Drive, located approximately 0.4 mile southwest of the Project site. Therefore, the Project would not emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter-mile of a school and impacts would not occur. No further analysis is required in the EIR.

d) Would the project be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

No Impact.

The DTSC EnviroStor database and SWRCB GeoTracker database were used to evaluate the Project site. Neither the Project site nor properties within 1,000 feet are listed within either of these databases. Therefore, the Project would not be on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5. As such, there would be no impact, and no further evaluation in the EIR is required.

e) 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 project result in a safety hazard or excessive noise for people residing or working in the project area?

No Impact.

The Project site is not located within an airport land use plan, and there are no airports or airstrips within two miles of the Project site. The nearest airport is the San Gabriel Valley Airport,

which is located approximately 8.8 miles southeast of the Project site. The Project would not involve the construction of high-rise structures or involve activities that could pose a safety hazard to helicopter or aircraft operations or airport activities, nor would it conflict with an airport land use plan. There would be no impact related to airport safety or noise and no further analysis in the EIR is required.

f) Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

Less than Significant Impact.

During Project construction there would be a temporary closure of the block of Sunset Avenue between Glorieta Street and West Mountain Street for the installation of a pipeline on Sunset Avenue. An alternate route between Glorieta Street and West Mountain Street would remain open along Morton Avenue. Other construction activities within the public right-of-way would accommodate one open lane. The City's Department of Transportation may require a transportation management plan to ensure adequate safety and circulation is maintained throughout construction activities. Coordination with the City's Department of Transportation and adherence to the City's Greenbook and other regulations would ensure construction activities do not interfere with emergency vehicle access. Further details regarding road closures and adherence to applicable policies during construction are contained under Threshold 4.17.2(a). Operation of the proposed Project would involve minimal and infrequent traffic in and out of the Project site and would not result in interference with emergency vehicle access. Impacts related emergency response or evacuation would be less than significant, and no further analysis in the EIR is required.

g) Would the project expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires?

No Impact.

According to the Fire and Resource Assessment Program Very High Fire Hazard Severity Zones in LRA As Recommended by CAL FIRE map for the City of Pasadena, the Project site is not located within or near any areas designated as a VHFHSZ in either a Local Responsibility Area (LRA) or a State Responsibility Area (SRA; CAL FIRE 2011). Additionally, the Project involves the replacement of existing reservoirs and construction of a new on-site GWTP. The Project would not introduce new uses to the site that would increase wildland fire hazards. As such, the Project would not expose people or structures, directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires. Therefore, there would be no impact and no further analysis in the EIR is required.

4.9.3 MITIGATION MEASURES

There would be no significant impacts pertaining to hazards and hazardous materials; therefore, no mitigation measures are required.

4.10 HYDROLOGY AND WATER QUALITY	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	☐	☐	☒	☐
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☐	☐	☒	☐
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:				
i) result in substantial erosion or siltation onsite or offsite;	☐	☐	☒	☐
ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;	☐	☐	☒	☐
iii) 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; or	☐	☐	☒	☐
iv) impede or redirect flood flows?	☐	☐	☒	☐
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	☐	☒
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	☒	☐

4.10.1 EXISTING CONDITIONS

The Raymond Basin aquifer, which underlies the Project site, is situated on an alluvial valley that covers approximately 40 square miles and is bordered by the San Gabriel Mountains on the north; the San Rafael Hills on the west; and the Raymond Fault on the south and east. The general east-west trend of the San Gabriel Mountains, the north-south trend of the San Rafael Hills, and northeast trend of the Raymond Fault result in the basin having a triangular form. The Raymond Basin is divided into the Monk Hill Subbasin to the west, the Santa Anita Subbasin to the east, and the Pasadena Subbasin in the central portion (beneath the Project site); these designations are based on differences in elevation and groundwater flow. The Raymond Basin is recharged by the Arroyo Seco, a tributary to the Los Angeles River, and by Eaton Wash, Santa Anita Wash, and other streams in the watershed (California Department of Water Resources [DWR] 2004). Pumping rights to the Raymond Basin are adjudicated and the Raymond Basin Management Board (RBMB) administers the provisions of the adjudication decree. The Board coordinates the pumping rights and the groundwater storage accounts of public and private water agencies, including the City.

The Project site is currently developed with the existing Sunset Reservoir facility owned and operated by PWP. The reservoirs are fed a blend of local well water and imported water via the

MWD P-01 turnout. PWP blends MWD water with their local well supplies to meet their water quality standards due to key constituents found in the local well supplies. These constituents include perchlorate, TCP, and nitrate.

4.10.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?

Less than Significant Impact.

The proposed Project would not violate any water quality standards or waste discharge requirements. The Project involves the replacement of two existing reservoirs, construction of a new on-site GWTP, and pipeline, mechanical and street improvements and site enhancements that would occur within the public right-of-way on Sunset Avenue and Mountain Street adjacent to the reservoir property. Construction of the Project would include ground-disturbing activities, such as grading, and would require cut and fill. Soil exposed by such construction activities could be subject to erosion if exposed to heavy rain, winds, or other storm events. However, as discussed in Section 4.7, Geology and Soils, the Project would implement BMPs for stormwater control to prevent sediment-laden runoff from areas of ground disturbance. As such, there would not be substantial pollutants introduced into storm water runoff, including sediment, during construction of the Project. Handling of hazardous materials and wastes during construction would be in compliance with federal, state, and local requirements, as discussed in Section 4.9, Hazards and Hazardous Materials.

The Project would incorporate LID features in accordance with the Los Angeles County stormwater requirements, including the 2014 Low Impact Development Standards Manual, the MS4 Permit, and the Hydraulic Design Manual. Stormwater at the Project site would be treated by bioretention. The bioretention facility would include an overflow and underdrain system, which would either discharge to the drain vault in the southwest corner of the site, or, if necessary, to the existing storm drain system within West Mountain Street. Stormwater facilities would be kept as far away from existing wells as possible. When possible, self-treating areas would be used to decrease the required quantity of LID features, which would be coordinated with the landscape architect during final design. Grading would be adjusted to accommodate Los Angeles County LID requirements during final design.

Waste streams produced by the Project would be disposed of correctly in accordance with applicable regulations and requirements. Well flush water would be directed to the nearby storm drain and GAC backwash waste and instrumentation waste would be directed to the sanitary sewer, located along Sunset Avenue and West Mountain Street. For the IX system, the Project would use resin that has been conditioned off-site, and forward flushing of the resin on-site would be required. GAC backwash waste would be discharged at a reduced rate to avoid backing up the sewer system. Discharge of backwash to the sanitary sewer would be permitted and regulated under a Sanitary Sewer Discharge Permit issued by the Pasadena Department of Public Works. All facilities serving the sanitary sewer would have capacity to support the waste streams produced by the Project. The volume, type, and concentration of such waste discharges to the sanitary sewer would be subject to specific permit requirements to limit potential adverse water quality effects, and therefore Project-related wastewater discharges are

anticipated to be treated at the Los Angeles-Glendale Wastewater Treatment Plant (LAGWRP) in accordance with applicable water quality standards.

Implementation of the Project would not violate any water quality standards or waste discharge requirements, or otherwise substantially degrade surface or ground water quality. Impacts would be less than significant, and no further analysis in the EIR is required.

b) Would the project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

Less than Significant Impact.

The proposed Project would not substantially deplete groundwater supplies or interfere substantially with groundwater recharge. The Project involves the replacement of two existing reservoirs, construction of a new on-site GWTP, and mainline work on Sunset Avenue and the Sunset Avenue/Mountain Street intersection. The proposed GWTP would help PWP utilize their local groundwater supply and help treat for perchlorate and VOCs. The GWTP would provide PWP with greater water supply reliability and operational flexibility. The GWTP has been designed to utilize local groundwater supplies without causing adverse effects to the groundwater basin. Implementation of the Project would not substantially decrease groundwater supplies or interfere substantially with groundwater recharge. RBMB would continue to manage pumping rights and storage within the basin, which would regulate PWP's withdraws from groundwater supplies. While the Project would allow PWP more flexibility and capacity to use available supplies, implementation of the Project would not directly alter the City's withdraw rights, which would continue to be managed through RBMB. As the Raymond Basin is an adjudicated groundwater basin, it complies with California's Sustainable Groundwater Management Act, and is not required to have a separate sustainable groundwater management plan. In 2014 member pumpers, including PWP of the Pasadena Sub-basin, voluntarily agreed to reduce pumping by 30% to reduce impacts to the aquifer level. Therefore, the Project would not conflict with or obstruct implementation of a water control plan or sustainable groundwater management plan. Impacts would be less than significant, and no further analysis in the EIR is required.

c) Would the 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 through the addition of impervious surfaces, in a manner which would:

i) result in substantial erosion or siltation onsite or offsite?

ii) substantially increase the rate or amount of surface runoff in a manner that would result in flooding on or offsite?

iii) 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?

iv) impede or redirect flood flows?

Less than Significant Impact.

The Project involves the replacement of two existing reservoirs, construction of a new on-site GWTP, and street improvements and site enhancements within the public right-of-way on Sunset Avenue and Mountain Street adjacent to the reservoir property. Due to the nature of the Project, the Project would not significantly alter the existing drainage pattern of the site. With exception of the concrete equipment pads, the site would be graded to direct runoff from the high side of the site along Sunset Avenue to the southwest towards Mountain Street. As discussed above under Threshold 4.10(a), the Project would implement erosion control and sediment control BMPs that would minimize the occurrence of soil erosion or siltation. Additionally, the Project would incorporate LID features in accordance with the Los Angeles County stormwater requirements, including the 2014 Low Impact Development Standards Manual, the MS4 Permit, and the Hydraulic Design Manual. Stormwater at the Project site would be treated by bioretention, and runoff would not exceed the capacity of the stormwater drainage system, as runoff patterns would not be significantly altered from existing conditions. Any changes to on-site drainage patterns or runoff volumes would be addressed by compliance with LID requirements as noted previously, which would limit off-site stormwater discharges to the storm drain system from an 85th percentile, 24-hour rain event to pre-Project levels. This would be achieved through temporary on-site detention of stormwater flows exceeding the pre-Project conditions, which would preclude the potential for the Project's stormwater flows to exceed the capacity of existing facilities. Further, potential waste streams including chemicals and other materials utilized for water treatment, trash, motor oil and other vehicle fluids, metals, sediment, and other pollutants typically found in urban settings would not serve as a substantial source of polluted runoff given implementation of applicable stormwater BMPs during construction (as required by the Project-specific Storm Water Pollution Prevention Program) and operation (as required by the Project-specific Water Quality Management Plan) Given compliance with applicable regulations as described in Section 4.9, Hazards and Hazardous Materials, which would protect against polluted runoff.

The Project site is not subject to flood flows. According to the Federal Emergency Management Agency (FEMA), the Project site is in Zone X (areas determined to be outside the 0.2 percent annual chance floodplain) and is deemed an "Area of Minimal Flood Hazard" (FEMA 2008). Additionally, according to the City's Dam Failure Inundation Map (Plate P-2 of the Safety Element), the Project site is not located in a dam inundation area (City of Pasadena 2002a).

The Project does not represent a substantial alteration in the existing drainage pattern and there would be no adverse effects such as erosion, siltation, runoff, or flooding onsite or offsite. There would be a less than significant impact, and no further analysis in the EIR is required.

d) Would the project, in flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?

No Impact.

According to the Federal Emergency Management Agency (FEMA), the Project site is in Zone X (areas determined to be outside the 0.2 percent annual chance floodplain) and is deemed an "Area of Minimal Flood Hazard" (FEMA 2008). Zone X is located outside of the special flood hazard areas subject to inundation by the one percent annual chance of flood (100-year floodplain), and no floodplain management regulations are required. In addition, according to the City's Dam Failure Inundation Map (Plate P-2 of the Safety Element), the Project site is not located in a dam inundation area (City of Pasadena 2002a). Therefore, the Project would not result in releasing pollutants in a flood hazard zone. The City of Pasadena is located inland and is not subject to tsunami (sea waves) hazards. The Project would not expose people or

structures to tsunami hazards due to distance from the Pacific Ocean. There is no large open water body near the Project site that may pose seiche hazards. Thus, no seiche hazards would be created by the Project, and the Project would not be exposed to seiche hazards. Therefore, the proposed Project would not risk release of pollutants due to Project inundation in flood hazard tsunami, or seiche zones. There would be no impact, and no further analysis in the EIR is required.

4.10.3 MITIGATION MEASURES

There would be no significant impacts pertaining to hydrology and water quality; therefore, no mitigation measures are required.

4.11 LAND USE AND PLANNING	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Cause a significant environmental impact due to conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒

4.11.1 EXISTING CONDITIONS

The Project site is zoned as Public and Semi-Public (PS) in the City's Zoning Map and designated as Institutional in the City's Land Use Plan diagram (City of Pasadena 2018a, 2015a). The Institutional designation applies to facilities owned and operated by the City or other public and/or private institutions such as corporate yards, schools, libraries, and hospitals (City of Pasadena 2016).

4.11.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project physically divide an established community?

No Impact.

The proposed Project does not involve the displacement of existing residences or the construction of any physical barriers through the developed areas surrounding the Project area. The Project would replace existing reservoir facilities with new facilities meeting current engineering and seismic safety standards. The new facilities would have a footprint similar to existing conditions and would not divide an established community. There would be no impact, and no further analysis in the EIR is required.

b) Would the project cause a significant environmental impact due to conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?

No Impact.

The proposed Project involves the replacement of the two existing reservoirs at the Project site, which may leak and do not meet current seismic requirements. The Project would also include the construction of a new GWTP within the boundaries of the site. The Project site is zoned as Public and Semi-Public and is designated as Institutional. The proposed Project improvements and components are consistent with the City's land use and zoning designation. Since no urban development is proposed and no change to the use of the land would occur with the Project, no conflict or inconsistency with regional plans (i.e., SCAG's Regional Comprehensive Plan, Regional Housing Needs Assessment, Regional Transportation Plan/Sustainable Communities Strategy, and Compass Blueprint) or with the growth forecasts used in the development of these regional plans would occur. There would be no impact and no further analysis in the EIR is required.

4.11.3 MITIGATION MEASURES

There would be no impacts related to land use and planning therefore, no mitigation measures are required.

4.12 MINERAL RESOURCES	**Potentially Significant Impact**	**Less than Significant with Mitigation**	**Less than Significant Impact**	**No Impact**
Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) 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?	☐	☐	☐	☒

4.12.1 EXISTING CONDITIONS

Mineral resources are naturally occurring chemicals, elements, or compounds such as bituminous rock, gold, sand, gravel, clay, crushed stone, limestone, diatomite, salt, borate, potash, geothermal, petroleum, and natural gas resources. Construction aggregate refers to sand and gravel (natural aggregates) and crushed stone (rock) that are used as Portland-cement-concrete aggregate, asphaltic-concrete aggregate, road base, railroad ballast, riprap, fill, and the production of other construction materials.

The California Geological Survey (CGS) has identified deposits of regionally significant aggregate resources in the State in accordance with the Surface Mining and Reclamation Act (SMARA). The Project site is not located within an area that has important mineral resources (CGS 2010).

Review of maps prepared by the California Department of Conservation shows that there are no oil, gas, or geothermal fields in or near the Project site (California Department of Conservation 2001). Additionally, there are no active or idle oil wells in or near the Project site. The nearest well is an idle oil and gas well located approximately 4.7 miles south of the Project site (Geologic Energy Management Division [CalGEM] 2021).

4.12.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

No Impact.

As discussed above, the Project site is not located within an area that has important mineral resources, and therefore, the Project would not result in the loss of availability of a known mineral resource that would be of value to the region or residents of the State. There would be no impact on regionally important mineral resources, and no further analysis in the EIR is required.

b) Would the project 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?

No Impact.

There are no identified oil, gas, or geothermal resources or ongoing mining/extraction activities at the Project site. The Draft Open Space and Conservation Element of the City of Pasadena General Plan Update does not identify any mineral resources in the City (City of Pasadena 2012). Additionally, no new structures or facilities would be constructed as part of the Project that could potentially restrict or obstruct future mineral resource recovery activities within the Project site. Long-term operation and maintenance activities of the proposed Project would not require mineral resources. Thus, there would be no impacts to locally important mineral resources, and no further analysis in the EIR is required.

4.12.3 MITIGATION MEASURES

There would be no significant impacts related to mineral resources, and no mitigation measures are required.

4.13 NOISE	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project result in:				
a) 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?	☒	☐	☐	☐
b) Generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐

4.13 NOISE	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project result in:				
c) For a project 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, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

4.13.1 EXISTING CONDITIONS

Noise can be defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, or sleep. Sound intensity or acoustic energy is measured in decibels (dBs) that are A weighted (indicated by dBA) to correct for the relative frequency response of the human ear.

Noise-sensitive land uses (NSLUs) are land uses that may be subject to stress and/or interference from excessive noise. NSLUs in the project vicinity include the single-family residences east of Sunset Avenue. The nearest single-family residence is approximately 80 feet from the Project's eastern boundary. Although residences are in close proximity to the Project site, construction equipment would move throughout the site over the course of a workday.

The City's noise ordinance includes specific provisions regarding construction noise. Section 9.36.070 of the Municipal Code prohibits the operation of construction equipment and construction activity except from 7:00 AM to 7:00 PM Monday through Friday, and from 8:00 AM to 5:00 PM on Saturday in or within 500 feet of a residential district. Operation of construction equipment is prohibited on Sunday and on defined holidays. Section 9.36.080 of the Municipal Code prohibits the operation of powered construction equipment that generates a noise level of 85 dB(A) when measured at 100 feet.

4.13.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project generate 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?

Potentially Significant Impact.

Construction noise impacts from general construction activities of the project would include noise generated from construction equipment involved in demolition, site preparation, grading, and building construction. The loudest pieces of equipment from this type of construction would likely include a dozer, concrete saw, backhoe, and grader.

Following completion of the Project, operational noise would be generated from operation of the on-site pump room and emergency generator. The pump station would operate on a 24-hour basis and will be assessed against compliance with the City's Noise Ordinance, which allows

generation of an increase of no more than 5 decibels as measured at the property line. The emergency generator would only run for normal maintenance operations during the daytime, so the generator operations are assumed to meet the noise standard in the City's Noise Ordinance, however further analysis will be included in the EIR. The nighttime generator operations are assumed exempt for nighttime operations for emergency power supply. The nearest residential receptor located on Sunset Avenue is approximately 80 feet from the proposed emergency generator.

The Project has the potential to generate a substantial increase in noise during construction and operation and may conflict with established standards. This impact is potentially significant and will be addressed in the EIR.

b) Generation of excessive groundborne vibration or groundborne noise levels?

Less Than Significant Impact.

Ground-borne vibration is a concern for projects that require heavy construction activity such as blasting, pile-driving, and operating heavy earth-moving equipment. Ground-borne vibration can result in a range of impacts, from minor annoyances for people to major shaking that damages buildings. Typically, ground-borne vibration generated by manmade sources attenuate rapidly with distance from the source of vibration. Sensitive receptors for vibration include structures (especially older masonry structures), people (especially residents, the elderly, and sick), and vibration-sensitive equipment.

Construction activities associated with the Project have the potential to result in ground-borne vibration. Possible sources of vibration during general Project construction activities would be a vibratory roller and large bulldozer. A vibratory roller can generate approximately 0.210 in/sec peak particle velocity (PPV) at 25 feet (Caltrans 2013). A 0.210 in/sec PPV vibration level would equal 0.05 in/sec PPV at a distance of 80 feet,[1] the distance to the nearest existing off-site structure or vibration sensitive location. This would be lower than what is considered a "strongly perceptible" level for humans of 0.12 in/sec PPV, and lower than the 0.2 in/sec PPV threshold for architectural damage to non-engineered timber and masonry buildings. In addition, a large bulldozer vibration level would equal 0.02 in/sec PPV at a distance of 80 feet, which is also below the "strongly perceptible" level for humans of 0.12 in/sec PPV. Therefore, groundborne vibration impacts from Project construction activities would be less than significant and no further analysis is required in the EIR.

c) For a project located within the vicinity of a private airship 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, would the project expose people residing or working in the project area to excessive noise levels?

The Project is not located within an airport land use plan, and there are no airports or airstrips within two miles of the Project site. The nearest airport is the San Gabriel Valley Airport, which is located approximately 8.8 miles southeast of the Project site. Therefore, the project is not located within the noise exposure range of the airport and construction workers would not be

[1] Equipment PPV = Reference PPV * $(25/D)^n$ (in/sec), where Reference PPV is PPV at 25 feet, D is distance from equipment to the receiver in feet, and n = 1.1 (the value related to the attenuation rate through the ground); formula from Caltrans 2013.

exposed to excessive noise levels. No impact would occur and no further analysis is required in the EIR.

4.13.3 MITIGATION MEASURES

Mitigation measures will be developed and presented in the EIR, if applicable, for impacts that are determined to be potentially significant.

4.14 POPULATION AND HOUSING	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through the extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

4.14.1 EXISTING CONDITIONS

The Project site does not support a residential community nor contain residential land uses. There are nearby residential uses surrounding the Project site, to the north, south, east, and west.

4.14.2 IMPACT ANALYSIS

Impact Discussion

a. Would the project induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through the extension of roads or other infrastructure)?

No Impact.

The Project does not propose the construction of new homes or businesses that may result in direct or indirect population growth in the area. Also, no extension of infrastructure to unserved areas is proposed. The Project would replace the existing reservoirs at the Project site and constructing a new on-site GWTP. The presence of the construction crew would be temporary and would not generate a measurable demand for housing, goods, or services in the area.

No major change in PWP's operational or maintenance activities would occur that would lead to new employees or which would induce growth and development in the area. The Project would maintain potable water supply but would not promote development in the City or the surrounding area, as the water supply provided by the Project would accommodate existing and planned PWP customers. The Project would not extend the reach of water infrastructure. The Project would not directly or indirectly induce substantial unplanned population growth in the surrounding area. There would be no impact, and no further analysis in the EIR is required.

b. Would the project displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?

No Impact.

Project construction activities would not displace existing people or housing on the site, as none exist within the Project site. Additionally, construction activities for the Project would be confined to the existing reservoir site and the adjacent roads, and would not displace people or housing located on or near the site. No housing demolition or household displacement is proposed with the Project. Thus, no displacement impacts would occur such that replacement housing would be needed. No mitigation is required and no further analysis in the EIR is required.

4.14.3 MITIGATION MEASURES

There would be no significant impacts pertaining to population and housing; therefore, no mitigation measures are required.

4.15 PUBLIC SERVICES	**Potentially Significant Impact**	**Less than Significant with Mitigation**	**Less than Significant Impact**	**No Impact**
Would the project:				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered government facilities, need for new or physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

4.15.1 EXISTING CONDITIONS

Public services for the Project site are provided by the Pasadena Fire Department, the Pasadena Police Department, the Pasadena Unified School District, the City of Pasadena Parks and Natural Resources Division, the Pasadena Library, and other City departments. The Los Angeles County Fire Department and the United States Forest Service also provide wildfire protection services, particularly related to the Angeles National Forest.

Fire Protection Services

The Pasadena Fire Department provides fire protection services to the City and operates eight fire stations. Pasadena Fire Station 36, located at 1140 North Fair Oaks Avenue, is the nearest fire station, at 1,580 feet (0.3 mile) northeast of the proposed Project.

The Los Angeles County Fire Department has automatic aid agreements with 33 cities in the County, including the City of Pasadena, to provide fire protection services during a fire or medical emergency regardless of territory. Thus, City and County firefighters would provide emergency response to the Project in the event of a fire incident.

Police Protection Services

The Pasadena Police Department provides police protection and law enforcement services in the City. The Pasadena Police Department also participates in the California Law Enforcement Mutual Aid Plan and the California Disaster and Civil Defense Master Mutual Aid Agreement, which allows the City to request mutual aid from and to provide mutual aid to adjacent police protection and law enforcement agencies.

School Services

The Pasadena Unified School District (PUSD) provides school services to the Project area through the Madison Elementary School, Washington Middle School, and John Muir High School (PUSD 2021).

Parks

The City of Pasadena Parks and Facilities Department has 24 parks within its jurisdiction. There are no parks located within the boundaries of the Project site. The nearest park is Brenner Park located at 235 Barthe Drive, immediately south of the Project site across West Mountain Street. Approximately 0.2 miles east of the Project site is Robinson Park Recreation Center.

Other Public Facilities

There are ten City libraries, with the La Pintoresca Branch Library located nearest the Project site at 1355 North Raymond Avenue, approximately 0.5-mile northeast of the Project site.

4.15.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered government facilities, need for new or physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:

- **Fire protection?**
- **Police protection?**
- **Schools?**
- **Parks?**
- **Other public facilities?**

Fire Protection

No Impact.

The proposed Project would not introduce habitable structures that could generate a long-term demand for fire protection services. Additionally, the Project involves the replacement of existing reservoirs and construction of an on-site GWTP. The Project does not propose any new land uses that generate a new resident population. Thus, the Project would not result in a need for new or physically altered fire protection facilities.

The proposed Project components would not be susceptible to fire, due to the nature of the Project as a water storage and treatment facility. Project improvements would be constructed in accordance with the Pasadena Fire Prevention Code (Chapter 14.28 of the City's Municipal Code). Compliance with applicable regulations would minimize the potential for fire and, therefore, the Project's demand for fire protection services.

Construction activities would temporarily create an increased demand for fire-protection services due to the use of equipment, electricity, fuels, and other fire sources that may ignite flammable and combustible materials. However, such impacts would be temporary. Additionally, the Project would comply with the Pasadena Fire Prevention Code (Chapter 14.28 of the City's Municipal Code) and Standard Specifications for Public Works Construction (Greenbook) would further reduce fire impacts related to the Project. No new or physically altered fire protection facilities would be needed to serve the Project, and thus, there would be no impact, and no further analysis in the EIR is required.

Police Protection

No Impact.

The Project does not involve the development of habitable structures or operational activities that could increase demands for long-term police protection services. The proposed Project does not include a new land use that could attract criminal elements or criminal activities into the area. Construction activities may provide opportunities for crime (e.g., theft and vandalism). However, construction areas would be fenced, which would prevent theft and vandalism during the construction phase. There would be no impact on police protection services and no further analysis in the EIR is required.

Schools

No Impact.

The Project would occur on the existing reservoir site, which is zoned as Public and Semi-Public (PS) and designated as Institutional. The proposed Project would not generate a demand for school services because no residential land uses that may be occupied by households with school-aged children are proposed. Operation of the Project would not create a demand for school services. No impact on schools would occur with the Project, and no mitigation is required. No further analysis in the EIR is required

Parks

No Impact.

The Project would not generate a demand for parks or recreational facilities because the Project does not propose residential development that may be occupied by households that would utilize local parks and recreational areas. Additionally, Project construction and operation activities would occur within the boundaries of the Project site and directly adjacent areas and would not impact surrounding areas, including the nearby Brenner Park. There would be no impact on the level of service at City parks and no further analysis in the EIR is required.

Other Public Facilities

No Impact.

The Project would not generate a demand for libraries because the Project does not propose residential development that may be occupied by households, nor would the Project bring in other land uses that may require library services or facilities. No impact on existing library services would occur with the Project.

Long-term operation and maintenance for the Project would be similar to existing conditions. Maintenance of the proposed Project facilities would be provided by the same PWP personnel. There would be no need for any physical improvements to existing or construction of new PWP facilities. There would be no impacts to other public facilities, and no further analysis in the EIR is required.

4.15.3 MITIGATION MEASURES

There would be no significant impacts pertaining to public services; therefore, no mitigation measures are required.

4.16 RECREATION	**Potentially Significant Impact**	**Less than Significant with Mitigation**	**Less than Significant Impact**	**No Impact**
Would/does the project:				
a) Would the 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?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

4.16.1 EXISTING CONDITIONS

The Project site is zoned Public and Semi-Public (PS) in the City's Zoning Map and designated as Institutional in the City's Land Use Plan diagram (City of Pasadena 2018a, 2015a). The Project site is currently developed with the Pasadena Sunset Reservoir Facility consisting of SR1 and SR2. There are no recreational facilities located on the Project site. The nearest recreational facility is Brenner Park, located south of the Project site immediately across West Mountain Street and Robinson Park Recreation Center located east of the project site.

4.16.2 IMPACT ANALYSIS

Impact Discussion

a) Would the 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?

No Impact.

The Project would not induce population growth directly or indirectly, which could generate a need for or increase the use of parks and recreational facilities. Project construction would occur predominantly within the boundaries of the existing facility, including pipeline infrastructure and access off of Sunset Avenue and Mountain Street. The Project would not construct structures that would directly or indirectly induce population growth. There would be no impacts to recreation, and no further analysis in the EIR is required.

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

No Impact.

The proposed Project does not include recreational facilities or require the construction or expansion of recreational facilities, which would have an adverse effect on the environment. There would be no impact, and no further analysis in the EIR is required.

4.16.3 MITIGATION MEASURES

There would be no significant impacts pertaining to recreation; therefore, no mitigation measures are required.

4.17 TRANSPORTATION	Potentially Significant Impact	Less Than Significant With Mitigation	Less Than Significant Impact	No Impact
Would the project:				
a) Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit roadway, bicycle, and pedestrian facilities?	☐	☐	☒	☐
b) Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?	☐	☐	☒	☐
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☒	☐
d) Result in inadequate emergency access?	☐	☐	☒	☐

4.17.1 EXISTING CONDITIONS

Regional Access

The Foothill Freeway (I-210) starts at the Golden State Freeway (I-5) in the northern portion of the San Fernando Valley, and generally runs in a southeasterly and easterly direction near the southern base of the San Gabriel and San Bernardino Mountains to the I-10 in Redlands. Caltrans estimates the 2017 traffic volumes on the I-210 north of the Project (between the junction of Lincoln Boulevard and Mountain Street) during the peak hour at 14,000 vehicles, with a peak month volume of 139,000 vehicles per day and an average daily traffic (ADT) volume of 136,000 vehicles. Caltrans estimates the 2017 traffic volumes on the I-210 south of the Project (between the junction of Mountain Street and State Route [SR] 134/SR 710) during the peak hour at 14,000 vehicles, with a peak month volume of 146,000 vehicles per day and an ADT volume of 143,000 vehicles (Caltrans 2021b).

Local Roadway Network

The Project site can be accessed via I-210 by exiting on Mountain Street and traveling east for approximately 700 feet. The site can be accessed via West Mountain Street and from the north along Sunset Avenue. In 2016, the ADT volume on Mountain Street between Chapman Avenue and Barthe Drive was 14,834 ADT. In 2018, the ADT volume on Sunset Avenue between Hammond Street and Glorieta Street was 1,675 ADT (City of Pasadena 2021). As further described in Section 3.1.3, the Project may include the construction of a new traffic signal at the Project's Mountain Street driveway in order to facilitate safe ingress and egress for vehicles accessing the site.

Transit Services

The Los Angeles County Metropolitan Transportation Authority (Metro) provides regional bus and passenger train services in the County. Metro Bus Route 267 runs along Lincoln Avenue, west of the Project site. Pasadena Transit lines 51 and 52 run nearest the Project site, on West Mountain Street, immediately south of the Project site (Los Angeles County Metro 2017).

4.17.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project conflict with a program, plan, ordinance or policy addressing the circulation system, including transit roadway, bicycle, and pedestrian facilities?

Less than Significant Impact.

The proposed Project involves the replacement of two existing reservoirs and construction of a new on-site GWTP, as well as connections to adjacent existing utilities. Construction would occur predominantly within the boundaries of the existing Sunset Reservoir facility and incidentally within adjacent public street rights-of-way to construct pipeline connections to the City's existing water and sewer system. Construction-related traffic for the Project would be temporary and would include worker trips and truck trips carrying equipment and material to and from the Project site. Worker-related truck trips and the delivery of materials, concrete, and export of soils (if necessary) would generate additional traffic. It is anticipated that construction activities would require a peak of up to 30 vehicle round trips per day, consisting of 20 round

trips associated with worker travel to the construction site at the beginning of the work day and departure from the work site at the end of the work day, and up to 10 delivery/soil export trips per day. It should be noted that during construction activities, temporary parking for PWP employees (whose parking would be displaced during construction activities on-site) would be provided at an off-site parking lot. PWP employees would park at the off-site parking lot and be transported in shuttles to and from the existing City Yards located immediately west of the existing reservoir facility.

Increases in construction-related traffic on area roadways could result in relatively limited and temporary traffic access reductions along Sunset Avenue and W. Mountain Street. While the majority of the worker trips (in passenger cars) would occur during the AM and PM peak periods, the construction-related truck trips would be primarily scattered throughout the day. Up to 10 daily construction-related truck trips would be generated during construction activities. The impact of construction-related truck traffic would be a temporary and intermittent lessening of the capacities of adjacent streets and haul routes because of the slower movements and larger turning radii of construction trucks compared to passenger vehicles. However, the increase in 10 truck trips on local streets and haul routes would not be considered substantial as they would be scattered throughout the day. In addition, construction traffic would not result in any long-term degradation in operating conditions on affected roads. Accordingly, the Project would not cause a substantial increase in traffic in relation to the existing traffic on the street system.

In addition to the increase in traffic from construction-related activities, lane closures could occur along W. Mountain Street and Sunset Avenue during construction activities associated with pipeline and other utility connections in the street right-of-way. Most of the street construction areas are expected to be less than 20 feet wide within the pavement, sidewalk/parkway, and shoulder areas. At least one lane would remain open for traffic during construction within the affected streets as often as possible (i.e., W. Mountain Street and Sunset Avenue). During construction of the pipeline on Sunset Avenue there would be a temporary closure of one block of Sunset Avenue between Glorieta Street and West Mountain Street. An alternate route between Glorieta Street and West Mountain Street would remain open along Morton Avenue during construction hours. At least one lane would remain open on evenings and weekends. The closures of lanes and small local roadways would temporarily affect the existing transportation systems and alter present patterns of circulation.

Construction would be temporary and the specific location of potential impacts would be limited in size, and the transportation system and pre-construction patterns of circulation would be restored to pre-construction conditions upon completion of construction activities. Traffic increases and lane closures associated with the Project are not anticipated to generate substantial traffic, substantially affect transportation systems, or alter present patterns of circulation.

However, in accordance with standard regulations of the City of Pasadena, and to ensure appropriate traffic controls are implemented, approval of a Construction Staging and Traffic Management Plan (CSTMP) by the City of Pasadena would be included as a Project condition of approval. The CSTMP would require PWP's construction contractor to address vehicular circulation issues associated with the closure of traffic lanes, parking lanes, parkways, or other public rights-of-way in accordance with the Manual of Uniform Traffic Control Devices (MUTCD). Traffic control measures may include, but are not limited to flag persons, warning signs, lights, barricades and cones to provide safe passage of vehicular (including public transportation vehicles such as buses), bicycle, and pedestrian traffic, and access by emergency responders. In addition, the plan will demonstrate the location of bus stops and bus and bicycle routes that

would be temporarily impacted by construction activities and will recommend places to temporarily relocate bus stops and bus and bicycle routes. In addition, a Utility Excavation permit would be obtained from the City of Pasadena's Department of Public Works for use of other public rights-of-way. Lane closures would be conducted in accordance with the latest edition of the MUTCD. If the public right-of-way occupation requires a diagram that is not included based on the MUTCD, a separate traffic control plan must be submitted as part of the CSTMP to the City of Pasadena's Department of Transportation for approval. Implementation of the CSTMP would ensure construction-related improvements within the public right-of-way do not adversely affect vehicular circulation and access in the area. Circulation during construction, including any lane or street closures, would be approved by the City of Pasadena and included in the CSTMP prior to construction. Similarly, if the proposed addition of a traffic signal at the Mountain Avenue entrance/exit to the Project site is constructed it would be designed and installed following review and approval of the signal plans by the City's Public Works Department.

Operation of the proposed Project would not substantially increase traffic and would not result in a significant increase in operational traffic over existing conditions. Operational trips related to maintenance, deliveries, and employees would be minimal and similar to existing conditions. The Project would have similar functional infrastructure to the existing site, so the level of activity for the new Project is not expected to increase significantly. Increased operational activities associated with this project would primarily be the result of the GWTP and occasional generator testing.

Some project components would require daily inspections and weekly sampling; however, this would occur at the same time the reservoir and well that are also in operation such that site visits would represent a marginal increase in activity. Every three months, when a media exchange is needed, several operators and a large service truck would be needed for the removal and delivery of the media. Chemical delivery trips occur less than once per month and are not expected to change in frequency compared to existing conditions. Initially, more frequent monitoring and maintenance of the landscaping would be needed until such time the landscape have matured, after which general maintenance would occur roughly once per month.

Minor changes in traffic related to the Project would not conflict with an applicable program plan, ordinance, or policy; namely the Mobility Element of the City's General Plan. Impacts would be less than significant, and no further discussion in the EIR is required.

b) Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?

Less Than Significant Impact.

The analysis of vehicle miles traveled in CEQA Guidelines section 15064.3 provides that transportation impacts of projects are, in general, best measured by evaluating the project's vehicle miles traveled. Vehicle miles traveled (VMT) reflects both the number and the distance of the trips taken. On November 16, 2020 the City of Pasadena City Council adopted a resolution to replace the City's transportation performance measures with five new Transportation Performance Measures and new thresholds of significance to determine transportation impacts under CEQA. The new performance measures and CEQA thresholds are consistent with the City's adopted General Plan and Senate Bill (SB) 743 and include VMT per capita, vehicle trips (VT) per capita, proximity and quality of bicycle network, proximity and quality of transit network, and pedestrian accessibility. The new measures support the City's

vision of creating a community where people can circulate without cars, which relies upon an integrated multimodal transportation system that provides choices and accessibility for everyone in the City. Per the *Transportation Impact Analysis Current Practice and Guidelines*, any project which is expected to generate fewer than 300 new permanent daily trips is considered exempt, is not expected to generate any impacts, and does not require a full traffic analysis (City of Pasadena 2015c). The Project involves upgrades to the existing Sunset Reservoir facility and would not result in a significant increase of operational trips. The Project would result in a small number of new permanent daily trips well below the 300 daily trips threshold. Therefore, the Project would not conflict or be inconsistent with Section 15064.3(b) of the State CEQA Guidelines. There would be a less than significant impact, and no further analysis in the EIR is required.

c) Would the project substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

Less than Significant Impact.

The Project would construct on-site access roads, but such roads would not include hazardous features or incompatible uses and would not be accessible to the public. Construction would occur within the boundaries of the existing Sunset Reservoir facility and would only occur for limited periods within portions of public roadways immediately adjacent to the reservoir property. Construction of pipeline connections within Sunset Avenue may result in the need to close the segment of Sunset Avenue between Glorieta Street and W. Mountain Street temporarily while pipeline construction is completed. However, traffic along Sunset Avenue would be routed around the pipeline work when necessary, and local access to residents along this block would be maintained since all homes adjacent to Sunset Avenue do not have driveway access along this street. Additionally, during construction, adherence to the Greenbook and the City's Supplements and Modifications to the Greenbook, would be required. The Greenbook also requires that access be made available at the end of each workday. Adherence to Greenbook standards and existing traffic regulations would ensure that there would not be increased hazards for any users of the road throughout construction activities involving work in the public right-of-way. With regard to long-term operations, the new reservoir facilities would be accessed via the two existing access driveways at the site, including Sunset Avenue and one on W. Mountain Street. The existing employee entrance to the north along Sunset Avenue would be widened to allow for safety and ease of traffic flow. The existing site entrance along West Mountain Street would also be maintained but would be modified to meet the new finished grade of the proposed site and may also include the construction of a new traffic signal in order to provide safe ingress and egress to vehicles accessing the site at this location. This intersection would be a three-way signalized intersection that would be designed to current City standards and would generally allow traffic along W. Mountain Street to flow except when a vehicle is entering the site from eastbound W. Mountain Street (left-turn signal) or leaving the site onto W. Mountain Street. While the construction of the traffic signal would result in temporary traffic detours, lane closures, or other limited traffic effects, the new traffic signal once operational would minimally affect traffic flow along W. Mountain Street and would increase vehicular safety at this location. An access road would run from the West Mountain Street entrance up to the GWTP site. Delivery and service trucks would enter the site from the south via Mountain Street, following the service road along the GWTP at the northwest edge of the site, and would exit the site to the north onto Sunset Avenue. The service road would be sized to accommodate large service and delivery vehicles entering and exiting the site and would

maintain space for offloading. The GWTP facility would be accessible via key-actuated motorized gates.

As such, the proposed Project would not substantially increase hazards due to a geometric design feature or incompatible uses. Impacts would be less than significant, and no further analysis in the EIR is required.

d) Would the project result in inadequate emergency access?

Less than Significant Impact.

In the event of an emergency at the Project site, there are multiple ingress and egress points. Emergency access would be maintained at and around the Project site during construction and operation. As noted previously under Threshold 4.17.2(c), temporary lane closures or closure of a segment of Sunset Avenue would not substantially affect traffic flow in the area during construction given compliance with Greenbook specifications, the Work Area Traffic Control Handbook ("WATCH") and approval of the Construction Staging and Traffic Control plans. When the Project construction is completed, operation of the proposed Project would involve minimal and infrequent traffic in and out of the Project site and would not result in interference with emergency response access. Impacts related to emergency access would be less than significant, and no further analysis in the EIR is required.

4.17.3 MITIGATION MEASURES

There would be no significant impacts pertaining to transportation; therefore, no mitigation measures are required.

4.18 TRIBAL CULTURAL RESOURCES	**Potentially Significant Impact**	**Less than Significant with Mitigation**	**Less than Significant Impact**	**No Impact**
Would the project:				
a) Cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code Section 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:				
i) 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 section 5020.1(k)? or	☒	☐	☐	☐
ii) 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 Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe?	☒	☐	☐	☐

Information in this section is based on information obtained from the Cultural Resources Assessment Report (HELIX 2021b; Appendix B). The Cultural Resources Assessment Report included a records search, Sacred Lands File search, Native American outreach, a review of historic aerial photographs and maps, and a pedestrian survey for the Project area.

4.18.1 EXISTING CONDITIONS

This section evaluates the Project's potential for any adverse effects on tribal cultural resources. A tribal cultural resource, as defined in Section 21074 of the Public Resources Code, is a site, feature, place, or cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to California Native American tribe.

As presented above in Section 4.5, Cultural Resources, although 84 cultural resources have been previously discovered within 0.5-mile of the Project site, there are no known prehistoric archaeological resources within the boundaries of the site itself. A Sacred Lands File Search was completed by the NAHC. The NAHC indicated in a response dated April 21, 2021, that no known sacred lands or Native American cultural resources are within the Project area, but that the absence of specific site information in the Sacred Lands File does not indicate the absence of cultural resources in the Project area. Letters were sent on May 17, 2021, to the eight Native American representatives and interested parties identified by the NAHC. The only response received to date is from the Gabrieleno Band of Mission Indians - Kizh Nation, requesting contact information for the lead agency.

Assembly Bill 52 Consultation

PWP is undertaking AB 52 notifications to those Tribes who have requested notification and will initiate consultation if requested by those Tribes. Information resulting from these consultations will be used to help assess Project impacts and will be incorporated into the EIR, as appropriate.

4.18.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code Section 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:

i) 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 section 5020.1(k)?

ii) 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 Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1,

the lead agency shall consider the significance of the resource to a California Native American tribe?

Potentially Significant Impact.

As discussed above in Section 4.5, although 84 cultural resources have been previously discovered within 0.5-mile of the Project site, there are no known prehistoric archaeological resources within the boundaries of the site itself. Additionally, the NAHC did not identify known sacred lands or tribal cultural resources within the Project site during the Sacred Lands File Search. Letters were sent on May 17, 2021, to the eight Native American representatives and interested parties identified by the NAHC. The only response received to date is from the Gabrieleno Band of Mission Indians - Kizh Nation, requesting contact information for the lead agency. Currently, no responses have been received that indicate the presence of tribal cultural resources on the Project site. PWP is currently undertaking AB 52 notification to the appropriate Tribes. Given the ongoing consultation process, at this time impacts to tribal cultural resources are considered potentially significant and will be discussed further in the EIR.

4.18.3 MITIGATION MEASURES

Mitigation measures will be developed and presented in the EIR, if applicable, for impacts that are determined to be potentially significant.

4.19 UTILITIES AND SERVICE SYSTEMS	**Potentially Significant Impact**	**Less than Significant with Mitigation**	**Less than Significant Impact**	**No Impact**
Would the project:				
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	☐	☐	☒	☐
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?	☐	☐	☐	☒
c) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☒	☐
d) 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 goals?	☐	☐	☒	☐
e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	☐	☐	☒	☐

4.19.1 EXISTING CONDITIONS

The Project site is currently developed with the existing Sunset Reservoir facility. Southern California Gas (SoCalGas) provides natural gas to the area and PWP provides water and power to the site.

4.19.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction of which could cause significant environmental effects?

c) Would the project result in a determination by the wastewater treatment provider which serves or may serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

Less than Significant Impact.

The Project itself is the construction of new water infrastructure, and the environmental impacts of the proposed facilities are addressed in this IS and will be further addressed in the forthcoming EIR. The intent of the Project is to provide necessary upgrades to the existing facility that is currently experiencing leaking tanks and replace infrastructure that does not comply with current seismic requirements. Implementation of the Project would not result in the need for relocation or construction of additional or expanded water infrastructure.

During startup of the GWTP 3,000 gpm would be conveyed to the storm drain for a short period of time in order to complete testing and permitting requirements. During typical operations, the Project would generate wastewater in the form of waste streams during operation of the GWTP. Well flush water would be directed to a nearby storm drain, and GAC backwash waste and instrumentation waste would be directed to the sanitary sewer, which are located along Sunset Avenue and West Mountain Street. Roughly 6,000 gallons per day of flows are projected to enter the sewer system. To avoid backing up the sewer system, the backwash waste would be discharged at a reduced rate. Additionally, although the Project may require slight upgrades to on-site wastewater facilities, the Project would be designed to ensure it would not generate wastewater that would require the relocation or construction of new or expanded wastewater treatment facilities and would not result in the wastewater treatment provider having inadequate capacity.

Stormwater at the Project site would be treated by bioretention. The bioretention facility would include an overflow and underdrain system, which would either discharge to the drain vault in the southwest corner of the site, or, if necessary, to the existing storm drain system(s) within West Mountain Street. Stormwater facilities would be kept as far away from existing wells as possible. When possible, self-treating areas would be used to decrease the required quantity of LID features, which would be coordinated with the landscape architect during final design. The Project would not generate stormwater that would require the relocation or construction of new or expanded stormwater drainage facilities.

Power would be provided to the Project by PWP, and emergency generator power would be provided at the site and supplied via an automatic transfer switch as needed. Power would be

required to operate the various facilities at the site. However, the Project would not substantially increase power usage at the site over existing conditions. Additionally, natural gas and telecommunication utilities may be required by the Project but would not require a substantial increase over existing conditions. The Project would not require the relocation or construction of new or expanded electric power, natural gas, or telecommunications facilities. Impacts would be less than significant, and no further evaluation in the EIR is required.

b) Would the project have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years?

No Impact.

The proposed Project involves the replacement of two existing reservoirs and construction of a new on-site GWTP. The Project would serve as part of PWP's critical water supply infrastructure and would provide a total water storage capacity of 11.0 MG. Minimal amounts of water would be required to operate the facility. Implementation of the Project would have a positive impact on water availability by constructing a new GWTP to treat water for the City. Therefore, the Project would have sufficient water supplies available to serve the Project and reasonably foreseeable future development during normal, dry and multiple dry years. There would be no impact, and no further analysis in the EIR is required.

d) Would the 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 goals?

e) Would the project comply with federal, state, and local management and reduction statutes and regulations related to solid waste?

Less than Significant Impact.

Construction and implementation of the proposed Project is not anticipated to generate a significant amount of solid waste. The construction contractor would be required to dispose of solid wastes in accordance with local solid waste disposal requirements. All non-recyclable solid waste generated during construction would be taken to a landfill with sufficient permitted capacity. Additionally, as discussed above, the grading plan would be refined during Final Design to minimize soil requiring disposal. Construction would not generate solid waste exceeding applicable standards and would not impair the attainment of solid waste reduction goals.

Operation of the proposed Project would result in the generation of minimal amounts of solid waste. The Project involves the replacement of existing reservoirs facilities on the existing site and operation of a GWTP. Solid waste from the plant would include prefilter cartridges and spent media from the LGAC and IX treatment systems. Therefore, due to the nature of the Project, the amount of solid waste generated would not be significant. In addition, GAC is provided as entirely virgin or some vendors offer regeneration. Regeneration is the process by which spent GAC from the generator of the waste (i.e., PWP) is reactivated applying a thermal process. A small amount of virgin GAC is added to make up for losses as a result of regeneration. The reactivated GAC is returned to the original owner (generator) and the performance is equal to virgin media. It also reduces disposal by landfill. Operation of the Project would not generate solid waste that would exceed State or local standards, nor impair

the attainment of solid waste reduction goals. Impacts would be less than significant, and no further analysis in the EIR is required.

4.19.3 MITIGATION MEASURES

There would be no significant impacts pertaining to utilities and service systems; therefore, no mitigation measures are required.

4.20 WILDFIRE	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
If located in or near State Responsibility Areas or lands classified as Very High Fire Hazard Severity Zones, would the project:				
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?	☐	☐	☐	☒
c) 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?	☐	☐	☐	☒
c) 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?	☐	☐	☐	☒

4.20.1 EXISTING CONDITIONS

According to the Fire and Resource Assessment Program Very High Fire Hazard Severity Zones in LRA As Recommended by CAL FIRE map for the City of Pasadena, the Project site is not located within or near any areas designated as a VHFHSZ in either an LRA or an SRA (CAL FIRE 2011).

4.20.2 IMPACT ANALYSIS

Impact Discussion

a) If located in or near State Responsibility Areas or lands classified as Very High Fire Hazard Severity Zones, would the project substantially impair an adopted emergency response plan or emergency evacuation plan?

b) If located in or near State Responsibility Areas or lands classified as Very High Fire Hazard Severity Zones, would the project due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?

c) If located in or near State Responsibility Areas or lands classified as Very High Fire Hazard Severity Zones, would the 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?

d) If located in or near State Responsibility Areas or lands classified as Very High Fire Hazard Severity Zones, would the 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?

No Impact.

As stated above, the Project site is not located within or near any areas designated as a VHFHSZ in either an LRA or an SRA (CAL FIRE 2011). Additionally, the Project involves the replacement of existing reservoirs and construction of a new on-site GWTP. The Project would not introduce new uses to the site that would increase wildfire hazards. Therefore, there would be no impacts related to wildfires, and no further analysis in the EIR is required.

4.20.3 MITIGATION MEASURES

There would be no significant impacts associated with wildfire; therefore, no mitigation measures are required.

4.21 MANDATORY FINDINGS OF SIGNIFICANCE	**Potentially Significant Impact**	**Less than Significant with Mitigation**	**Less than Significant Impact**	**No Impact**
Does the project:				
a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	☒	☐	☐	☐
b. Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☒	☐	☐	☐
c. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☒	☐	☐	☐

4.21.1 IMPACT ANALYSIS

a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?

Potentially Significant.

As discussed above in Section 4.4, Biological Resources, the Project does not have the potential to impact special status biological species. Compliance with the MBTA and CFG Code would avoid impacts to birds during nesting season. Other impacts to species are not expected to occur, largely due to the urban nature of the existing site. Adherence to regulations would ensure that the Project does not degrade the quality of the environment; does not substantially reduce the habitat of fish or wildlife species; does not cause a fish or wildlife population to drop below self-sustaining levels; does not threaten to eliminate a plant or animal community; and does not reduce the number or restrict the range of Rare or Endangered plant or animal.

As discussed in Section 4.5, Cultural Resources there is potential to impact a historic resource, which may eliminate important examples of the major periods of California history or prehistory. The potentially significant cultural resource impacts will be further analyzed in the EIR.

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

Potentially Significant Impact.

State CEQA Guidelines Section 15130 requires a discussion of the cumulative impacts of a project when the project's incremental effect is "cumulatively considerable," meaning that the project's incremental effects are considerable when viewed in connection with the effects of past, current, and probable future projects. Because the proposed Project has the potential for significant impacts to occur, cumulative impacts may also be significant. A cumulative impact analysis will be provided in the EIR.

c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

Potentially Significant Impact.

Implementation of the proposed Project may potentially cause substantial adverse effects on human beings with potentially significant impacts to air quality, GHGs, and noise, The EIR will provide further analysis of the issue areas that may, directly or indirectly, have a significant impact on human beings.

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Initial Study Appendix A

Sunset Reservoir Tree Protection Assessment

Summary

There are thirty-two (32) trees near the work limits that have root and/or branch conflicts. The branch pruning should cause no significant harm to the trees. Twelve (12) trees will likely have root conflicts which require pruning. Of these, six (6) should be considered for removal due to the resulting structural instability issues. The Tree Protection recommendations should be adequate to protect the remaining trees.

Assignment

I was contacted by Nuvis Landscape Architecture to provide a Tree Protection Assessment for the Sunset Complex Reservoir project. The existing reservoir tanks will be removed and replaced with new tanks. The parking area on the west side will also be lowered, a retaining wall installed, and the entire parking area will be repaved. Around the edge of the complex are trees, many of which are Protected Species. The trees need to be evaluated and Tree Protection Recommendations provided. Nuvis has requested an independent Arboricultural opinion on the trees near or within the Work Limits. The Scope of this written Report will include:

1. Documenting trees that will likely be affected by construction activities.
2. Tree Protection Recommendations based upon the City of Pasadena Tree Protection Guidelines.
3. Recommendations for pruning or removal based upon current conditions and Project Plans.

On 14 June 2021 I met with Mr. Michael King, an Arborist for the City. We walked the site and I explained what I understood about the Project. We had a discussion on the best way to protect trees under this construction design, and elements for this report. I then walked the site and documented the trees likely to be effected during construction.

Limits of the Assignment

This report documents the trees outside the Work Limits likely affected by construction activities and recommends Tree Protection procedures. Trees with trunks further than ten (10) feet from the Work Limits (or ends of branches outside of the Work Limits), shrubs, bushes and other vegetation, are not included in this report. Also, Trees within the Work Limits likely to be Removed are also not the focus of the Scope of this Assignment.

The City of Pasadena Tree Protection Plans (CPTPP) are utilized for direction in creating this report. Due to the nature of the existing conditions on this Project, not all of the elements will be applicable. However, the main philosophy is incorporated. Additionally, the Project Plans provided were at 60% completion. Further information and design decisions may affect the Recommendations given in this report. Nothing in this report is implied to limit increasing Tree Protection as necessary.

The author recognizes the authority of the City of Pasadena, and their Forestry Department, have the final decision-making authority on the disposition of the trees. While the City, and the Contractors on the Project, are encouraged to follow this Report's Recommendations (as the design stands on this date), the City may choose to change or ignore them based upon their own observations and conclusions.

The author presumes there are specific State and County Codes, and Engineering elements, that are required for the construction of a reservoir, and that these are reflected the Project Plans. These design features necessary for the project, outside the expertise of the author, may require certain trees to be removed. This report's recommendations are subject to change per these requirements.

This report is limited to a visual ground inspection. No climbing occurred, and no aerial lift was utilized. No boring, sounding, or root crown exposure was performed. This report documents the health and structural stability condition on the date given.

Purpose and use of the Report

The guiding philosophy of this report is to retain and protect all trees not in direct conflict with or prohibiting the reasonable development of the new reservoirs and will not become structurally unstable due to necessary root pruning. This report is for Nuvis Landscape Architecture, Kennedy Jenks, the City of Pasadena Forestry Department and the Project Arborist to make informed decisions for the trees. It also may be provided to a Tree Care Contractor who is contracted to perform work on the trees.

Assessment Methods

Trees with trunks further than ten (10) feet from the Work Limits (or ends of branches outside of the Work Limits) are beyond the Scope and not included in this report. These particular trees will likely not be significantly affected by the construction activities. The

Tree Protection measures recommended should keep them from being substantially affected as well.

Tree branches will need to be pruned to provide clearance for retaining wall installation and construction activities. The pruning recommended will not significantly harm the trees. To leave these branches in place will complicate and interfere with reasonable construction activities, and potentially leave the branches vulnerable to damage from equipment or contact with new structures. The trees will need to be evaluated prior to work in this area by the Project Arborist and the contractors to determine exact clearance needed, the pruning that may or may not be needed, and how best to incorporate the greatest amount of Tree Protection possible.

The west side parking area will be lowered and a retaining wall installed. This will likely expose and damage the roots of some trees during demolition and construction activities. A solid Root Protection Zone will not be possible. Additionally some trees may have structural stability issues if roots are pruned due to their structural conditions. If pruning the roots results in a significant increase of a tree failure within the next 2 years I will recommend the tree to be removed. If there may be a slight decline in tree health due to root loss, I will not recommend removal.

Using the Plan Pages provided[1] I assessed the trees and their likelihood of being damaged by construction activities. Branches overhanging the work limits below approx. 12 ft. were evaluated for their tolerance to pruning. Trees with trunks within 10 ft. were evaluated on their tolerance to potential root pruning. This also included a structural stability assessment. Toleration of branch and/or root pruning is primarily based upon the condition of the individual tree. Trees in a weakened or declined state, or with significant disease or defects, may not tolerate the necessary branch or root pruning.

The assessment involves observations of three areas for potential issues:

Canopy - foliage color, percentage of twig and limb dieback, and branch defects
Trunks - significant leans, sap leakage, cavities, decay and damage
Root Crown - decay and damage

[1] DS-121-122, DC-001-003, C-004-017. Plan Development is not complete at this date - @ 60%

Any issues were noted, and an overall rating was calculated. The rating scale is defined as follows:

Good: No significant observable defects. The canopy, trunk and root crown area appear normal for the species. The tree may have minor signs or defects that could be corrected or are not relevant to the assessment.

Fair: The tree exhibits signs of disease, stress, decay, insect infestation or damage. Signs may include thinning or yellowing foliage, dieback, decay, insect damage, or sap leakage. The tree may contain noteworthy defects such as branch/trunk damage, decay, cavities or a lean.

Poor: More than 50% of the overall health or structure of the tree is affected by disease, stress, decay, insect damage or decay. The decline is not likely reversible.

The Tree Protection recommendations are based on these observable observations of the trees.

Tree Protection Plans often include a procedure for determining the Tree Protection Zone (TPZ),[2] which includes the Root Protection Zone (RPZ). This may be based upon the dripline,[3] or a formula that creates a certain distance from the trunk.[4] Per the Plans the new construction is within both of these methods. Therefore, the author is utilizing "as far as possible from the tree" formula.

Certain Grading, Paving and Yard Piping Plan sheets do not show certain existing trees within the WL as retained, especially on the south side. They show one Street Tree on Sunset Avenue to be removed to create a new driveway, and one on Mountain Street where a new pipeline will be installed. These trees and the ones currently located by the existing reservoirs that will likely be removed are not included in the Tree Matrix. Existing trees on the edge of or outside the work limits that may be removed in the future will still be documented in this report with recommendations. A final decision on tree removals can be made between the City and the Design Team.

[2] The extent of protected area around the tree
[3] Outer edge of the crown
[4] Often used is the 1 ft. per each trunk diameter inch. A 15 in. diameter tree would have a Tree Protection Zone extending 15 ft. from the base of the tree in all directions.

Observations and Discussion

I walked the boundaries of the work limits starting at the northeast corner and continuing in a counterclockwise direction. For this report I gave a number to trees that will need branch pruning and/or potentially root pruning. These numbers coordinate with the Pictures in Appendix A. This number is strictly for report clarity, no tags were placed, and no official numbering system is implied. Additionally there are trees on the site with numbered tags. These are noted under my numbering system. The details for these trees are contained in the Tree Survey Matrix below.

The tree species observed in the Project area are Oak (*Quercus agrifolia*), Chinese Elm (*Ulmus parvifolia*), Carrotwood (*Cupaniopsis anacardioides*), Fan Palm (*Washingtonia robusta*), Crape Myrtle (*Lagerstroemia indica*), Brachychiton (*B. populneus*) and Walnut (*Juglans californica*). They are generally in Good condition with some in Fair condition. Several Crape Myrtle are dead.

These are my general observations, separated into four areas. I am primarily using Plan pgs. DC-001-003 for the tree locations. These start at the northeast end and follow the edge of the work limits in a counterclockwise direction. Individual tree specifics are contained in the Tree Survey Matrix. The Matrix follows this order, as do the associated pictures in Appendix A.

North End – DC-001

From my understanding the northeast upper parking will only be repaved. On the east side are two large Fan Palms (WR1-2) which should not be impacted. On the northwest and west side the trees are outside the work limits (WL). There potentially may be pruning necessary for one Mulberry tree (*Morus alba* – M1) and a Canary palm (*Phoenix canariensis* – CP1). At the southwest corner is a Carrotwood tree (CW1) with branches extending into the work area. These may be pruned back to the WL as necessary.

Turning the corner to the west there are several branches from an Oak (#1) extending into the WL. One 3-4 in. branch and additional small stems may be pruned back to an appropriate location. No retaining wall is scheduled to be installed in this area, and no grade lowering.

West Side – DC-001-002

At the northwest corner are 1-2 in. Oak branches (#2) that may be raised. Roots should not be affected. This is near where the retaining wall will be installed per Plan pg. C-010,[5] and approx. where the grade reduction will begin. In the west median is a Crape Myrtle (CM1) that is dead and may be removed. The center median to the east has a multi-stem Crape Myrtle (CM2) that could be retained. Per the Paving Plan C-007 this median is redesigned. Retention of the tree is recommended.

Further south are two Oaks (#3-4) that have 1-2 in. branches that may be pruned back to the WL. They are more than 10 ft. from the work limits so their roots should not be affected. South of here is a Crape Myrtle (CM3) that is dead and can be removed. By the parking lot fence are 3 Oaks (#5-7) that will need 1-2" stems raised and pruned back. Trees #5 and #6 are 8.5 ft. from the WL. Roots will potentially be encountered.

North of the bridge walkway are two Oaks (#8-9) with 1-2" branches raised. The Oaks are 6 ft. and 3 ft. back of WL. Roots will likely be encountered.

South of the bridge are 3 Oaks (#10-12, tags #1621-1623) that are 2 ft., 6 ft. and 7 ft. back of WL respectively. The crowns have been raised and should not be in conflict. There will be root issues, especially with #10. These are upslope holding roots, and the tree is in Fair condition. Additionally, per Plan sheets C-008, -011, -016 show an access ramp to be installed immediately east of this tree. Tree #10 should be considered for removal due to holding and support roots being removed. There will be no Tree Protection procedures that will adequately protect its roots. Trees #11-12 should be evaluated for potential significant root loss.

Across the parking area is a median with a large Fan Palm and a small Oak (<2 in. DSH). These will be removed per the Paving and Grading Plan sheets (C-008, 011).

Further south are 3 Oaks (#13-15, tags #1617-1619) that sit 21 ft. back of the WL. There should be no conflicts. The retaining wall installation ends south of this location.

On a mound facing Mountain St are 3 Chinese Elm (#16-18). #16 is 10+ ft. back of WL. #17 has a significant lean towards Mountain St and is 6 ft. back of WL. #18 is 4 ft. back of WL,

[5] I used the existing railing as the approx. location for the retaining wall.

has a significant vertical cavity, and has an off-center crown on the south side towards Mountain St. Additionally, per the Grading and the Yard Piping Plan sheets (C-011, -016) there will be new pipeline installed where these trees are located. Trees #17 and #18 should be removed due to holding and support roots likely being removed. There will be no Tree Protection procedures that will adequately protect their roots.

Across from these Elms to the north is a *Brachychiton* in a median. Per the Grading and Paving Plans (C-008, -011) this tree will be removed.

South Side – DC-003

Per the current Plan sheets (C-009, -012, -017) the only site trees shown to retain are the ones in the Monument area at the corner of Sunset Ave and Mountain St. The Historical Monument and Landscape Conceptual Design Sheet (Nuvis 6-3-2021) has a note: REMOVE EXISTING TREES PER CITY ARBORIST AS NEEDED TO ACCOMMODATE RESERVOIR CONSTRUCTION. I will describe the trees around this portion that may be in conflict based upon demolition and new construction work limits at the current retaining wall. Those trees with branches and/or roots not in potential direct conflict may not be specifically mentioned or described. I will recommend trees potentially in conflict to be pruned or removed. Removals are based on the tree not tolerating the likely redesign of the area per the current plans. The final decision will be made by the Design Team and the City Arborist.

South of the Mountain St driveway are two Chinese Elm (#19-20, tags #1607, 1608). #19 is <1 ft. back of WL and has a lean towards Mountain St. #20 is <1 ft. inside the WL. Tree #19 should be removed due to holding and support roots likely being removed. Tree #20 should be removed as it is within the work limits. Significant holding and support roots will be removed during construction activities. There will be no Tree Protection procedures that will adequately protect its roots.

South of the Pump House is a Chinese Elm (#21, tag #1606). It is 20 ft. back of WL. Potential for some minor limb pruning.

Going around the southern end in a counterclockwise direction are various species. They are outside of the WL and should not be in conflict unless entire area is being removed.

East Side – DC-001-003
Just past the group of Chinese Elms in the southeast corner, heading north, is another Elm (#22) that may need <1" stems punned.

North of that Elm tree is a Walnut and a Brachychiton (#23-24). Interfering stems <1 in. may be pruned back as needed.

Street Trees on Sunset Ave.
These street trees are Oak (*Quercus agrifolia*) and Pacific Madrone (*Arbutus menziesii*). They are to be Protected. There are branches from several of these trees that extend into the WL. Additionally there is one Madrone scheduled to be removed for the creation of a new driveway.

North of the Walnut is a street tree Oak (#25) with branches extending into the WL. Interfering stems <1 in. may be pruned back as needed.

The second street tree north of it is a Pacific Madrone (#26). A long 4-inch branch extends into the work area. This branch may be removed at the parent branch.

The second and third street tree north are Oaks (#27-28). Both may have 1-2 in. stems raised and pruned back.

The second tree north of these is a Madrone which may also need some 1-2 in. stems pruned back.

The second tree north of this one, a Madrone, is scheduled to be removed for the creation of a new driveway.

Next is an Oak and then a Madrone. Both may have 1-2 in. stems pruned back as necessary. Just north of this Madrone the other driveway will be installed.

The last tree is a large Oak south of the existing entrance. The branches should not be in conflict.

TREE SURVEY MATRIX

This matrix contains my assigned tree number, picture number(s), species, common name, DSH[6], approx. height (ft.), condition, tag number (if observed), and notes. The DSH and Height of the tree were attained only if there is potential root conflict. The trees start on the northeast corner and goes clockwise around the site. This matrix does not include trees assumed to be removed per the existing plans.

T#	Pic	Species	Common Name	D"	H'	Cond	Tag#	Notes
1	14-16	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune 1 3-4" + small stems
2	17-19	*Quercus agrifolia*	Coast Live Oak	*	*	G		Raise 1-2" stems
3	22-23	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune 1-2" stems
4	24-25	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune <1" stems
5	27-33	*Quercus agrifolia*	Coast Live Oak	18	25	G		8.5 ft. back of work limits Prune <1" stems
6	27-33	*Quercus agrifolia*	Coast Live Oak	13/13	35	G		8.5 ft. back of work limits Prune <1" stems
7	27-33	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune 1-2" stems
8	34-37	*Quercus agrifolia*	Coast Live Oak	12	15	G		6 ft. back of work limits Prune <1" stems
9	34-37	*Quercus agrifolia*	Coast Live Oak	16	25	G		3 ft. back of work limits Prune <1" stems
10	38-45	*Quercus agrifolia*	Coast Live Oak	24	35	F	1623	2 ft. back of work limits CONSIDER FOR REMOVAL
11	38-45	*Quercus agrifolia*	Coast Live Oak	13	30	G	1622	6 ft. back of work limits
12	38-45	*Quercus agrifolia*	Coast Live Oak	19	45	G	1621	7 ft. back of work limits
13	46-47	*Quercus agrifolia*	Coast Live Oak	*	*	G	1619	21 ft. back of work limits
14	46-47	*Quercus agrifolia*	Coast Live Oak	*	*	G	1618	21 ft. back of work limits
15	46-47	*Quercus agrifolia*	Coast Live Oak	*	*	G	1617	21 ft. back of work limits
16	50-53	*Ulmus parvifolia*	Chinese Elm	Dbl trunk	25	G		POTENTIAL REMOVAL
17	50-53	*Ulmus parvifolia*	Chinese Elm	14	35	F		Significant lean CONSIDER FOR REMOVAL
18	50-53	*Ulmus parvifolia*	Chinese Elm	22	40	F		Trunk decay CONSIDER FOR REMOVAL
19	54-58	*Ulmus parvifolia*	Chinese Elm	22	45	F	1608	Significant lean CONSIDER FOR REMOVAL
20	54-58	*Ulmus parvifolia*	Chinese Elm	21	45	G	1607	Inside work limits CONSIDER FOR REMOVAL
21	59	*Ulmus parvifolia*	Chinese Elm	21	50	G	1606	20 ft. back of work limits Potential for minor limb pruning
22	66	*Ulmus parvifolia*	Chinese Elm	*	*	G		Prune <1" stems
23	67-68	*Juglans californica*	Walnut	*	*	G		Prune <1" stems
24	67-68	*Brachychiton populneus*	Bottle tree	*	*	F		Prune <1" stems
25	69-70	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune <1" stems
26	71-72	*Arbutus menziesii*	Pacific Madrone	*	*	G		Remove 4 in. branch at parent stem
27	73	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune <1" stems
28	74-75	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune 1-2" stems

[6] Diameter at Standard Height, measured approx. 4.5 ft. above the base of the tree.

29	76	*Arbutus menziesii*	Pacific Madrone	*	*	G		Prune 1-2" stems
30	77-78	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune 1-2" stems
31	79	*Arbutus menziesii*	Pacific Madrone	*	*	G		Prune 1-2" stems
32	80	*Quercus agrifolia*	Coast Live Oak	*	*	G		No pruning likely needed
WR1-2	1-3	*Washingtonia robusta*	Fan Palm	*	*	G		No conflicts likely
M1	5, 7	*Morus alba*	Mulberry	*	*	P		Potential pruning
CP1	5, 8	*Phoenix canariensis*	Canary Palm	*	*	G		Potential pruning
CW1	6, 10-13	*Cupaniopsis anacardioides*	Carrotwood	*	*	G		Pruning likely necessary
CM1	20	*Lagerstroemia indica*	Crape Myrtle	6	10	D		Dead
CM2	21	*Lagerstroemia indica*	Crape Myrtle	Multi	10	G		Recommend retain
CM3	26	*Lagerstroemia indica*	Crape Myrtle	5	8	D		Dead

*** No DSH or Height are listed as there is a low or no Likelihood of root issues**

Tree Protection Recommendations

A Project Arborist shall be acquired to oversee and monitor the Tree Protection. This may be a Pasadena City Forestry Arborist or an independent contractor. The Arborist should be ISA Certified or a Registered Consulting Arborist, having attained a Tree Risk Assessment Qualification. The Arborist shall have 3 or more years of experience with similar projects.

The Project Arborist shall walk the site with the Contractor prior to the start of work to determine the branch pruning that will be needed. Root Protection and Root Pruning procedures should be discussed and a plan agreed upon.

The applicable portions of the City's Tree Protection Guidelines should be implemented and monitored for compliance by the Project Arborist. Due to the nature of this Project, Tree Protection fencing should be placed as far from the trunks as possible.

Street Trees

The trees on Sunset Avenue should be evaluated for proper street clearance. There will be large trucks going up and down this road, and likely parking. The trees should be evaluated to prevent damage through contact with the large trucks and equipment.

The new driveway entrance, according to current plans, will be just north of an existing Madrone. This tree should be evaluated when the roots are exposed. Proper pruning per the City's Tree Protection Guidelines should occur.

Tree Pruning Procedures

All tree pruning should be under the direction of an ISA Certified Arborist and follow ANSIA A300 Pruning Standards and the City's Tree Protection Guidelines. The Project Arborist will evaluate each tree and make the Pruning Specifications for that tree. Included will be:

- Prune only what is necessary to achieve clearance, and no more than 15% of the live crown shall be removed.
- The Minimal amount of cuts to achieve the desired results is preferred.
- Only use pruning tools designed to make clean cuts. Hand saws, chain saws, pole pruners that have been sharpened and cleaned.

Root Pruning Procedures

All tree root pruning should be under the direction of an ISA Certified Arborist. While there are trees listed as Likely to need root pruning, the trees on this site 10-feet or more outside of the work limits may possibly have roots that will be exposed or damaged. All roots encountered should come under these procedures.

A Root Protection Plan shall be developed by the Project Arborist. This will be discussed with the Contractor to determine the best methods to implement the Plan. The Plan will include the following elements:

1. The minimal amount of roots as possible should be pruned.
2. Work near existing roots shall be done with hand tools. Concrete and asphalt may be broken by mechanical means but should be cleared away from the roots by hand.
3. Roots should be exposed by hand tools or an Air Spade.
4. The Project Arborist will determine if the roots required to be pruned will result in structural instability of the tree. Additional methods or adjustment of the Plan Design should be considered to avoid pruning the significant roots. If additional methods or adjustment to the design is not practical or reasonable, then removal of the tree should be considered.
5. The Project Arborist and the Contractor will determine the number of roots to be cut and the location to make the cuts.
6. Roots will be pruned with sharp, cleaned tools designed for this purpose, such as hand and chain saws. No chopping, ripping or tearing is allowed.
7. Cut root ends will not be left exposed overnight. Cover with moist native soil or burlap.
8. Damaged roots will be cut cleanly back from the damaged area.

Appendix A - Pictures

1. Northeast corner of the site.



2, 3. The two Fan Palms (WR1-2). They should not be in conflict with repaving activities.





4. Looking north at the north end.



5. Northwest side of the north parking area.



6. The northwest corner of the north parking and north side of the west parking area.



7. M1 in the Norwest corner. Is in Poor condition. Likely will need clearance pruning for paving.



8. CP1 will likely need clearance pruning for paving operations.



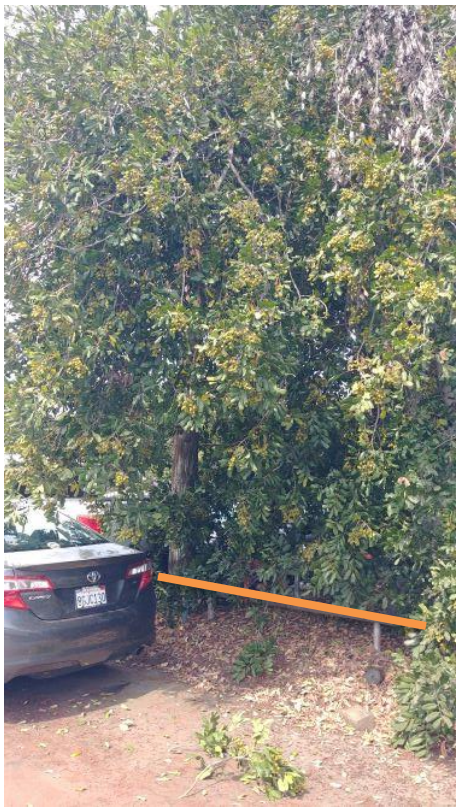
9. Trees south of CP1 will likely not be in conflict with paving operations.



10. Trees at corner of north parking. CW1 (arrow) will likely need clearance pruning.



11, 12. Looking southwest and north at the branches to be clearance pruned. Orange line marks the location of the work limits which is approx. where the metal rail fence is located.





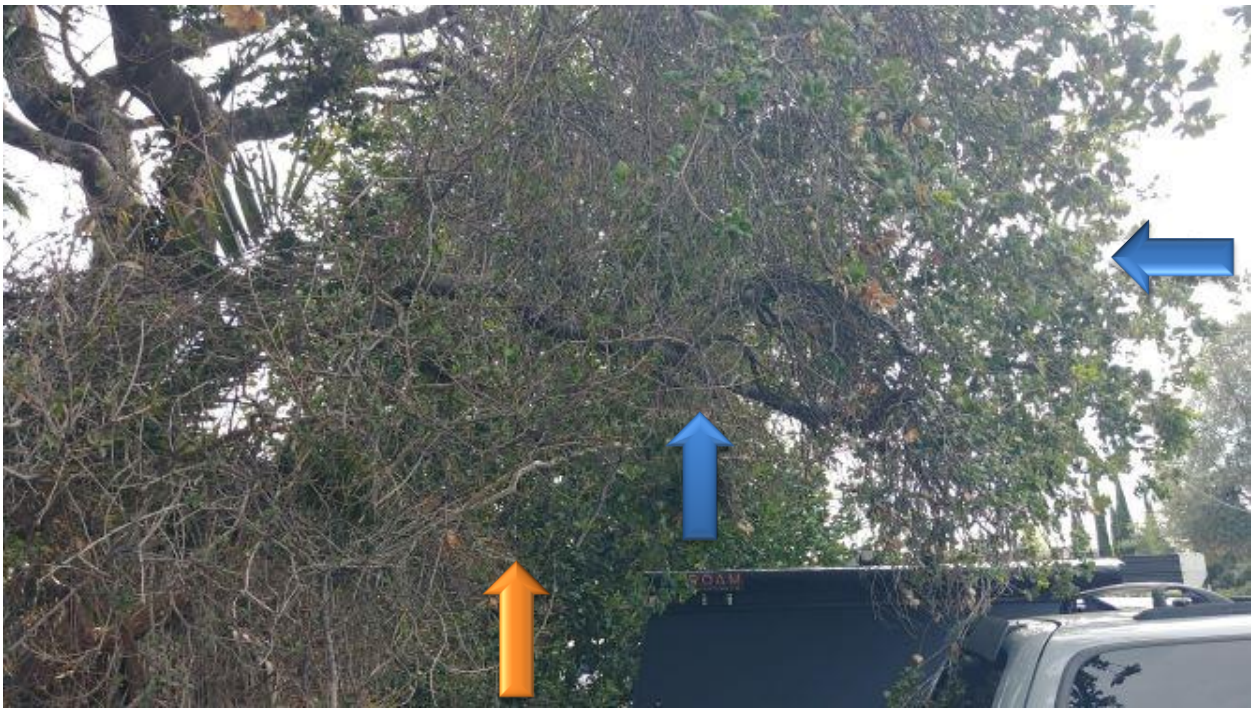
13. Looking north at CW1 and the branches to be clearance pruned.



14. Looking north at #1.



15. Looking east at the overhanging branches (blue arrows) to be raised and pruned back. Orange arrow marks the approx. location of the work limits.



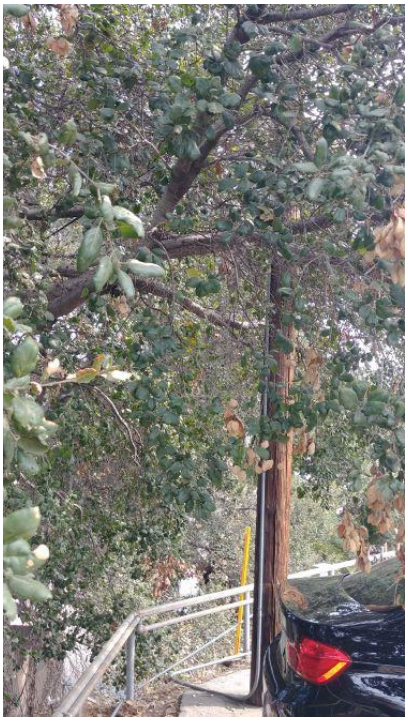
16. If necessary, branch may be pruned back to a location with a lateral branch (red line).



17. #2 in northwest corner of west parking area.



18. Looking north and south at the branches to be pruned on #2. The railing is the approx. location of the work limits.





19. Looking up at the branches of #2.



20. CM1 is dead.

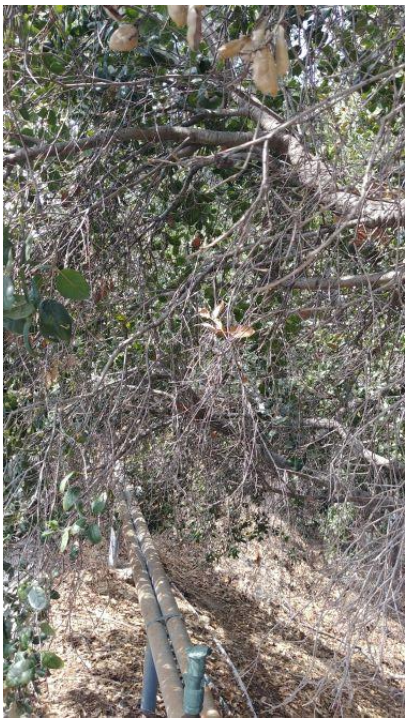


21. CM2 may be retained.



22, 23. #3 location and the small stems to be pruned.





24, 25. The tips of small branches from #4.





26. CM3 is dead.



27. Tree's #5-7.



28. Trunks of trees #5-7 (R-L). #5-6 are 8.5 ft. back of the work limits, #7 is 10+ ft.



29. Trees #5-6 (R-L).

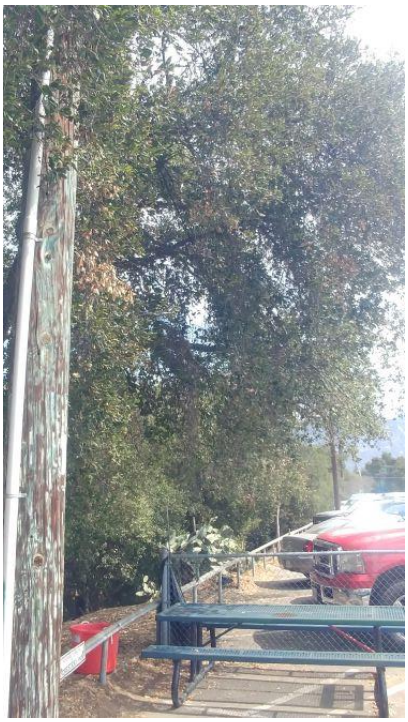


30. #7.



31-33. Branches potentially to be pruned on #5-7.







34. Trees # 8-9.



35, 36. Trees #8-9, 6 and 3 ft. back of WL respectively.

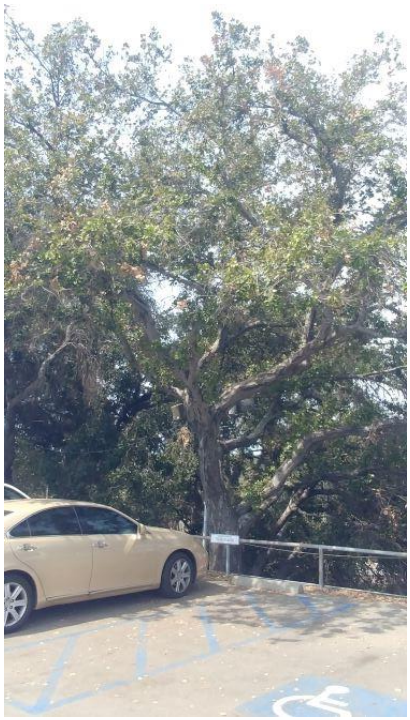




37. Potential branches to be pruned.



38, 39. Tree #10.





40, 41. Trees #11-12.

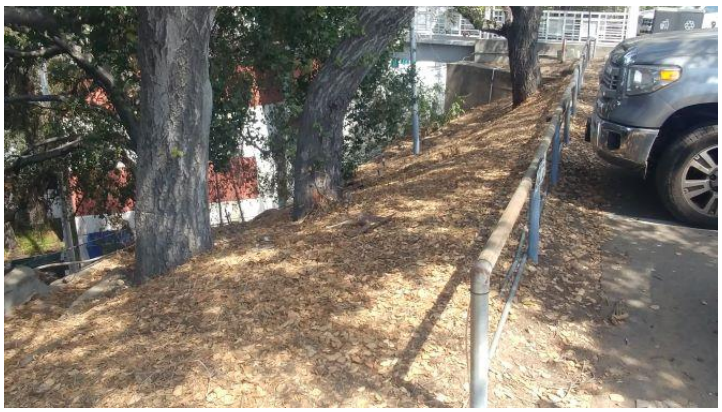




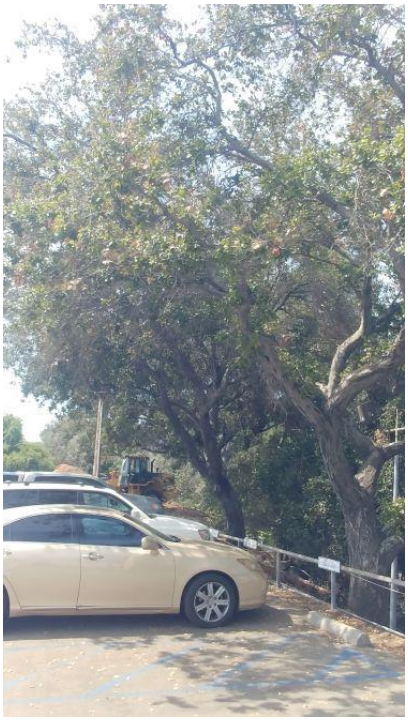
42. Tree #12.



43. Trees #10-12 (R-L).

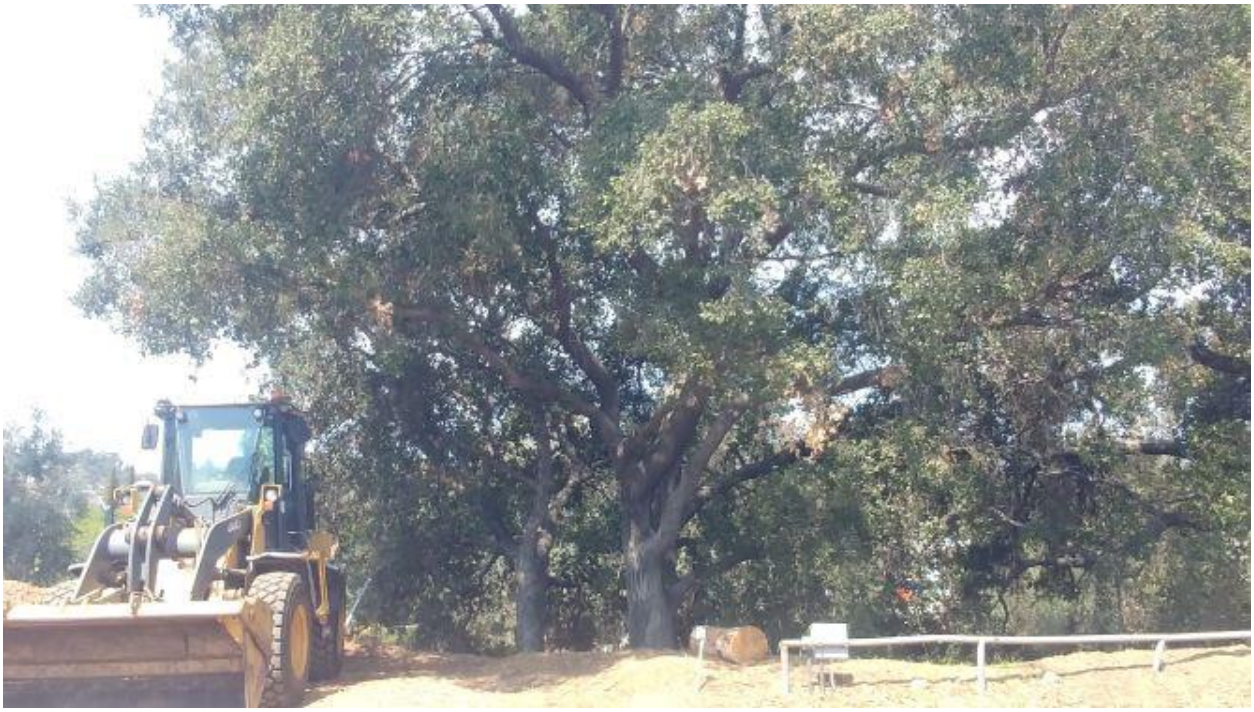


44, 45. Trees #10-12. Crowns should not need clearance pruning.





46. Trees 13-15.



47. Trees 13-15. The closest is 21 ft. behind the WL.



48, 49. Fan Palm, small Oak and Brachychiton to be removed per plans.





50. Trees #16-18 (R-L). Note lean on #17 and decay cavity on #18.



51. Trees 16-18. Note significant lean on #17.



52. Looking northwest.



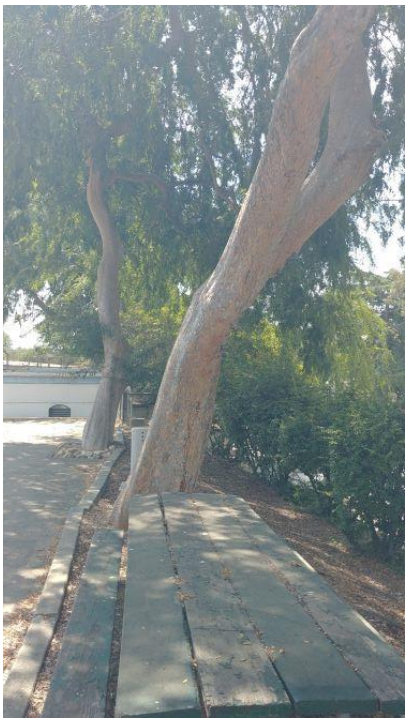
53. Trees #16-17.



54. Trees #19-20.



55, 56. Note significant lean of #19, and close proximity to curb.





57, 58. Tree #20. Note slight lean to east and tree well.



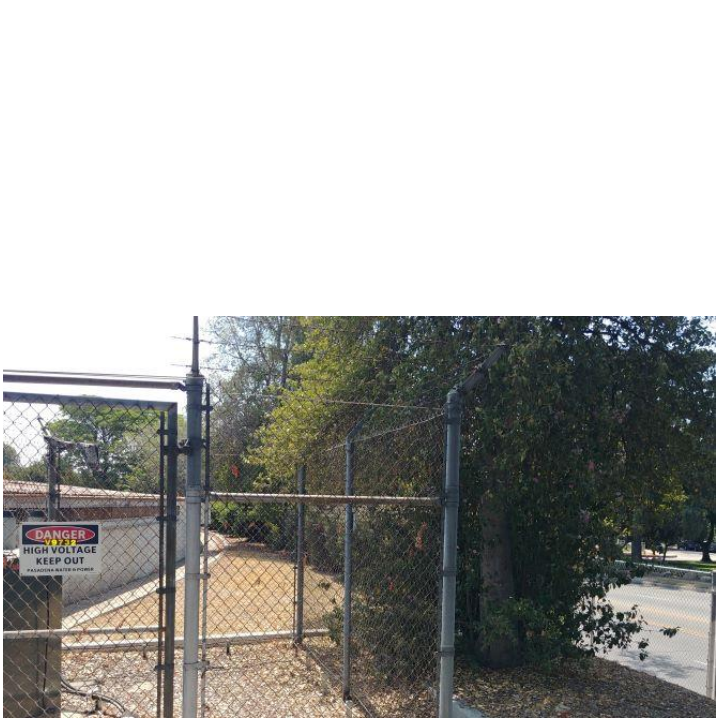


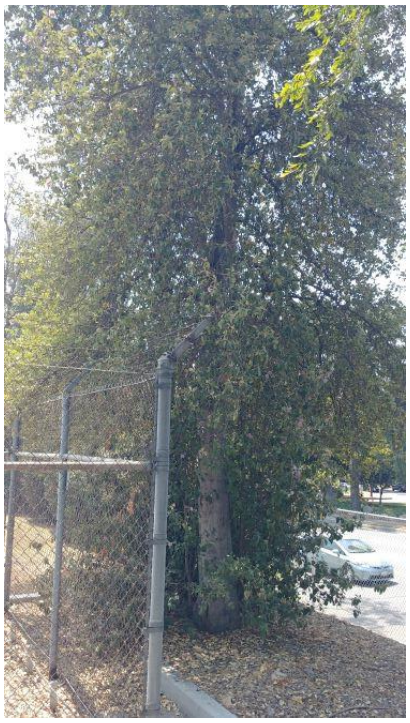
59. Tree # 21. Possibly minor crown raising.



South Side Trees Outside of Work Limits – Likely No Conflicts

60, 61.





62-64.



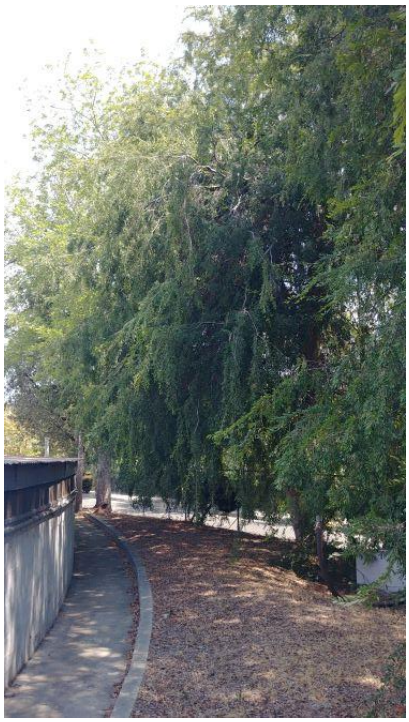




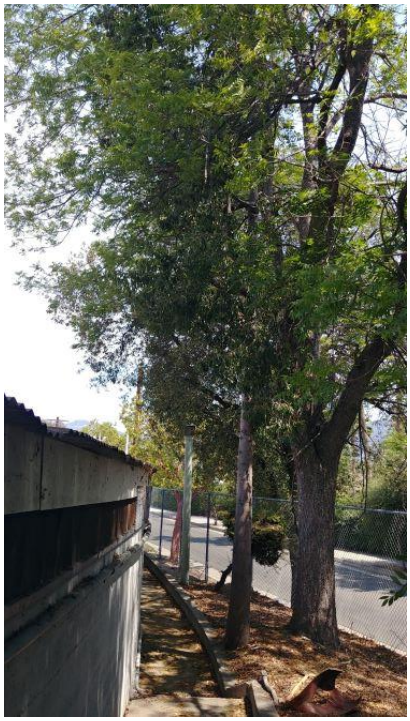
65. Chinese Elms in Southeast corner.

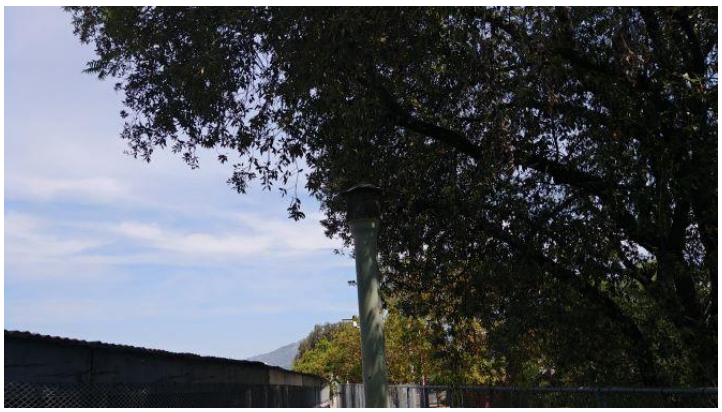


66. Tree #22.



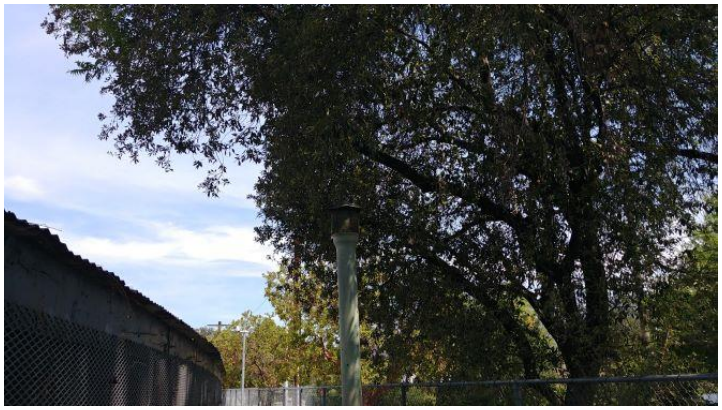
67, 68. Trees #23-24.





69, 70. Tree #25 (Street Tree Oak).





71. Tree #26 (Street Tree Madrone).



72. 4-inch branch may be pruned at parent stem (arrow).



73. Tree #27 with #28 in the background.



74. Tree #28.



75. Looking up at crown of #28.



76. Tree #29. The second tree to the north (arrow) is scheduled to be removed for a driveway installation.



77. Tree #30.



78. Closer view of #30.



79. Tree #31.



80. Tree #32.



Appendix B - Assumptions and Limiting Conditions

1. Loss or alteration of any part of this report invalidates the entire report.

2. The report and the opinions expressed herein represent the professional opinion of the author. The fee generated from this report is not contingent upon any prior or future outcome or subsequent event. Any future work done by this author related to this tree or other trees of the client shall be billed separately from this work.

3. Possession of this report or a copy thereof does not imply right of publication or use for any other purpose by any other than the person to whom it is addressed, without the prior expressed written or verbal consent of the author.

4. The author does not have any financial or business associations with any commercial arborist performing work for the client. Any future work done by a commercial arborist shall be performed via a separate contract between the client and the arborist.

5. Sketches, diagrams, graphs and photographs provided in the Appendixes of this report are provided as a visual aid, are not necessarily to scale, and shall not be construed as an engineering or architectural reports or surveys.

6. Care has been taken to obtain information from reliable sources. The author cannot guarantee the accuracy nor be responsible for the information provided by others.

7. Unless otherwise specified, the information contained in this report covers only those items that were examined and reflects the condition of those items at the time of inspection. The inspection is limited as stated in the text of this report. There is no warranty or guarantee that problems or deficiencies of the tree in question will not rise in the future.

8. The author shall not be required to give testimony or attend court by reason of this report unless subsequent contractual arrangements are made. This includes payment of an additional fee for such services as described in a subsequent contract for services.

APPENDIX C – CERTIFICATE OF PERFORMANCE

I, Eric Gorsuch, certify that:

- I have personally inspected the subject tree of this report and I have stated my findings accurately;
- That the analysis, opinions and conclusions stated herein are my own;
- That my analysis, opinions and conclusions were developed and this report has been prepared according to commonly accepted arboricultural practices and standards;
- That no one provided significant professional assistance to the author, unless specified therein;
- That my compensation is not dependent upon the reporting of a predetermined conclusion or opinion that favors my cause, my client, or any other party;
- I have no current or prospective interest in the tree or the property that is the subject of this report, and have no personal interest or bias with respect to the party(ies) involved.

I further certify that I am a member in good standing of the American Society of Consulting Arborists and the International Society of Arboriculture. I have been a Certified Arborist since 2005 and Tree Risk Assessment Qualified since 2013.



Eric Gorsuch, Registered Consulting Arborist #575

Date _____

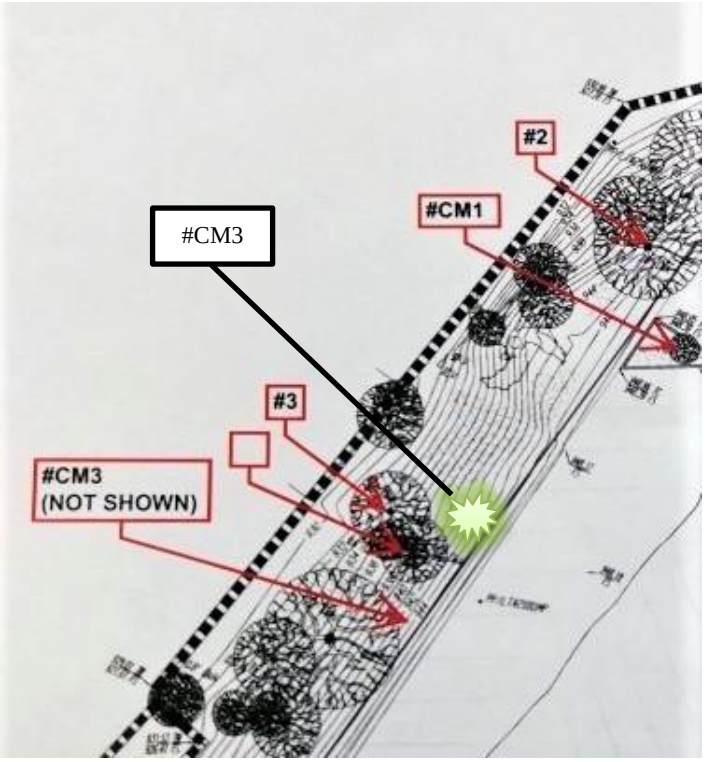
ADDENDUM 11-5-21

5 November 2021
Nuvis Landscape Architecture
RE: Sunset Reservoir, Pasadena

This Addendum to the 22 June 2021 report is to reflect the updated information provided. I have updated the count with three (3) additional trees and created a new list of nineteen (19) trees likely to be removed due to the new construction design (#Rxx). This Addendum should provide information on the questions raised regarding the tree recommendations. Each of these points contain views of the Plan Sheets with KJ comments and my responses for clarification.

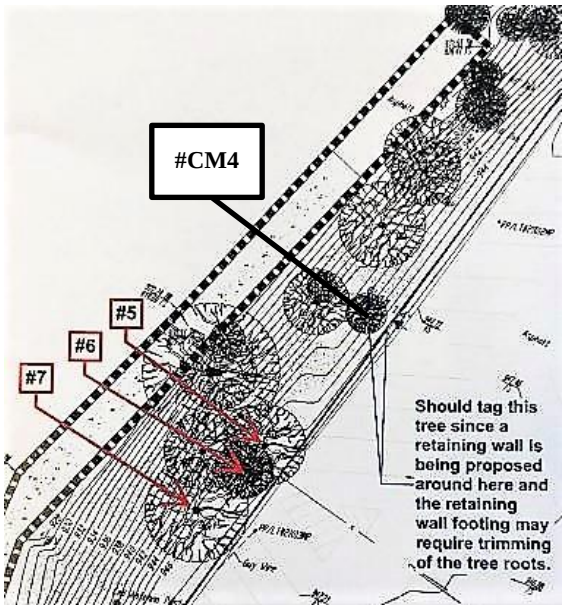
UPDATES

1. Correct placement of #CM3 (Sheet C-004).

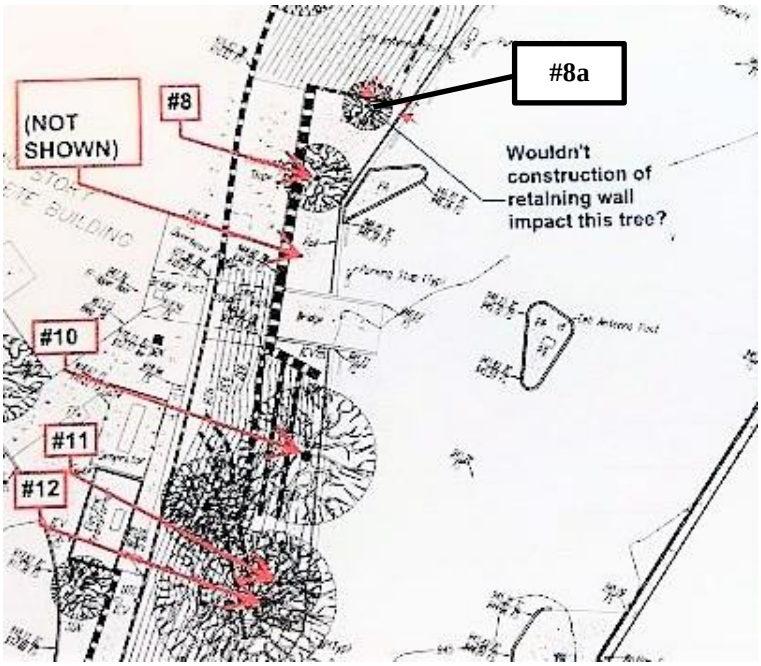


V & E Tree Service, Inc.
P.O. Box 3280 Orange, CA 92857 714-997-0903 Fax 714-637-4070

2. Added one Crape Myrtle (CM#4, Sheet C-004).



3. Added one Oak (#8a, Sheet C-005).



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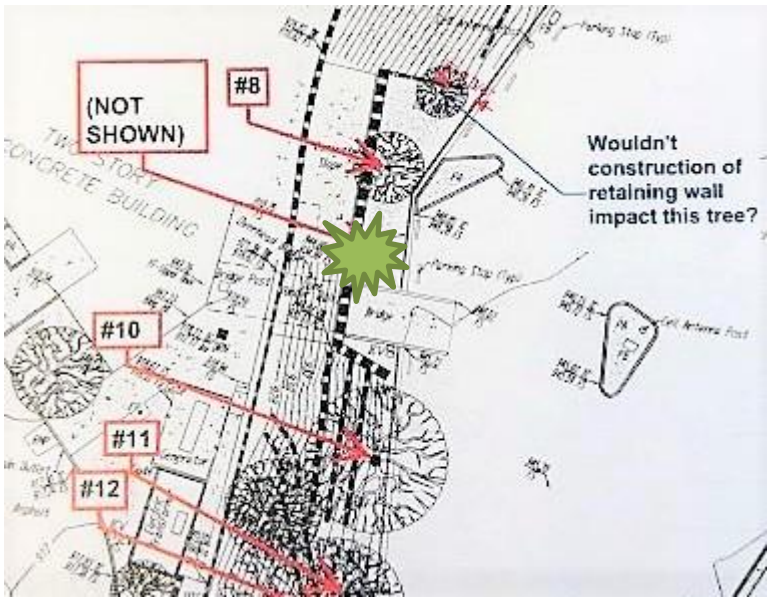
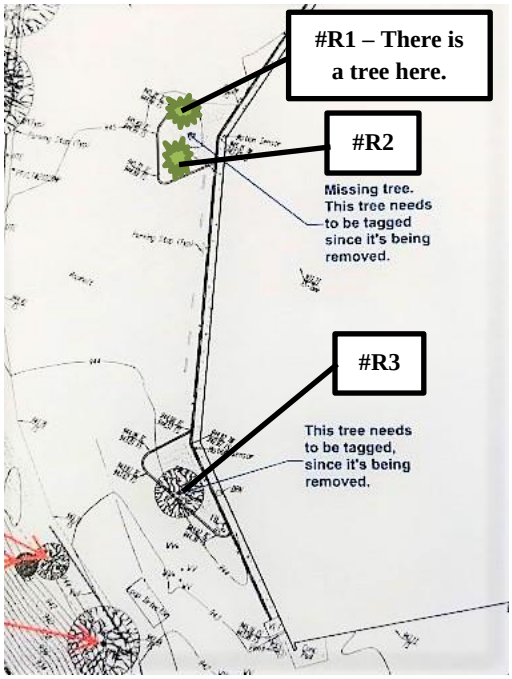
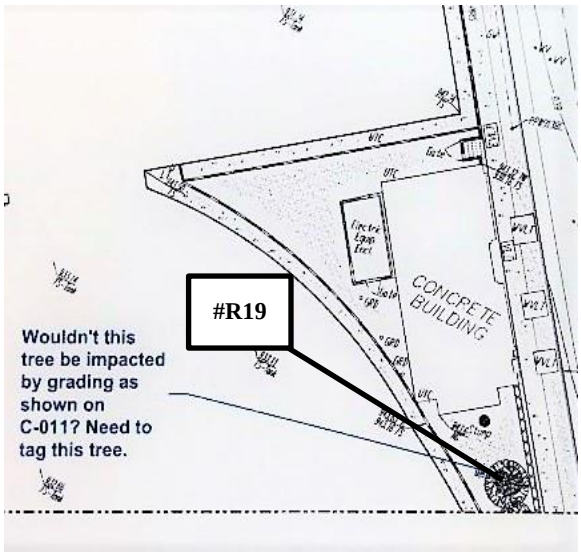
4. Confirm placement of tree #9 (Sheet C-005).



5. Three (4) trees to be removed (Sheet C-005).





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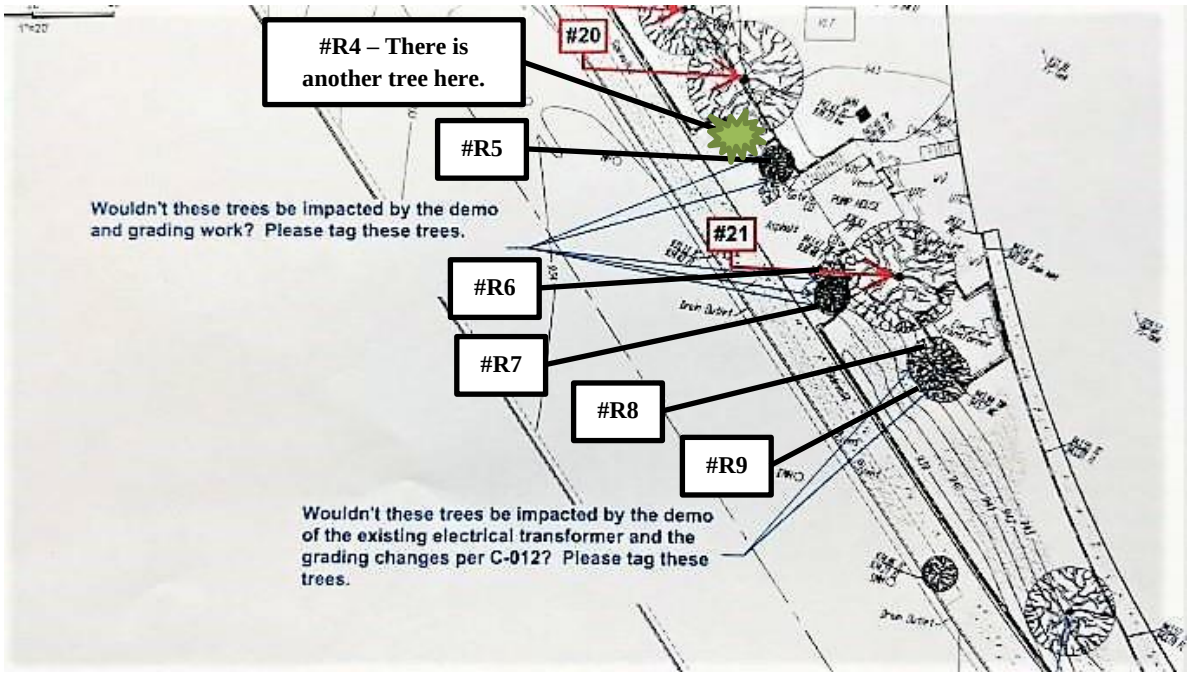
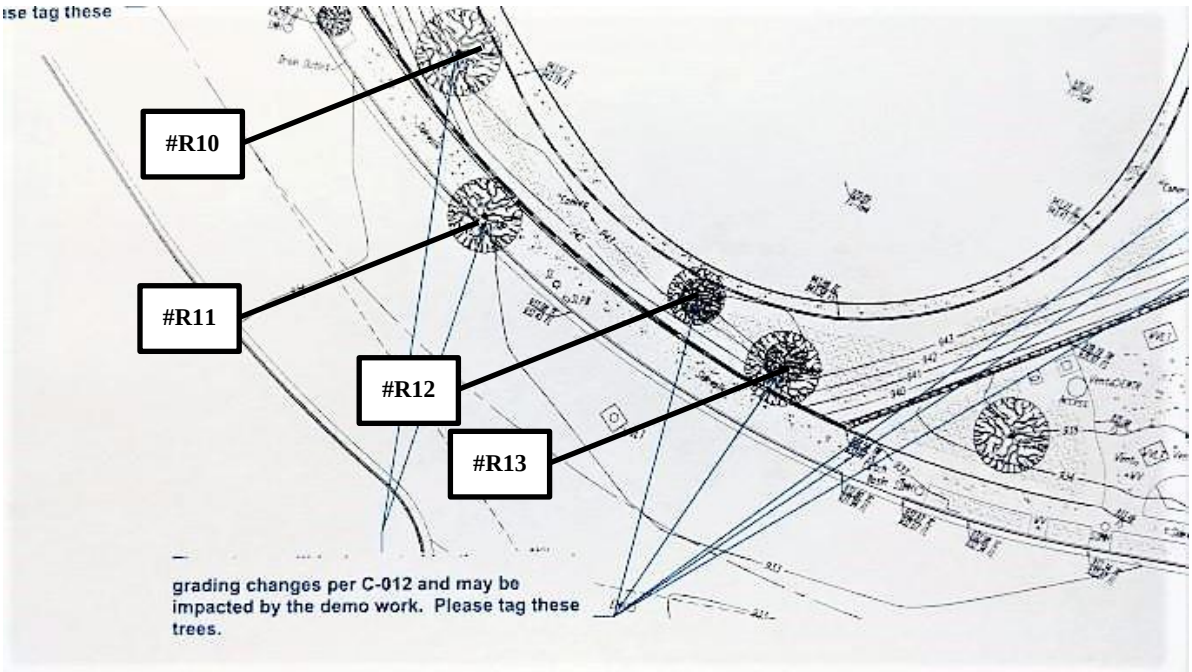
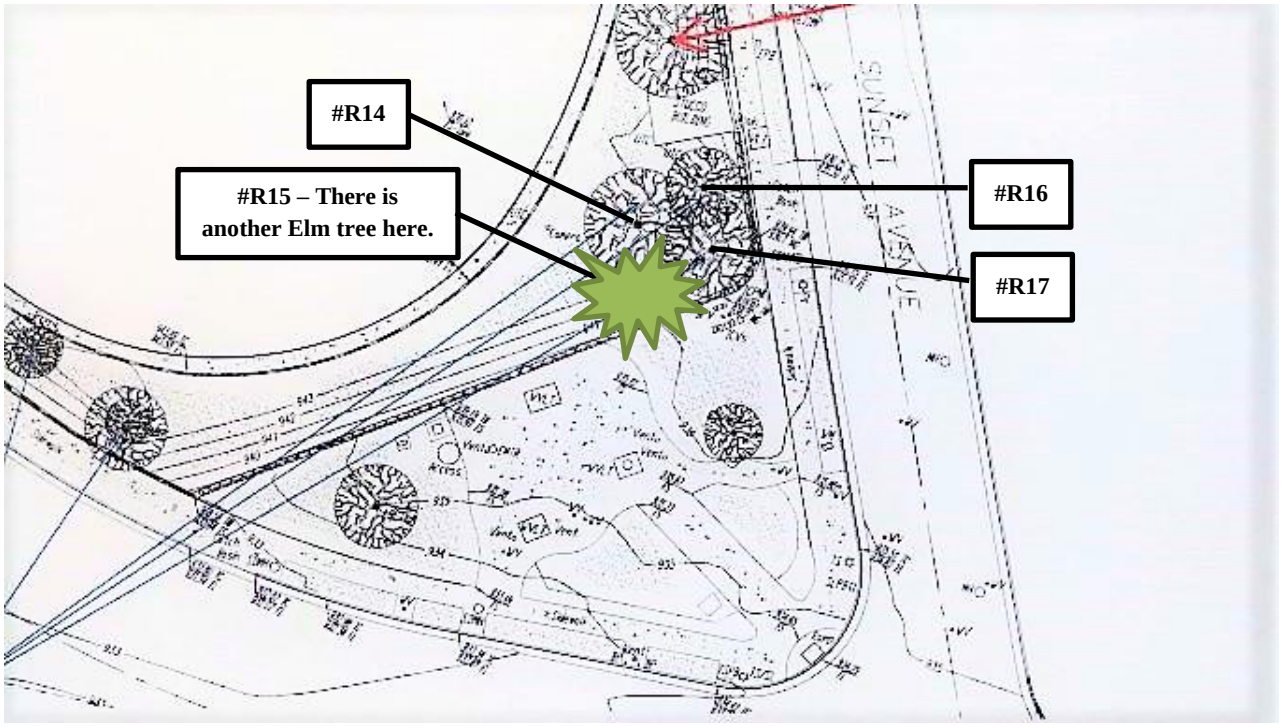
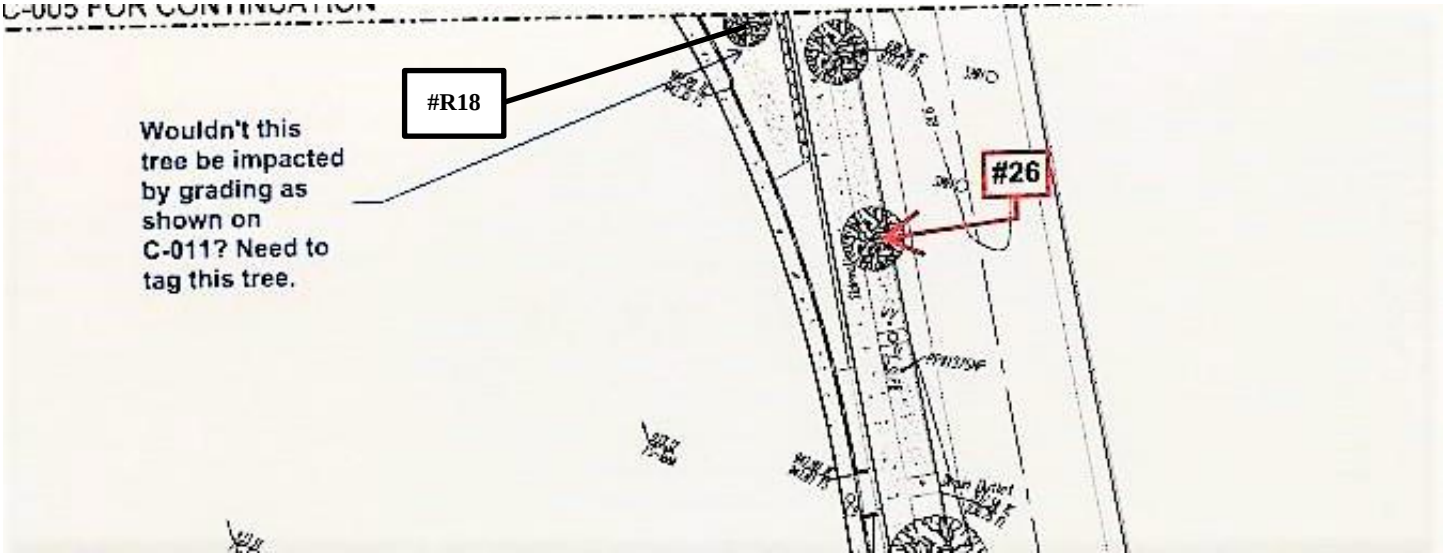
6. Sixteen (15) trees to be removed (Sheet C-006).









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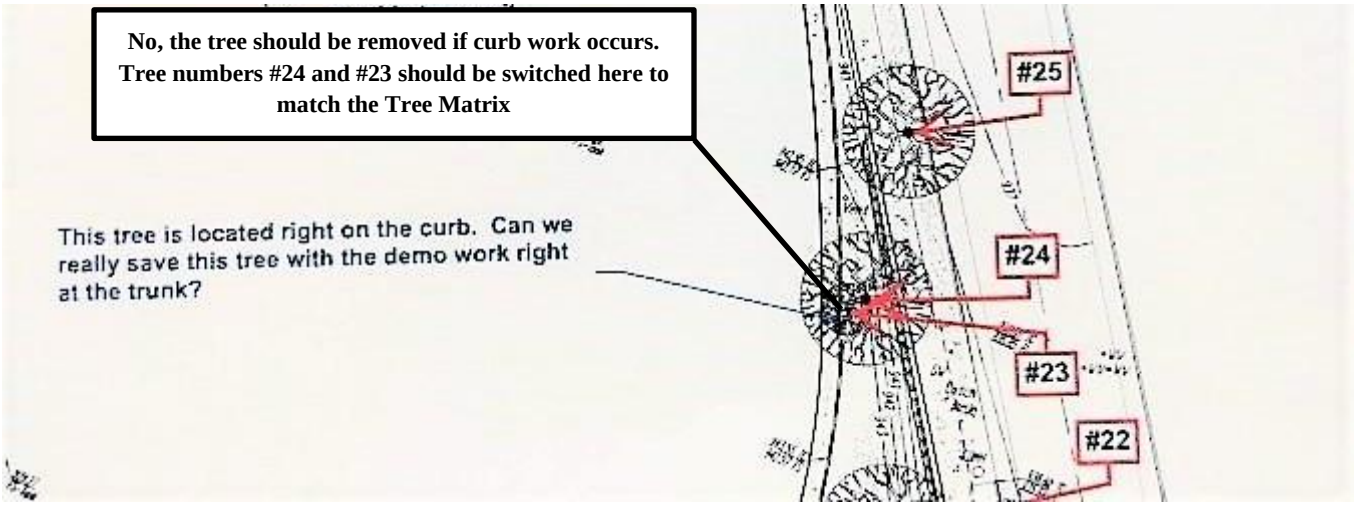
7. Comment on tagging Street Tree on Montana potentially impacted by demo work (Sheet C-006).



8. Comment on #24 impacted by demo work, and correct numbering (shown as #23 - Sheet C-006).



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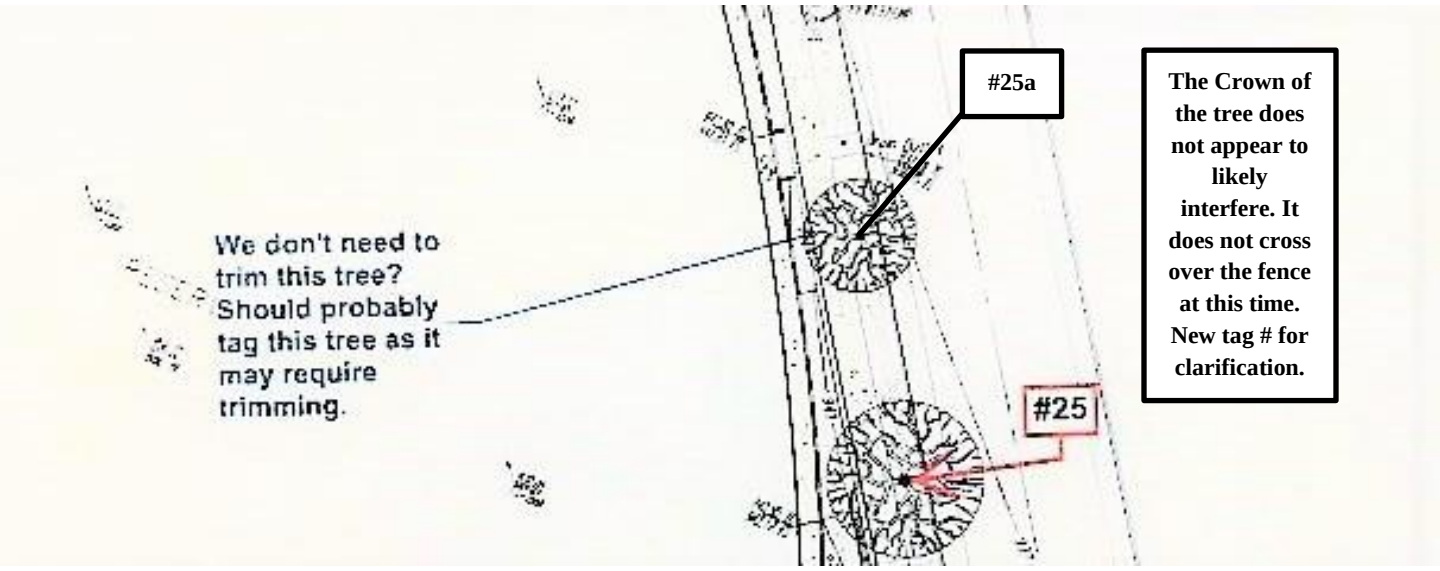
9. Comment on tagging Street Tree on Sunset potentially to be pruned (Sheet C-006).



UPDATED TREE SURVEY MATRIX

Updated information is in **bold.** "Consider for Removal" is defined as trees that will likely not tolerate the necessary root pruning likely to occur, but are not specifically called out to remove.

T#	Species	Common Name	D"	H'	Cond	Tag#	Notes
1	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune 1 3-4" + small stems
2	*Quercus agrifolia*	Coast Live Oak	*	*	G		Raise 1-2" stems
3	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune 1-2" stems
4	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune <1" stems
5	*Quercus agrifolia*	Coast Live Oak	18	25	G		8.5 ft. back of work limits Prune <1" stems
6	*Quercus agrifolia*	Coast Live Oak	13/13	35	G		8.5 ft. back of work limits Prune <1" stems
7	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune 1-2" stems
8	*Quercus agrifolia*	Coast Live Oak	12	15	G		6 ft. back of work limits Prune <1" stems
8a	***Quercus agrifolia***	**Coast Live Oak**	**7**	**15**	**G**		**6.5 ft. back of work limits Prune <1" stems**
9	*Quercus agrifolia*	Coast Live Oak	16	25	G		3 ft. back of work limits Prune <1" stems
10	*Quercus agrifolia*	Coast Live Oak	24	35	F	1623	2 ft. back of work limits **CONSIDER FOR REMOVAL**
11	*Quercus agrifolia*	Coast Live Oak	13	30	G	1622	6 ft. back of work limits
12	*Quercus agrifolia*	Coast Live Oak	19	45	G	1621	7 ft. back of work limits

13	*Quercus agrifolia*	Coast Live Oak	*	*	G	1619	21 ft. back of work limits
14	*Quercus agrifolia*	Coast Live Oak	*	*	G	1618	21 ft. back of work limits
15	*Quercus agrifolia*	Coast Live Oak	*	*	G	1617	21 ft. back of work limits
16	*Ulmus parvifolia*	Chinese Elm	Dbl trunk	25	G		**CONSIDER FOR REMOVAL**
17	*Ulmus parvifolia*	Chinese Elm	14	35	F		Significant lean **CONSIDER FOR REMOVAL**
18	*Ulmus parvifolia*	Chinese Elm	22	40	F		Trunk decay **CONSIDER FOR REMOVAL**
19	*Ulmus parvifolia*	Chinese Elm	22	45	F	1608	Significant lean **CONSIDER FOR REMOVAL**
20	*Ulmus parvifolia*	Chinese Elm	21	45	G	1607	Inside work limits **CONSIDER FOR REMOVAL**
21	*Ulmus parvifolia*	Chinese Elm	21	50	G	1606	20 ft. back of work limits Potential for minor limb pruning
22	*Ulmus parvifolia*	Chinese Elm	*	*	G		Prune <1" stems
23	*Juglans californica*	Walnut	*	*	G		Prune <1" stems
24	***Brachychiton populneus***	**Bottle tree**	*	*	**F**		**Conflict with demolition RECOMMEND REMOVAL**
25	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune <1" stems
25a	***Arbutus menziesii***	**Pacific Madrone**	*	*	**G**		**No conflicts likely**
26	*Arbutus menziesii*	Pacific Madrone	*	*	G		Remove 4 in. branch at parent stem
27	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune <1" stems
28	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune 1-2" stems
29	*Arbutus menziesii*	Pacific Madrone	*	*	G		Prune 1-2" stems
30	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune 1-2" stems
31	*Arbutus menziesii*	Pacific Madrone	*	*	G		Prune 1-2" stems
32	*Quercus agrifolia*	Coast Live Oak	*	*	G		No pruning likely needed
WR1-2	*Washingtonia robusta*	Fan Palm	*	*	G		No conflicts likely
M1	*Morus alba*	Mulberry	*	*	P		Potential pruning
CP1	*Phoenix canariensis*	Canary Palm	*	*	G		Potential pruning
CW1	*Cupaniopsis anacardioides*	Carrotwood	*	*	G		Pruning likely necessary
CM1	*Lagerstroemia indica*	Crape Myrtle	6	10	D		Dead
CM2	*Lagerstroemia indica*	Crape Myrtle	Multi	10	G		Recommend retain
CM3	*Lagerstroemia indica*	Crape Myrtle	5	8	D		Dead
CM4	***Lagerstroemia indica***	**Crape Myrtle**	**5**	**8**	**F**		**Conflict with new construction RECOMMEND REMOVAL**
R1	***Quercus agrifolia***	**Coast Live Oak**	**<4**	**5**	**G**		**Removal**
R2	***Washingtonia robusta***	**Fan Palm**		**40**	**G**		**Removal**
R3	***Brachychiton populneus***	**Bottle Tree**	**12**	**20**	**G**		**Removal**
R4	***Ligustrum spp.***	**Privet**	**Multi**	**15**	**G**		**Removal**
R5	***Ligustrum spp.***	**Privet**	**Multi**	**15**	**G**		**Removal**
R6	***Ligustrum spp.***	**Privet**	**Multi**	**15**	**G**		**Removal**
R7	***Ligustrum spp.***	**Privet**	**Multi**	**15**	**G**		**Removal**
R8	***Brachychiton populneus***	**Bottle Tree**	**16**	**30**	**G**		**Removal**

R9	*Brachychiton populneus*	Bottle Tree	16	30	G		Removal
R10	*Ligustrum spp.*	Privet	17	35	G		Removal
R11	*Eucalyptus halepensis*	Eucalyptus	16	30	F		STREET TREE – Appears outside of limits – Remove if conflicts with construction design
R12	*Schinus terebinthifolius*	Brazilian Pepper	18	25	F		Removal
R13	*Pistacia chinensis*	Pistache	24	35	G		Removal
R14	*Ulmus parvifolia*	Chinese Elm	17	40	G		Removal
R15	*Ulmus parvifolia*	Chinese Elm	17	40	G		Removal
R16	*Ulmus parvifolia*	Chinese Elm	15	35	G		Removal
R17	*Ulmus parvifolia*	Chinese Elm	13	30	F		Removal
R18	*Prunus spp.*	Cherry	12	15	P		Removal
R19	*Prunus spp.*	Cherry	20	10	P		Removal

Thank you for the additional information and clarifications. Please contact me if you have any questions.

Eric Gorsuch
ASCA Registered Consulting Arborist #575
ISA Certified Arborist WE-7438A
ISA Tree Risk Assessment Qualified
TCIA Certified Treecare Safety Professional 00144
714-222-2735

ADDENDUM 3-17-22

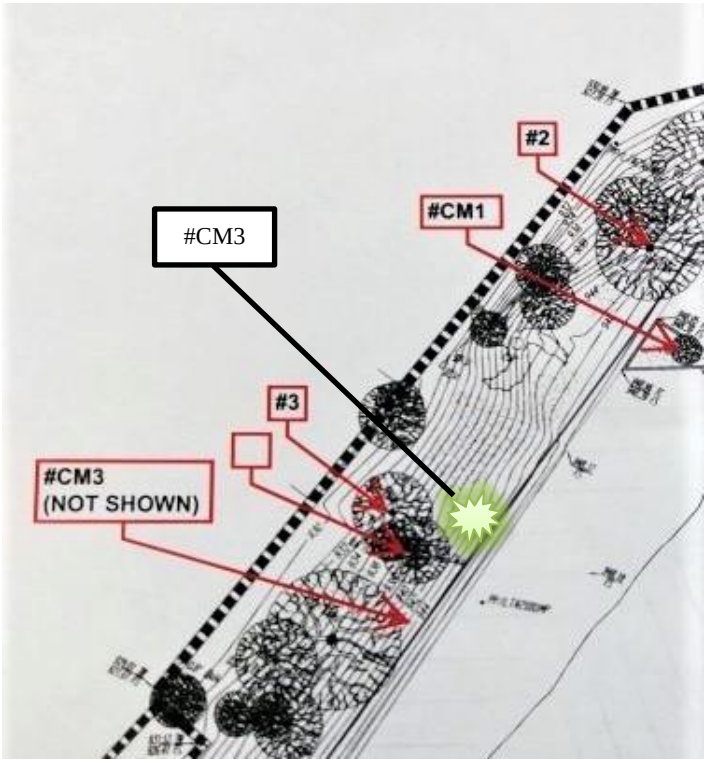
17 March 2022
Nuvis Landscape Architecture
RE: Sunset Reservoir, Pasadena

This Addendum to the 22 June 2021 report is to reflect the updated information provided. It includes corrections to *Addendum 11-5-21* and replaces it. Comments in **bold** are corrections to *Addendum 11-5-21.*

ADDENDUM 11-5-21

I have updated the count with three (3) additional trees and created a new list of nineteen (19) trees likely to be removed due to the new construction design (#Rxx). This Addendum should provide information on the questions raised regarding the tree recommendations. Each of these points contain views of the Plan Sheets with KJ comments and my responses for clarification.

1. Correct placement of #CM3 (Sheet C-004).



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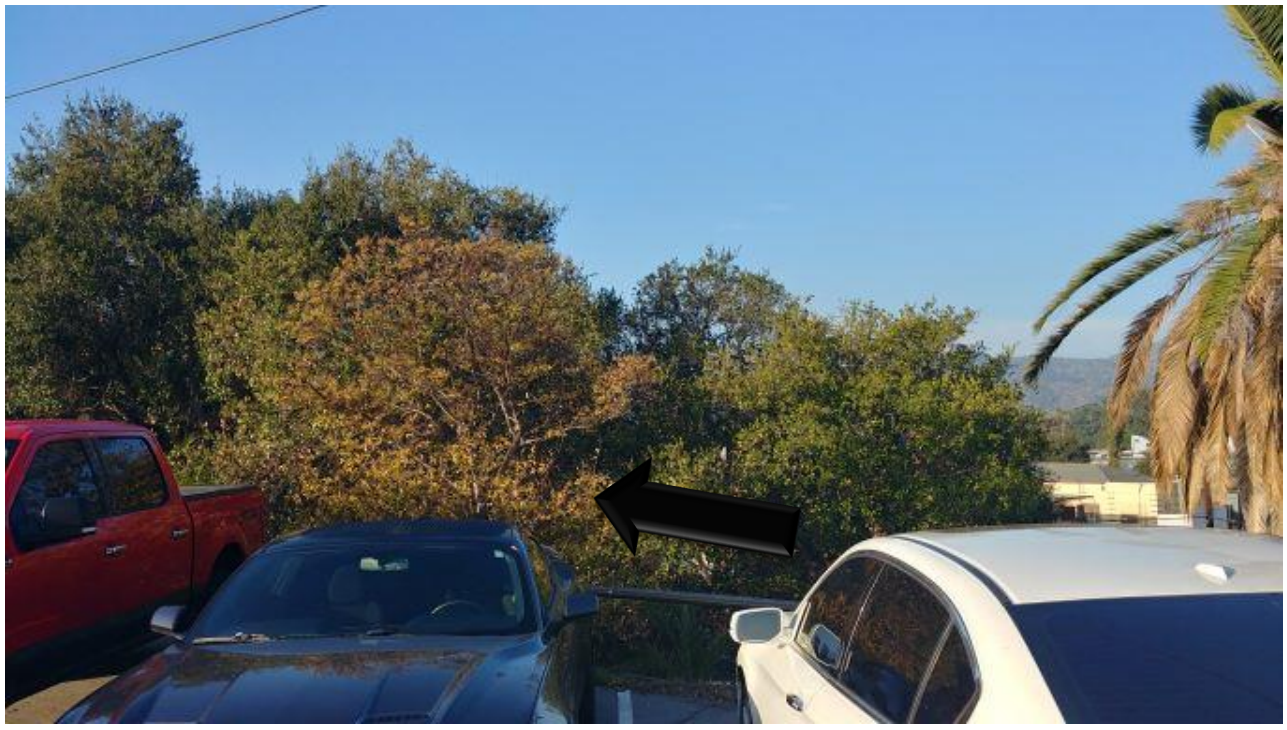
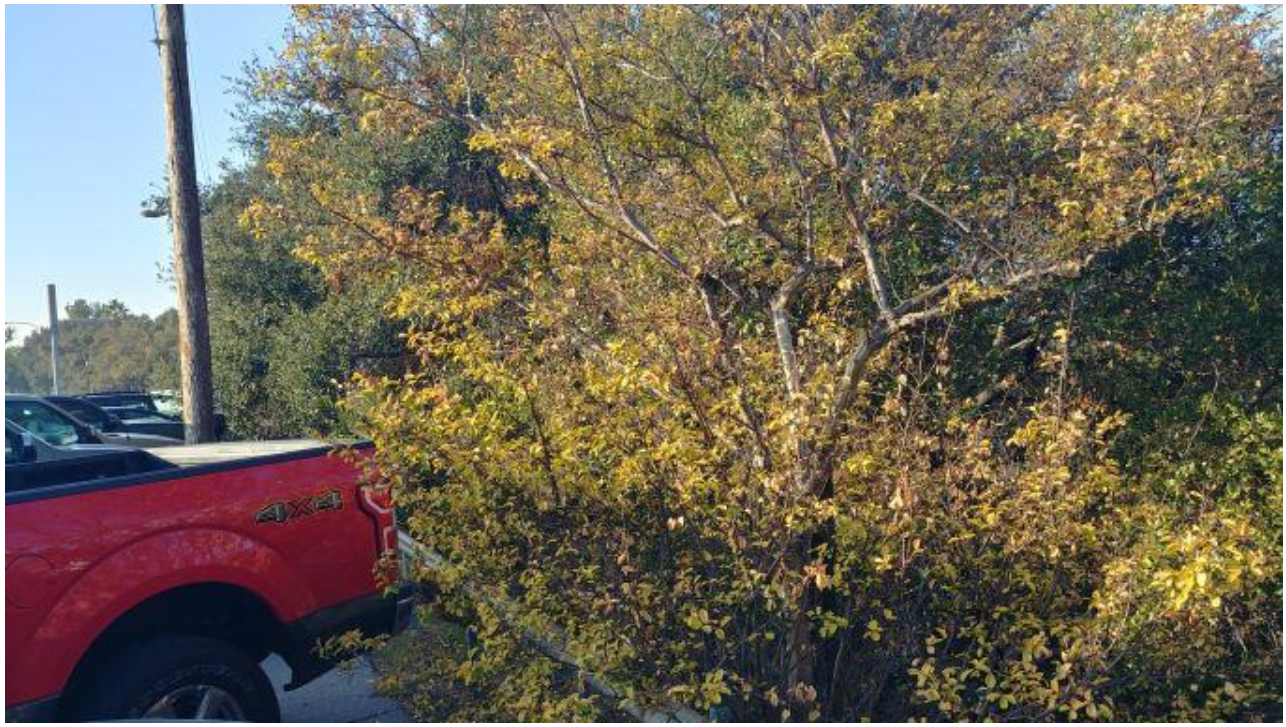
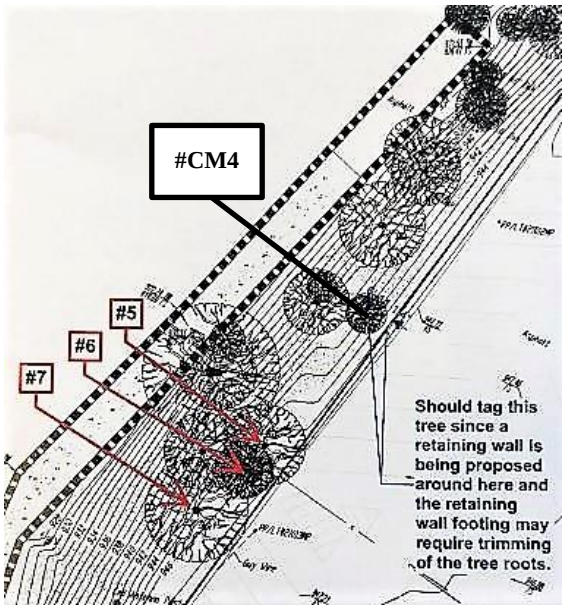
(a, b). Correct photos of #CM3. Tree is in conflict with new construction.





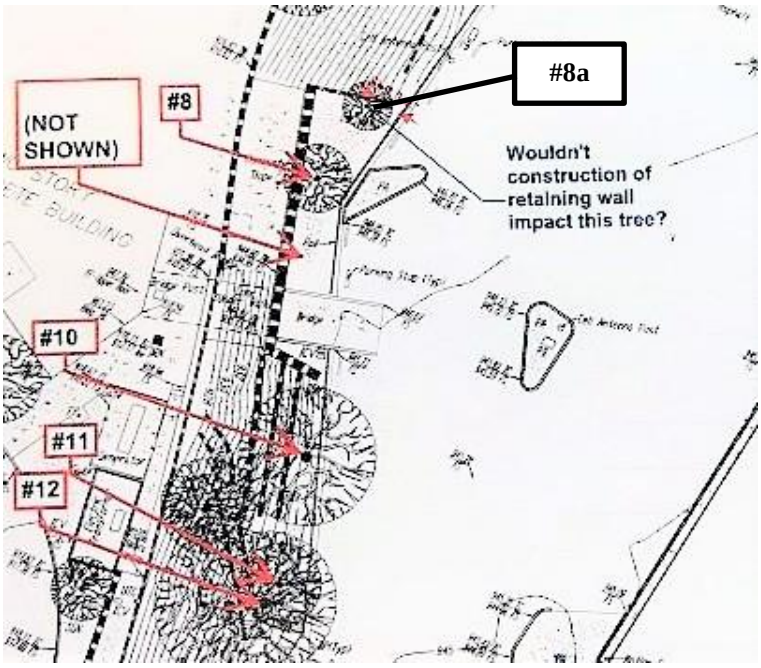
2. Added one Crape Myrtle (CM#4, Sheet C-004).



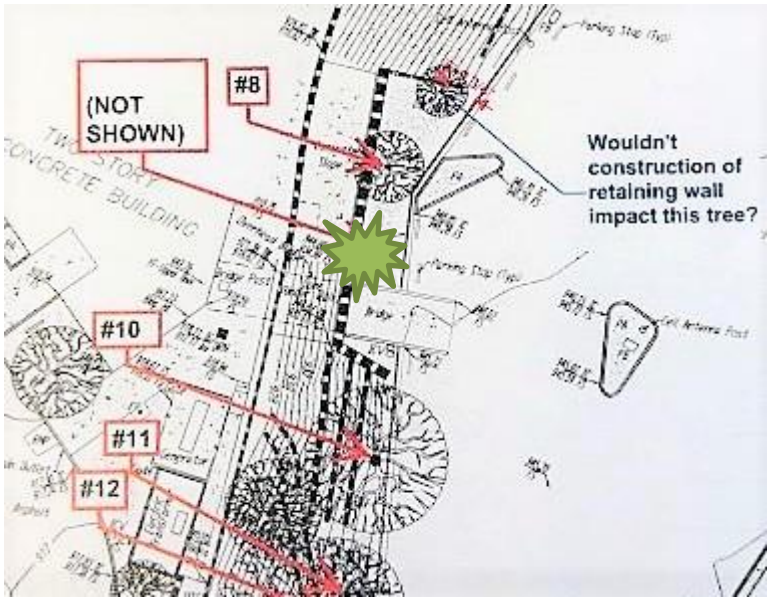
(a). Correct photo of #CM4.



3. Added one Oak (#8a, Sheet C-005).



4. Confirm placement of tree #9 (Sheet C-005).



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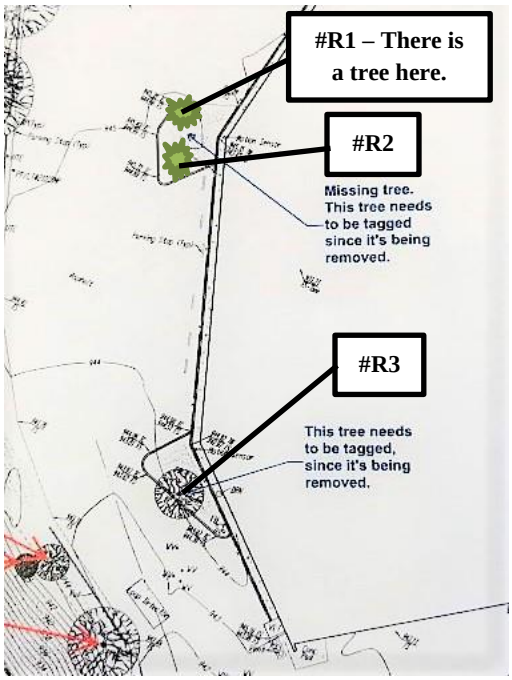
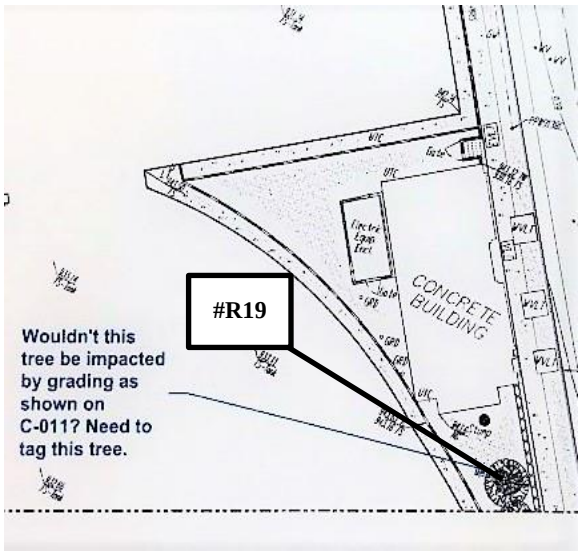
5. Three (4) trees to be removed (Sheet C-005).





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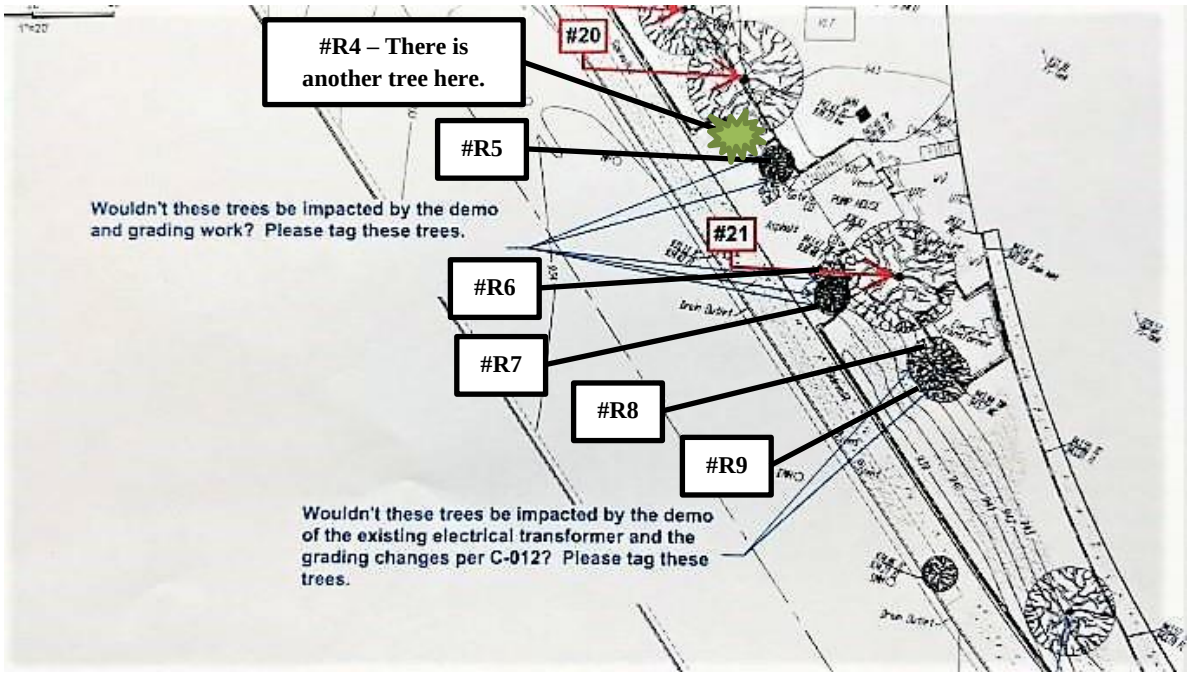
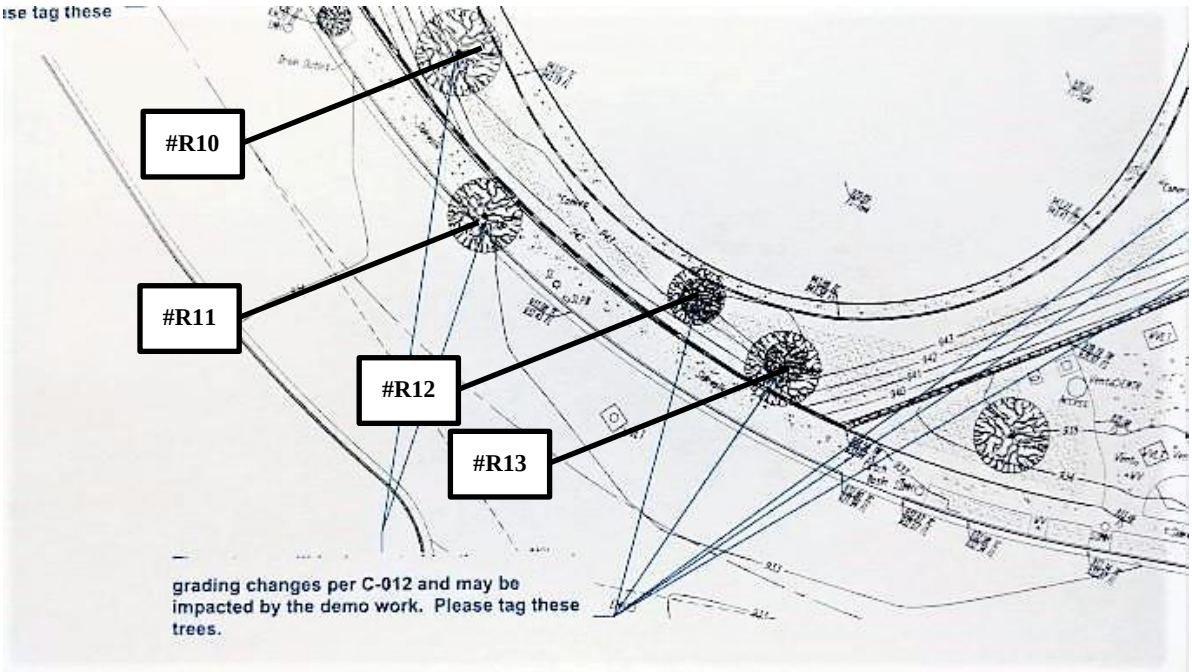
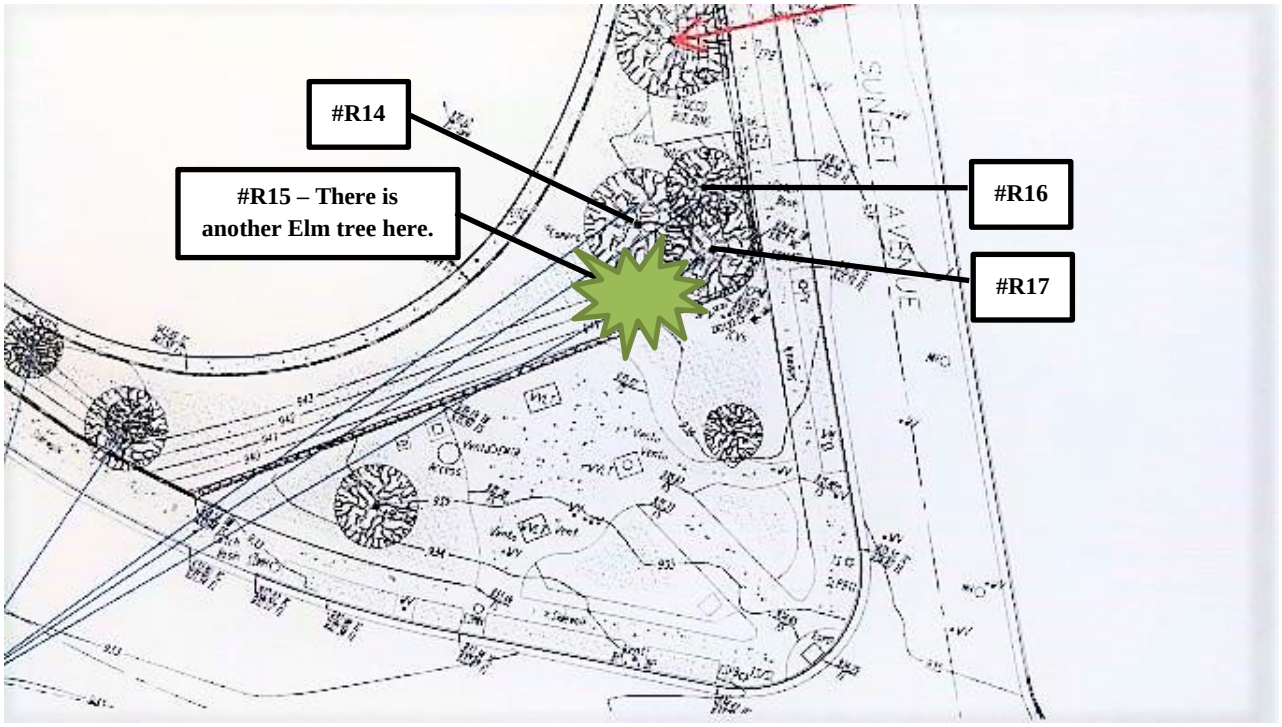
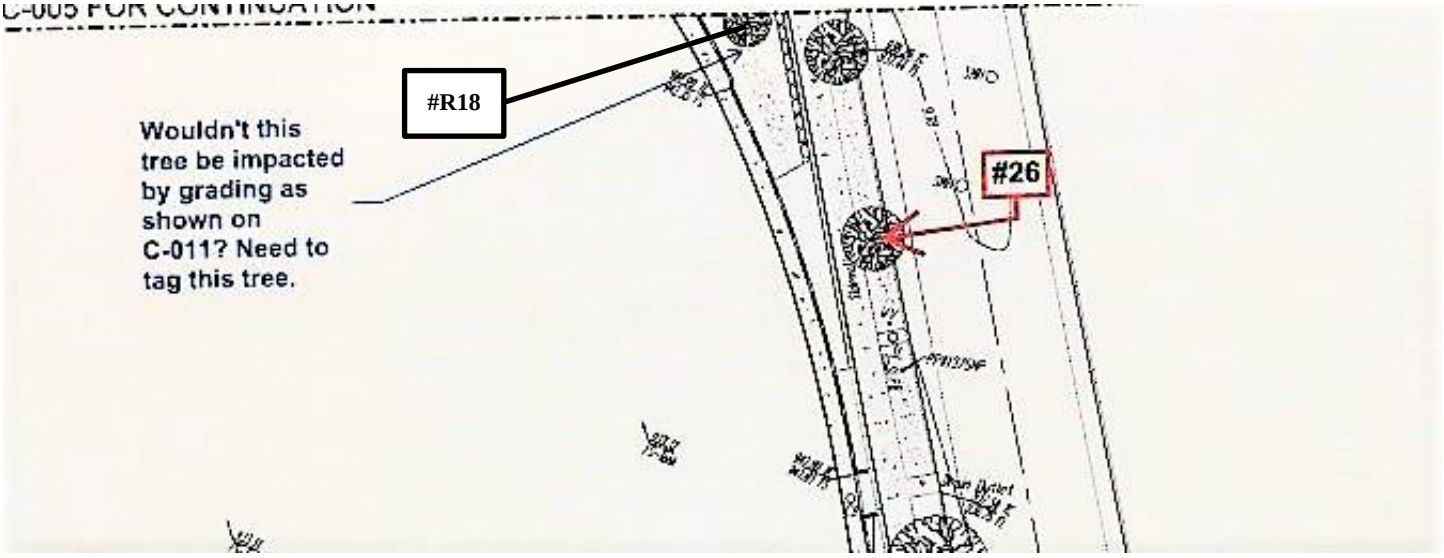
6. Sixteen (**16**) trees to be removed (Sheet C-006).









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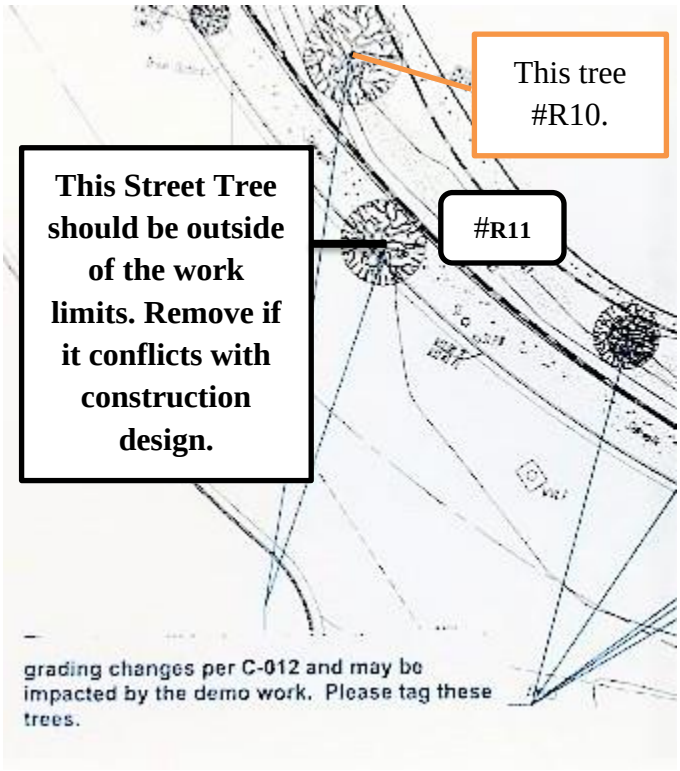
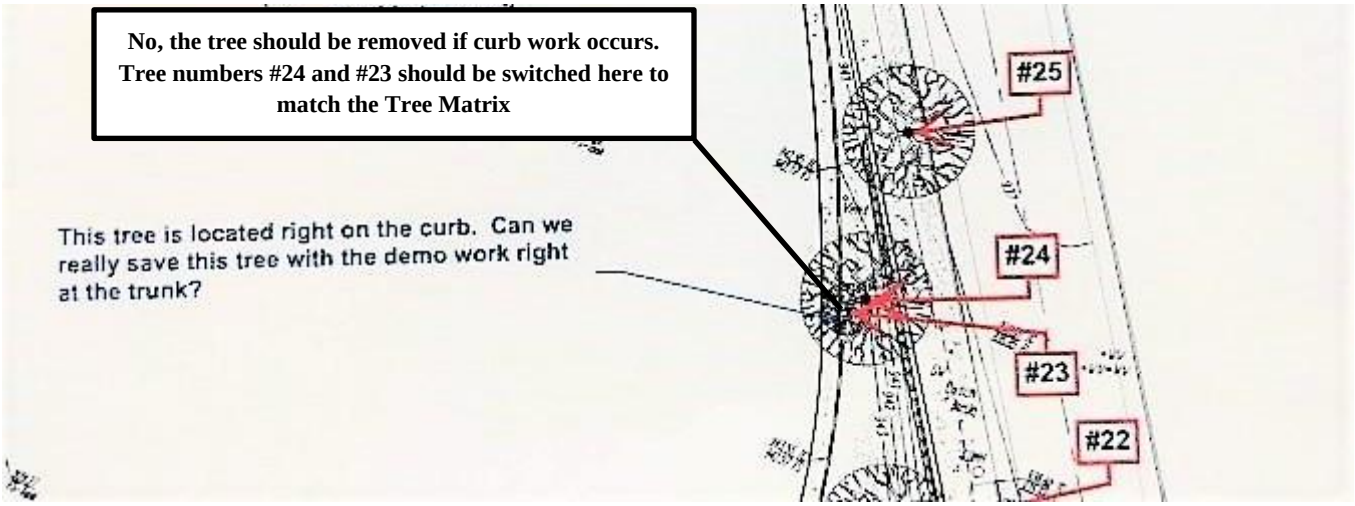
7. Comment on tagging Street Tree on Montana potentially impacted by demo work (Sheet C-006).



8. Comment on #24 impacted by demo work, and correct numbering (shown as #23 - Sheet C-006).



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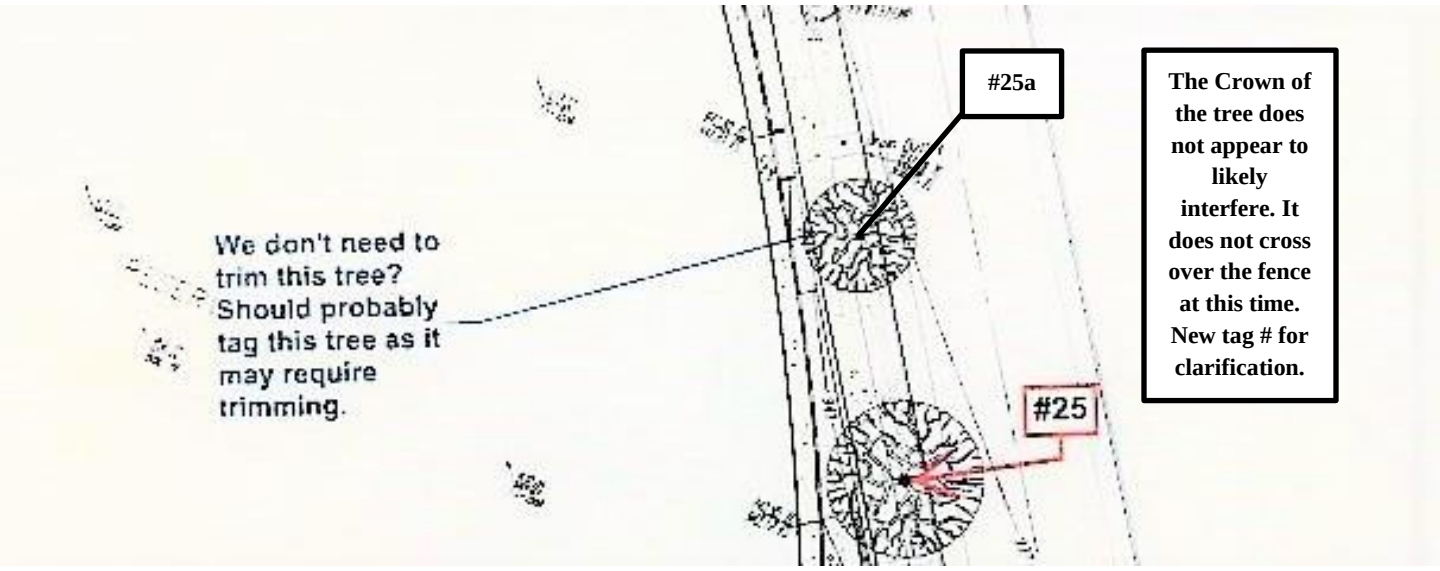
9. Comment on tagging Street Tree on Sunset potentially to be pruned (Sheet C-006).



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ADDENDUM 3-17-22

These are answers to the questions on Plan Sheets C-004-6 not already corrected above in *Addendum 11-5-21.*

C-004

1. The North end parking area will only be repaved with no retaining wall installed and no grade lowering. I only documented the trees in that area that should be pruned.

2. The small immature palms around #CM3 and south of it do not need to be noted or tagged. They may be removed as they will interfere with construction.

C-005

3. The missing tree by the cell tower is a shrub.

C-006

4. The missing tree by the fence line is a shrub.

UPDATED TREE SURVEY MATRIX

Updated information is in **bold.** "Consider for Removal" is defined as trees that will likely not tolerate the necessary root pruning likely to occur, but are not specifically called out to remove.

T#	Species	Common Name	D"	H'	Cond	Tag#	Notes
1	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune (1) 3-4" + small stems
2	*Quercus agrifolia*	Coast Live Oak	*	*	G		Raise 1-2" stems
3	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune 1-2" stems
4	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune <1" stems
5	*Quercus agrifolia*	Coast Live Oak	18	25	G		8.5 ft. back of work limits Prune <1" stems
6	*Quercus agrifolia*	Coast Live Oak	13/13	35	G		8.5 ft. back of work limits Prune <1" stems
7	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune 1-2" stems
8	*Quercus agrifolia*	Coast Live Oak	12	15	G		6 ft. back of work limits Prune <1" stems
8a	***Quercus agrifolia***	**Coast Live Oak**	**7**	**15**	**G**		**6.5 ft. back of work limits** **Prune <1" stems**
9	*Quercus agrifolia*	Coast Live Oak	16	25	G		3 ft. back of work limits Prune <1" stems
10	*Quercus agrifolia*	Coast Live Oak	24	35	F	1623	2 ft. back of work limits **CONSIDER FOR REMOVAL**

ASCA AMERICAN SOCIETY of CONSULTING ARBORISTS

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CERTIFIED ARBORIST ISA

11	*Quercus agrifolia*	Coast Live Oak	13	30	G	1622	6 ft. back of work limits
12	*Quercus agrifolia*	Coast Live Oak	19	45	G	1621	7 ft. back of work limits
13	*Quercus agrifolia*	Coast Live Oak	*	*	G	1619	21 ft. back of work limits
14	*Quercus agrifolia*	Coast Live Oak	*	*	G	1618	21 ft. back of work limits
15	*Quercus agrifolia*	Coast Live Oak	*	*	G	1617	21 ft. back of work limits
16	*Ulmus parvifolia*	Chinese Elm	Dbl trunk	25	G		**CONSIDER FOR REMOVAL**
17	*Ulmus parvifolia*	Chinese Elm	14	35	F		Significant lean **CONSIDER FOR REMOVAL**
18	*Ulmus parvifolia*	Chinese Elm	22	40	F		Trunk decay **CONSIDER FOR REMOVAL**
19	*Ulmus parvifolia*	Chinese Elm	22	45	F	1608	Significant lean **CONSIDER FOR REMOVAL**
20	*Ulmus parvifolia*	Chinese Elm	21	45	G	1607	Inside work limits **CONSIDER FOR REMOVAL**
21	*Ulmus parvifolia*	Chinese Elm	21	50	G	1606	20 ft. back of work limits Potential for minor limb pruning
22	*Ulmus parvifolia*	Chinese Elm	*	*	G		Prune <1" stems
23	*Juglans californica*	Walnut	*	*	G		Prune <1" stems
24	***Brachychiton populneus***	**Bottle tree**	*	*	**F**		**Conflict with demolition** **RECOMMEND REMOVAL**
25	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune <1" stems
25a	***Arbutus menziesii***	**Pacific Madrone**	*	*	**G**		**No conflicts likely**
26	*Arbutus menziesii*	Pacific Madrone	*	*	G		Remove 4 in. branch at parent stem
27	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune <1" stems
28	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune 1-2" stems
29	*Arbutus menziesii*	Pacific Madrone	*	*	G		Prune 1-2" stems
30	*Quercus agrifolia*	Coast Live Oak	*	*	G		Prune 1-2" stems
31	*Arbutus menziesii*	Pacific Madrone	*	*	G		Prune 1-2" stems
32	*Quercus agrifolia*	Coast Live Oak	*	*	G		No pruning likely needed
WR1-2	*Washingtonia robusta*	Fan Palm	*	*	G		No conflicts likely
M1	*Morus alba*	Mulberry	*	*	P		Potential pruning
CP1	*Phoenix canariensis*	Canary Palm	*	*	G		Potential pruning
CW1	*Cupaniopsis anacardioides*	Carrotwood	*	*	G		Pruning likely necessary
CM1	*Lagerstroemia indica*	Crape Myrtle	6	10	D		Declining
CM2	*Lagerstroemia indica*	Crape Myrtle	Multi	10	G		Recommend retain
CM3	***Lagerstroemia indica***	**Crape Myrtle**	**5**	**8**	**D**		**Conflict with new construction** **RECOMMEND REMOVAL**
CM4	***Lagerstroemia indica***	**Crape Myrtle**	**5**	**8**	**F**		**Conflict with new construction** **RECOMMEND REMOVAL**
R1	***Quercus agrifolia***	**Coast Live Oak**	**<4**	**5**	**G**		**Removal**
R2	***Washingtonia robusta***	**Fan Palm**		**40**	**G**		**Removal**
R3	***Brachychiton populneus***	**Bottle Tree**	**12**	**20**	**G**		**Removal**
R4	***Ligustrum spp.***	**Privet**	**Multi**	**15**	**G**		**Removal**
R5	***Ligustrum spp.***	**Privet**	**Multi**	**15**	**G**		**Removal**
R6	***Ligustrum spp.***	**Privet**	**Multi**	**15**	**G**		**Removal**

R7	*Ligustrum spp.*	Privet	Multi	15	G		Removal
R8	*Brachychiton populneus*	Bottle Tree	16	30	G		Removal
R9	*Brachychiton populneus*	Bottle Tree	16	30	G		Removal
R10	*Ligustrum spp.*	Privet	17	35	G		Removal
R11	*Eucalyptus halepensis*	Eucalyptus	16	30	F		STREET TREE – Appears outside of limits – Remove if conflicts with construction design
R12	*Schinus terebinthifolius*	Brazilian Pepper	18	25	F		Removal
R13	*Pistacia chinensis*	Pistache	24	35	G		Removal
R14	*Ulmus parvifolia*	Chinese Elm	17	40	G		Removal
R15	*Ulmus parvifolia*	Chinese Elm	17	40	G		Removal
R16	*Ulmus parvifolia*	Chinese Elm	15	35	G		Removal
R17	*Ulmus parvifolia*	Chinese Elm	13	30	F		Removal
R18	*Prunus spp.*	Cherry	12	15	P		Removal
R19	*Prunus spp.*	Cherry	20	10	P		Removal

Thank you for the additional information and clarifications. Please contact me if you have any questions.

Eric Gorsuch
ASCA Registered Consulting Arborist #575
ISA Certified Arborist WE-7438A
ISA Tree Risk Assessment Qualified
TCIA Certified Treecare Safety Professional 00144
714-222-2735

Initial Study Appendix B

Cultural Resources Assessment Report

Pasadena Sunset Complex Project

Cultural Resources Assessment Report

June 2021 | 00407.00036.001

Submitted to:

City of Pasadena
Water and Power Department
150 South Los Robles Avenue, Suite #200
Pasadena, California 91101

Prepared for:

Kennedy Jenks
300 North Lake Avenue, Suite 1020
Pasadena, California 91101

Mary Robbins-Wade
Cultural Resources Group Manager

Prepared by:

HELIX Environmental Planning, Inc.
7578 El Cajon Boulevard
La Mesa, CA 91942

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Pasadena Sunset Complex Project

Cultural Resources Assessment Report

Submitted to:

City of Pasadena
Water and Power Department
150 South Los Robles Avenue, Suite #200
Pasadena, California 91101

Prepared for:

Kennedy Jenks
300 North Lake Avenue, Suite 1020
Pasadena, California 91101

Prepared by:

HELIX Environmental Planning, Inc.
7578 El Cajon Boulevard
La Mesa, CA 91942

June 2021 | 00407.00036.001

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National Archaeological Database Information

Authors:	Trevor Gittelhough, M.A., RPA, and Mary Robbins-Wade, M.A., RPA
Firm:	HELIX Environmental Planning, Inc.
Client/Project:	Kennedy Jenks / Pasadena Sunset Complex Project
Report Date:	June 2021
Report Title:	Cultural Resources Assessment for the Pasadena Sunset Complex Project, Pasadena, Los Angeles County, California
Submitted to:	City of Pasadena
Type of Study:	Cultural Resources Assessment
New Sites:	None
Updated Sites:	None
USGS Quad:	Pasadena 7.5' Quadrangle
Acreage:	9.15 acres
Key Words:	Los Angeles County; Township 1 North, Range 12 West; City of Pasadena; Sunset Reservoir; Arroyo Seco; negative archaeological survey; sensitivity assessment; no resources found.

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ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
APE	Area of Potential Effects
APN	Assessor's Parcel Number
BLM	Bureau of Land Management
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CHRIS	California Historical Resources Information System
City	City of Pasadena
CLG	Certified Local Government
CRHR	California Register of Historical Resources
GLO	General Land Office
HELIX	HELIX Environmental Planning, Inc.
HRER	Historical Resources Evaluation Report
HRG	Historic Resources Group
I-	Interstate
JPL	Jet Propulsion Lab
NAHC	Native American Heritage Commission
NHPA	National Historic Preservation Act
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
OHP	Office of Historic Preservation
PRC	Public Resources Code
project	Sunset Complex Project
PWP	Pasadena Water and Power Department
SCCIC	South Central Coastal Information Center
SHPO	State Historic Preservation Officer
SR	Sunset Reservoir
TCP	Traditional Cultural Properties
TCR	Tribal Cultural Resources
USGS	U.S. Geological Survey
VOCs	Volatile Organic Compounds

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EXECUTIVE SUMMARY

HELIX Environmental Planning, Inc. (HELIX) was contracted by Kennedy Jenks to provide cultural resources services for the Sunset Complex Project (project) in the City of Pasadena, Los Angeles County, California. The project is a proposed replacement of existing reservoirs and associated structures that includes the demolition of existing structures and hardscape within the approximately 9.15-acre project site. 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), Section 106 of the National Historic Preservation Act (NHPA), as amended, and City of Pasadena cultural resources guidelines. A separate Historical Resources Evaluation Report (HRER) is being prepared to address the existing built environment resources.

The records search received from the South Central Coastal Information Center (SCCIC) in May 2021 indicated that six previous cultural resources studies have been conducted within a half-mile of the project area, none of which occurred within the project site. The records search results also indicated that a total of 84 cultural resources have been previously recorded within a half-mile of the project area, all of them are historic built environment resources; however, no resources have been recorded within the project area prior to this survey.

The field investigations included a pedestrian survey of the project area by a HELIX archaeologist on June 3, 2021. Due to the completely developed nature of the project site, exposed ground surfaces were quite limited. The survey did not result in the identification of any cultural material within the project area.

Based on the results of the current study, no historic properties per the National Historic Preservation Act of historical resources per the California Environmental Quality Act would be affected by the project. However, due to the cultural sensitivity of the project region and the alluvial setting of the project area, it is recommended that grading and other ground-disturbing activities be monitored by a qualified archaeologist and a Native American monitor, as discussed in this report. 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 project archaeologist will coordinate with the Monitoring Tribe and Pasadena Water and Power Department staff to develop and implement appropriate avoidance or mitigation measures.

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1.0 INTRODUCTION

HELIX Environmental Planning, Inc. (HELIX) was contracted by Kennedy Jenks to provide cultural resources services for the Pasadena Sunset Complex Project (project) in the City of Pasadena (City), Los Angeles County, California. The project is a proposed upgrade and replacement of reservoirs, including the demolition of existing structures and hardscape. 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 area. 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), as well as Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and City guidelines and regulations.

1.1 PROJECT LOCATION

The project is located in the City of Pasadena in Los Angeles County (Figure 1, *Regional Location*). The project is located 250 feet east of Interstate- (I-)210 (Foothill Freeway) and 0.75 mile north of State Route 134 (Ventura Freeway) within an unsectioned portion of Township 1 North, Range 12 West, on the U.S. Geological Survey (USGS) 7.5' Pasadena quadrangle (Figure 2, *USGS Topography*). The approximately 9.15-acre project site is located within Assessor's Parcel Number (APN) 5728-021-916 and is bordered by Sunset Avenue to the east, East Mountain Street to the south, Glen Avenue to the west, and mixed residential and commercial properties to the north (Figure 3, *Aerial Photograph*).

1.2 PROJECT DESCRIPTION

The project proposes the demolition of the existing Sunset Reservoir complex and replacement with new reservoirs, along with a groundwater treatment facility. Both reservoirs will be removed and replaced with new prestressed concrete reservoirs. As the "A" Basin (where water has been previously blended) is to be demolished, an inlet clearwell will be installed upstream of the reservoirs. Additionally, a new ground water treatment plant will be developed, in order to treat for perchlorate and volatile organic compounds (VOCs). Replacement and construction of associated piping, inlet and outlet, valves, and hardscaping will also occur across the project area.

1.3 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 to the California Register of Historical Resources (CRHR) or National Register of Historic Places (NRHP), as applicable.

1.3.1 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 NHPA and its implementing regulations (16 United States Code 470 et seq., 36 Code of Federal Regulations [CFR] 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.

Significant resources must retain enough of their historic character or appearance to be recognizable as historical resources and to convey the reasons for their significance. Resource 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, 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 NRHP criteria under which it is proposed for eligibility.

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.

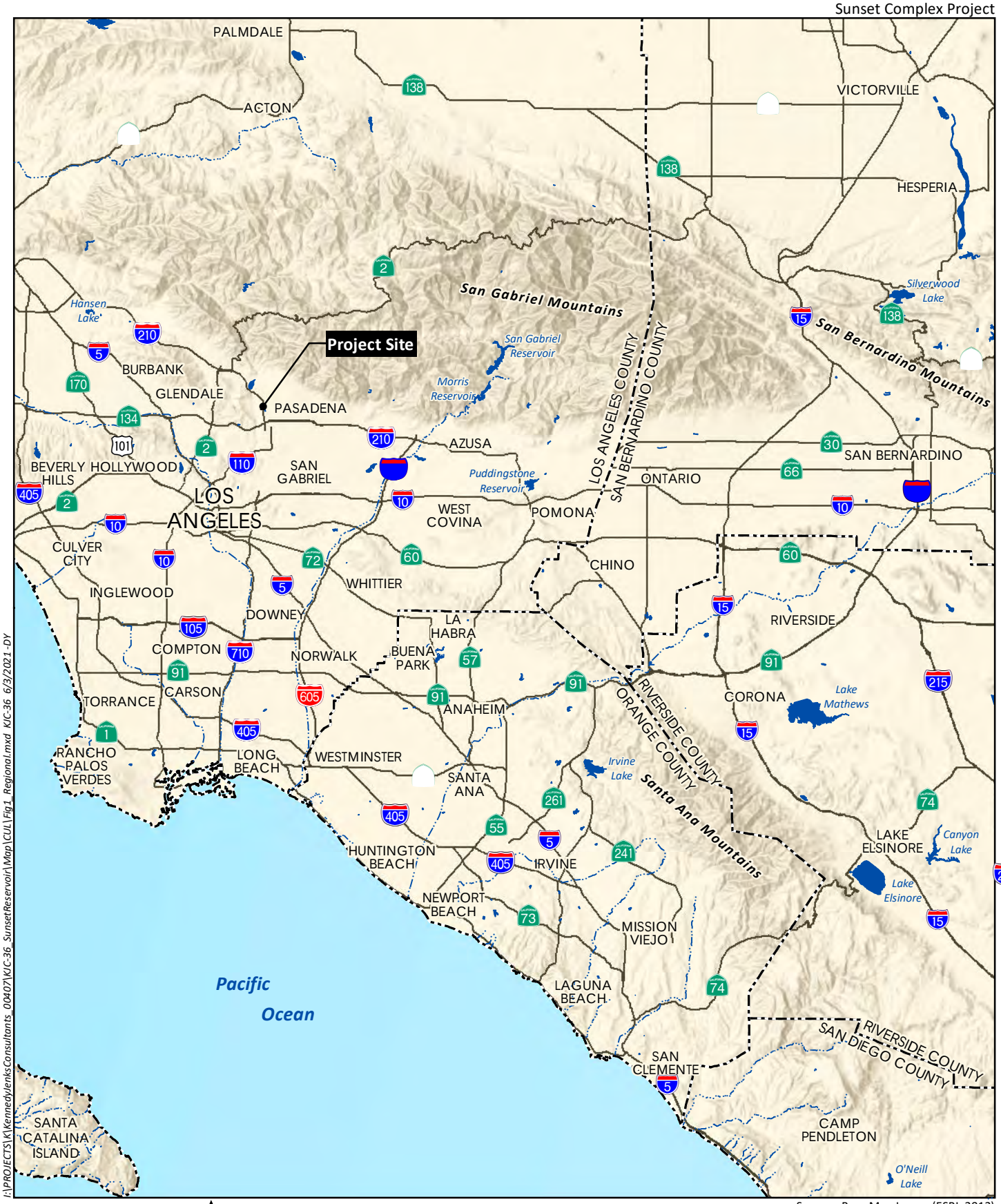
1.3.2 California Environmental Quality Act

CEQA, Public Resources Code (PRC) 21084.1, and California Code of Regulations (CCR) Title 14 Section 15064.5, address determining the significance of impacts to archaeological and historic resources and discuss significant cultural resources as "historical resources," which are defined as:

- resource(s) listed 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 National Register of Historic Places (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 on the CRHR (14 CCR Section 15064.5[a][3])



I:\PROJECTS\K\KennedyJenksConsultants_00407\KJC-36_SunsetReservoir\Map\CUL\Fig1_Regional.mxd KJC-36 6/3/2021 -DY

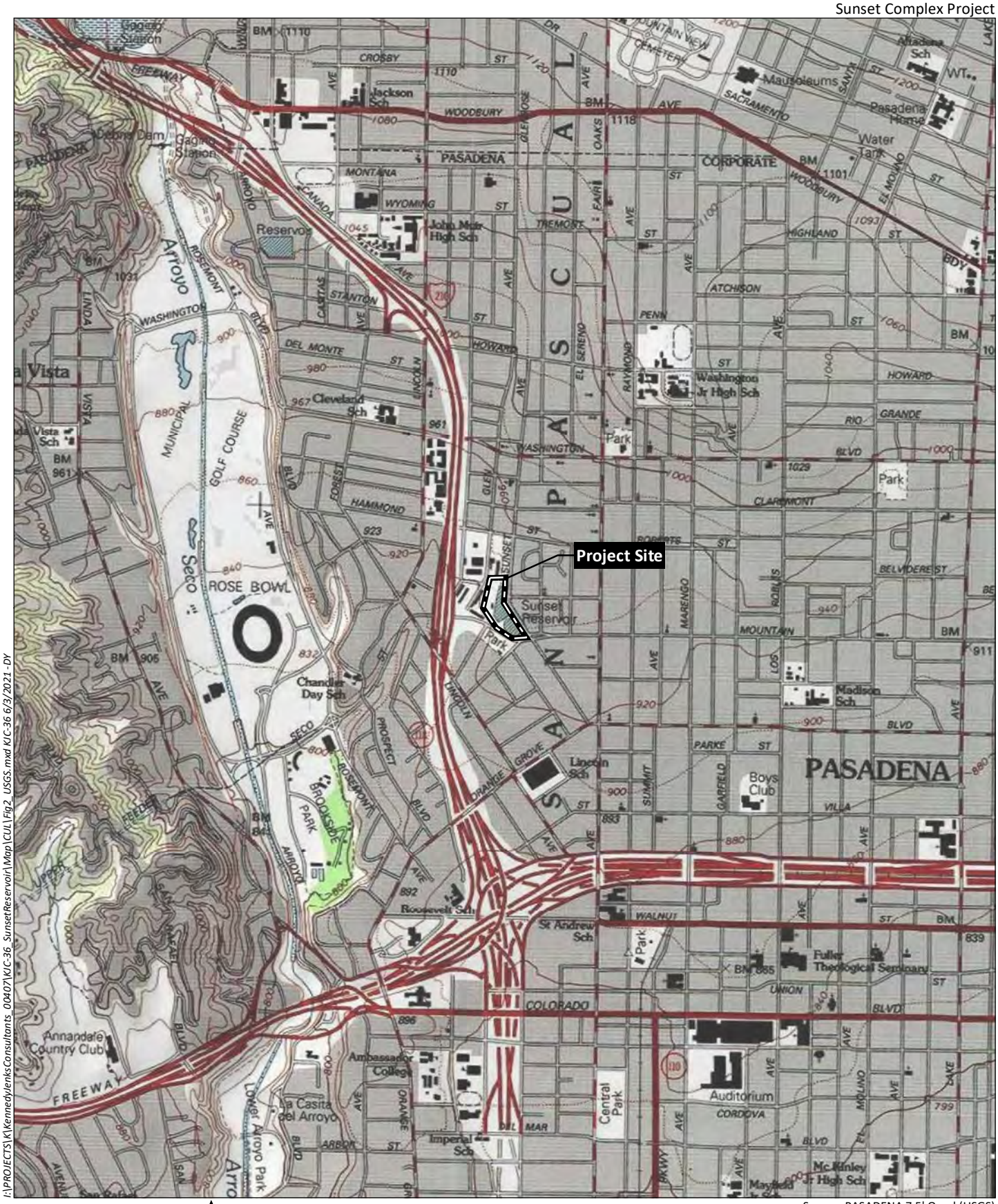
0 10 Miles

Source: Base Map Layers (ESRI, 2013)

HELIX Environmental Planning

Regional Location

Figure 1



I:\PROJECTS\K\KennedyJenksConsultants_00407\KJC-36_SunsetReservoir\Map\CUL\Fig2_USGS.mxd KJC-36 6/3/2021 - DY

0 2,000 Feet

Source: PASADENA 7.5' Quad (USGS)

HELIX Environmental Planning

USGS Topography

Figure 2

Sunset Complex Project



I:\PROJECTS\K\KennedyJenksConsultants_00407\KJC-36_SunsetReservoir\Map\CUL\Fig3_Aerial.mxd KJC-36 6/3/2021 - DY

0 200 Feet

Source: Aerial (Nearmap, 2020)

HELIX Environmental Planning

Aerial Photograph

Figure 3

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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.

1.3.3 Pasadena General Plan

Pasadena's General Plan Land Use Element was adopted in 2015, and consists of a collection of objectives, policies, and implementation measures designed to define and implement the vision of the community in narrative and graphic terms using established development criteria and standards that help guide land use actions. It describes the allowed intensities, types, configurations, and locations of land uses throughout the City, which include residential, commercial, mixed-use, industrial, open space, recreation, and public uses.

Identified as part of the General Plan, was the significance of historic buildings, properties, districts, landscapes, and civic places on the identity and character of Pasadena. Goal 8, Historic Preservation, was designed in order to preserve and enhance Pasadena's cultural and historic resources, the policies of which are detailed below;

> Goal Eight. Historic Preservation. Preservation and enhancement of Pasadena's cultural and historic buildings, landscapes, streets and districts as valued assets and important representations of its past and a source of community identity, and social, ecological, and economic vitality.
>
> - **8.1:** Identify and Protect Historic Resources. Identify and protect historic resources that represent significant examples of the City's history.
>
> - **8.2:** Historic Designation Support. Provide assistance and support for applicants applying for designation of a historic resource through a clear, thorough, and equitable process that identifies if monuments, individual or landmark districts, historic signs or landmark trees are eligible for designation based on adopted evaluation criteria.
>
> - **8.3:** Preservation Efforts. Support preservation and restoration efforts through education, facilitation, and incentive programs.

- **8.4**: Adaptive Reuse. Encourage sensitive adaptive re-use including continuing the historic use of historic resources to achieve their preservation, sensitive rehabilitation, and continued economic and environmental value.

- **8.5**: Scale and Character of New Construction in a Designated Landmark and Historic Districts. Promote an architecturally sensitive approach to new construction in Landmark and Historic districts. Demonstrate the proposed project's contextual relationship with land uses and patterns, spatial organization, visual relationships, cultural and historic values, and relationships in height, massing, modulation, and materials.

- **8.6:** Infrastructure and Street Design Compatibility. Encourage street design, public improvements, and utility infrastructure that preserves and is compatible with historic resources.

- **8.7:** Preservation of Historic Landscapes. Identify, protect, and maintain cultural and natural resources associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values.

- **8.8:** Evolving Preservation Practices. Continue to implement practices for historic preservation consistent with community values and conformance with the Secretary of the Interior's Standards for the Treatment of Historic Properties, California Historical Building Code, State laws, and best practices.

- **8.9:** Maintenance. Support and encourage maintenance and upkeep of historic resources to avoid the need for major rehabilitation and to reduce the risk of demolition, loss through fire, deterioration by neglect, or impacts from natural disasters.

- **8.10:** Enforcement. Ensure that City enforcement procedures and activities comply with local, State, and Federal historic preservation requirements and fosters the preservation of historic resources.

1.3.4 Local Regulations

Sections 17.62.010 et seq. of the Pasadena Municipal Code specify significance criteria for the designation of historic resources, procedures for designation, and review procedures to encourage, enhance, and promote historic preservation. The historic preservation program establishes criteria for the designation of historic monuments, landmarks, historic signs, landmark trees, or landmark districts, consistent with the National Register of Historic Places for evaluating historic properties. These criteria are intended to promote the adaptive reuse of the City's historic resources, enhance and preserve historically significant structures, and stabilize and improve property values. These sections also serve to fulfill the City's responsibility as a Certified Local Government (CLG) under federal preservation laws and conducting Section 106 and CEQA reviews. They promote tourism and public awareness of conservation through rehabilitation, restoration, and maintenance of existing buildings.

The Certified Local Government Program is jointly administered by the National Park Service and State Historic Preservation Offices to certify local communities in becoming recognized as a CLG. Pasadena is a

CLG, and as such, is committed to preserving, protecting, and increasing awareness of historic places. As a CLG, Pasadena must continually improve its preservation programs and is eligible for state and federal grants to support efforts such as preservation plans, historic resources surveys, and preservation education and outreach programs.

Any property in Pasadena that is found eligible for designation as a local landmark is considered to meet the definition of historical resource as defined by State CEQA Guidelines Section 15064.5. Pursuant to Municipal Code Section 17.62.040, a landmark meets one or more of the following criteria:

- It is associated with events that have made a significant contribution to the broad patterns of the history of the City, region, or state.
- It is associated with the lives of persons who are significant in the history of the City, region, or state.
- It embodies the distinctive characteristics of a type, architectural style, period, or method of construction, or represents the work of an architect, designer, engineer, or builder whose work is of significance to the City or the region, or possesses artistic values of significance to the City or to the region.
- It has yielded or may be likely to yield, information important locally in prehistory or history.

1.3.5 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 (TCP) 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.

California State Assembly Bill (AB) 52 revised PRC Section 21074 to include Tribal Cultural Resources (TCRs) as an area of CEQA environmental impact analysis. 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. Per PRC Section 21080.3, a CEQA lead agency must consult with any California Native American tribe that requests consultation, and that is traditionally and culturally affiliated with the geographic area of a proposed project, to identify resources of cultural or spiritual value to the tribe, even if such resources are already eligible as historical resources as a result of cultural resources studies. A TCR may be considered significant if it is (i) included in a local or state register of historical resources; (ii) determined by the lead agency to be significant pursuant to criteria set forth in PRC Section 5024.1; (iii) a geographically defined cultural landscape that meets one or more of these criteria; (iv) a historical resource described in PRC Section 21084.1 or a unique archaeological resource described in PRC Section 21083.2; or (v) a non-unique archaeological resource if it conforms with the above criteria.

1.4 AREA OF POTENTIAL EFFECT

Pursuant to 36 CFR 800.16(d), the Area of Potential Effect (APE) is the geographic area within which an undertaking may directly or indirectly alter the character or use of historic properties. The APE for the project consists of the project property, totaling approximately 9.15 acres (see Figure 3). The Sunset Reservoir complex is owned and operated by the City of Pasadena Water and Power Department (PWP).

1.5 PROJECT PERSONNEL

A cultural resources survey was conducted by HELIX in 2021 to assess whether the project would have any effects on cultural resources. Mary Robbins-Wade, M.A., RPA served as the Cultural Resources Task Lead and Principal Investigator; she provided senior technical oversight and contributed to this report. Trevor Gittelhough M.A., RPA is the primary report author, and Kassie Sugimoto, M.A., RPA conducted the field survey. Ms. Robbins Wade and Ms. Sugimoto meet the qualifications of the Secretary of Interior's Standards and Guidelines for archaeology. Mx. Gittelhough meets the qualification of the Secretary of Interior's Standards and Guidelines for archaeology and history. Resumes for key project personnel are presented in Appendix A.

2.0 PROJECT SETTING

2.1 NATURAL SETTING

The project area is located south of the San Gabriel Mountains, in the City of Pasadena. The San Gabriel Mountains are on a thin slice of crust, bounded by the San Andreas and San Gabriel fault zones, that include Proterozoic and Mesozoic bedrock (Barth 1990). Following the emplacement of the bedrock, movement along the major bounding faults from the Late Cretaceous to the Paleocene resulted in the initiation of uplift of the mountains (Barth 1990). Ongoing tectonic activity, in the form of compressional deformation from the large restraining bend in the San Andreas fault zone, results in the steep terrane and high erosional rates characteristic of the mountains today (Dixon et al. 2012). Geologically, the project area is underlain by alluvial fan gravel and sand derived from the San Gabriel Mountains, dating to the Pleistocene (Dibblee 1989). Soils consist of soils from the Urban land-Palmview-Tujunga complex (0 to 5 percent slopes); this series consists of well-drained soils formed in stable and competent alluvium, derived primarily from granite (NRCS 2017a, 2017b).

The project area is set within an alluvial fan formed from streams flowing from the San Rafael Hills, depositing soils from at the base of dissected hills to the south and above the Santa Clarita River floodplain. The south-flowing Arroyo Secco is located approximately 0.8 mile west. The project area is currently occupied by the Sunset Reservoir No. 1 and No. 2, along with associated facilities, and has been developed since at least 1888 (see History of the Project Area section below). The project area is relatively flat and has little topographic relief, and the vicinity has been heavily developed with residential neighborhoods.

Soil conditions in the project area are described in the Sunset Reservoir Perchlorate Treatment Facility geotechnical report (Diaz, Yourman, & Associates 2009). The geotechnical investigation included a review of previous reports, as well as the excavation of two bores sampled across the project area. Soil profiles were recorded for each of the bores. The upper ten feet of subsurface sediments consist of dark grayish brown, moist, loose to medium dense, fine to coarse-grained sands with little gravel, with sediments below that comprised of dark brown and olive brown, moist, medium dense to very dense, fine- to coarse-grained sands (Diaz, Yourman, & Associates 2009). These sediments are designated by the Natural Resources Conservation Service (NRCS) as part of the Palmview-Tujunga complex, sandy loam series, which consists, of well-drained soils formed in stable and competent alluvium, derived primarily from granite (NRCS 1999).

2.2 CULTURAL SETTING

2.2.1 Prehistoric Period

Archaeological research in Southern California has identified several distinct chronological sequences that are used to understand cultural shifts within the region. Wallace (1955, 1978) developed a prehistoric chronology for the southern California coastal region that was built on early studies and data synthesis, which is widely used to this day and is also applicable to many near-coastal and inland areas. Divided into four distinct periods, Wallace's prehistoric sequence is as follows: Early Man, Milling Stone, Intermediate Prehistoric, and Late Prehistoric. Though the sequence originally did not have a high level of chronological precision from the lack of absolute date information (Moratto 1984), this has been alleviated by the plethora of radiocarbon dates that have been collected in the past four decades by southern California researchers (Byrd and Raab 2007). Since its creation, several revisions have been made to Wallace's (1955) synthesis using these dates, as well as projectile point assemblages (e.g., Koerper and Drover 1983; Koerper et al. 2002; Mason and Peterson 1994).

Chronological Period	Characteristics	Date Range
Early Man	Diverse mixtures of subsistence combining hunting and gathering but with a greater emphasis on hunting in many places.	Circa 10,000–6000 B.C.
Milling Stone	Subsistence strategies shift from hunting/gathering to those centered on collecting plant foods and the hunting of small animals. Begin to see both extended and loosely flexed burials.	6000–3000 B.C.

Chronological Period	Characteristics	Date Range
Intermediate	Shifts in strategies to a heavier emphasis on maritime subsistence strategies, along with a wider use of plant foods, that trend towards adaptations to regional and local resources. Fully flexed burials, often placed face-down or face-up, and oriented toward the north or west.	3000 B.C.–A.D. 500
Late Prehistoric	The increased usage of bow and arrow technology, a matching increase in land and sea mammal hunting, along with the continuation of wide-ranging uses of plant foods. Both the diversity and complexity of material culture increases dramatically. Increase in populations, accompanied by the presence of larger, more permanent villages.	A.D. 500–Historic Contact

2.2.2 Ethnohistory

2.2.2.1 Gabrieliño

The project site is located within the region that has traditionally been occupied by the Gabrieleño people (also spelled as Gabrieleno or Gabrielino; Bean and Smith 1978:538; Kroeber 1925: Plate 57). Other Indigenous groups in the surrounding areas include the Chumash to the north and northwest, the Tataviam/Alliklik to the north, the Serrano to the east, and the Luiseño and Juaneño to the south. Interactions between these groups are well-documented, comprised primarily of trade and intermarriage.

The name Gabrieleño identifies the Indigenous people who were administered by the Spanish missionaries settled at Mission San Gabriel. This group is now considered to have a regional dialect of the Gabrielino language, along with the Santa Catalina Island and San Nicolas Island dialects (Bean and Smith 1978:538). In the post-European contact period, Mission San Gabriel included natives of the greater Los Angeles area, while also including members of surrounding Indigenous groups from other areas such as Kitanemuk, Serrano, and Cahuilla. There is little evidence that the people we call Gabrieleño had a broad term for their group (Dakin 1978:222); rather, they identified themselves as an inhabitant of a specific community with locational suffixes (e.g., a resident of Yaanga was called a Yabit, much the same way that a resident of New York is called a New Yorker; Johnston 1962:10).

Several native words have been suggested as labels for the broader group of Indigenous people from the Los Angeles region. These include Tongva (or Tong-v; Merriam 1955:7–86) and Kizh (Kij or Kichereno; Heizer 1968:105), though evidence indicated that these terms referred to local places or smaller groups of people within the larger group that we now call Gabrieleño. Nevertheless, many present-day descendants of these people have taken on Tongva as a preferred group name because it has a native rather than Spanish origin (King 1994:12). Thus, the term Gabrieleño /Tongva is used in the remainder of this report when discussing the Indigenous people of the Los Angeles Basin and their descendants.

The Gabrieleño/Tongva subsistence economy was centered on hunting and gathering. Due to the rich and varied nature of their environment, the Indigenous population exploited mountains, foothills, valleys, deserts, riparian, estuarine, and open and rocky coastal eco-niches. Acorns served as the staple

food, supplemented by the roots, leaves, seeds, and fruits of a variety of flora (e.g., islay, cactus, yucca, sages, and agave). Freshwater and saltwater fish, shellfish, birds, reptiles, and insects, as well as both large and small mammals, were also hunted or collected and served as a large part of their diet (Bean and Smith 1978:546; Kroeber 1925:631–632; McCawley 1996:119–123, 128–131).

A wide variety of tools and implements were used by the Gabrieleño/Tongva to gather and collect food resources. These included the bow and arrow, traps, nets, blinds, throwing sticks and slings, spears, harpoons, and hooks for hunting and fishing. Those groups located near the ocean used oceangoing plank canoes, or *ti'at*, and tule balsa canoes for fishing, travel, and trade between the mainland and the Channel Islands (McCawley 1996:7). Gabrieleño/Tongva people processed their resources with a variety of tools, including hammerstones and anvils, mortars and pestles, manos and metates, strainers, leaching baskets and bowls, knives, bone saws, and wooden drying racks. Food was likewise consumed from a variety of vessels, with Catalina Island steatite used to make ollas and cooking vessels (Blackburn 1963; Kroeber 1925:629; McCawley 1996:129–138).

At the time of Spanish contact, the basis of Gabrieleño/Tongva religious life was the Chinigchinich cult, centered on the last of a series of heroic mythological figures. Chinigchinich gave instruction on laws and institutions, and also taught the people how to dance, the primary religious act for this society. He later withdrew into heaven, where he rewarded the faithful and punished those who disobeyed his laws (Kroeber 1925:637–638). The Chinigchinich religion seems to have been relatively new when the Spanish arrived. It was spreading south into the southern Takic groups even as Christian missions were being built and may represent a mixture of native and Christian beliefs and practices (McCawley 1996:143–144).

The burial practices of the Gabrieleño/Tongva included both burials and cremations, with inhumation the more common practice on the Channel Islands and the adjacent mainland coastal areas, while cremation was the primary practice on the remainder of the coast and through the inland areas (Harrington 1942; McCawley 1996:157). Remains were buried in distinct burial areas, sometimes associated with villages and sometimes with no clear village association (Altschul et al. 2007). Cremation ashes have been found in archaeological contexts buried within stone bowls and in shell dishes (Ashby and Winterbourne 1966:27), as well as scattered among broken ground stone implements (Cleland et al. 2007). Archaeological data corresponds with ethnographic descriptions of an elaborate mourning ceremony that occurred over several days and included a variety of offerings, such as seeds, stone grinding tools, animal skins, baskets, wood tools, shell beads, bone and shell ornaments, and projectile points and knives. Offerings varied, both with the sex of the deceased individual as well as their status (Dakin 1978:234–365; Johnston 1962:52–54; McCawley 1996:155–165).

2.2.2.2 Tataviam

Boundaries between different Indigenous groups are fluid, moving as groups gain and lose status and power. The Tataviam are the next closest Indigenous group near the project, and their territory was located primarily in the upper drainage of the Santa Clara River, with lands extending east to the southern fringe of Antelope Valley, but centered on the south sides of the Liebre, Sawmill, and Sierra Pelona Mountains.

Like the Gabrieleño/Tongva, the Tataviam language is a part of the Takic branch of the Uto-Aztecan language family (Mithun 2001:540). The Tataviam language probably began to differentiate itself from the others in the language group around 1000 B.C. (King and Blackburn 1978:535). The name "Tataviam"

itself, is derived from the Kitanemuks' name for them (King and Blackburn 1978:535). Similarly, the Ventureño Chumash referred to them as the "Alliklik" in order to separate them from the Beñeme Serrano in the western Mojave Desert and Antelope Valley, and both names are used by ethnographers and archaeologists (Kroeber 1925:614).

Information about Tataviam social organization and political structure is limited, but there is no evidence to indicate a substantial difference between their structure and those of the Kitanemuk and Gabrieleño/Tongva groups. Tataviam villages ranged from large centers of around 200 individuals to small settlements of 10 to 15 people (King and Blackburn 1978:536). Intermediate-sized villages were dispersed between the larger centers, with smaller villages spaced around the larger villages. It was estimated that the Tataviam population at contact was no more than 1,000 people. Mortuary practices probably included cremation, as well as a mourning ceremony practiced in late summer or early fall (King and Blackburn 1978:535). With the construction of the San Fernando Mission in 1797, the Tataviam were forced to settle within the Mission, though some were also taken to Mission San Gabriel as well.

Archaeological data, the primary source of information available, indicate broad similarities among the Tataviam, Chumash, and Gabrieleño/Tongva (King and Blackburn 1978:536). Considering their environment and geographical range, it is likely that Tataviam relied more heavily on yucca as a staple than acorns. Other foods most likely included sage seeds, juniper seeds, and islay berries, with hunting focused on small mammals such as rabbits and rodents but also included deer and antelope. Extensive trade networks existed between the Indigenous groups in the region, and the Tataviam traded lithic material and large game animals with coastal groups for marine resources, shell, asphaltum, and steatite.

2.2.2.3 Indigenous Communities in Pasadena

The project is located within the territory of the Gabrieleño/Tongva, which was rich in villages of various sizes (King 2004; McCawley 1996:36–40). In general, however, it has been very difficult to determine the precise location of any specific Indigenous village occupied in the Ethnohistoric period (McCawley 1996:31–32). Traditional place names referred to at the time of Spanish contact did not necessarily represent a continually occupied settlement at a single location, and in many cases, these communities were in fact representative of several smaller camps scattered across a general area, shaped by the local geography and subject to change over generations (Johnston 1962:122). By the time ethnographers, anthropologists, and historians began efforts to document their locations, many of the villages had been abandoned, their locations already heavily affected by agricultural and urban development, and Indigenous lifeways had been changed forever. Additionally, alternative names and spellings for historic communities, conflicting reports on their meaning, and differing geographic reference points, from different informants, further confound relocation attempts.

Even with the growing collection of archaeological evidence, making a conclusive determination on whether a specific assemblage represents the remains of a former village site can be difficult. Although the precise location of any given village is subject to much speculation, the vicinity of Pasadena once contained many Gabrieleño/Tongva villages, including several concentrated along the banks of the Arroyo Seco and its offshoots. This type of settlement pattern concentrated along waterways is reflected in historical maps published by the Southwest Museum (1962; reprinted in Johnston 1962) and George Kirkman (1938). Maps such as these convey a general sense of significant historical areas based

on the geographic information available at the time and are considered as a representational depiction of these locations rather than explicit geographic points.

Known ethnographically documented villages within the Pasadena vicinity included *Akuronga*, *Alyeupkigna*, *Hahamon'ga*, *Haramoknga*, *Puntitavjatngna*, and *Sisitkanonga*. The closest of these villages to the project site is *Hahamon'ga* (alternative spellings and names include *Hahmogna*, *Hahamog-na*, and *Xaxaamonga*). Current ethnographic thought places this settlement in the upper part of the Arroyo Seco, in the area now owned by the Jet Propulsion Lab (JPL), approximately 2.65 miles north-northwest of the project site. Another village of the same name is located in Glendale, and it is possible that these were two separate locations used by the same band. The village of *Akuronga* (or *Akuuronga*) is purported to be located near La Presa Drive and Huntington Drive, approximated 4.65 miles southeast of the project site. *Sonaanga* has been identified as being located at the current location of San Marino High School, approximately 4.15 miles southeast, while *Alyeupkigna* (or *Aluupkenga*) is located six miles east-southeast near Baldwin Lake on the Santa Anita Ranch, and *Sisitkanonga* (or *Sisitcanonga*) is located along the banks of Eaton Creek, approximately 4.8 miles northeast of the project. Like *Hahamon'ga*, these other villages were described in ethnographic accounts, but the exact locations are unknown (McCawley 1996).

2.2.3 Historical Background

2.2.3.1 Spanish Period

The first European explorers to reach southern California were the members of Juan Rodriguez Cabrillo's 1542 expedition. Between that time and 1769, Spanish, British, and Russian explorers made only limited excursions into Alta (upper) California, and none established permanent settlements in the region (Starr 2007).

In 1769, the San Diego Presidio was established by Gaspar de Portolá, marking the first Spanish settlement in Alta California. At the same time, Mission San Diego de Alcalá was established by the Franciscan Father Junipero Serra, the first of 21 missions built by Spanish Franciscan monks in Alta California between 1769 and 1823. Portolá proceeded north, exploring the Arroyo Seco as he passed through the Los Angeles Basin, before heading through the San Fernando Valley, then reaching the San Francisco Bay on October 31, 1769. On September 4, 1781, 12 years after Portolá's initial visit, a dozen families from Sonora, Mexico, founded El Pueblo de la Reina de los Angeles de la Porciúncula ("The Town of the Queen of Angels on the Portiuncula River"; or simply El Pueblo de la Reina de los Angeles, "The Town of the Queen of Angels") under the specific directions of Governor Felipe de Neve.

The Portolá expedition marked the beginning of Spanish military supply routes that serviced the newly established missions, including Mission San Gabriel de Arcángel (1771), the first permanent European settlement in the area. In 1772, Spanish Commander Pedro Fages explored a canyon that passed through the mountains north of present-day Gorman and named the area Cañada de Las Uvas, or Grapevine Canyon. Friar Francisco Garces further explored the region in 1776, and Spanish settlers began establishing ranchos in the San Fernando Valley by the 1790s (Beck and Haase 1974:15).

Almost immediately, the Franciscan padres began attempts at converting the local Indigenous populations to Christianity through baptism, as well as relocating them to mission grounds (Engelhardt 1927a). Twenty-six years after the establishment of Mission San Gabriel de Arcángel, the San Fernando Mission was founded in 1797, as a stopping point between the San Gabriel and San Buenaventura

missions (Engelhardt 1927b). Most of the Indigenous population in the Los Angeles Basin, as well as the surrounding foothill and mountain ranges, were persuaded or forced to settle near the two missions. These included Tataviam, Chumash, the Gabrieleño, the Serrano, many Cahuilla as far as the Coachella and San Jacinto valleys, and even some Luiseño of the San Jacinto Valley, as well as Indigenous groups from the southern Channel Islands.

2.2.3.2 Mexican Period

The primary focus of the Spanish during their occupation of California was the construction of the mission system and associated presidios for the purpose of integrating the Native American population into Christianity. While there were incentives provided by the Spanish monarchy to entice settlers to pueblos or towns, only three pueblos were established during the Spanish period, of which only two were successful and remain as California cities (San José and Los Angeles). Several factors hindered growth within Alta California, including the threat of foreign invasion, political dissatisfaction, and unrest among the Indigenous population. In 1821, after more than a decade of intermittent rebellion and warfare, New Spain (Mexico and the California territory) won independence from Spain. A year later, in 1822, the Mexican legislative body in California ended the Spanish isolationist policies of the region, and decreed California ports open to foreign merchants.

Although Mexico had gained its independence in 1821, Spanish patterns of culture and influence remained for some time. The missions continued, operating in mostly the same fashion as they had previously, and most of the laws related to the distribution of land did not change throughout the 1820s. Beginning in the 1820s, extensive land grants were established in the interior, partly to increase the population inland and away from the more settled coastal areas where the Spanish had concentrated their colonization efforts. Furthermore, the secularization of the missions in 1834 resulted in the subdivision of former mission lands and the establishment of additional ranchos. These massive swaths of land were granted to prominent and well-connected individuals as ranchos, 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. During the age of the ranchos (1834–1848), landowners focused their resources on the cattle industry and devoted large tracts to grazing. Cattle hides were the primary southern California export during this time, used to trade for goods from the east and other areas in the United States and Mexico. The influx of explorers, trappers, and ranchers associated with the land grants increased the number of non-native inhabitants of the region, and this rising population contributed further to the decimation of the Indigenous population, from the introduction and rise of diseases foreign to them, and from the violence enacted against them.

2.2.3.3 American Period

The United States took control of California in 1846, seizing Monterey, San Francisco, San Diego, and Los Angeles with little resistance. Los Angeles soon slipped from American control, however, and needed to be retaken in 1847. Approximately 600 U.S. sailors, Marines, Army dragoons, and mountain men converged under the leadership of Colonel Stephen W. Kearney and Commodore Robert F. Stockton in early January of that year to challenge the California resistance, which was led by General Jose Maria Flores. The American party scored a decisive victory over the Californios in the Battle of the Rio San Gabriel and at the Battle of La Mesa the following day, effectively ending the war and opening the door for increased American immigration (Harlow 1992:193–218). Hostilities officially ended with the signing

of the Treaty of Guadalupe Hidalgo in 1848, in which the United States agreed to pay Mexico $15 million for the conquered territory, including California, Nevada, Utah, and parts of Colorado, Arizona, New Mexico, and Wyoming, representing nearly half of Mexico's pre-1846 holdings. California joined the Union in 1850 as the 31st state (Wilkman and Wilkman 2006:15). Though the discovery of gold in northern California in 1848 gave rise to the California Gold Rush, the first California gold was found in Los Angeles County in 1842. The large strike at Sutter's Creek seven years later led to an enormous influx of American citizens in the 1850s and 1860s, and these "forty-niners" rapidly displaced the old rancho families. One year after the discovery of gold, nearly 90,000 people journeyed to the California gold fields. With most miners drawn to central California by its well-known strikes, Los Angeles attracted people who were largely peripheral to the Gold Rush.

Pasadena

Originally a part of Rancho del Rincon de San Pascual, the area that is now Pasadena was sold by Manuel Garfias to Benjamin Eaton and Dr. John S. Griffin (Wood 1917). In 1874, the California Colony of Indiana, formed by Dr. Thomas B. Elliott and consisting of a group of families from Indiana, purchased land from Dr. John S. Griffin and established the community of Pasadena (Reid 1895). In 1886, the same year that saw the completion of the Santa Fe Railroad, Pasadena was incorporated. With the railroad, the region's Mediterranean climate brought in a growing number of Eastern tourists, which Pasadena began to capitalize upon. They built sewers, paved streets, and added electric lighting to support the growing tourist industry, along with numerous hotels and guest houses (Carpenter 1984). In addition, the land boom instigated by the completion of the railroad created a growing population in Los Angeles that used Pasadena as a suburb. The use of local rail lines and electric streetcar lines, developed by such individuals as Henry Huntington, made such growth possible.

With the advent, and subsequent popularity, of the automobile industry, Pasadena and Los Angeles formed a partnership to construct the Colorado Street Bridge. Completed in 1913, this bridge was the first of many that allowed easy access across the Arroyo Seco and was soon followed by others such as the San Rafael Bridge and the Holly Street Bridge. The growth of automobile use further impacted Pasadena, as the city saw an increase in population from 45,000 in 1920 to over 76,000 by 1930 (Historic Resources Group [HRG] 2007). This culminated with the construction of not only California's but the United States' first freeway, the Arroyo Seco Parkway (also known as the Pasadena Freeway or CA-110), completed in 1940. By 1939, however, the Depression had devastated the tourism industry, and many of Pasadena's grand hotels were shuttered.

Like most of the United States, Pasadena saw a revival as World War II began. As California became a major staging area for the Pacific Theater of the war, high-tech manufacturing and scientific companies took advantage of the utilities and development of Pasadena and made it their home. This soon included NASA's Jet Propulsion Laboratory, which is still in use today. After the war, Pasadena saw further growth and diversification, with an influx of immigrants from Central America and Armenia, and African-Americans as part of the Second Great Migration.

Sunset Reservoir

The Sunset Reservoir Complex is part of the Pasadena Water & Power water distribution system and consists of two reservoirs, Sunset Reservoir No. 1 (SR-1) and Sunset Reservoir No. 2 (SR-2), that are supplied by a common inlet facility, referred to as A-Basin. SR-1 was constructed in 1888 as an open reservoir but was updated in 1899 to include a wood-framed roof and corrugated steel deck, while SR-2

was constructed in 1900; however, documents of its construction are difficult to obtain. In 1934, a four-foot concrete wall was constructed along the perimeters of both reservoirs in order to increase their storage capacity, and the roof on SR-1 was raised to accommodate the increase by splicing the original posts with new posts (Carollo 2015). The same year, a facility to aerate the water received from San Gabriel was built adjacent to the reservoirs. A full history of the project site and its structures is addressed in a Historical Resources Evaluation Report (HRER) prepared by HELIX and submitted under separate cover (McCausland 2021).

3.0 METHODS

3.1 RECORDS SEARCH

HELIX staff requested a record search of the California Historical Resources Information System (CHRIS) at the South Central Coastal Information Center (SCCIC) on April 5, 2021. The records search covered a 0.5-mile radius around the project area and included the identification of previously recorded cultural resources and locations and citations for previous cultural resources studies. A review of the CRHR, the state Office of Historic Preservation (OHP) historic properties directory, and Local Register was also conducted. The records search summary is included as Appendix B (Confidential Appendices, bound separately).

3.2 NATIVE AMERICAN CONTACT PROGRAM

HELIX contacted the Native American Heritage Commission (NAHC) on April 6, 2021, for a Sacred Lands File search and a list of Native American contacts for the project area. Letters were sent on May 17, 2021, to the eight Native American representatives and interested parties identified by the NAHC. Native American correspondence is included as Appendix C (Confidential Appendices, bound separately).

3.3 OTHER ARCHIVAL RESEARCH

Various archival sources were also consulted, focused on property-specific historical information and ethnographic literature to identify relevant background for the project area and its historical inhabitants. Research focused on a variety of primary and secondary materials, including historical maps, aerial and ground photographs, ethnographic reports, and technical reports prepared for the project. Sources consulted include the following: Huntington Library Digital Archives (plats); University of California, Santa Barbara Digital Library (aerial photographs); USGS historical topographic maps; and the Bureau of Land Management (BLM) General Land Office (GLO) Records. The purpose of this research was to identify historic structures and land use in the area.

3.4 ARCHAEOLOGICAL SURVEY

A pedestrian survey of the project site was conducted on June 3, 2021, by HELIX staff archaeologist Kassie Sugimoto. Due to the completely develop nature of the project site, standard transects were not used, although the survey consisted of a systematic inspection of all areas of exposed ground surface for evidence of the presence of prehistoric artifacts, historic artifacts, sediment discoloration that might indicate the presence of cultural middens or subsurface features, roads and trails, and depressions and other features that might indicate the former presence of structures or buildings. The project area was

photographed using a digital camera. All field notes, photographs, and records related to the current study are on file at the HELIX office in La Mesa, California.

3.5 SENSITIVITY ASSESSMENT

In circumstances where a known archaeological or tribal cultural resource is not present, HELIX assessed the potential for the presence of an undocumented resource (i.e., sensitivity). Careful consideration of the broad historical use of the project vicinity and the specific physical setting of the project, including an assessment of the likelihood of whether or not the area could contain buried material, was undertaken by a qualified HELIX archaeologist. As no subsurface archaeological investigations were undertaken as part of this assessment, the resulting sensitivity determination is by nature qualitative, ranging along a scale of probability for encountering cultural resources, designated here as low, moderate, and high. In general, for areas in which there are few indicators of prehistoric habitability, such as water sources or known sites, and poor physical integrity within the project site due to historic and modern disturbances, the resulting sensitivity assessment would be low. Areas near natural features or known sites affiliated with Native Americans, and that may have sediments present dating to the time period, would have a sensitivity assessment that would be moderate to high.

4.0 RESULTS

4.1 PREVIOUS SURVEYS

The results of records search received from SCCIC on May 10, 2011, identified six previous cultural resource studies within the half-mile record search limits, none of which occurred within the project site (Table 1, *Previous Studies within Half Mile of the Project Area*). Five of the studies were archaeological surveys or site visits, one of which included a historic resources survey; the remaining report title does not indicate the type of study but appears to have been a site visit/survey as well. These reports are summarized below in Table 1.

Table 1
PREVIOUS STUDIES WITHIN HALF MILE OF THE PROJECT AREA

Report Number (LA-)	Year	Author	Report Title
00375	1978	David M. Van Horn	Ultrasystems Project: Archaeological Report
05249	2000	Philomene C. Smith	Negative Archaeological Survey Report: Route 210:kp30.3/40.2-170-129971
07441	2005	Wayne H. Bonner	Cultural Resource Records Search and Site Visit Results for Cingular Telecommunications Facility Candidate La-987-01 (sv-025-01) Cingular Collocation, 369 West Washington Boulevard, Pasadena, Los Angeles County, California.
07457	2006	Lorna Billat	Pintoresca Park/la-0121a
08814	2006	Wayne H. Bonner and Sarah A. Williams	Cultural Resources Records Search Results and Site Visit for Cingular Wireless Candidate Lsancac155, 1190 North Fairoaks, Avenue, Pasadena, Los Angeles County, California
12284	2013	Carrie Chasteen	Historical Resources and Archaeological Survey Report for the Installation of Soundwall on I-210 Project

4.2 PREVIOUSLY RECORDED RESOURCES

The SCCIC has a record of 84 previously recorded cultural resources within a 0.5-mile radius of the project, but none have been recorded within the project area (Table 2, *Previously Recorded Resources within Half Mile of the Project Area*). All the resources recorded within the 0.5-mile search radius consist of historic built environment resources, including historic buildings and structures, districts and their contributing elements, and a park. This includes the Bungalow Courts of Pasadena, a historic district, and 82 other historic buildings with addresses on the OHP Historic Property list. All resources are summarized below in Table 2.

Table 2
PREVIOUSLY RECORDED RESOURCES WITHIN HALF MILE OF THE PROJECT AREA

Primary Number (P-19-##)	Trinomial (CA-LA-#)	Age	Description	Recorder, Date
179697	N/A	Historic	Billson House	J F Merritt, City of Pasadena, 1977
180076	N/A	Historic	950 N Marengo	C McAvoy, HRG, 1991
180085	N/A	Historic	Prospect Historic District	J. C. Terell, Pasadena Heritage, 1981
180088	N/A	Historic	Samuel Merrill House; Voided - 19-183241; Other - Merrill-Grider House	T. Gregory, The Building Biographer, 2000
180107	N/A	Historic	Sarah A Menning House	C McAvoy, HRG, 1993
180108	N/A	Historic	Dowling-Rodriguez House	C McAvoy, HRG, 1993
180109	N/A	Historic	Edwin Michner House	C. McAvoy, HRG, 1993
180110	N/A	Historic	Don Ferguson House	C. McAvoy, HRG, 1993
180112	N/A	Historic	581 N Raymond	C McAvoy, HRG, 1993
180113	N/A	Historic	Hugh B Rice House	C. McAvoy, HRG, 1993
180115	N/A	Historic	666 N Raymond	C. McAvoy, HRG, 1993
180116	N/A	Historic	Bell House	C. McAvoy, HRG, 1993
180117	N/A	Historic	Card House	C. McAvoy, HRG, 1993
180225	N/A	Historic	Sinclair House	G. Sullivan, Pasadena Cultural Heritage Program, 1978

Table 2 (cont.)
PREVIOUSLY RECORDED RESOURCES WITHIN HALF MILE OF THE PROJECT AREA

Primary Number (P-19-##)	Trinomial (CA-LA-#)	Age	Description	Recorder, Date
180227	N/A	Historic	524 N Fair Oaks	W. & M. Dean, Cultural Heritage Program, 1977
180235	N/A	Historic	40 W Peoria	C. McAvoy, HRG, 1993
180236	N/A	Historic	48 W Peoria	C. McAvoy, HRG, 1993
180237	N/A	Historic	58 W Peoria	C. McAvoy, HRG, 1993
180238	N/A	Historic	66 W Peoria	C. McAvoy, HRG, 1993
180239	N/A	Historic	78 W Peoria	C. McAvoy, HRG, 1993
180691	N/A	Historic	N Lincoln Court; Other - Bungalow Court; Voided - 19-184328; Voided - 19-183847	L. Kliwinski, Thirtieth Street Architects, 1994
180695	N/A	Historic	1274-1282 N Raymond Court; Other - Bungalow Court	L. Kliwinski, Thirtieth Street Architects, 1994
180737	N/A	Historic	Kosy Knook Court; Other - Bungalow Court	L. Kliwinski, Thirtieth Street Architects, 1994
180882	N/A	Historic	895-899 N Fair Oaks Ave	D. Miller, Urban Conservation, 1982
180883	N/A	Historic	889-893 N Fair Oaks Ave	D. Miller & N. Impostato, Urban Conservation, 1982
180884	N/A	Historic	867-875 N Fair Oaks Ave	D. Miller, Urban Conservation, 1983
180885	N/A	Historic	841 N Fair Oaks Ave	D. Miller, Urban Conservation, 1983
180887	N/A	Historic	Anderogg Residence	D. Miller, Urban Conservation, 1983
180888	N/A	Historic	735 N Fair Oaks Ave	D. Miller, Urban Conservation, 1982

Table 2 (cont.)
PREVIOUSLY RECORDED RESOURCES WITHIN HALF MILE OF THE PROJECT AREA

Primary Number (P-19-##)	Trinomial (CA-LA-#)	Age	Description	Recorder, Date
180889	N/A	Historic	F Mull Residence	H. J. McCreight, Urban Conservation, 1982
180890	N/A	Historic	886 N Fair Oaks Ave	H. McCreight & D. Miller, Urban Conservation, 1982
180891	N/A	Historic	Doane Residence	D. Miller & N. Impostato, Urban Conservation, 1983
180892	N/A	Historic	790 N Fair Oaks Ave	Unknown
180893	N/A	Historic	820 N Fair Oaks Ave	Unknown
180894	N/A	Historic	832 N Fair Oaks Ave	Unknown
180895	N/A	Historic	790, 820, 832 N Fair Oaks Ave	D. Miller, Urban Conservation, 1983
181066	N/A	Historic	Decker residence; Resource Name - Frank Decker House	D. Miller, Urban Conservation, 1983
182119	N/A	Historic	St Barnabas Church	D. Miller, Urban Conservation, 1985
182168	N/A	Historic	Court @ 940-948 N Raymond Ave; Voided - 19-187069; Voided - 19-180694	L. Kliwinski, 1994
182169	N/A	Historic	Clarence McMillian House	D. Miller, Urban Conservation, 1985
182184	N/A	Historic	George Wharton & Emma James House	D. Miller, Urban Conservation, 1985
182202	N/A	Historic	Bungalow Courts	D. Miller, Urban Conservation, 1985
182230	N/A	Historic	1036 Summit Ave	D. Miller, Urban Conservation, 1985

Table 2 (cont.)
PREVIOUSLY RECORDED RESOURCES WITHIN HALF MILE OF THE PROJECT AREA

Primary Number (P-19-##)	Trinomial (CA-LA-#)	Age	Description	Recorder, Date
183111	N/A	Historic	La Pintoresca Library	M. Valentine, Urban Conservation, 1984
183112	N/A	Historic	La Pintoresca Park	M. Valentine, Urban Conservation, 1984
183420	N/A	Historic	H L Huntington	J. Draeger & C. Anderson, Urban Conservation, 1989
183827	N/A	Historic	Raymond Court	L. Kliwinski, 1994
183828	N/A	Historic	Raymond Court	Unknown
183829	N/A	Historic	Raymond Court	Unknown
183830	N/A	Historic	Raymond Court	Unknown
183831	N/A	Historic	Raymond Court	Unknown
184209	N/A	Historic	534 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184210	N/A	Historic	Carroll Building	S. DeWolfe, Urban Conservation, 1990
184242	N/A	Historic	546 N. Fair Oaks Drive	Unknown
184243	N/A	Historic	547 N. Fair Oaks Drive	Unknown
184244	N/A	Historic	559 N. Fair Oaks Drive	Unknown
184245	N/A	Historic	565 N. Fair Oaks Drive	Unknown
184246	N/A	Historic	650 N. Fair Oaks Drive	Unknown
184300	N/A	Historic	566-572 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184301	N/A	Historic	574-578 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184302	N/A	Historic	584 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184303	N/A	Historic	587-589 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184304	N/A	Historic	590 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184305	N/A	Historic	599 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184306	N/A	Historic	600 N. Fair Oaks Drive	C. McAvoy, HRG, 1993

Table 2 (cont.)
PREVIOUSLY RECORDED RESOURCES WITHIN HALF MILE OF THE PROJECT AREA

Primary Number (P-19-##)	Trinomial (CA-LA-#)	Age	Description	Recorder, Date
184307	N/A	Historic	604 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184308	N/A	Historic	512 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184325	N/A	Historic	520 Lincoln	C. McAvoy, HRG, 1993
184326	N/A	Historic	Wampler Apts.	C. McAvoy, HRG, 1993
184327	N/A	Historic	527 Lincoln	C. McAvoy, HRG, 1993
184329	N/A	Historic	557-559 Lincoln	C. McAvoy, HRG, 1993
184330	N/A	Historic	94 W. Peoria	C. McAvoy, HRG, 1993
184331	N/A	Historic	100 W. Peoria	C. McAvoy, HRG, 1993
184333	N/A	Historic	41 W. Villa	C. McAvoy, HRG, 1993
184334	N/A	Historic	55 W. Villa	C. McAvoy, HRG, 1993
184348	N/A	Historic	47 W. Villa	Unknown
184715	N/A	Historic	Rose & Capatano Confectionary	S. DeWolfe, Urban Conservation, 1990
184716	N/A	Historic	Patterson-Sanders Garage	S. DeWolfe, Urban Conservation, 1990
184717	N/A	Historic	J B Asman Barber Shop	S. DeWolfe, Urban Conservation, 1990
189992	N/A	Historic	New Fair Oaks Historic District	Unknown
189997	N/A	Historic	Bristol-Cypress Historic District	Unknown
190332	N/A	Historic	Gossett Residence	Carrie Chasteen, Parsons, 2013
190590	N/A	Historic	Pasadena Arroyo Parks and Recreation District, NRHP Registered District	Carrie Chasteen, Parsons, 2013
190680	N/A	Historic	Bungalow Courts of Pasadena, Historic District	Teresa Grimes, Pasadena Heritage, 2007

4.3 NATIVE AMERICAN CONTACT PROGRAM

HELIX contacted the NAHC on April 6, 2021, for a Sacred Lands File search and a list of Native American contacts for the project area. The NAHC indicated in a response dated April 21, 2021, that no known sacred lands or Native American cultural resources are within the project area, but that the absence of specific site information in the Sacred Lands File does not indicate the absence of cultural resources in the project area. Letters were sent on May 17, 2021, to the eight Native American contacts identified by the NAHC. The only response received to date is from the Gabrieleno Band of Mission Indians - Kizh Nation, requesting contact information for the lead agency. If any additional responses are received, they will be forwarded to PWP staff. PWP is undertaking AB 52 notifications to those Tribes who have requested notification and will initiate consultation if requested by those Tribes. Information resulting from these consultations will be used to help assess project impacts and will be incorporated into this report, as appropriate (only non-confidential material will be included). Native American correspondence is included as Appendix C (Confidential Appendices, bound separately).

4.4 OTHER ARCHIVAL RESEARCH

Historic aerials from 1928, 1944, 1956, 1960, 1962, and 1973 were reviewed, as were historic USGS topographic maps, including the 1894 Los Angeles, 1896 Pasadena, and 1900 Pasadena (1:62,500), along with the 1928 Altadena (1:24,000), and 1953, 1966, 1972, and 1988 Pasadena (1:24,000) topographic maps. Also reviewed were seven BLM plat survey maps (two from 1870 and one each from 1871, 1876, 1893, 1900, and 1904), along with several other historic maps of the area.

The early survey plat maps showed the project area within the western boundary of Rancho San Pasqual, and when referencing historic maps of the area, the Sunset Reservoir is visible in multiple maps. This includes Henry Hancock's 1858 "Map of Rancho San Pascual finally confirmed to Manuel Garfias", which shows three structures surrounding the project area, a trail that runs along the north, west, and south edges of the project area, and a ditch or waterway that runs from the reservoir east. A map from 1876, "Map Showing the Property of the Lake Vineyard Land and Water Association", places the reservoir within land owned by the San Gabriel Orange Grove Association, and Hancock's 1880 "Rancho San Pasqual: Pasadena" supports this, with the addition of a north/south road that runs just to the east of the reservoir.

By the 1894 Los Angeles quadrangle map, the reservoir is surrounded by four roads, with a few structures to the east. There is no change in the 1896 and the 1900 Pasadena topographic maps, and by the 1928 Altadena quadrangle map, the reservoir has expanded as a single large reservoir, and the surrounding area has been developed much more, with structures recorded around the area. In the 1953 topographic map, the reservoir receives its first label as Sunset Reservoir, with the entire area coded as a residential neighborhood, which changes in 1966 to the areas directly west of the reservoir being coded as commercial. Additionally, both SR-1 and SR-2 are recorded on the map, and a park is now present south of the reservoir. The 1972 Pasadena map shows the expansion of the I-210 freeway to the east of the project, and by 1988 it is shown as completed, with East Mountain Avenue being re-routed to its current alignment. The aerial photographs show the changes from 1928 onward, with both reservoirs visible in the heavily populated neighborhoods, as well as the construction of the I-210 freeway and Mountain Avenue re-alignment visible in the 1973 aerial.

4.5 SURVEY RESULTS

No archaeological sites have been previously documented within the project area, and the survey did not identify any new cultural resources within the project area. Visibility was excellent for the project area; however, ground surface visibility was almost non-existent due to existing structures and asphalt. Based on the sediments present along the edges and in areas of ornamental vegetation, it is estimated that fill dirt, or disturbed redeposited sediment, is present across the entirety of the project area.

5.0 SUMMARY AND MANAGEMENT RECOMMENDATIONS

A study was undertaken to identify the cultural resources that are present in the Sunset Complex Project area and to determine the effects of the project on historical resources per CEQA and historic properties per the NHPA. The cultural resources survey did not identify any cultural resources within the project area other than built environment resources, which are addressed in a separate HRER (McCausland 2021). Therefore, no impacts to non-built-environment cultural resources are anticipated.

The entire APE has been disturbed by the development of the existing Sunset Reservoir and associated buildings beginning in the nineteenth century and continuing into the twentieth century. The 84 resources recorded within a half-mile of the project area are all historic structures, districts, and contributing elements to the historic districts.

5.1 SENSITIVITY ASSESSMENT

While no archaeological resources were identified in the CHRIS records search within the project site and a 0.5-mile radius, and the Sacred Lands File records search did not identify any sacred lands or TCRs in the project area, review of ethnographic literature and historical maps did identify the documentation of significant Native American villages and sites nearby.

The project site is east of the Arroyo Seco, currently located approximately 0.8 mile to the west of the project area, within the river's historical floodplain. Minor shifts in the main channel of the river have occurred numerous times in recorded history, including two significant shifts in 1862 and 1884. The general proximity of the project site to areas of known habitation, the river, and broad travel corridors has the effect of an overall increase in the sensitivity for unknown archaeological sites and tribal cultural resources, at least higher than low background levels, particularly for the archaeological remains of temporary open camps. Such camps are typically identified by the presence of hearth features, ground stone, and other types of artifact assemblages. However, additional factors related to the preservation of such materials are considered with respect to alluvial depositional settings within the area, as discussed below.

The Tataviam village known as *Hahamon'ga* is the closest ethnographically documented Indigenous community to the project site. *Hahamon'ga* is estimated to be located in the upper part of the Arroyo Seco, in the area now owned by the JPL, approximately 2.65 miles north-northwest of the project site. Archival research has also identified several other nearby ethnographic villages, including *Akuronga,* which is theorized to be approximately 4.65 miles southeast of the project site, near La Presa Drive and Huntington Drive; *Sonaangaha*, which is described as being located at the current location of the San

Marino High School, approximately 4.15 miles southeast; *Alyeupkigna* which is located approximately six miles east-southeast, near Baldwin Lake on the Santa Anita Ranch; and *Sisitkanonga*, which is estimated to be located along the banks of Eaton Creek, approximately 4.8 miles northeast of the project. Like *Hahamon'ga*, these other villages were described in ethnographic accounts, but the exact locations are unknown (McCawley 1996).

The project site is on the south-central portion of the City's original 1849 annexation boundary. Maps and historical accounts characterize the project site and surroundings as open fields, likely used for livestock grazing and agriculture. However, the reservoir is present on historic maps as early as 1858 and has continued to be expanded and updated ever since. The project site was subject to updates and additional construction in 1888, 1899, 1900, and 1934. These construction episodes have compromised the integrity of the physical setting and likely destroyed or displaced any archaeological resources that may have been deposited on the surface or shallowly buried. However, it has been demonstrated elsewhere, both in Pasadena and portions of Los Angeles, that deeply buried archaeological deposits can exist within alluvium below Historic-period disturbances and may also be intermixed with Historic-period debris. Alluvial deposits within the geographic region can be massive, extending well below the surface, and may contain sediments deposited before human occupation of North America. Furthermore, most accumulations of alluvial sediments were formed by a combination of high- and low-energy depositional events. High-energy events are less likely to have preserved any material remains left on the surface by Native Americans, while low-energy floods tend to produce more favorable environments for the preservation of cultural materials. Thus, low-energy alluvial sediments dating to the Late Pleistocene or Holocene time periods have the greatest potential for preserving archaeological resources. There is no absolute measure of depth below the surface in which sediments with these properties occur, and site-specific conditions must be considered. Also, such soil conditions are an indicator of a setting favorable for preservation, but the presence of soils with these properties is not an absolute indicator of the presence of archaeological or tribal cultural resources.

Another important consideration is the amount of past disturbance that has affected the project site. During the field visit on June 3, 2021, discussions with PWP staff indicated that ground disturbances beneath the project site are predicted to be between 60 and 70 feet beneath the ground surface. A pipeline was placed under the site and within the public right of way to provide water from Devils Gate Dam to the project site during the early part of the twentieth century (the dam was constructed in 1920). This pipe was dug up during World War II in order to repurpose the metal for airplane material. Over the decades, the project site has been the subject of a great deal of excavation to update the facilities and the subsurface infrastructure, disrupting the integrity of any subsurface resources that might have been present at one time. Based on this, HELIX finds the sensitivity for unidentified archaeological and tribal cultural resources within the project site to be low.

5.2 MANAGEMENT RECOMMENDATIONS

Based on the results of the current study, no known historic properties per the NHPA or historical resources per CEQA will be affected by the Sunset Complex Project in terms of archaeological or tribal cultural resources; historic built environment resources are addressed separately in the HRER (McCausland 2021). Due to the extensive disturbances to the project site over many decades, the potential for subsurface cultural resources is considered to be low. Therefore, no mitigation measures are required, and construction monitoring is not recommended.

In the event that cultural material is encountered during construction, ground-disturbing activities in the immediate area of the find should be halted until a qualified archaeologist is notified and assesses the resources. If significant cultural material is encountered, the qualified archaeologist will coordinate with the Consulting Tribe(s) and PWP staff to develop and implement appropriate avoidance or mitigation measures.

In the unlikely event that human remains are discovered, the County Coroner shall be contacted. If the remains are determined to be of Native American origin, the Most Likely Descendant, as identified by the NAHC, shall be contacted in order to determine proper treatment and disposition of the remains. All requirements of Health & Safety Code §7050.5 and PRC §5097.98 shall be followed.

Should the project limits change to incorporate new areas of proposed disturbance, an archaeological survey of these areas will be required.

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Appendix A

Resumes of Key Personnel

Trevor Gittelhough, RPA

Cultural Resources Assistant Project Manager

HELIX Environmental Planning

Summary of Qualifications

Trevor H. Gittelhough is an archaeological assistant project manager, specializing in underwater cultural resources, with over a decade of experience in archaeology, including both cultural resources management and academic projects. This experience includes site monitoring; surveys and excavations; laboratory sorting, cataloging, and analysis; and conservation. He has conducted environmental, paleontological, and cultural resources work throughout California, Nevada, Oregon, and Florida in support of compliance with California Environmental Quality Act (CEQA), National Environmental Policy Act (NEPA) and Sections 106 and 110 of the National Historic Preservation Act (NHPA) for public and private sector clients including a range of local, state, and federal agencies such as Southern California Edison, the United States Navy and Air Force, Caltrans, and FEMA.

He has experience in team management in the terrestrial and underwater archaeological management sectors, with expertise in implementation of mitigation and monitoring projects, report production, and coordination with Indigenous groups. Underwater and Indigenous archaeology are Mr. Gittelhough's specialties, which are enhanced by his skill and experience in sailing, diving, and prehistoric technology construction. His research interests include maritime technologies and practices, settlement patterns, trade and exchange, colonial interactions, prehistoric technologies, and anthropological/ archaeological theory. In addition, he has expertise in illustration of artifacts, stratigraphic and excavation unit profiles, site maps, GIS, remote sensing, and underwater excavation and mapping techniques.

Mr. Gittelhough's technical skills include terrestrial and submerged archaeological survey, excavation, and site testing. He has authored numerous site records and technical reports detailing the results of cultural resources work, as well as academic articles. He has also had thorough training in artifact analysis and specializes in lithic analysis and maritime conservation. His academic background includes advanced training in conservation and underwater archaeology. He has extensive training at the graduate level and earned his M.A. from East Carolina University. Mr. Gittelhough is Registered Professional Archaeologist, a member of the Society for American Archaeology (SAA), a member of the Society for Historical Archaeology (SHA), and a member of the Society for California Archaeology (SCA).

Selected Project Experience

Bouquet Canyon Road Project, Los Angeles County, CA (2021). Cultural Resource Specialist serving as lead archaeological monitor and technical report writer for this project in the City of Santa Clarita. This work included monitoring all ground-disturbing

Education

Master of Arts, Maritime Studies, East Carolina University, 2019

Bachelor of Arts, Archaeology, University of California, Santa Barbara, 2011

Registrations/ Certifications

Register of Professional Archaeologists, 2018

HAZWOPER Certification; 2018 – 2021

ESRI GIS Certification
AAUS Scientific Diver
Red Cross First AID
Red Cross CPR DAN
Divers First Aid

Professional Affiliations

Society for American Archaeology
Society for Historical Archaeology
Society for California Archaeology

activities associated with geotechnical studies, such as drilling and trenching. Monitoring was also undertaken during ground penetrating radar studies of portions of the project area.

California Crossings, Attisha Trust Parcel, San Diego County, CA (2021). Cultural Resource Specialist for a cultural resources study in support of biological mitigation measures (burrowing owl habitat creation) for the proposed Project in the County of San Diego. Prepared an archaeological resources assessment in compliance with state and federal regulations. Scope included a cultural resources records search, review of historic maps and aerials, and preparation of a technical report.

Enchanted Hills Park Project, Perris, Riverside County, CA (2021). Cultural Resource Specialist for a monitoring program during initial sitework for this project in the City of Perris, in Riverside County. Prepared monitoring letter report.

Mission Basin Groundwater Purification Facility Well Expansion and Brine Minimization Project, Oceanside, San Diego County, CA (2021). Cultural Resource Specialist for a cultural resources study in support of the proposed Project in the City of Oceanside, in northern San Diego County. Prepared a monitoring results memo for monitoring of geotechnical investigations and assisted with preparation of the cultural resources technical report in compliance with state and federal regulations. Scope included a cultural resources records search, preparation of a letter report/memo, and assistance with the technical report.

Oak Shores/Lake Morena Views MWC Consolidation Project, San Diego County, CA (2021). Cultural Resource Specialist for a cultural resources study in support of the proposed Project in eastern San Diego County. Assisted with preparation of a cultural resources technical report in compliance with state and federal regulations, as well as State Water Resources Control Board. Scope included a cultural resources records search, review of historic maps and aerials, and assistance with preparation of a technical report.

Archaeological Monitoring for the P-586 Missile Assembly Building - San Nicolas Island, Ventura County, CA (2021). Cultural Resource Specialist serving as archaeological monitor and technical report writer. This work included monitoring all ground-disturbing activities, including grubbing, grading, and trenching. Monitoring included close involvement with United States Navy personal and Tribal Members and Observers.

Shady View Residential Project Environmental Impact Report, Chino Hills, San Bernardino County, CA (2021). Cultural Resource Specialist for a cultural resources study in support of the proposed Project in the City of Chino Hills in San Bernardino County. Assisted in the preparation of the technical report in compliance with state and federal regulations. Project scope included a cultural resources records search, review of historic maps and aerials, field survey, and preparation of a technical report.

Trevor Gittelhough, RPA

Cultural Resources Assistant Project Manager

Previous Project Experience

Los Angeles County Natural History Museum Center for History and Cultural Project, Los Angeles County, CA. Assistant Project Manager for a cultural resources study in support of the proposed Project in the downtown area of the City Los Angeles. Prepared an archaeological and tribal cultural resources assessment in compliance with CEQA, specifically Assembly Bill 52. Scope included a cultural resources records search, review of historic maps and aerials, and preparation of a technical study for submittal to the Department of City Planning.

Environmental Services Support for the Villages at The Alhambra Project, Los Angeles County, CA. Assistant Project Manager for a cultural resources study in support of the proposed Project in the downtown area of the City Los Angeles. Prepared an archaeological and tribal cultural resources assessment in compliance with CEQA, specifically Assembly Bill 52. Scope included a cultural resources records search, review of historic maps and aerials, and preparation of a technical study for submittal to the Department of City Planning.

Tierra Crossing Tribal Cultural Resource and Archaeological Assessment, Los Angeles, CA. Assistant Project Manager for a cultural resources study in support of the proposed Project in the downtown area of the City Los Angeles. Prepared an archaeological and tribal cultural resources assessment in compliance with CEQA, specifically Assembly Bill 52. Scope included a cultural resources records search, review of historic maps and aerials, and preparation of a technical study for submittal to the Department of City Planning.

Tribal Cultural Resources Assessment for the 17346 Sunset Project, Los Angeles, CA. Assistant Project Manager for a cultural resources study in support of the proposed Project in the downtown area of the City Los Angeles. Prepared a tribal cultural resources assessment in compliance with CEQA, specifically Assembly Bill 52. Scope included a cultural resources records search, review of historic maps and aerials, and preparation of a technical study for submittal to the Department of City Planning.

Mary Robbins-Wade, RPA

Cultural Resources Group Manager

Summary of Qualifications

Ms. Robbins-Wade has 41 years of 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 under the California Environmental Quality Act (CEQA), as well as numerous archaeological studies under various federal jurisdictions, addressing Section 106 compliance and National Environmental Policy Act (NEPA) issues. She has excellent relationships with local Native American communities and the Native American Heritage Commission (NAHC), as well as has supported a number of local agency clients with Native American consultation under State Bill 18 and assistance with notification and Native American outreach for Assembly Bill 52 consultation. Ms. Robbins-Wade is a Registered Professional Archaeologist (RPA) and meets the U.S. Secretary of the Interior's Professional Qualifications for prehistoric and historic archaeology.

Selected Project Experience

12 Oaks Winery Resort. Project Manager/ Principal Investigator for a cultural resources survey of approximately 650 acres for a proposed project in the County of Riverside. Oversaw background research, field survey, site record updates, Native American coordination, and report preparation. Met with Pechanga Cultural Resources staff to discuss Native American concerns. Worked with applicant and Pechanga to design the project to avoid impacts to cultural resources. Work performed for Standard Portfolio Temecula, LLC.

28th Street between Island Avenue and Clay Avenue Utilities Undergrounding Archaeological Monitoring. Project Manager/Principal Investigator for a utilities undergrounding project in a historic neighborhood of East San Diego. Responsible for project management; coordination of archaeological and Native American monitors; coordination with forensic anthropologist, Native American representative/Most Likely Descendent, and City staff regarding treatment of possible human remains; oversaw identification of artifacts and cultural features, report preparation, and resource documentation. Work performed for the City of San Diego.

Archaeological Testing F11 Project. Project Manager for a cultural resources study for a proposed mixed-use commercial and residential tower in downtown San Diego. Initial work included an archaeological records search and a historic study, including assessment of the potential for historic archaeological resources. Subsequent work included development and implementation of an archaeological testing plan, as well as construction monitoring and the assessment of historic archaeological resources encountered. Work performed for the Richman Group of Companies.

Education

Master of Arts, Anthropology, San Diego State University, California, 1990

Bachelor of Arts, Anthropology, University of California, Santa Barbara, 1981

Registrations/ Certifications

Caltrans, Professionally Qualified Staff-Equivalent Principal Investigator for prehistoric archaeology, , Bureau of Land Management Statewide Cultural Resource Use Permit (California), permit #CA-18-35, , Register of Professional Archaeologists #10294, 1991

County of San Diego, Approved CEQA Consultant for Archaeological Resources, 2007

, Orange County Approved Archaeologist, 2016

Blended Reverse Osmosis (RO) Line Project. Project Manager/ Principal Investigator for cultural resources monitoring during construction of a 24-inch recycled water pipeline in the City of Escondido. Oversaw monitoring program, including Worker Environmental Awareness Training; responsible for Native American outreach/coordination, coordination with City staff and construction crews, and general project management. Work performed for the City of Escondido.

Buena Sanitation District Green Oak Sewer Replacement Project. Project Manager/Principal Investigator for a cultural resources testing program in conjunction with a proposed sewer replacement project for the City of Vista. Oversaw background research, fieldwork, site record update, Native American coordination, and report preparation. Work performed for Harris & Associates, Inc., with the City of Vista as the lead agency.

Cactus II Feeder Transmission Pipeline IS/MND. Cultural Resources Task Lead for this project in the City of Moreno Valley. Eastern Municipal Water District proposed to construct approximately five miles of new 30-inch to 42 inch-diameter pipeline; the project would address existing system deficiencies within the City and provide supply for developing areas. Oversaw background research, field survey, and report preparation. Responsible for Native American outreach for cultural resources survey. Assisted District with Native American outreach and consultation under AB 52. Work performed under an as-needed contract for Eastern Municipal Water District.

Dale 2199C Pressure Zone Looping Pipeline Project. Cultural Resources Task Lead for this project in Moreno Valley. Eastern Municipal Water District proposed construction of a new pipeline to connect two existing pipelines in the District's 2199C Pressure Zone. The pipeline would consist of an 18-inch-diameter pipeline between Kitching Street and Alta Vista Drive that would connect to an existing 12-inch-diameter pipeline in the northern end of Kitching Street and to an existing 18-inch-diameter pipeline at the eastern end of Alta Vista Drive. The project will improve reliability and boost the Dale Pressure Zone's baseline pressure and fire flow availabilities. Four potential alignments were under consideration; three of these bisect undeveloped land to varying degrees, while the other is entirely situated within developed roadways. Oversaw background research and field survey. Responsible for Native American outreach for cultural resources survey and co-authored technical report. Work performed under an as-needed contract for Eastern Municipal Water District.

Downtown Riverside Metrolink Station Track & Platform Project. Cultural Resources Task Lead for this project involving changes to and expansion of the Downtown Riverside Metrolink Station. Overseeing records search and background information, archaeological survey, and report preparation. Responsible for coordination with Native American Heritage Commission, Riverside County Transportation Commission (RCTC), and Federal Transportation Authority (FTA) on Native American outreach. Work performed for Riverside County Transportation Commission as a subconsultant to HNTB Corporation.

Emergency Storage Pond Project. Project Manager/Principal Investigator for a cultural resources testing program in conjunction with the Escondido Recycled Water Distribution System - Phase 1. Two cultural resources sites that could not be avoided through project design were evaluated to assess site significance and significance of project impacts. Work included documentation of bedrock milling

features, mapping of features and surface artifacts, excavation of a series of shovel test pits at each site, cataloging and analysis of cultural material recovered, and report preparation. The project is located in an area that is sensitive to both the Kumeyaay and Luiseño people, requiring close coordination with Native American monitors from both groups. Work performed for the City of Escondido.

Escondido Brine Line Project. Project Manager/Principal Investigator for cultural resources monitoring during construction of approximately 2.3 miles of a 15-inch brine return pipeline in the City of Escondido. The project, which is part of the City's Agricultural Recycled Water and Potable Reuse Program, enables discharge of brine recovered from a reverse osmosis facility that is treating recycled water; it is one part of the larger proposed expansion of Escondido's recycled water distribution to serve eastern and northern agricultural land. The project is located in an area that is sensitive to both the Kumeyaay and Luiseño people, requiring close coordination with Native American monitors from both groups. Oversaw monitoring program, including Worker Environmental Awareness Training; responsible for Native American outreach/coordination, coordination with City staff and construction crews, and general project management. Work performed for the City of Escondido.

Hacienda del Mar EIR. Senior Archaeologist for a proposed commercial development project for a senior care facility in Del Mar. Assisted in the preparation of associated permit applications and an EIR. Oversaw background research, updated records search and Sacred Lands File search, monitoring of geotechnical testing, coordination with City staff on cultural resources issues, and preparation of updated report. Prior to coming to HELIX, served as Cultural Resources Task Lead for the cultural resources survey for the project, conducted as a subcontractor to HELIX. Work performed for Milan Capital Management, with the City of San Diego as the lead agency.

Lilac Hills Ranch. 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. Oversaw background research, field survey, testing, recording of archaeological sites and historic structures, and report preparation. Responsible for development of the research design and data recovery program, preparation of the preservation plan, and Native American outreach and coordination. 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 cultural resource. The project changed over time, so additional survey areas were included, and a variety of off-site improvement alternatives were addressed. Work performed for Accretive Investments, Inc. with County of San Diego as the lead agency.

Moulton Niguel Water District Regional Lift Force Main Replacement. Cultural Resources Task Lead/Principal Investigator for the replacement of a regional lift station force main operated by Moulton Niguel Water District (MNWD). The project comprises an approximately 9,200 linear foot alignment within Laguna Niguel Regional Park in Orange County, in an area that is quite sensitive in terms of cultural resources. HELIX is supporting Tetra Tech throughout the preliminary design, environmental review (CEQA), and final design, including permitting with applicable state and federal regulatory agencies. The cultural resources survey will inform project design, in order to avoid or minimize potential impacts to cultural resources. Oversaw background research and constraints analysis, Native American

coordination, cultural resources survey, coordination with MNWD and Tetra Tech, and report preparation. Work performed for MNWD, as a subconsultant to Tetra Tech.

Murrieta Hot Springs Road Improvements Project. Principal Investigator/Cultural Resources Task Lead for cultural resources survey in support of an Initial Study/Mitigated Negative Declaration (IS/MND) for the widening of Murrieta Hot Springs Road in the City of Murrieta. The project would widen or restripe Murrieta Hot Springs Road between Winchester Road and Margarita Road from a 4-lane roadway to a six-lane roadway to improve traffic flow, as well as provide bike lanes in both directions along this segment. A new raised median, light poles, signage, stormwater catch basins, retaining walls, and sidewalks would also be provided on both sides of the roadway, where appropriate. The project area is in a location that is culturally sensitive to the Native American community. The cultural resources study included tribal outreach and coordination to address this cultural sensitivity.

Park Circle - Cultural Resources. Project Manager/Principal Investigator of a cultural resources survey and testing program for a proposed 65-acre residential development in the Valley Center area of San Diego County. The project is located along Moosa Creek, in an area that is culturally sensitive to the Luiseño people. Oversaw background research, historic study, field survey, testing, recording archaeological sites and historic structures, and report preparation. Responsible for Native American outreach and coordination. The cultural resources study included survey of the project area, testing of several archaeological sites, and outreach and coordination with the Native American community, as well as a historic study that addressed a mid-20th century dairy barn and a late 19th century vernacular farmhouse. Work performed for Touchstone Communities.

Peacock Hill Cultural Resources. Project Manager/Principal Investigator of a cultural resources study update for a residential development in Lakeside. Oversaw updated research, fieldwork, lab work, analysis by forensic anthropologists, report preparation, and Native American coordination. In the course of outreach and coordination with the Native American (Kumeyaay) community, possible human remains were identified, prompting additional fieldwork, as well as coordination with the Native American community and forensic anthropologists. Work performed for Peacock Hill, Inc.

Sky Canyon Sewer Environmental Consulting. Cultural Resources Task Lead for this project adjacent to the City of Murrieta in southwestern Riverside County. Eastern Municipal Water District (District) proposed to implement the Sky Canyon Sewer Main Extension Project to construct approximately 6,700 linear feet of new gravity-fed 36-inch-diameter sewer main to provide additional sewer capacity for planned development. The proposed 36-inch-diameter sewer main would extend the existing 36-inch-diameter French Valley Sewer at Winchester Road further downstream to Murrieta Hot Springs Road. Oversaw background research and field survey. Responsible for Native American outreach for cultural resources survey and co-authored technical report. Assisted District with Native American outreach and consultation under AB 52. Work performed under an as-needed contract for Eastern Municipal Water District.

Kassie Sugimoto, M.A.

Cultural Resources Project Manager I

HELIX Environmental Planning

Summary of Qualifications

Ms. Sugimoto has 10 years of professional experience in archaeology. She has worked in Southern California archaeology for 6 years, including work in historic archaeology, prehistoric archaeology, human osteology, and close coordination with Native American tribes. She has directed test and data recovery investigations, monitoring programs, and archaeological site surveys, and has prepared reports for various cultural resource management projects. She is well-versed in National Historic Preservation Act, National Environmental Policy Act (NEPA), and California Environmental Quality Act (CEQA) regulations and processes.

Selected Project Experience

Darco Project (TTM 31589) (2021). Archaeologist for cultural services provided in support of the Darco Residential Development Project, located in the City of Moreno Valley (City), Riverside County, California. HELIX was contracted by D.R. Horton to provide a Phase I archaeological study to meet the requirements of the City. The study included a records search from the Eastern Information Center; a Sacred Lands File search through the NAHC; tribal outreach with the local Native American community, as identified by the NAHC; review historic maps and aerial photographs of the project area; a field survey of approximately 36 acres; and preparation of a cultural resources survey report detailing the methods and results of the study, as well as recommendations.

Morningstar Village (2021). Archaeologist for cultural services provided in support of the Morningstar Village Project located in the community of French Valley, unincorporated Riverside County, California. HELIX was contracted by Morningstar Village LLC to provide a cultural resource study in support of a 404 Pre-Construction Notification application for a Nationwide Permits; the report addressed both CEQA and Section 106 of the National Historic Preservation Act to support agency permitting. The study included a records search from the Eastern Information Center; a Sacred Lands File search through the NAHC; tribal outreach with the local Native American community, as identified by the NAHC; review historic maps and aerial photographs of the project area; a field survey of the United States Army Corp of Engineers (USACE) permit area; and preparation of a cultural resources report detailing the methods and results of the study, as well as recommendations. An additional letter report was prepared for the USACE to summarize the cultural resources within the USACE permitting area, and additional tribal outreach was conducted at the request of USACE.

Education

Master of Arts, Anthropology, North Carolina State University, Raleigh, 2015

Bachelor of Arts, Archaeology, California State University Dominguez Hills, 2013

Professional Affiliations

Member, Project Management Institute (PMI), 2019-Present

Member, Society for American Archaeology, 2013-Present

Kassie Sugimoto, M.A.

Cultural Resources Project Manager I

Oak Valley Town Center (2021). Archaeologist for cultural services provided in support of the Oak Valley Town Center Project located in the City of Calimesa (City), Riverside County (County), California. HELIX was contracted by Oak Valley Development Company to provide a Phase 1 cultural resources study to the standards of the City of Calimesa; the report will address both CEQA and Section 106 of the National Historic Preservation Act, to support agency permitting. The study included a records search from the Eastern Information Center; a Sacred Lands File search through the NAHC; tribal outreach with the local Native American community, as identified by the NAHC; review historic maps and aerial photographs of the project area; conduct a field survey of approximately 244 acres; and prepare a cultural resources report detailing the methods and results of the study, as well as recommendations.

Sandalwood Commercial Development Project (2021). Archaeologist for cultural services provided in support of the Sandalwood Commercial Development Project, located in the City of Calimesa (City), Riverside County, California. HELIX was contracted by J&T Investments to provide a Phase I archaeological study to meet the requirements of the City. The study included a records search from the Eastern Information Center; a Sacred Lands File search through the NAHC; tribal outreach with the local Native American community, as identified by the NAHC; review historic maps and aerial photographs of the project area; conduct a field survey of approximately 10 acres; and prepare a cultural resources survey report detailing the methods and results of the study, as well as recommendations.

Sky Canyon Sewer Main Extension (2021). Archaeologist for cultural services provided in support of the Sky Canyon Sewer Main Extension Project located in the city of Murrieta, Riverside County, California. A Cultural Resources Monitoring Plan (CRMP) was developed in consultation with the consulting Tribe for the construction of approximately 6,700 linear feet of new gravity-fed 36 inch diameter sewer main proposed by the lead agency, the Eastern Municipal Water District. HELIX provided cultural services, including Native American Outreach and Coordination, development of a CRMP, Cultural Resources Monitoring, and a letter report upon completion of the archaeological monitoring program.

McCanna Hills Addendum to an Environmental Impact Report, Riverside County, California. Archaeologist for preparation of an addendum to EIR319 previously prepared for the McCanna Ranch Specific Plan near Lake Perris in western Riverside County.

Archaeological Studies for a Riverside County Parcel (APN 436-360-009), Riverside County, California. Project Manager and Project Archaeologist for execution and management of the project contract with the client, conducted field and archival research, prepared technical documents for the City of San Jacinto. Work performed for Panorama Properties, Inc.

Lincoln Van Buren Project, Riverside, California. Archaeologist for Phase I studies for the development of a gas station. Field archaeologist for archaeological survey. Work performed for Psomas.

University of California Riverside (UCR), Riverside, California. Archaeologist for Phase I studies for as needed contract. Field archaeologist for archaeological and historic surveys. Work performed for Psomas.

Cultural Resources Studies for the City of San Jacinto, San Jacinto, California. Project Manager and Project Archaeologist. Executed and managed the project's contract with the client, conducted field and archival research, prepared technical documents for the City for Assessor Parcel Numbers 439-112-032, 033, 034, 036, 003, 004, 007, 008, and 009. Work performed for Mark Development.

Appendix B

Records Search
(Confidential, bound separately)

Appendix C

Native American Correspondence
(Confidential, bound separately)

Initial Study Appendix C

Geologic and Geotechnical Reports

Seismic Vulnerability Assessment

Supplementary Topics: Storage, Water Quality, Benefit Cost, Service Goals, Emergency Planning, Hydraulics, SCADA

Prepared for:
City of Pasadena
Water Department

Prepared by:

G&E Engineering Systems Inc.
6315 Swainland Rd
Oakland, CA 94611
(510) 595-9453 (510) 595-9454 (fax)

G&E Report 81.01.07, Revision 0
June 26, 2006

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1.0 Introduction

This report provides information on several topics related to the overall Seismic Vulnerability Assessment of the Pasadena Water System.

These topics include:

- Additional reservoir storage and pumping plant upgrades
- Reservoir modifications to promote water mixing
- Benefit cost issues to justify the extent of seismic upgrades
- Service goals issues to justify the extent of seismic upgrades
- Emergency planning and response
- Hydraulic analyses of the Eagle Rock, Annandale, Lida and Sheldon pressure zones
- SCADA and instrumentation upgrades

1.1 Key Findings

Table 1-1 summarizes the costs for the various system improvements described in this report.

Item	Section	Cost
Eagle Rock Reservoir Expansion to 1.3 MG	2	$1,150,000
Calaveras Reservoir Mixing	3	$205,400
Emergency Response	6	$2,337,500
Ross Pumping Plant Expansion to 5 MGD	7.1	$1,500,000
Eagle Rock to Sunset Zone High Flow – Pipelines and Regulating Station	7.1	$2,650,000
Devils Gate Pumping Plant	7.3	$37,000
Sheldon East Reservoir	7.4	$2,500,000
San Rafael Regulating Station, Sheldon Zone Flow Control Instrumentation	8	$200,000
Seismic Instrumentation	8	$100,000
	Total	$10,679,900

Table 1-1. System Improvements Costs

The costs in Table 1-1 are over and above the costs for the reservoir, pump station and well seismic upgrades included in the Seismic Vulnerability Assessment (G&E, 2006a).

Water Demands, and Storage and Pumping. Tables 2-1, 2-2, 2-3 and 2-4 summarize the existing and year 2020 water demands and existing reservoir and pumping plant capacities. Based on three different types of water storage calculations, the existing PWP system either has a surplus of storage or a deficit of storage. If no new storage is added, then reliable pumping (quick connects and standby emergency power) could be provided to solve the storage shortfalls for the Annandale and Lida pressure zones. Some new storage (300,000 gallons) should be added to the Eagle Rock zone, in addition to substantially upgrading the Ross pumping plant (more pumps plus standby power). If reliable standby power is provided at the Jones pumping plant, the need for a new Sheldon East reservoir is diminished, but Section 7.4 of this report shows that in-zone pressure issues strongly suggest the addition of a new Sheldon East reservoir.

Our evaluations show that the Arroyo Seco pumping plant needs to be upgraded to increase pumping flow rates. This upgrade has already been addressed in the MWH master plan (2002), so it is not included in the cost items in Table 1-1.

Water detention time in Tanks and Reservoirs. Table 3-1 highlights that certain tanks in the existing water system are subject to long water detention times. The most problematic detention times are in the Mirador, Gould, Sunset, Allen and Don Benito reservoirs. This can be readily cured by re-chlorination at these tanks, which is already recognized and implemented by the Pasadena Water Department. Alternate strategies could help, such as taking one of the two tanks at Gould and Don Benito out of service during winter time months.

Water mixing within Tanks and Reservoirs. Table 3-2 summarizes the time needed to achieve essentially complete mixing of water within each existing reservoir, assuming realistic fill rates. For certain reservoirs, the mixing times are too long, and current operational practices are suggested to achieve full mixing of the water. The Calaveras reservoir cannot achieve fully mixed water by operational practices alone, and modifying the inlet-outlet pipe for this reservoir is recommended.

Benefit Cost Analysis. Four possible levels of seismic upgrades have been considered for the Pasadena Water System. These are called packages P1, P2, P3 and P4, costing $2.1, $5.9, $8.7 or $17.8 million, respectively. These packages are cumulative, meaning that P2 includes all the elements of P1, etc. The incremental benefit cost ratios of implement any of the four packages (assuming a 5% discount rate) are as follows:

- P1: BCR = 2.59
- P2: BCR = 2.36
- P3: BCR = 1.93
- P4: BCR = 0.20

A BCR greater than 1 means that the upgrades are worthwhile, and the benefits gained exceed the costs.

If a decision as to how much money to spend on seismic upgrades were made solely on benefit-cost results, P3 would be the logical level of upgrade.

The water system in its as-is condition will be severely damaged in a Sierra Madre M 7.2 earthquake, leading to $145 million in losses. By implementing the P3 program (costing $5.9 million), plus the emergency response actions outlined in this report (costing $2.3 million), the losses will be substantially reduced to $31 million. These upgrades will also substantially reduce losses in less severe earthquakes that can affect Pasadena.

Service Goals Analysis. Ten earthquake service goals are suggested for the Pasadena water system. After a major earthquake on the Sierra Madre fault, the as-is system only meets one of these then goals. By implementing the P3 seismic upgrade program, plus the emergency response actions outlined in this report, essentially all the service goals can be met even after large magnitude earthquakes on the Sierra Madre, Raymond or Verdugo-Eagle Rock faults.

Emergency Planning. The seismic upgrades in P3 will help reduce, but not entirely eliminate, damage to the Pasadena water system after large earthquakes. With suitable emergency planning and preparedness, Pasadena can meet its goals, in part, by being ready to "Manage the Damage". Section 6 of the report makes recommendations that include:

- Stockpiling of spare parts
- Available staff for emergency response and repair
- Procurement of suitable lengths and diameters of flexible hose.
- Procurement of five emergency generators, plus availability of more emergency generators and portable pumps via mutual aid.
- The existing Contingency Plan for Pasadena Water and Power should be updated to reflect the findings of the seismic vulnerability assessment.

Hydraulic Analyses. Hydraulic analyses were performed for 4 pressure zones, to help establish the need for in-zone upgrades (either more storage or pipes).

- For the Eagle Rock zone, about 6,950 feet of 16-inch pipe (possibly 8,150 feet) should be added to the zone; plus three new 100 horsepower pumps at the Ross pumping plant. The Eagle Rock reservoir should be expanded by at least 0.3 MG.

- For the Annandale and Lida zones, quick connect couplings and suitable sized emergency generators are a viable and lower cost option than adding additional in-zone storage. The cost of these upgrades is about $0.12 million for the Annandale zone, which is much less than the cost to install additional storage ($2 million). The cost of these upgrades is about $0.04 million for the Lida zone, which is much less than the cost to install additional storage ($1 million).

- For the Sheldon zone, the east side of the zone is not currently functional at maximum day demands strictly under gravity flow. Either a new Sheldon East reservoir should be installed, or reliable pumping (install permanent standby power) must be provided at the Jones pumping plant. Due to the topographic restrictions at the proposed Sheldon East site, coupled with the possible existence of a strand of the active Sierra Madre fault at the site, plus the findings from the hydraulic analyses, the following limitations are placed on the design of any new reservoir at this site:

    - The overflow should ideally not be higher than 1050 feet, unless a flow control valve is placed in the Sheldon zone to effectively split the zone into Sheldon East and Sheldon West. If a higher elevation is chosen, and the zone is not split, it is likely that the new Sheldon East reservoir will preferentially service a large portion of the total Sheldon zone, resulting is lower water turnover in the existing Sheldon reservoirs, thereby impacting water quality in the west side of the zone.

    - The Sheldon East site could likely accommodate a new 2 to 3 MG reservoir. A larger reservoir (4 MG) will require more extensive and costly excavations. Any new reservoir for the site will likely need to be able to accommodate a 2 to 3 meter uplift due to faulting, with damage, but without releasing water in a manner so as to create a life safety threat to downstream people, buildings and infrastructure. The new reservoir does not have to be reliable after a Sierra Madre M 7.2 earthquake. A single open cut reservoir could be installed, or possibly a dual steel tank system; the dual steel tank system could likely be sited in a manner so that at least one of the two tanks would survive a Sierra Madre M 7.2 earthquake. The cost for the new reservoir is $2.5 million. The cost for the additional piping is included in the master plan report by MWH (2002).

SCADA System. All batteries in the system should be verified or replaced so as to provide at least 18 hours (preferably 24 hours) continued operation. All batteries and computer equipment should be adequately restrained. New instruments (flow and pressure) should be installed at the San Rafael pressure regulating station, assuming the Eagle Rock upgrades described elsewhere in this report are implemented ($100,000). Instrumentation for a new rate control station in the Sheldon zone should be included, should the Sheldon East reservoir be constructed ($100,000) and the zone split. Seismic instruments should be installed in the water system at several points ($100,000, lower priority), possibly in conjunction with USGS and ShakeMap efforts. New instruments

should be considered for any new 16" diameter or larger pipe that crosses an active fault, should that pipe be designed to be rapidly isolated after an earthquake.

1.2 Acknowledgments

Mr. Farid Niknam of the Pasadena Water Department is the overall project manager of this effort. Many people in the Pasadena Water Department assisted in this effort, and their support is gratefully acknowledged.

This report was prepared by John Eidinger, Donald Duggan, Darlene Holston and Ken Goettel.

1.3 Abbreviations

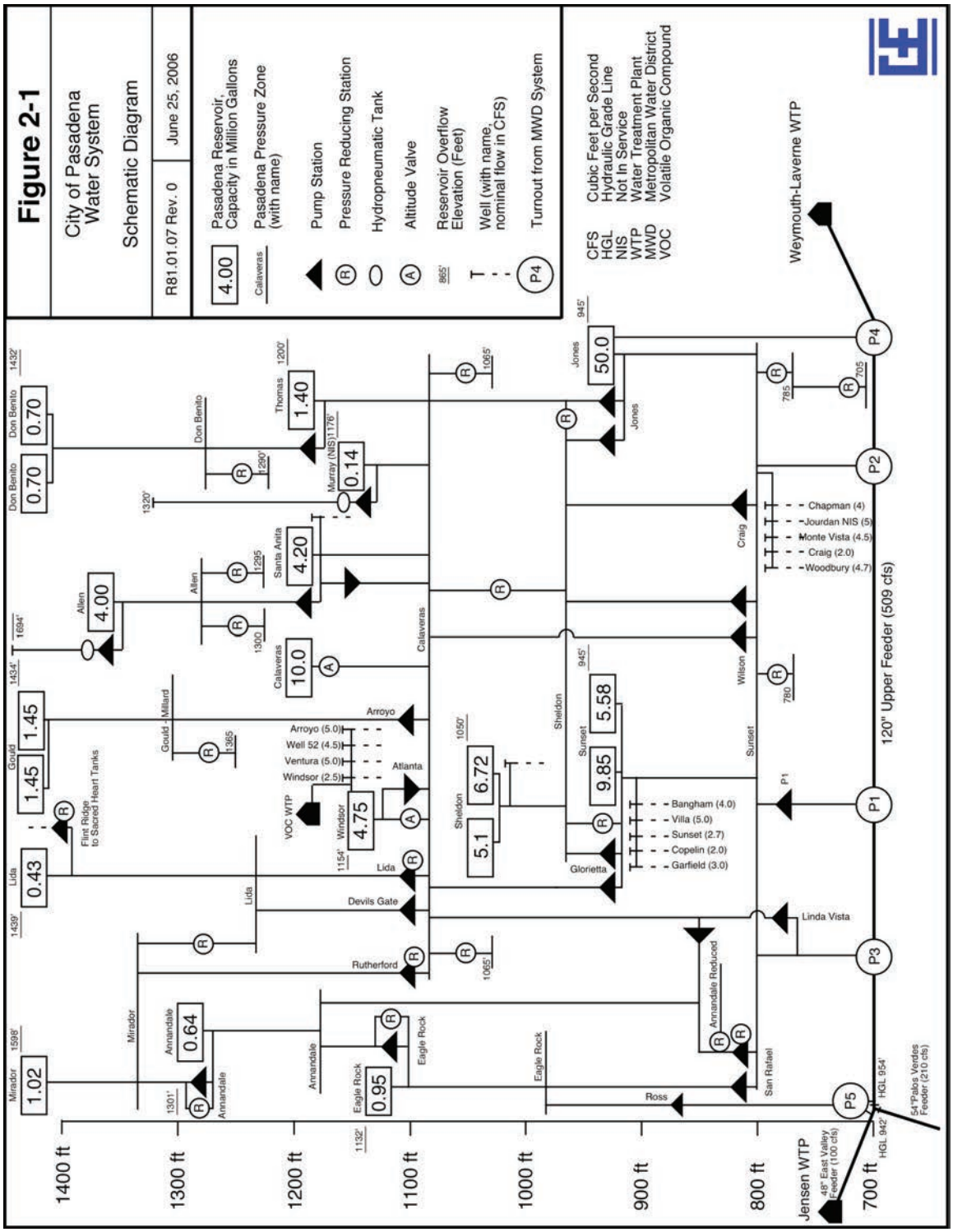
BCR	Benefit Cost Ratio
C	Hazen Williams coefficient
cfs	Cubic Feet per Second (1 cfs = 0.65 MGD)
FEMA	Federal Emergency Management Agency
FIFO	First In First Out
hp	Horsepower
g	acceleration of gravity (=32.2 feet / second / second)
G&E	G&E Engineering Systems Inc.
gpm	gallons per minute
kW	kiloWatt
M	Magnitude (moment)
MG	Million Gallons
MGD	Million Gallons per Day (1 MGD = 1.55 cfs)
MWD	Metropolitan Water District
MWH	Montgomery Watson Harza
OCLR	Open cut lined reservoir
PGA	Peak Ground Acceleration (measured in g)
P1-P5	Turnout abbreviations from MWD to PWP system
P1-P4	Priority 1, 2, 3 and 4 seismic upgrade packages.
PP	Pumping Plant
PWP	Pasadena Water and Power
RC	Reinforced concrete
SCADA	Supervisory Control and Data Acquisition

1.4 Limitations

The findings in this report are meant for post-earthquake planning purposes for the City of Pasadena. The findings are based on information made available to G&E Engineering Systems Inc.

2.0 Reservoir and Pumping Upgrades

Figure 2-1 shows a schematic layout of the Pasadena water system.



2.1 Water Demands

The water demands for Pasadena are estimated for the year 2020. All calculations presented in this report are based on these year 2020 demands.

The water demands are estimated based on data in the MWH report (2002). The demands are allocated within each of ten main pressure zones in the water system. By "main pressure zone", it is meant that regulated pressure zones that draw water from an uphill zone are assumed to be part of that uphill zone, for purposes of estimating reservoir storage and pump sizes for that zone.

Table 2-1 lists the water demands by main pressure zones. Maximum day demands are taken as 1.72 times ADD for each main pressure zone.

Main Zone	Total Zone Storage (gallons)	2002 ADD (MGD)	2002 MDD (MGD)	2020 ADD (MGD)	2020 MDD (MGD)
Gould Millard	2,900,000	0.99	1.70	1.22	2.10
Lida	430,000	0.22	0.38	0.27	0.47
Mirador	1,020,000	0.16	0.28	0.20	0.34
Annandale	640,000	0.51	0.88	0.63	1.08
Eagle Rock	950,000	1.23	2.12	1.52	2.61
Calaveras	20,400,000	8.39	14.43	10.33	17.78
Sheldon	11,820,000	6.70	11.52	8.25	14.20
Sunset	65,430,000	13.65	23.48	16.81	28.92
Allen	4,000,000	0.83	1.43	1.02	1.76
Don Benito	1,400,000	0.28	0.48	0.34	0.59
Total	108,990,000	32.96	56.69	40.60	69.83

Table 2-1. Water Demands by Main Pressure Zone

MWH (2002) considered fire flows for purposes of estimating storage volumes. except for Sheldon and Sunset, they assumed fire flows of 3,000 gpm for 3 hours. For Sheldon, they assumed 5,000 gpm for 5 hours; for Sunset, 4,000 gpm for 4 hours.

2.2 Reservoirs

There are 19 water storage reservoirs and tanks in the Pasadena water system. Figure 2-1 shows how the reservoirs serve the system. Table 2-2 lists the reservoir capacities, the overflow level, the bottom elevation, and the basic style of construction. Excluding the Murray reservoir (not in current service), the total storage capacity of all Pasadena reservoirs is about 109 million gallons. (The Sacred Heart tanks are not part of the Pasadena water system, but can provide flow via emergency regulator into the Lida pressure zone).

Reservoir	Minimum Water Level (feet)	Maximum Water Level (feet)	Capacity (MG)	Type	Roof System
Allen	1458	1480	4.00	OCLR	Wood with metal roof
Annandale	1283	1301	0.64	OCLR	Wood with metal roof
Calaveras	1188	1209	10.0	OCLR	Wood with metal roof
Don Benito 1	1402	1432	0.70	Steel	Wood roof
Don Benito 2	1402	1432	0.70	Steel	Wood roof
Eagle Rock	1114	1132	0.95	OCLR	Wood with metal roof
Gould 1	1411.6	1433.6	1.45	Steel	Aluminum dome
Gould 2	1411.6	1433.6	1.45	Steel	Aluminum dome
Jones	917	945	50.0	OCLR	RC walls and roof
Lida	1421	1439	0.43	OCLR	Concrete Roof
Mirador	1577	1598	1.02	OCLR	Wood with metal roof
Murray	1170	1176	0.14	OCLR	Wood
Sacred Heart		1710	0.8		Emergency only
Santa Anita	1186	1207	4.20	OCLR	Wood with metal roof
Sheldon 1	1032	1050	6.72	OCLR	Wood with metal roof
Sheldon 2	1031	1050	5.10	OCLR	Wood with metal roof
Sunset 1	928	945	5.58	OCLR	Wood with RC walls, metal roof
Sunset 2	928	945	9.85	OCLR	Wood with RC walls, metal roof
Thomas	1185	1200	1.40	RC	RC walls and roof
Windsor	1140	1154	4.80	OCLR	Wood with metal roof
Total			109.1		

Table 2-2. Reservoirs (Existing, 2005)

The Murray hydropneumatic tank is 2,500 gallons. The Allen hydropneumatic tank is 3,600 gallons. The Sacred Heart tank serves the Lida zone. The Altadena reservoir, with total storage capacity of 1.2 MG, is owned 2/3 by Foothill MWD and 1/3 by Pasadena, would serve the Calaveras zone by gravity flow.

The required storage can be considered as the sum of three components: equalizing storage, emergency storage, fire flow storage. Storage volumes also consider water detention times with respect to water quality issues. The components are described below:

- Equalizing storage, plus
- Emergency storage, plus
- Fire flow storage.

Various formulae have been used by other water utilities to establish the amount of in-system water storage. For example, for a water utility with very limited storage, the City of Brisbane (California) assumes that in-zone storage should be based on the following formula:

$$Storage = 1.33 * (0.25 * MaxDayDemand + FireFlowDemand) \qquad \text{(Eq. 1)}$$

Using this formula, and considering the entire City of Pasadena as a single zone, and assuming a fire flow demand 1.2 MG, then the local storage requirement would be (year 2020):

- 1.33 x (0.25 * 69.8 + 1.2) = 24.8 MG

The City of Pasadena currently has much more storage (109 MG) than this very limited storage (24.8 MG). The City of Brisbane recognizes that their storage is limited, and in part to increase system-wide reliability, Brisbane has permanently installed emergency generators and/or pumps with permanent standby power at every one of their pump stations.

Other water utilities use different formulae. For example, the East Bay Municipal Utility District (serving 22 cities in the eastern San Francisco Bay Area, California) assumes that in-zone storage should be based on the following formula:

$$Storage = 1.5 * MaxDayDemand + FireFlowDemand \qquad \text{(Eq. 2)}$$

Using this formula, and considering the entire City of Pasadena as a single zone, then the local storage requirement would be (year 2020):

- 1.5 x 69.8 + 1.2 = 105.9 MG

The EBMUD storage capacity is actually applied in a zone-by-zone basis, such that every pumped pressure zone must meet this criteria. In practice, EBMUD has quite a bit more storage (almost 700 MG), and over the past decade or so has been taking older reservoirs out of service in order to improve system-wide water quality. In its pumped pressure zones and in all newer developments, EBMUD only requires storage per (Eq. 2).

The storage requirements accurately adopted by other water utilities usually fall between the two extremes of Brisbane (limited storage) and EBMUD. This was not always the case, and fifty years ago it would not have been uncommon to plan for three (or more) days storage. Over the past decades, as power supplies have become more reliable, and with the implementation of real-time SCADA systems to monitor water levels, the need for very high local storage volumes has decreased. Under normal circumstances, including typical power outages and winter storms, EBMUD's pumped zones (lacking standby power) have had no water outages.

MWH (2002) proposed a storage requirement per pressure zone of 0.8*MDD + fire flows.

$$Storage = 0.8 * MaxDayDemand + FireFlowDemand \qquad \text{(Eq. 3)}$$

In consideration of emergency situations like common power outage, the amount of storage for Pasadena should consider the following issues:

- There should be sufficient local storage to carry Pasadena without impact to customers should there be typical outages due to power outage (common winter storm); regional power outage (summer time load imbalance or storm); or a not too uncommon water turbidity event in the MWD system. A minimum time for such types of outages would be 8 hours; EBMUD assumes 36 hours. It is likely that having sufficient water for 24 hours should be able to carry Pasadena through most "normal" disruptions; and a total water outage anywhere in Pasadena due to a lack of water supply would not occur much more than once every 50 to 200 years (barring a large earthquake).

It is therefore concluded that for purposes of Pasadena, a reasonable water storage criteria would be as follows:

- City Wide: 1.5 times maximum day demand plus fire flow. The City already more or less meets this criteria, assuming year 2020 maximum day demand.

- Pumped pressure zones, without standby power. Provide (ideally) 1.5 times (maximum day demand for that zone plus local area fire flow).

- Pumped pressure zones, with reliable standby power. Provide (minimum) 0.33 times maximum day demand for that zone plus 1.33 times local area fire flow; plus the ability to pump the required fire flow using permanent standby power.

In Pasadena, the high fire risk areas where there is limited water storage and small diameter water pipes are the Don Benito, Mirador, Annandale, Lida and Eagle Rock pressure zones. Under adverse conditions (high winds and low humidity in the dry September – October time frame), it is possible that a small ignition, if not controlled rapidly, could lead to a conflagration. It is doubtful that a water system upgrade could cost-effectively provide sufficient water supply to control a large conflagration in these areas. (One upgrade alternative would be to upgrade all these zones to be able to provide fire flows of 1,500 gpm simultaneously at two separate fronts for 4 hours, while simultaneously allowing for water loss through open service connections). It is more likely that alternative strategies (rapid ignition detection and response; active fuel management; fire department training, etc.) might provide a better overall strategy.

Using the above criteria, we estimate the storage needed for each main pressure zone. To do this, we use the water demands in Table 2-1, plus the following fire flows: for all the

smaller pressure zones, the fire flows were assumed to be 1,500 gpm for 2 hours; for Calaveras 3,000 gpm for 4.33 hours; for Sheldon and Sunset, 3,000 gpm for 3.33 hours.

The results from these calculations are provided in Table 2-3. The calculations in MWH (2002) rely on somewhat different fire flows and zone demands.

Main Zone	Total Zone Storage (MG)	Surplus Brisbane (MG)	Surplus EBMUD (MG)	Deficit Brisbane (MG)	Deficit EBMUD (MG)	Deficit MWH (MG)
Gould Millard	2.90	1.96			0.43	
Lida	0.43	0.04			0.45	1.10
Mirador	1.02	0.67	0.33			
Annandale	0.64	0.04			1.16	1.67
Eagle Rock	0.95			0.16	3.14	2.74
Calaveras	20.40	13.45			7.04	
Sheldon	11.82	6.30			10.07	3.50
Sunset	65.43	55.02	21.45			
Allen	4.00	3.18	1.18			
Don Benito	1.40	0.96	0.33			
Total	108.99	81.62	23.29	0.16	22.29	9.01

Table 2-3. Water Storage by Pressure Zone (2020)

Before deciding whether or not a particular pressure zone needs additional storage, one should also consider the type of water supply available to that zone (via gravity or pumping), whether there is additional water supply available from upper zone storage via pressure regulator, system hydraulics, and earthquake reliability factors.

From Table 2-3, only the Eagle Rock zone shows some amount of deficit of storage when using any of the three methods of calculation. We recommend that the Eagle Rock reservoir be increased in storage capacity by 300,000 gallons. This can be achieved by removing the reservoir roof, installing short height walls around the reservoir, and then reinstalling the reservoir roof. The upgrades would meet the latest seismic criteria (G&E 2006c). After the upgrade, the reservoir will still be essentially invisible to neighbors, and will provide better fire protection for the area. The cost of this upgrade is estimated to be $1,150,000, including construction, engineering, planning and inspection.

It can be seen that the EBMUD criteria results in more local storage than either the MWH or Brisbane criteria. The much lower storage suggested using the Brisbane criteria requires that every pumping plans have permanent standby power; the EBMUD criteria assumes that no pumping plant has any standby power. It is apparent that there is a trade-off between storage and pumping as two sources of water for a pressure zone, and that some reduction in local storage seems reasonable if there is more reliable water available from pumping. For design of new elevated pressure zones, it is not uncommon that no local-in zone storage is provided, (addressing the topography, land available and "view" issues voiced by neighbors) should the pump station be outfitted with variable speed pumps, and the ability to pump the fire flows, without the need for offsite power.

As is recommended in the Seismic Vulnerability Assessment (G&E 2006a), several pumping plants should be retrofitted to include quick connect couplings (or bypass pumping tees), with the ability of have available within a short time (8 or less for hillside zones, 16 hours or less for the Calaveras and Sheldon zones) suitable portable / permanent emergency generators or portable pumping, or reliable power (reliable meaning power is restored within these time periods after a major earthquake on the any of the Sierra Madre, Verdugo-Eagle Rock or Raymond faults) delivered by the city-wide electric system, to push water from lower to upper zones before those zones are likely to go "dry" after a major earthquake. The primary reason for this equipment is that very large nearby earthquakes are likely to cause long term power outages for essentially the entire City of Pasadena for up to 36 to 72 hours (G&E 2006b); although with some limited mitigation efforts to the Pasadena power system, City-wide power outages can be reduced by half (these mitigation activities are described in G&E 2006b). In the interim time, water demands from consumption, fire flows and leakage through broken pipes can lead to complete loss of water supply from storage in the smaller up-hill pressure zones within about 8 hours; and the lower elevation large zones (Calaveras, Sheldon and Sunset) within about 16 hours. Thus, it is important to be able to draw water from lower elevation zones (or MWD if available) and pump the water uphill within these time frames.

In a major earthquake on the Sierra Madre fault, it is possible that the MWD Upper Feeder will be damaged for 90 days or longer, due to fault offset through tunnel portions of that conduit. In this case, it is important to restore power to Pasadena's wells within a few hours after the earthquake, so that there will be sufficient water within the city. The Seismic Vulnerability Assessment (G&E 2006a) describes the quick connect upgrades needed for the wells.

For these reasons, upgrades to pump stations and wells are recommended to have a reliable way of restoring water supply and pumping within a few hours after any earthquake that includes a City-wide power outage.

2.3 Pump Stations

There are 21 pump stations (also called booster stations) in the Pasadena Water System. Figure 2-1 shows how these pump stations function to move water between pressure zones. Table 2-4 provides key operational capacities of the pump stations. (Source data for Table 2-4 from annual year books, supplemented by data from MWH (2002)).

Pump Station	Pump Number	Pump Rated Capacity, horsepower	Pump Rated Capacity, gpm	Discharge Head, feet	Zone Served
Allen	#1	7.5	110	110	Allen Hydro
	#2	40	457	216	Allen Hydro
	#3		400	180	Allen Hydro
Annandale	#1	40	321	325	Mirador
	#2	40	299	317	Mirador
Arroyo	#2	40	317	295	Millard / Gould
	#3	40	750[1]		Millard / Gould
Atlanta	#3	60	2,700	70	Calaveras
(5.9)	#4	100	3,620	69	Calaveras
Craig	#2	125	1480	149	Sheldon East (Brigden)
	#3	40	1002	130	Sheldon East (Brigden)
	#4	40	1002	130	Sheldon East (Brigden)
Devils Gate	#1	60	575	316	Lida
	#2	60	550	321	Lida
Eagle Rock	#1	30	320	280	Annandale
	#2	40	420	220	Annandale
Flint Ridge	#1	60	550	320	Sacred Heart
	#2	60	550	320	Sacred Heart
Glorietta	#1	300	4,600	360	Calaveras
	#2	400	4,500	309	Calaveras
	#3	150	3,580	134	Sheldon
Jones	#2	150	1,677	262	Thomas / Calaveras
	#3	50	1,100	124	Sheldon
	#4	50	396	278	Thomas / Calaveras
	#5	150	1,898	284	Thomas / Calaveras
	#6	125	2,200	155	Sheldon

Table 2-4. Pump Stations (Part 1)

[1] One of the two pumps at Arroyo was upgraded in 1999 from 307 gpm to 750 gpm, per MWH 2002.

Pump Station (Report Section)	Pump Number	Pump Rated Capacity, horsepower	Pump Rated Capacity, gpm	Discharge Head, feet	Zone Served
Lida	#1	50	400	270	Lida
	#2	50	400	270	Lida
Linda Vista	#1	200	2,250	290	Calaveras
	#2	20	360	145	Annandale
Murray	#1	20	250	150	Murray Hydro
	#2	20	250	167	Murray Hydro
P1	#1				Sunset
Ross	#1	50	744	198	Eagle Rock
	#2	50	748	201	Eagle Rock
Rutherford	#1	40	280	405	Mirador
	#2	40	280	405	Mirador
San Rafael	#1	40	400	240	Eagle Rock / Annandale
	#2	100	1,200	214	Eagle Rock
	#3	75	1,200	214	Eagle Rock
Santa Anita	#1	125	1,340	299	Allen
	#2	250	2,200	220	Allen
	#3	250	2,200	220	Allen
Thomas	#3	100	1,000	238	Don Benito
	#4	100	1,000	238	Don Benito
VOC			3,500		Windsor Reservoir
			3,500		Windsor Reservoir
Wilson	#1	200	4,150	165	Sheldon
	#2	200	4,495	152	Sheldon
	#3	200	2,420	282	Calaveras
	#4	200	2,275	280	Calaveras
	#5	200	2,345	280	Calaveras

Table 2-4. Pump Stations (Part 2)

We examined the possible need to upgrade pump stations (booster stations) to increase pumping capacity. Table 2-5 considers only booster pump stations (all water supply from MWD), and assumes that the largest pump serving a zone is out of service.

In Table 2-5, we assume that the preferred water source for Mirador zone is via the Rutherford pumping plant.

Pressure Zone to be Supplied	Year 2020 MDD (MGD)	Supply Booster Stations	Pumping Rate with largest pump out of service (MGD)	Pumping Rate with largest pump out of service (gpm)	Time to pump 2020 MDD[2] (hours)
Don Benito	0.59	Thomas	2.88	1,000	9.9
Gould / Millard	2.10	Arroyo	0.46	317	110.3
Lida	0.47	Lida, Devils Gate	1.61	1,121	6.9
Mirador	0.34	Annandale, Rutherford	1.24	859	6.6
Annandale	1.08	San Rafael, Eagle Rock, Linda Vista 2	1.58	1,080	16.4
Eagle Rock	2.61	Ross, San Rafael	3.88	2,692	16.1
Eagle Rock + Annandale	3.69	Ross, San Rafael, Linda Vista 2	4.39	3,052	20.2
Eagle Rock + Annandale + Mirador	4.02	Ross, San Rafael, Linda Vista 2, Rutherford	5.20	3,540	18.6
Allen + Allen Hydro	1.81	Santa Anita	5.10	3,540	8.5
Sheldon	14.2	Wilson, Jones, Craig, Glorietta	20.90	14,514	16.3
Calaveras	17.78	Atlanta, Glorietta, Jones, Linda Vista, Wilson	34.68	24,080	12.3
Calaveras + Don Benito + Allen + Gould + Lida + Mirador	22.97				15.9

Table 2-5. Time to Pump Maximum day Demand

As seen in Table 2-5, the Gould / Millard zone cannot be supplied at year 2020 Maximum Day Demand rate (estimated at 2.1 MG) using just the existing Arroyo pumps,

[2] The pump flows are based on available pump capacity information, generally assuming only one pump turned on in the zone at a time. When multiple pumps are turned on, each becomes somewhat more inefficient, due to rising head losses with increased water velocity in the pipe network. Therefore, the time to fill values may be low.

assuming one out of service, as it would take 110 hours to supply 24 hours worth of water. Year 2000 ADD for the Gould / Millard zone is about 1.70 MGD, so even with both pumps on, the year 2000 maximum day demand cannot be met by pumping alone.

At present time, this shortfall can be met via supply from the in-zone Gould tanks (as long as maximum day demands abate within a few days) and in emergency, via interconnects 14 and 18 with the Lincoln Avenue Water Company (see MWH page 134 Figure 4-1).

EBMUD sizes its pump stations to be able to pump maximum day demand within 18 hours, assuming the largest pump out of service. The "18 hour" target duration was set for two reasons:

- Many power companies establish provide time-of-use schedules that provide lower cost electricity should no power be used during peak demand times, generally in the late afternoon. This ultimately saves money for the water company, by lowering peak electric power demands on the power company. In Pasadena, the water department currently does not have such a rate schedule, although it might be considered in the future.

- Being able to pump the maximum day demand within 18 hours provides a further factor of safety in the overall design of the water system.

As can be seen from Table 2-5, the Gould / Millard zone is clearly deficient in terms of pumping capacity. Table 2-5 also shows that the Eagle Rock zone including its higher elevation supported zones (using the combined pumps at Ross, San Rafael, Linda Vista and Rutherford pumping plants) is moderately short on pumping capacity when using the EBMUD criteria.

MWH (Page 7-31) recommends abandoning the Annandale PP. They report that the pumps are seldom used due to a cycling problem with the automatic controls, and water hammer; and instead, the Rutherford pump station is commonly used to fill the Mirador reservoir. From an earthquake risk reduction point of view, using the Annandale pump station is useful to push water from MWD turnouts P5 to the Mirador zone, after a Sierra Madre earthquake (MWD turnouts P4 and P2 will be unavailable, and depending on damage pattern, MWD turnouts P1 and P3 may not be able to get water from the East Side feeder), therefore avoiding the need to re-pump the water and lessening the high flow rates from the Eagle Rock zone into the Sunset zone via the regulating station at the San Rafael pumping plant. MWH noted it would cost about $650,000 to rehab the Annandale pump station. From an earthquake point of view, a portable pump placed at the Annandale pump station would serve much the same purpose, so in an earthquake emergency causing long term loss of the Upper Feeder, it would be suitable to maintain the site with (at least) the ability to do bypass emergency pumping (keep space available to leave the portable pump, and a lower pressure and high pressure fire hydrants for hookup).

Ross PP. As described in the SVA (G&E 2006a), the Ross PP should be upgraded from its current 2 MGD (3 cfs) rate to at least 5 MGD (8 cfs) (ideally upgraded to 8 MGD) to be able to supplement local wells should there be a long term outage of the Upper Feeder (likely in a large Sierra Madre earthquake event).

Arroyo PP. To meet the EBMUD pumping criteria (pump MDD in 18 hours), a total of 2.79 MGD pumping capacity would be required, not including the largest pump. Currently, there are two 310 gpm pumps (MWH reports one 310 gpm pump and one 750 gpm pump). The discharge head for Arroyo Seco pump station is relatively high (about 300 feet). As the Gould zone already has sufficient in-zone storage, even using EBMUD criteria, then it might be acceptable to relax the pumping criteria to something like meeting MDD in 24 hours, with the largest pump out of service. Thus, the target pump station size for Arroyo Seco is three 750 gpm (= 1.08 MGD = 1.7 cfs) pumps (one existing plus two new). In comparison, MWH proposes that the pump station be upgraded from the existing 0.7 cfs + 1.7 cfs pumps to 2.4 cfs + 1.7 cfs + 2.4 cfs, which would provide a reliable pumping capacity of 4.1 cfs (= 2.7 MGD). MWH assumes a somewhat higher peaking factor for the Gould / Millard zone that does G&E, resulting in somewhat different calculations. Table 2-6 summarizes the findings:

Arroyo Pump	Existing (MGD)	G&E Recommended Year 2020 (MGD)	MWH Recommended Year 2002 (MGD)	MWH Recommended Year 2020 (MGD)
2	0.46	1.08	1.55	1.94
3 (horizontal)	1.08	1.08	1.08	1.08
4	-	1.08	1.55	1.94
Reliable Capacity	0.46	2.16	2.63	3.02

Table 2-6. Arroyo Seco Pump Station

3.0 Reservoir Mixing Time Evaluations

We examined the water mixing characteristics of the water reservoirs and tanks, with the intent to help decide whether the inlet-outlet piping to these reservoirs should be altered as part of the overall seismic improvements.

The MWH 2002 Master Plan goes into detail about the need to make various water system upgrades to address pressure, fire flows, pipe age and other factors. In Section 3 of this report, we address *only* the issue of water mixing within each existing reservoir, and given these issues, make recommendations as to how to modify inlet-outlet pipes (or reservoir operations) in order to promote better mixing of water within the reservoirs.

Water quality within the Pasadena water system has more to do than just mixing of water within the reservoirs. For example, to maintain high water quality, as measured by chlorine levels, travel times of water in the distribution system should be kept as short as possible. Network travel times are affected by many factors such as the spatial and temporal distribution of demands, pipe sizes, pipe wall characteristics and network geometry. In addition to the transit time through the pipes, water is often stored in tanks to reduce pumping costs or maintain fire protection levels. Tank/reservoir detention (residence) times may be long and can negatively impact water quality in the overall system. Poor mixing and long detention times in tanks/reservoirs can lead to loss of disinfectant residual, microbial re-growth, and the formation of disinfection by-products. The hydraulics of mixing of waters within tanks/reservoirs must be understood to correctly represent the effect of tank/reservoirs detention times on overall system water quality.

Once water enters a tank / reservoir, the internal water flows and constituent distribution can be modeled by a number of approaches. The most complex is computational fluid dynamics modeling that includes a detailed physical tank description. A simpler model can be used for preliminary evaluation; this simpler model considers how water entering each tank might stir the existing water within the tank. With sufficient stirring, the water quality essentially everywhere in the tank will be about the same. Another level of refinement considers movement of the water in the tank as uniform layers assuming different types of plug flow. This report relies upon these simpler models to consider water detention times.

To introduce spatial variability within a tank, the tank can be partitioned into several compartments to represent the flow patterns and mixing zones within the tank. Such systems are conceptual descriptions rather than fully portraying the complete physical processes, and ideally they should be formulated and calibrated with field data.

Flow to many tanks/reservoirs is provided with sufficient momentum that causes the water to be nearly completely mixed. Under this assumption, at a given instant, the water in the tank is a uniform blend of all waters that have entered the tank/reservoir over time.

Each reservoir and tank in the Pasadena system can be thought of as being in one of four styles of mixing:

- Complete Mixing. This assumes that all water enters a tank and is instantaneously and completely mixed with all water already in the tank. This is the simplest behavior to assume in hydraulic analyses. This assumption seems to apply quite well to a large number of facilities that operate in a fill-and-draw fashion. For example, complete mixing assumption is reasonable under current operating conditions for the existing Don Benito (both tanks), Lida, Annandale, Mirador, Murray, Thomas (both basins), Allen and Santa Anita reservoirs.

- Two Compartment. This assumes that the tank operates into two compartments, both of which are completely mixed. The inlet-outlet pipe of the tank only fills or draws water from the first compartment, where it is completely mixed. If the first compartment is full, then water overflows into the second compartment, where it is completely mixed. Water leaves the first compartment, which, if full, receives an equivalent amount of water from the second compartment. The second compartment represents water in "dead" zones. for example, the Calaveras reservoir appears to currently operate with "two compartments", with sufficient mixing occurring near the inlet-outlet pipe, but not at locations far away from the inlet-outlet pipe.

- FIFO Plug Flow. This assumes that the water that is "first in (FI)" is the same water that is "first out (FO)". This assumes that there is no mixing of water within the tank; instead, all the water moves through the tank in a segregated fashion. This approximates a tank with internal baffles with one inlet pipe and a separate outlet pipe, with simultaneous inflow and outflow. For example, the Eagle Rock, Gould (both tanks), Windsor, Sunset (both basins) and Jones reservoirs normally operate with FIFO plug flow.

- LIFO Plug Flow. This assumes that the water that is "last in (LI)" is the same water that is "first out (FO)". This assumes that there is no mixing of water within the tank. Instead, each "plug" of water enters the tank from the inlet pipe, and the water parcels stack up on one another, with water entering and leaving the tank from the bottom. This type of model might apply to a tall, narrow standpipe with an inlet-outlet pipe at the bottom of the tank, and where the water enters the tank with low momentum flow. There are no tanks or reservoirs in the Pasadena system that currently approximate this condition.

Using the storage volumes and pressure zone demands described in Section 2, we first evaluated the average detention times for (totally mixed) water in each reservoir. the results are in Table 3-1.

Zone	Storage	Winter 2020	ADD 2020	MDD 2020	Winter	ADD	MDD
	Gallons	Gal per Day	Gal per Day	Gal per Day	Days	Days	Days
Gould Millard	2,900,000	914,609	1,219,478	2,097,502	3.17	2.38	1.38
Lida	430,000	203,246	270,995	466,112	2.12	1.59	0.92
Mirador	1,020,000	147,816	197,087	338,990	6.90	5.18	3.01
Annandale	640,000	471,162	628,216	1,080,532	1.36	1.02	0.59
Eagle Rock	950,000	1,136,332	1,515,109	2,605,988	0.84	0.63	0.36
Calaveras	20,400,000	7,751,077	10,334,769	17,775,803	2.63	1.97	1.15
Sheldon	11,820,000	6,189,775	8,253,034	14,195,218	1.91	1.43	0.83
Sunset	65,430,000	12,610,513	16,814,017	28,920,109	5.19	3.89	2.26
Allen	4,000,000	766,793	1,022,391	1,758,512	5.22	3.91	2.27
Don Benito	1,400,000	258,677	344,903	593,233	5.41	4.06	2.36
Total	108,990,000	30,450,000	40,600,000	69,832,000	3.58	2.68	1.56

Table 3-1. Water Detention Times, Assuming Complete Mixing Daily (Year 2020)

Table 3-1 lists the average detention times for all the reservoirs in each pressure zone, assuming year 2020 demands, and assuming that the tanks are completely mixed each day. Year 2020 demands are assumed to be about 17% higher than demands in the 2000 to 2002 time frame. As can be seen, the existing storage and year 2020 demand patterns suggest the following:

- Mirador Reservoir. In the winter time, water demand is so low that the reservoir will commonly have water in it for about 7 days. Even if completely mixed, this is a long time. Re-chlorination (sweetening) in Mirador reservoir is likely needed.

- Gould Tanks. The 3.17 day turnover in the Gould Tanks during the winter time can be readily reduced to half this level, by taking one of the two tanks out of service during the winter months (December 1 through March 31), corresponding to low fire threat season. The water remaining in one of the two Gould tanks is sufficient to meet normal electric power outages in the winter time, while maintaining about 1 day supply plus fire flows for the zone.

- Sunset. The 5.19 day turnover for the Sunset 1, 2 and Jones reservoirs is slow for winter time demands. This can be somewhat reduced by lowering the operating level of the Sunset and Jones reservoirs in the winter time; re-chlorination (sweetening) in these reservoirs is likely needed.

- Allen. The 5.22 day turnover for the Allen reservoir is slow for winter time demands. Re-chlorination (sweetening) in this reservoir is likely needed.

- Don Benito Tanks. The 5.41 day turnover in the Don Benito Tanks during the winter time can be readily reduced to half this level, by taking one of the two tanks out of service during the winter months (December 1 through March 31), corresponding to low fire threat season. The water remaining in one of the two Don Benito tanks is sufficient to meet normal power outages in the winter time,

while maintaining about 1 day supply plus fire flows for the zone. Re-chlorination (sweetening) in Don Benito tanks is likely needed.

As described in the MWH report (2002), PWP has noticed high nitrite levels in the Sunset, Jones, Sheldon, Mirador, Lida and Gould reservoirs and the southwest portion of the Sunset pressure zone (MWH p. 7-60). One of the major sources of nitrification problems is the mixing of MWD water, which is chloraminated (chlorine plus ammonia), and Pasadena well water, which is disinfected with free chlorine. Mixing of free chlorine and chloramines eliminates both disinfectants.

The high nitrite levels observed at Lida and Sheldon are not only due to long average detention times from in-zone water. Lida water must first be detained in the Calaveras zone. Sheldon water must first be detained in the Sunset zone.

PWP has developed a Nitrification Control and Monitoring Plan. This plan provides early detection and elimination of conditions that would promote nitrification. During summer months, PWP staff test nitrite levels in the reservoirs daily, less often in other months. If nitrite (NO2) levels are above 5 mg/L two days in a row, action is taken immediately.

Disinfectant levels reduce over time, with chloramines residuals dropping to negligible levels in about a week. Reservoirs with low turnover (such as Mirador, Lida and Gould) are prone to nitrification due to longer detention times, as the water has already flowed through several other reservoirs. Operationally, low disinfectant levels in Mirador, Annandale and Lida reservoirs have been addressed by using water from MWD connection P3 (at Linda Vista PP) and "deep cycling" the reservoirs. "Deep cycling" consists of draining the reservoir to one-half to one-quarter full, and then turning on all the pumps to re-fill with water at higher quality and higher disinfectant level.

MWD water is delivered to PWP with a chloramine concentration of about 2.5 mg/L. Water from PWP wells is chlorinated and is blended at the A basin, making the concentration about 1.0 mg/L within Sunset reservoir. This low concentration has led to nitrification in the southwest part of the Sunset pressure zone. This has been partially offset by dropping water from P5 (via Ross PP, Eagle Rock reservoir and the PRV at San Rafael PP) into the Sunset zone, with a concentration of about 2.5 mg/L.

Jones reservoir is typically a FIFO Plug reservoir, with water from P4 entering at the north end, and leaving at the south end (FIFO). Normally in the summer time, Jones gets chlormainated water from P4. In the winter time, if little MWD water is purchased at P4, then chlorinated well water may enter Jones, resulting is loss of residual.

Typical solutions to these issues include: evaluation of reservoir detention times; reservoir cycling (mixing or pumping water through the reservoir), or disinfectant sweetening (adding additional chlorine to increase the disinfectant in the reservoir). Distribution system flushing can also be used to remove water in dead-end locations.

Following the methods in Rossman and Grayman (1999), the time needed to achieve essentially complete mixing of water in each reservoir was calculated. Table 3-2 summarizes the time it would take under assumed conditions to get full mixing for each existing reservoir.

Reservoir	Capacity (MG)	Fill rate, gpm	Mixing Time (hours)	Cycle range (percent)	Recommendations to improve mixing
Allen	4.00	670	14.0	28.1	Use larger Santa Anita pumps
Annandale	0.64	145	15.1	20.5	Operate Eagle Rock pumps preferentially
Calaveras	10.0	1,500	18.2	16.4	Modify inlet-outlet pipes to create FIFO plug flow; install 16" or 20" nozzles; create two basins; increase fill rate
Don Benito 1	0.70	500	4.6	19.9	
Don Benito 2	0.70	500	4.6	19.9	
Eagle Rock	0.95	744	3.8	18.0	
Gould 1	1.45	158	23.9	15.6	Take one tank out of service in the winter, operate Arroyo 3, upgraded Arroyo PP
Gould 2	1.45	158	23.9	15.6	
Jones	50.0	5,500	14.4	9.6	
Lida	0.43	400	2.8	15.7	
Mirador	1.02	280	10.7	17.6	
Murray	0.14	396	1.0	17.0	
Santa Anita	4.20	2,275	6.7	21.9	
Sheldon 1	6.72	1790	9.8	17.2	
Sheldon 2	5.10	1790	8.2	15.6	
Sunset 1	5.58	3372	5.3	19.9	
Sunset 2	9.85	3372	7.8	16.5	
Thomas	1.40	1677	4.4	15.8	
Windsor	4.80	3,500	3.2	13.9	

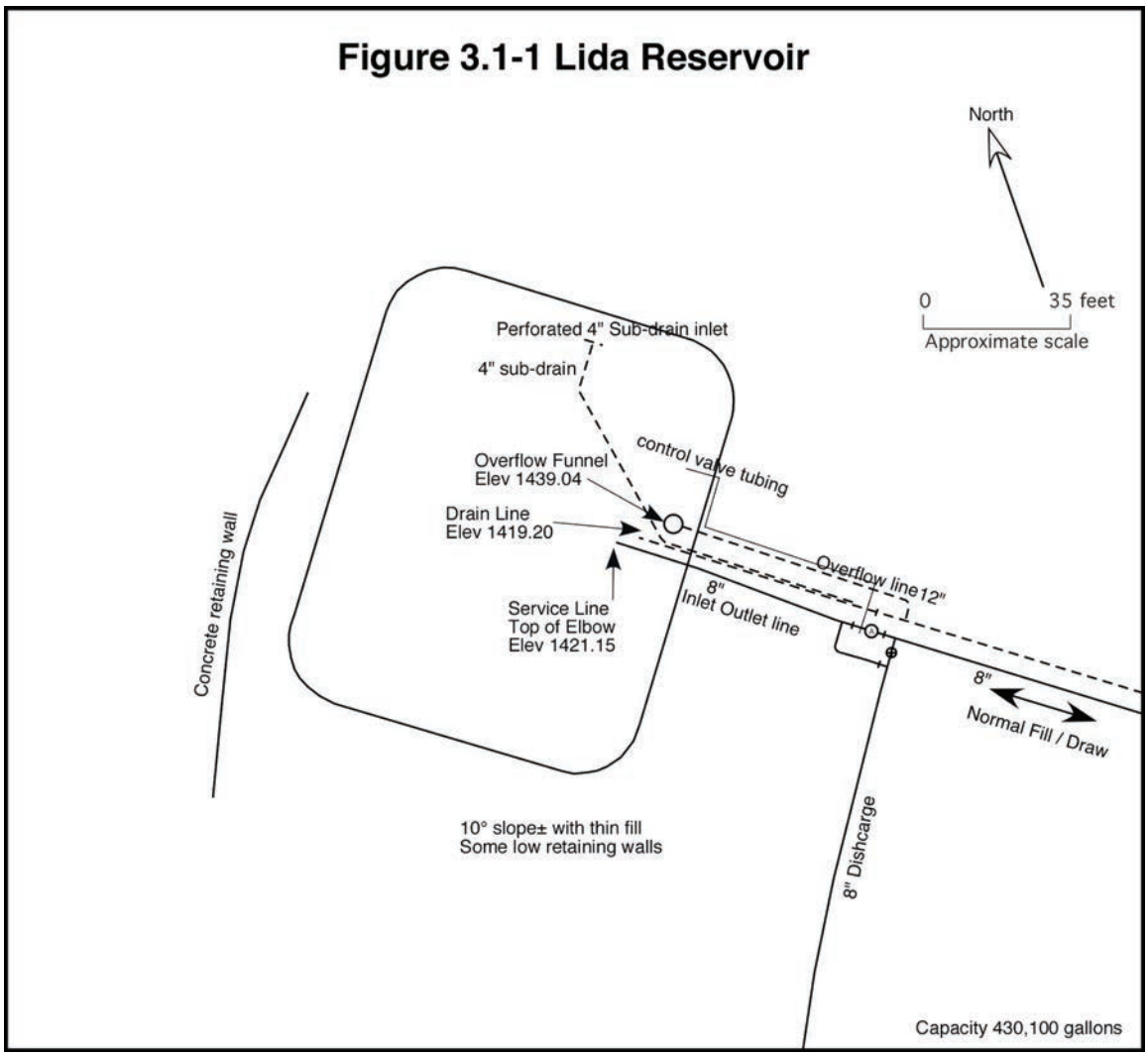
Table 3-2. Time Needed to Get Complete Mixing, At Assumed Fill Rate

In Table 3-2, the fill rate is the fill rate (gpm) for each reservoir, or basin within a reservoir, as described in the text for each reservoir in the following sub-sections. The fill rate was taken as the lowest pumping rate available for the primary pumps to that reservoir, assuming negligible in-zone demand at the time of pumping; or at the assumed MWD fill rates described in Section 3.8 (Sunset Reservoir) and Section 3.15 (Jones Reservoir).

Sections 3.1 through 3.15 summarize the issues for each reservoir.

3.1 Lida Reservoir

Figure 3.1-1 is a plan view of the Lida Reservoir. The normal fill/draw is via a 8-inch inlet/outlet pipe. The 8-inch discharge line shown in Figure 3.1-1 leads to an emergency connection with another water company, and is rarely used.

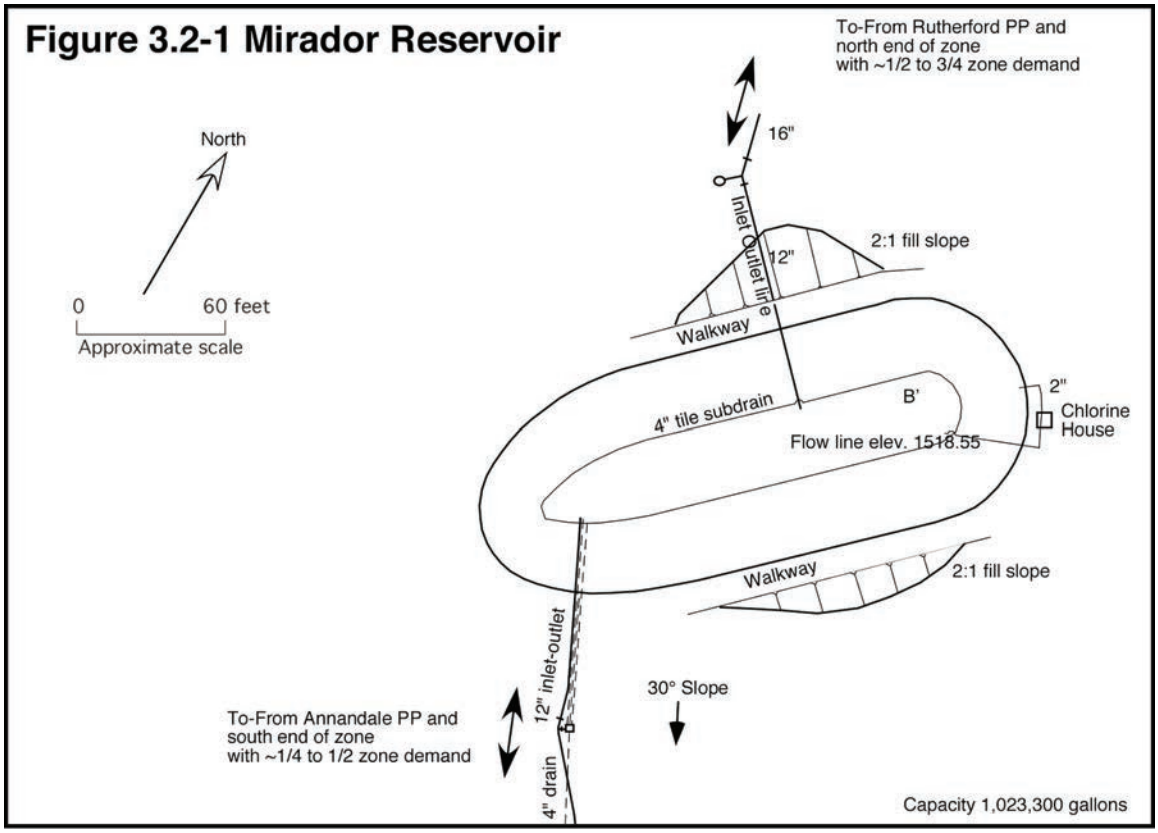


The pumps available to push water into the Lida reservoir are at the Lida pumping plant and the Devils Gate pumping plant. Assuming the smallest pump turned on at a time with near zero in-zone demand (say, in the early morning hours from midnight to 4 am), then with an 8-inch inlet pipe, complete mixing in a full reservoir should occur in about 2.8 hours.

Thus, most likely, the reservoir operates as complete mixing. Thus, no changes in inlet-outlet pipes are recommended.

3.2 Mirador Reservoir

Figure 3.2-1 is a plan view of the Mirador Reservoir.

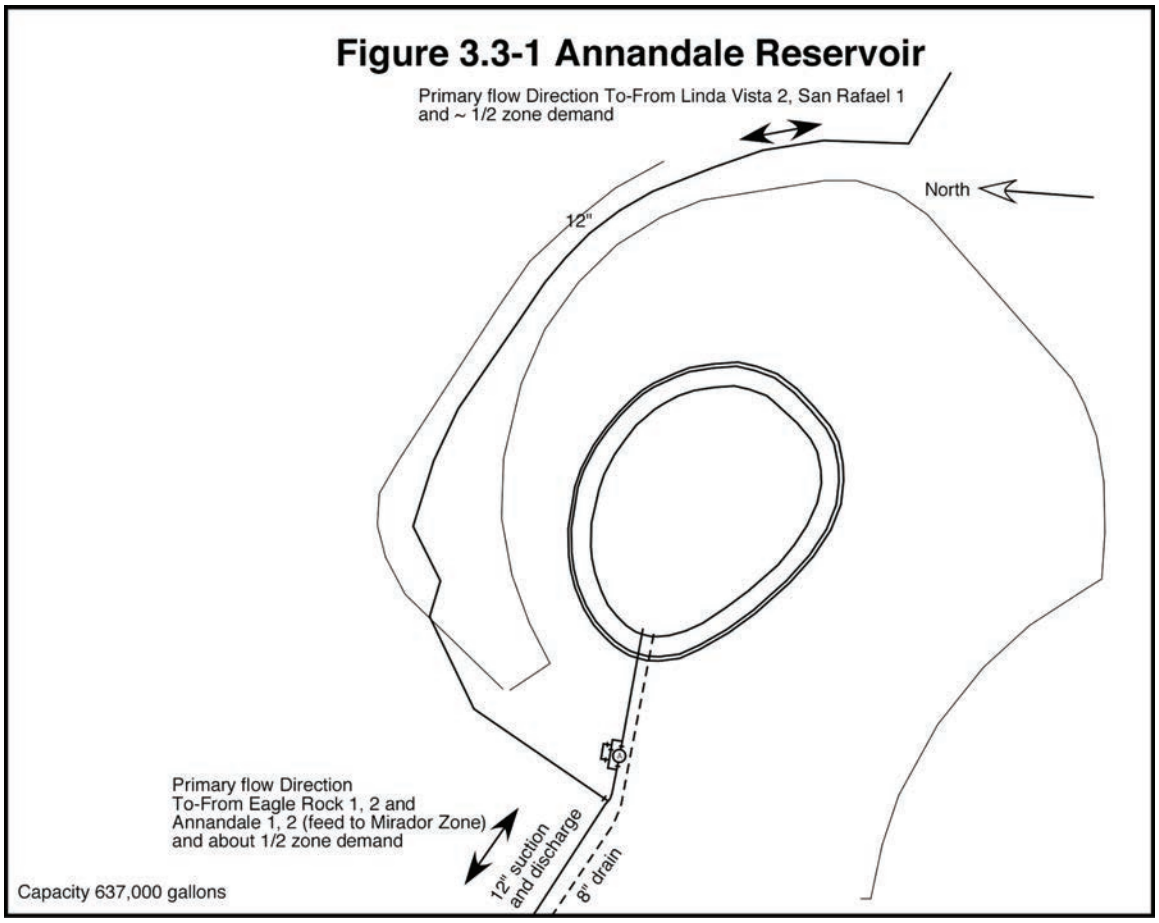


The Mirador reservoir can be filled from either the Annandale or Rutherford pumping plants. Under current normal operations, only the Rutherford pumping plant is in regular use to fill the Mirador Zone. The water normally enters the reservoir from the north inlet-outlet pipe, but leaves via both the north and south inlet-outlet pipes. There are no bypass pipes in the network to allow water form the Rutherford pumping plant to serve the south end of the Mirador zone, so water must traverse through the reservoir.

Assuming just one Rutherford pump is turned on (280 gpm), it would take 10.7 hours to achieve a mixed tank; 5.3 hours if both Rutherford pumps are turned on. Given that a portion of the water acts in FIFO flow to serve the south end of the zone, it is likely that the tank is commonly fully mixed. Thus, no changes in inlet-outlet pipes are recommended.

3.3 Annandale Reservoir

Figure 3.3-1 is a plan view of the Annandale Reservoir.



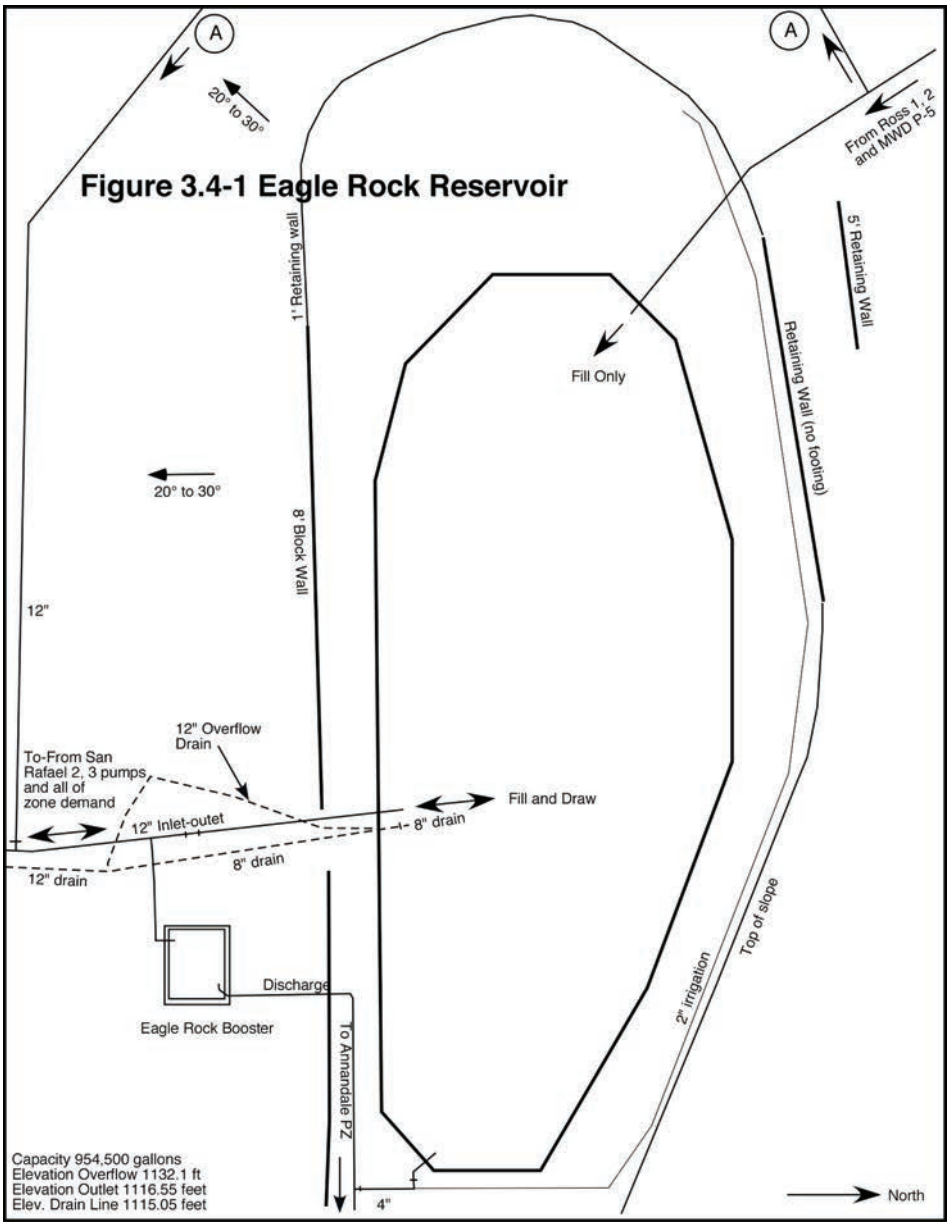
The Annandale reservoir can be filled from either the Eagle Rock, San Rafael or Linda Vista pumping plants. The water enters the reservoir from the single inlet-outlet pipe.

Assuming just the Linda Vista #2 pump is turned on (145 gpm), it would take 15.1 hours to achieve a mixed tank; 6.8 hours if just the Eagle Rock #1 pump is turned on. Thus, no changes in inlet-outlet pipes are recommended; but it is recommended that the zone be filled preferentially using the Eagle Rock pumps, then supplemented by the San Rafael pump and lastly the Linda Vista pump.

3.4 Eagle Rock Reservoir

Figure 3.4-1 is a plan view of the Eagle Rock Reservoir. The Eagle Rock reservoir can be filled by either the Ross #1 and #2 pumps, or the San Rafael #2 and #3 pumps. For purposes of water detention times, the existing Ross pumps are assumed. When filling the reservoir from the Ross PP, the valves can be set to create FIFO plug flow (all water enters via the northwest inlet and leaves via the south inlet-outlet pipe), or FILO (all water enters and leaves via the south inlet-outlet pipe).

Assuming just the Ross #1 pump is turned on (744 gpm), it would take 3.8 hours to achieve a mixed tank; less time if either San Rafael pump is turned on. It is likely that the tank is commonly fully mixed. Thus, no changes in inlet-outlet pipes are recommended.



3.5 Gould Tanks

Figure 3.5-1 is a plan view of the Gould Tanks.

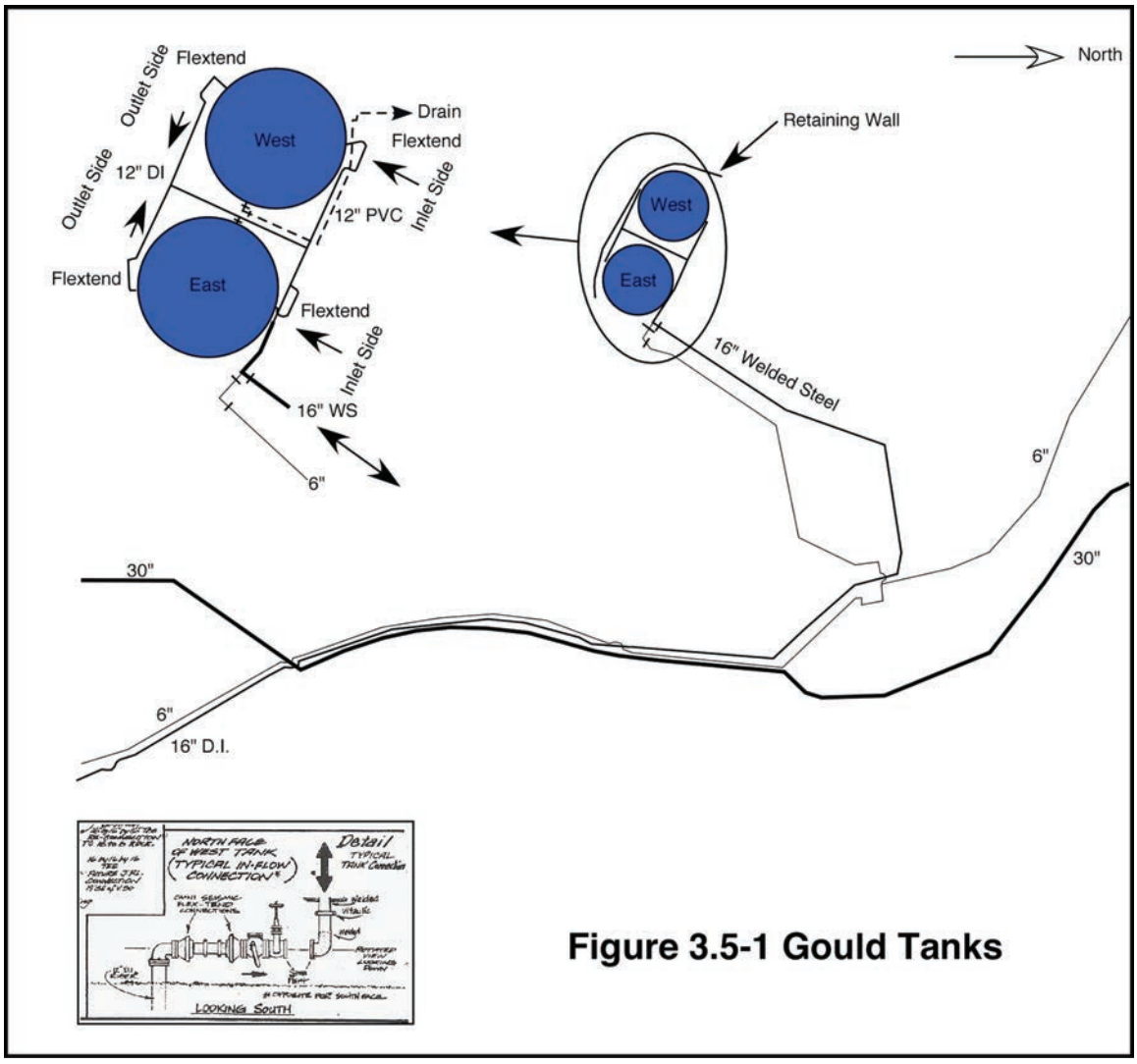


Figure 3.5-1 Gould Tanks

The Gould Tanks can be filled by the Arroyo #2 or #3 pumps. During current winter time demand, there is need for only one Gould tank in order to maintain sufficient in-zone storage one average daily demand plus fire flows. During summer time, both tanks should be kept in service.

The existing inlet and outlet pipes are set up using check valves so that water enters the northeast side of each tank, and leaves from the southwest side of each tank. Thus, the tanks are normally operated in FIFO flow.

For purposes of water detention times, the existing Arroyo #2 (317 gpm) and #3 (750 gpm) pumps are assumed. When filling just one tank using Arroyo #2, complete mixing

is reached in 11.90 hours (somewhat long). When filling just one tank using Arroyo #3, complete mixing is reached in 5.0 hours. When filling both tanks using Arroyo #2, complete mixing is reached in 23.9 hours (not acceptable).

To achieve complete mixing in the winter time, when demands in the Gould / Millard zones are currently about 0.75 MGD, water detention times in the two tanks can reach 2.9/0.75 = 3.9 days. To shorten the detention time in the winter time, it is recommended that one of the two Gould tanks be taken out of service from about December 1 through March 31 of each winter season. If both tanks are kept in service in the winter time, then the larger Arroyo #3 pump should be run preferentially to improve mixing in the tanks.

3.6 Windsor Reservoir

Figure 3.6-1 is a plan view of the Windsor Reservoir.

When the reservoir is in use, it is normally filled from the VOC WTP. In turn, the VOC WTP gets water from the Arroyo / Well 25, Well 52, Ventura and Windsor, wells. The rated pump flow[3] for these four wells is 4.5 cfs, 4.5 cfs, 4.0 cfs and 2.5 cfs, respectively. The rated pump flow[4] for these four wells as used in hydraulic models by MWH is 2,600 gpm, 2,800 gpm, 2,500 gpm and 1,320 gpm, respectively. The VOC WTP has two pumps, each rated at 3,500 gpm, to pump the accumulated well water into the Windsor Reservoir.

At the current time (2006), the reservoir is out of service, pending resolution to the water quality issues associated with the four wells that normally fill it.

Water from the VOC normally enters the reservoir via the sand box, located in the northwest corner of the reservoir. A k-rail wall (about 3 feet high, resting on the gunite floor of the reservoir) is installed on the floor of the reservoir, presumably to force FIFO type operation of the reservoir when it is filled for the first quarter (or so) of its capacity. Once water reaches over the height of the k-rail wall, then the reservoir acts like one large basin, with the k-rail acting to promote mixing of the water going over the sandbox weir.

The Behner WTP is no longer in service, so there is no longer any inflow of water from that source.

[3] Well flow rates in cfs taken from PWP SCADA system.

[4] Well flow rates in gpm taken from MWH hydraulic model.

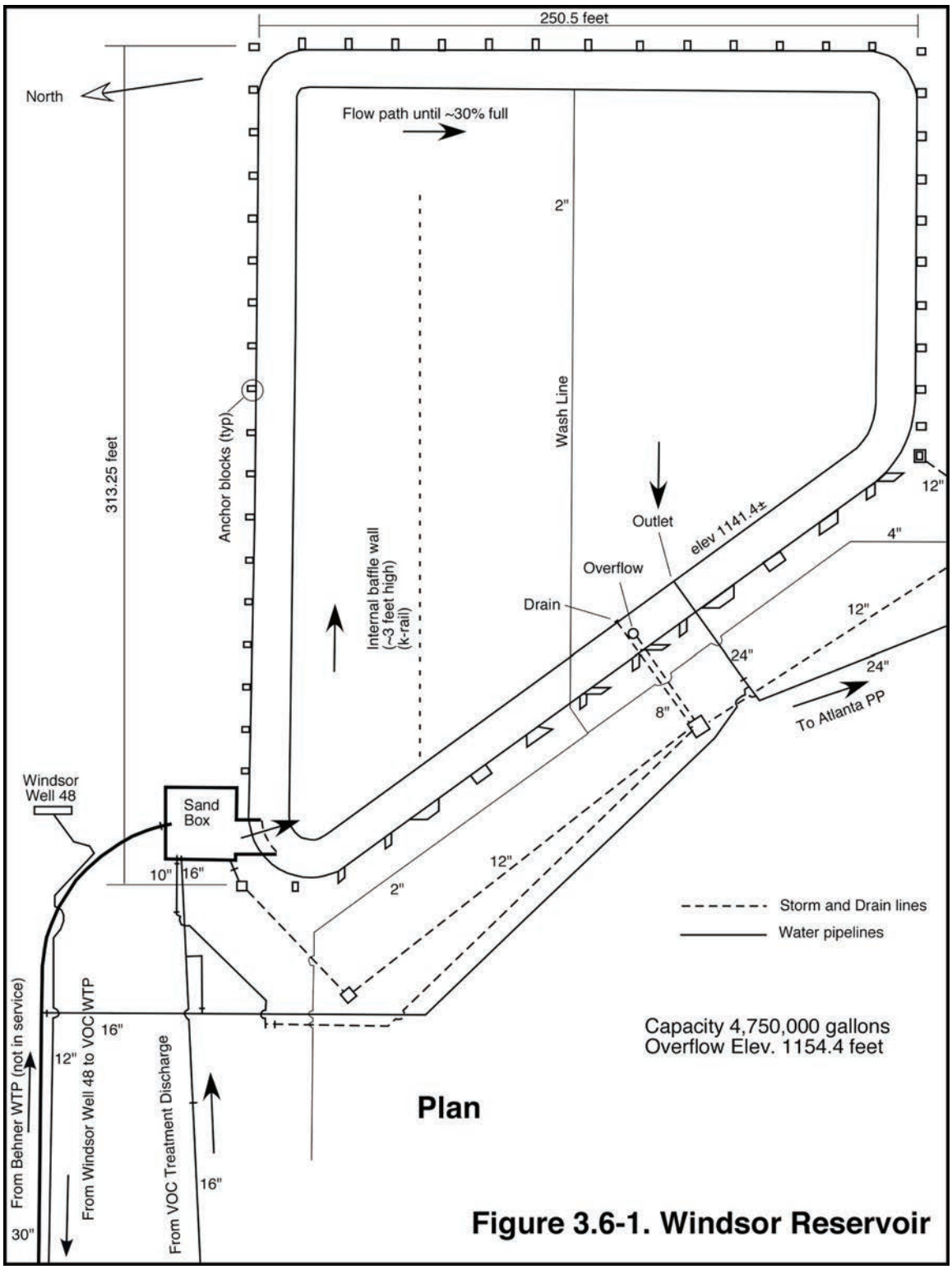


Figure 3.6-1. Windsor Reservoir

The water entering the sand box comes from a 16-inch diameter pipe from the VOC. The water entering the reservoir from the sand box is at essentially the same rate as water entering the sand box (except at start up or change of rate), but spread out over a wider

area, as it enters the top of the Windsor reservoir over a weir wall. According to PWP staff, the bypass pipe from the 16-inlet pipe to the 24-inch outlet pipe is never used.

If one assumes that the reservoir is nearly full under normal operations, and one assumes water entering the reservoir has the momentum provided via a 16-inch diameter pipe at a 7.8 cfs rate (=3,500 gpm), then the time needed to achieve mixing would be 3.2 hours.

Water from the Windsor reservoir is normally pumped into the Calaveras pressure zone via the Atlanta pumping plant. The Atlanta pumping plant has two pumps, one rated at 2,700 gpm, and one rated at 3,620 gpm. Thus, the Atlanta pumping plant is sized large enough to be able to withdraw water from Windsor reservoir at approximately the rate of either VOC pump pumping into Windsor reservoir. If left unfilled with new well water, the Atlanta pumping plant could pump out the entire contents of a full Windsor reservoir in about 13 hours.

Given the FIFO operation of the Windsor when being filled, and the short 3.2 hour time to achieve mixing under idealized conditions, and the ability to empty the reservoir within 13 hours, it is likely that there is no need to change the existing inlet-outlet pipes to address water quality issues.

3.7 Sheldon Reservoir

Figure 3.7-1 is a plan view of the Sheldon Reservoir. This reservoir has two basins (east and west), which can be operated separately or together.

Under normal conditions, Sheldon Reservoir is filled with pumped flow from the Sunset zone, via the Glorietta pumping plant. Some flow from the Wilson, Craig and Jones pumping plants might also fill Sheldon Reservoir, especially if operated in the early morning hours when the demand within the Sheldon zone is lowest.

Prior to construction of the Upper Feeder, it was common to fill the Sheldon reservoir from the Calaveras pressure zone by gravity flow. This reflects the time when much of Pasadena's water was drawn from the wells and surface water in Arroyo Seco. Today (2006), the surface water from Arroyo Seco is no longer available (the Behner WTP has been taken out of service), and the water from the Monk Basin wells (Arroyo / Well 25, Well 52, Ventura and Windsor wells) with a combined rate limited to about 3,500 gpm when using one pump at the VOC WTP, is normally totally used by customers in the Calaveras and higher elevation pressure zones. Thus, plug FIFO flow from the Calaveras zone inlet pipes (north end of basins) to the Sheldon zone outlet pipes (south ends of basins) is not the common operating mode anymore.

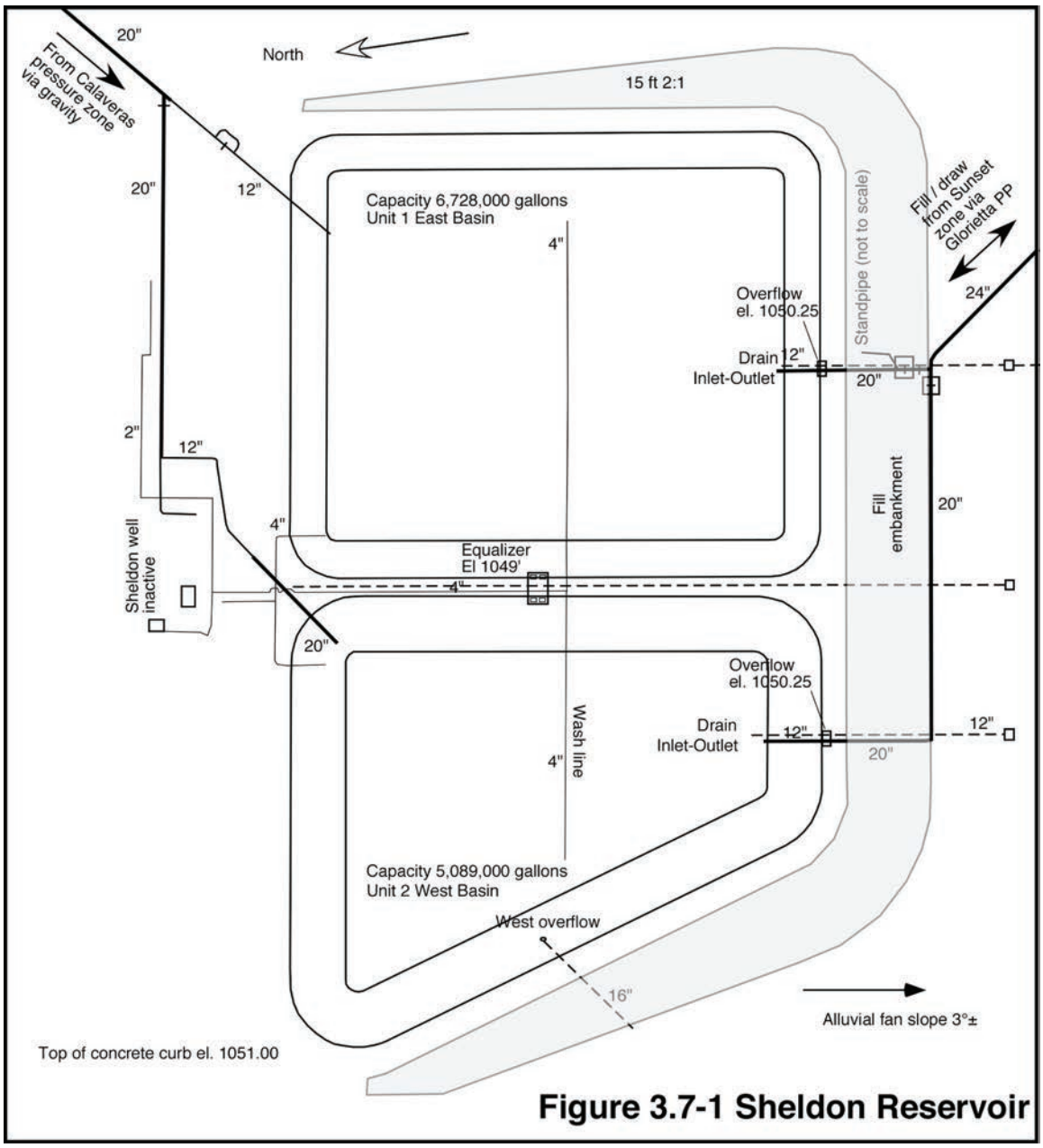


Figure 3.7-1 Sheldon Reservoir

Up to the point where the water elevation in the basins reaches 1049 feet (over 90% full), water does not mix between the east and west basins. When water reaches 1049 feet, water can mix between the two basins via the equalizer. The equalizer is like a set of concrete box culverts that allow flow from one basin to the other; there are no flow controls (valves or gates) in the equalizer.

Assuming that only one basin is in use, and assuming Glorietta #3 pump operating to fill the reservoir in the early morning hours, then mixing is achieved in 4.9 hours (east basin) or 4.1 hours (west basin). This mode of operation is marginally acceptable during winter months, when in-zone demand is about 6.2 MGD. However, during summer time, Sheldon zone demands are about 14.2 MGD, so both basins should be kept in service. In

this case, assuming that flows from Glorietta Pump #3 is split equally between the two basins, the mixing time would be 9.8 hours (east basin) or 8.2 hours (west basin). This appears to be marginally acceptable, with each fill cycle filling the reservoir by about 16 to 17% of capacity, within the normal range of cycling the reservoir on a daily basis. In the summer time, either alternate the basins for filling (close the outlet valve in each basin on alternate days, but this is not recommended without addition of remotely operated valves), or run Glorietta and Wilson pumps simultaneously for short periods of time rather than filling the zone on a more gradual basis, with the objective or achieving a net inflow of about 2,000 gpm (or more) when filling either basin.

3.8 Sunset Reservoir

Figure 3.8-1 is a plan view of the Sunset Reservoir. Sunset reservoir has 2 main basins. Basin number 1 is oval, and subdivided into two sub-basins. Basin number 2 is an irregular polygon.

The A basin is a small mixing tank located between Basins 1 and 2. In older times, the A basin was use to aerate the incoming water (hence "A"). Today, MWD water aeration is no longer needed, and the A basin acts as a mixing chamber to blend water from the local wells with MWD water.

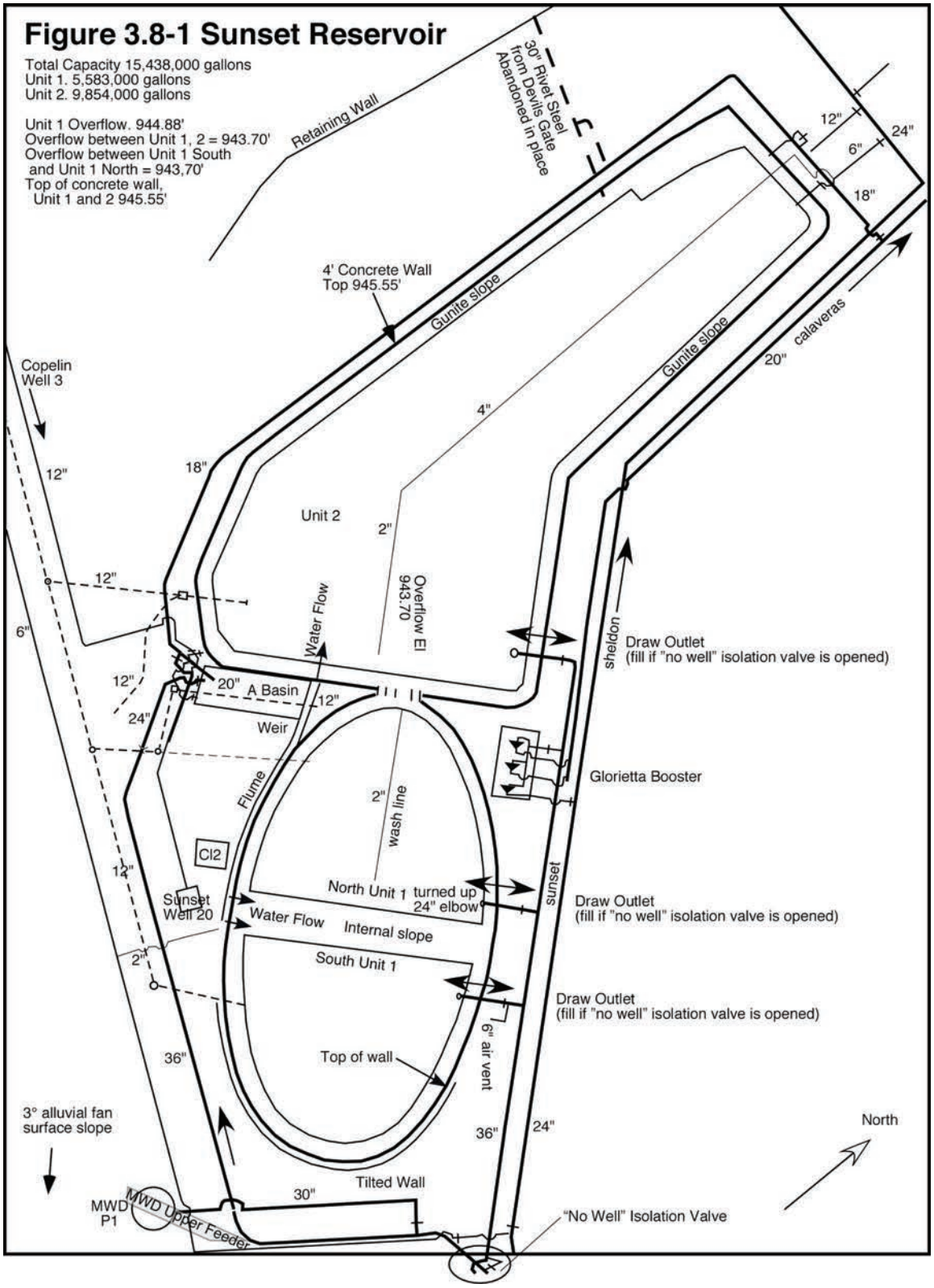
Under normal operation, water from MWD is directed into the A basin, where it then leaves in two flumes. Each flume is a rectangular concrete channel. One flume heads east to fill Basin 1, spilling over the walls and into either sub-basin. The other flume heads north to fill Basin 2.

The water then moves as FIFO plug flow with mixing to the outlet pipes, where the water goes into the Sunset pressure zone, or to the Glorietta pumping plant.

In Figure 3.8-1, a valve is labeled as the "no well" isolation valve. It is understood that this valve is commonly left closed. If it were opened, then PWP would lose the ability to blend much of MWD water in the A basin, and the basins would operate largely as fill-and-draw rather FIFO plug flow with mixing.

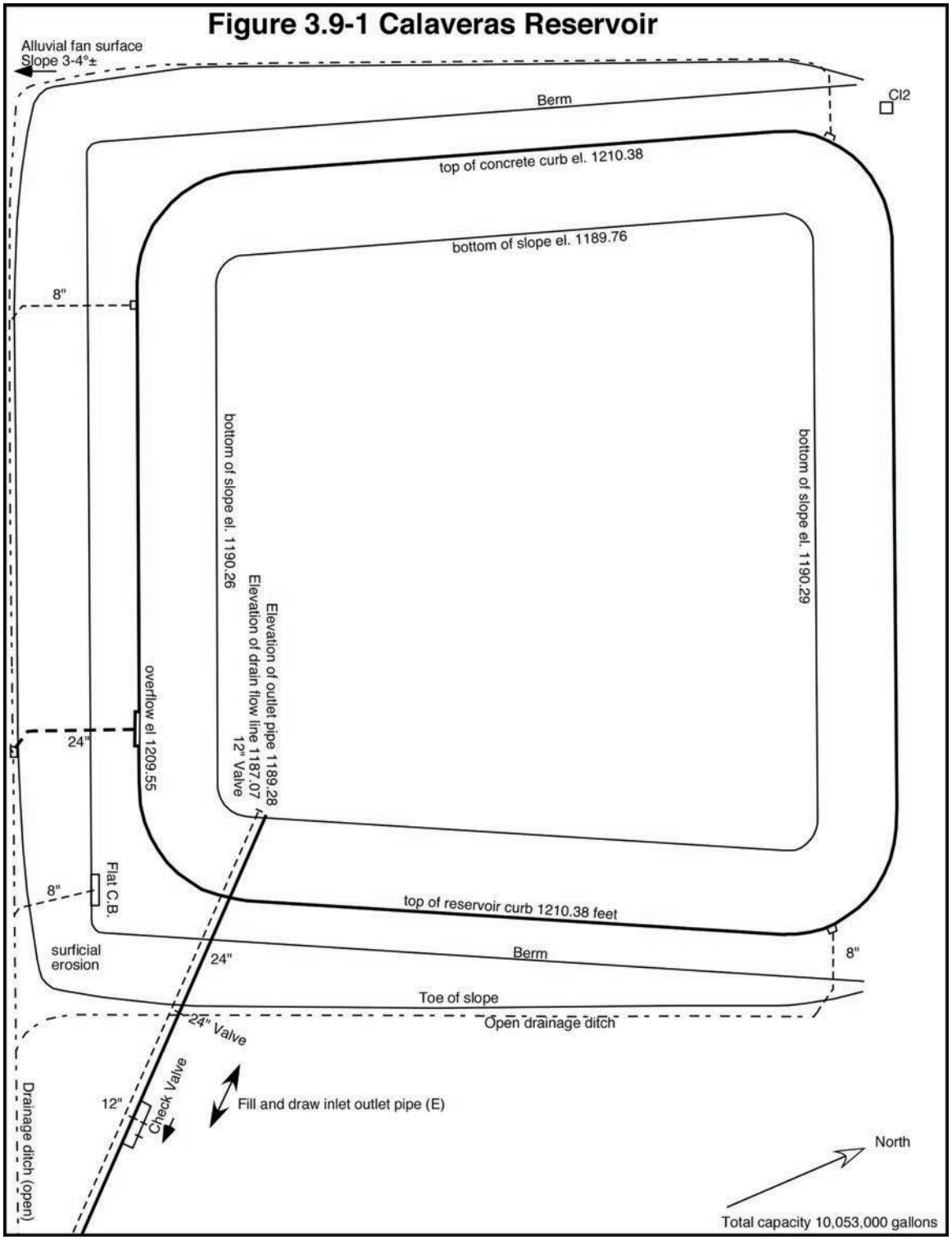
The flow rate from MWD to Pasadena is variable over the course of the year, depending in part on whether PWP would rather take the water at P1 (Sunset reservoir), P4 (Jones reservoir) or at some combination at P2, P3 and/or P5. If one assumes that, on average, wells provide 10 MGD into the system, with an average day demand of 33 MGD, then, on average, PWP draws 23 MGD from the MWD. Assuming that one-third of this amount is taken at P1 (Sunset) and the bulk of the remaining two thirds at P4 (Jones), then the average inflows of MWD water are about 7 MGD (Sunset) and 14 MGD (Jones), with the remaining at P2, P3 and P5. Assume also that on average, one well is operating to fill the Sunset Reservoirs (say Copelin, at a 3 MGD rate). Say at night time, when demand in the Sunset zone is low, and pumps at the Glorietta pump station are on, that all of this water (10 MGD) enters the reservoir via the A basin. Assume the equivalent

diameter of the flumes can be set at 2 feet. Then, the time to achieve mixing is 5.3 hours (Basin 1) or 7.8 hours (Basin 2).



3.9 Calaveras Reservoir

Figure 3.9-1 is a plan view of the existing Calaveras Reservoir.



The Calaveras reservoir is normally filled with water from the Atlanta pumping plant (if well water is being produced from the Monk basin), or by the Glorietta #1 and #2 pumps or by the Wilson #3, #4 and #5 pumps. The main pipelines and flow paths (when filling) are shown in Figure 3.9-3. If in-zone demand is extremely low, Calaveras reservoir can also receive water from the Linda Vista #1 pump or the Jones #2, #4 and #5 pumps, but this is not likely under normal operations. If one assumes that only one of the Glorietta pumps is used to fill Calaveras reservoir, while other pumps are used to maintain Calaveras zone demands (or fill Santa Anita an Thomas reservoirs), then the mixing time is 6.1 hours.

However, as detailed network models of the Calaveras zone have not been performed, it is obvious form the overall network that only a portion (say 1,500 gpm) of the Glorietta water will reach the Calaveras reservoir; the rest being used by in-zone demand. With the rather large inlet pipe, momentum of water entering the reservoir at one corner could lead to inadequate mixing, taking 18 hours to achieve complete mixing. A more reasonable target fill cycle time is 6 hours. Further, PWP staff has reported that there is a dead water problem with Calaveras reservoir, further supporting the idea that typical fill rates are not as high as 4,500 gpm.

To improve functionality for the reservoir, three possible upgrades are considered:

- Figure 3.9-2a. Subdivide the reservoir into two basins. Use inlet 20" nozzle. Force FIFO flow. Fill at 1,500 gpm rate.

- Figure 3.9-2b. Use pipes to try to create FIFO flow. Use inlet 16" nozzle. Fill at 1,500 gpm rate.

- Modify operations to increase fill rate to 4500 gpm over a 6 hour period. This increased fill rate may be sufficient to improve reservoir mixing, without modifying internal pipes in the reservoir.

The upgrade in Figure 3.9-2a will be more expensive than the one in Figure 3.9-2b

- Install an interior baffle wall. We recommend a reinforced concrete baffle wall without berms, so as to reduce the loss of storage volume to a minimum. The wall will require a new foundation under the existing liner. The wall will have to be designed to take unbalanced hydrostatic loads (one basin full, the opposite basin empty), as well as extra hydrodynamic loads from seismic forces. To prevent damage to the baffle wall, the hydrodynamic forces should be based the higher of PGA = 0.55g with I=1.25 (normal 475 year earthquake motion); or PGA = 0.98g with I=1.0 (2,475 year motion, which will result in somewhat larger forces).

- The top of the baffle wall, except at weirs, should be the same as the current overflow, or 1209.55 feet.

- The new baffle wall can be placed in the north-south direction, about mid-way between two lines of roof girders; or under a girder line. At completion of construction, the girder's redwood support posts should be about the same length as they are currently (this is to avoid creating "stiff" spots in the roof).

- The new baffle wall will create an "east basin" and a "west basin". The east basin can be filled and drained with the existing inlet-outlet pipe and drain line. The east basin can use the existing overflow.

- The new west basin will require modification of the bottom liner to accommodate a suitable drain. To provide the flexibility to drain the west basin without draining the east basin, a new drain pipe will need to be installed. It is recommended that the new drain pipe be routed to connect with the old drain pipe; and that the existing drain pipe gate valve be moved (and cleared/replaced) a few feet to accommodate the new drain pipe.

- The existing inlet-outlet pipe should be modified such that it has a branch just where it enters the reservoir's east basin; and then add a gate valve on the branch for the east basin, and a run of pipe to the west basin with an additional gate valve. In this manner, the existing 24" inlet-outlet pipe can be used to fill and drain the east basin by itself; the west basin by itself; or valved to flow into the east basin and withdraw from the west basin. Alternately, the existing 24" inlet-outlet pipe and 12" drain line can be removed and replaced with four pipes (two drains, two inlet-outlets) to the extent that they can be placed within the original 6-foot-wide by 5.5-foot deep access tunnel; the access tunnel is concreted closed, so it was not possible to assess the condition of the tunnel (it should be empty except for several concrete bulwarks). The main advantage of re-using the tunnel and placing new pipe through it is that the various valves to control the inlet-outlet pipes can be kept outside the reservoir, and there would be not be the need to access internal-basin valves via roof-top operators. Any new 12" or larger pipes inside the reservoir should be supported atop the thickened 14-inch thick slab along the edges of the reservoir floor, and designed to take full hydrodynamic loads.

- The new baffle wall should have two overflow weirs at elevation 1209 to allow mixing of the two basins in the top 1.38 feet of the reservoir. The weirs should be at either end of the baffle wall. Each weir should be 4 feet long, which should provide over 10 square feet of flow area (combined) when the reservoir is near full.

- The baffle wall should also have a slide gate (3 feet by 3 feet) at the north end of the wall, to promote mixing between the two basins when the west basin is used for in-flow and the east basin is used for outflow, and when the water levels are blow 1209 feet. The bottom of the slide gate opening would be at about elevation 1191 feet and the top at elevation 1194 feet. For maintenance purposes, a parallel

20-inch diameter pipe placed at 1191 feet at the south end of the baffle wall will provide an alternate flow path should the slide gate require maintenance (or vice versa).

- The existing chlorination system will need to be modified to allow the independent operation of either basin, or the flow-through operation of the two basins working as detention ponds.

With the conceptual upgrades shown in Figure 3.9-2a, and using 20" nozzles, and still assuming a fill rate of 1,500 gpm, then the mixing time in the west basin would be 9.6 hours, or about half the time as for the reservoir in its current condition. The improvements allow the reservoir to be operated as two independent basins, each with fill/draw operation, or as two compartments with FIFO plug flow with mixing.

The cost to install this baffle wall, along with the associated pipe modifications, is $892,000. This cost includes changing the chlorine system for two basins, draining the reservoir, installing the baffle wall, installing the new pipe and drain lines, providing a roof level walkway to gain access to the operating valves, and leak testing and patching of the liner after the work is complete. See the engineering description for the second alternative (below) for recommended water quality / mixing tests to be done as part of the design process for any alternative.

Figure 3.9-2b shows the second alternative approach to upgrade the reservoir. In this case, the 24" diameter inlet-outlet pipeline is extended around the perimeter of the reservoir, supported on the 14"-thickened slab at the edges. Check valves are inserted in the pipes to force fill from the southeast corner and draw from the northwest corner. A fill nozzle of 16" diameter is included to increase the velocity of water entering the reservoir, thereby improving mixing. The draw nozzle is left at 24" (same size as pipe), as mixing is not an issue during drawdown. By setting up the pipes in this manner, and still using a slow fill rate of 1,500 gpm, mixing time is reduced to 12.1 hours, and the spatial location of the fill and draw locations should promote FIFO conditions, even if the pumps do not fill the reservoir for the full 12.1 hours. The longer length of pipe will create some minor head loss under static operation conditions (no pumps on), but should be satisfactory. The 16" nozzle will impose some extra pumping costs under normal operations.

The cost to implement the second alternative is $205,400, broken down as follows:

- 420 feet new 24" pipe at $12/inch-foot installed: $121,000.

- Two new walkways atop roof to provide access to the valves. Assume wood planking atop wood beams, small operator platform, all attached to underlying wood roof system; replace galvanized sheet metal sheathing. Say each walkway is 120 square feet @$60/square foot installed = $7,200 x 2 = $14,400.

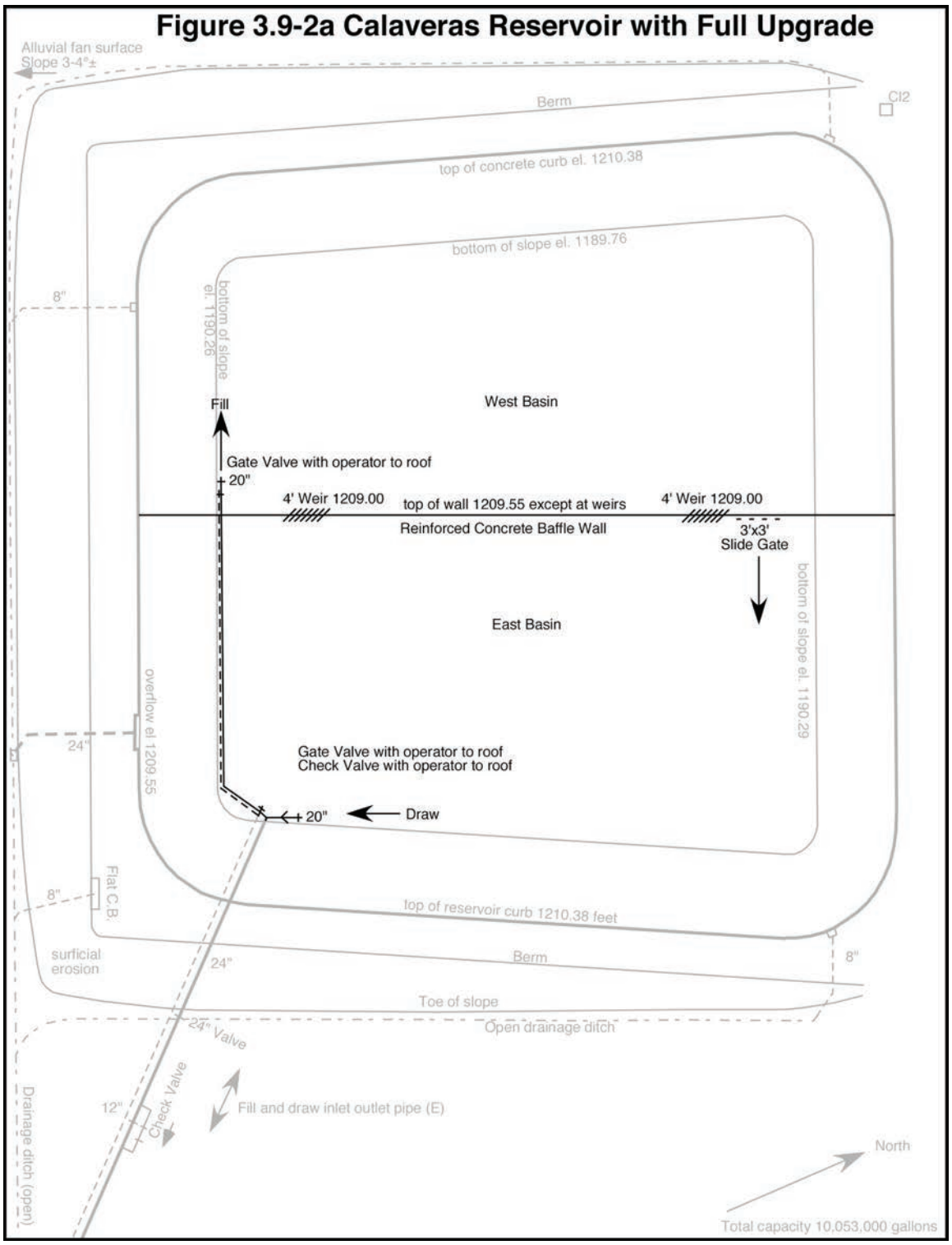
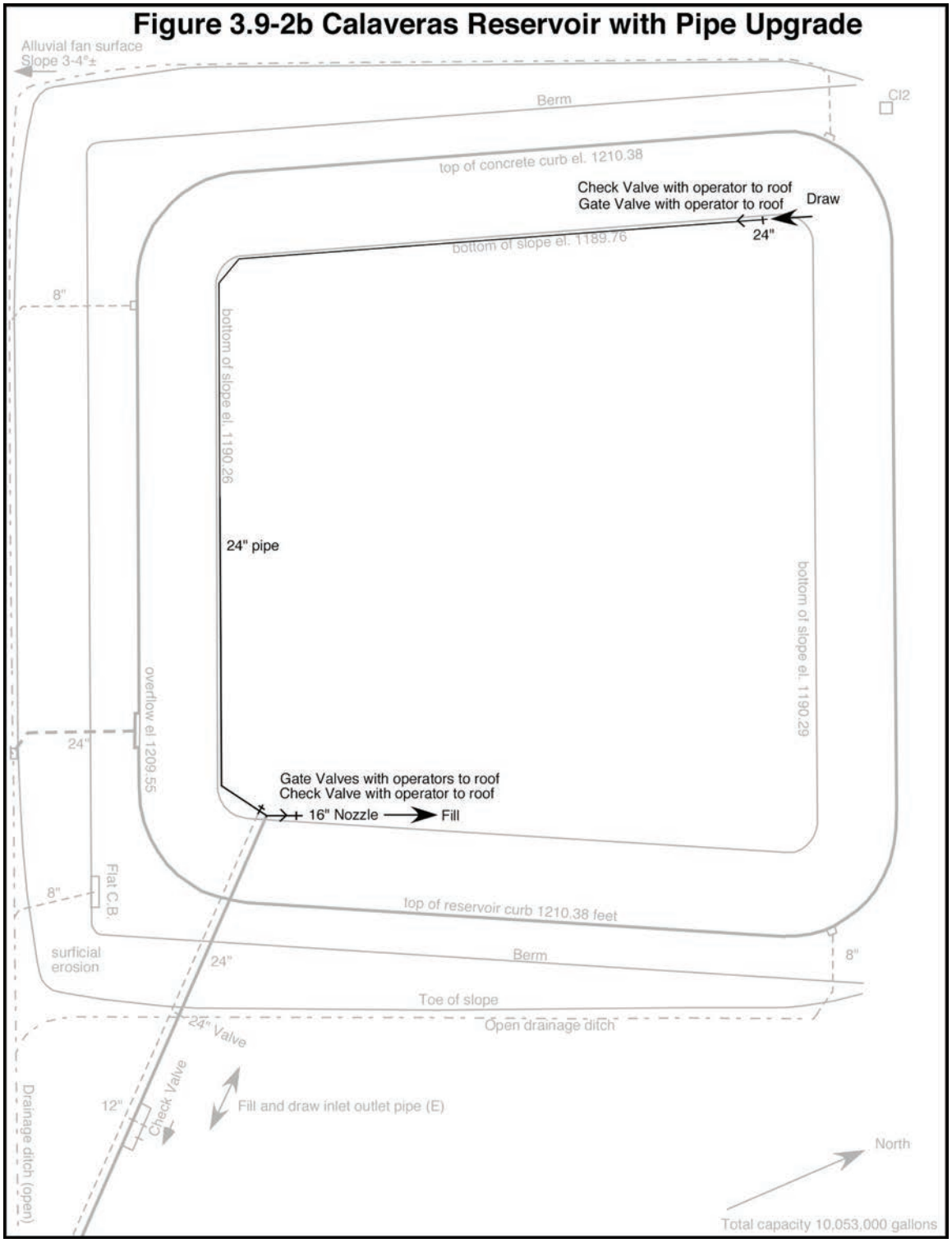


Figure 3.9-2a Calaveras Reservoir with Full Upgrade
Alluvial fan surface
Slope 3-4°±
Berm
Cl2
top of concrete curb el. 1210.38
bottom of slope el. 1189.76
8"
bottom of slope el. 1190.26
Fill
West Basin
Gate Valve with operator to roof
20"
4' Weir 1209.00
top of wall 1209.55 except at weirs
4' Weir 1209.00
Reinforced Concrete Baffle Wall
3'x3'
Slide Gate
East Basin
bottom of slope el. 1190.29
overflow el 1209.55
24"
Gate Valve with operator to roof
Check Valve with operator to roof
20"
Draw
8"
Flat C.B.
top of reservoir curb 1210.38 feet
surficial
erosion
24"
Berm
8"
Toe of slope
Open drainage ditch
24" Valve
Check Valve
12"
Fill and draw inlet outlet pipe (E)
Drainage ditch (open)
North
Total capacity 10,053,000 gallons



- Two new walkways atop roof to provide access to the valves. Assume wood planking atop wood beams, small operator platform, all attached to underlying wood roof system; replace galvanized sheet metal sheathing. Say each walkway is 120 square feet @$60/square foot installed = $7,200 x 2 = $14,400.

- Liner test, liner patches and contingency: $35,000.

- Final design, including pressure zone hydraulic checks, structural design: $35,000.

- As part of the design process, it is recommended to conduct some water quality sampling tests at different points within the reservoir, over two 24-hour time periods. In the first 24-hour time period, fill the reservoir under current winter time demand operations. In the second 24-hour time period, attempt to fill the reservoir under very high pumping rates when demand is low (midnight to 6 am) to see if the reservoir can be filled at a 4,500 gpm rate for 6 hours in its current condition, and then left to be drawn down during the next 18 hours period. The final design of the pipes and nozzles in the reservoir should then be selected based on the least cost approach to force water mixing and turnover in the reservoir, and limiting energy costs needed to fill the reservoir.

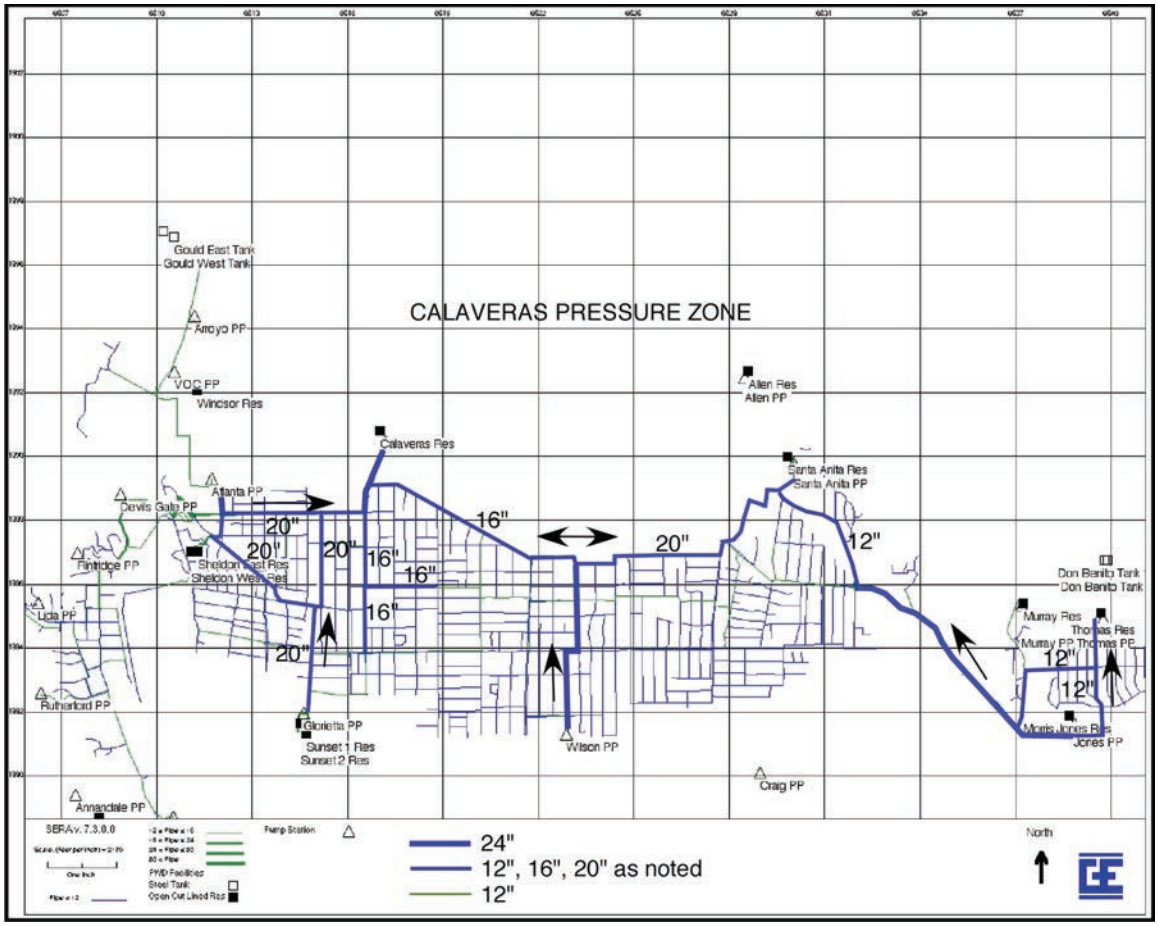
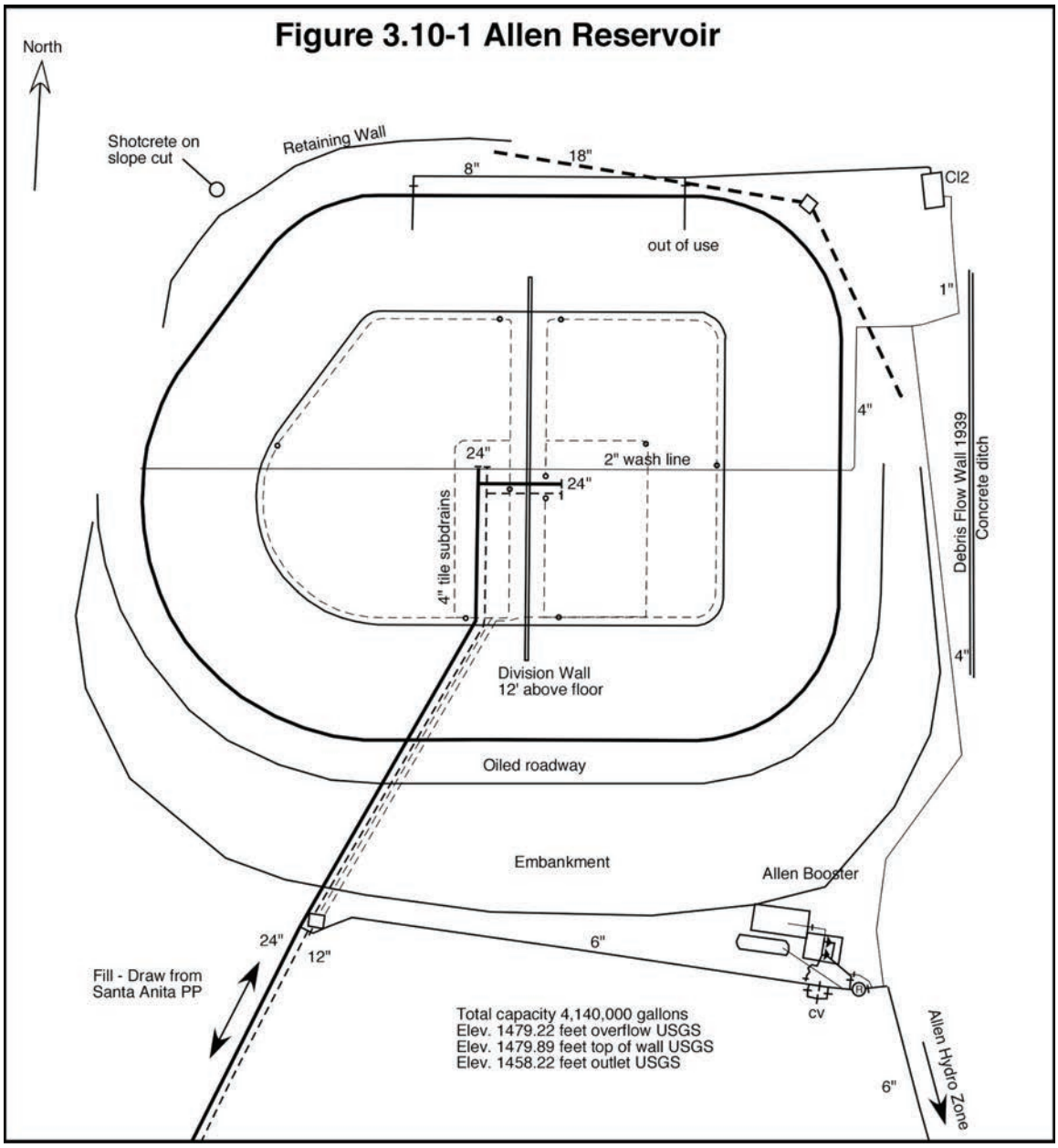


Figure 3.9-3. Calaveras Pressure Zone Main Flow Paths

3.10 Allen Reservoir

Figure 3.10-1 is a plan view of the Allen Reservoir. The reservoir is filled via a 24" inlet-outlet fill-draw pipe, with all water coming from the Santa Anita PP. Within the reservoir itself, there are two basins, with separate 24" diameter inlet-outlet pipes to each basin. The basin dividing wall is 12 feet high, allowing the reservoir to be operated as two separate basins until it is about half full, and then one large basin once the reservoir reaches its fill level, and water goes over the internal division wall.



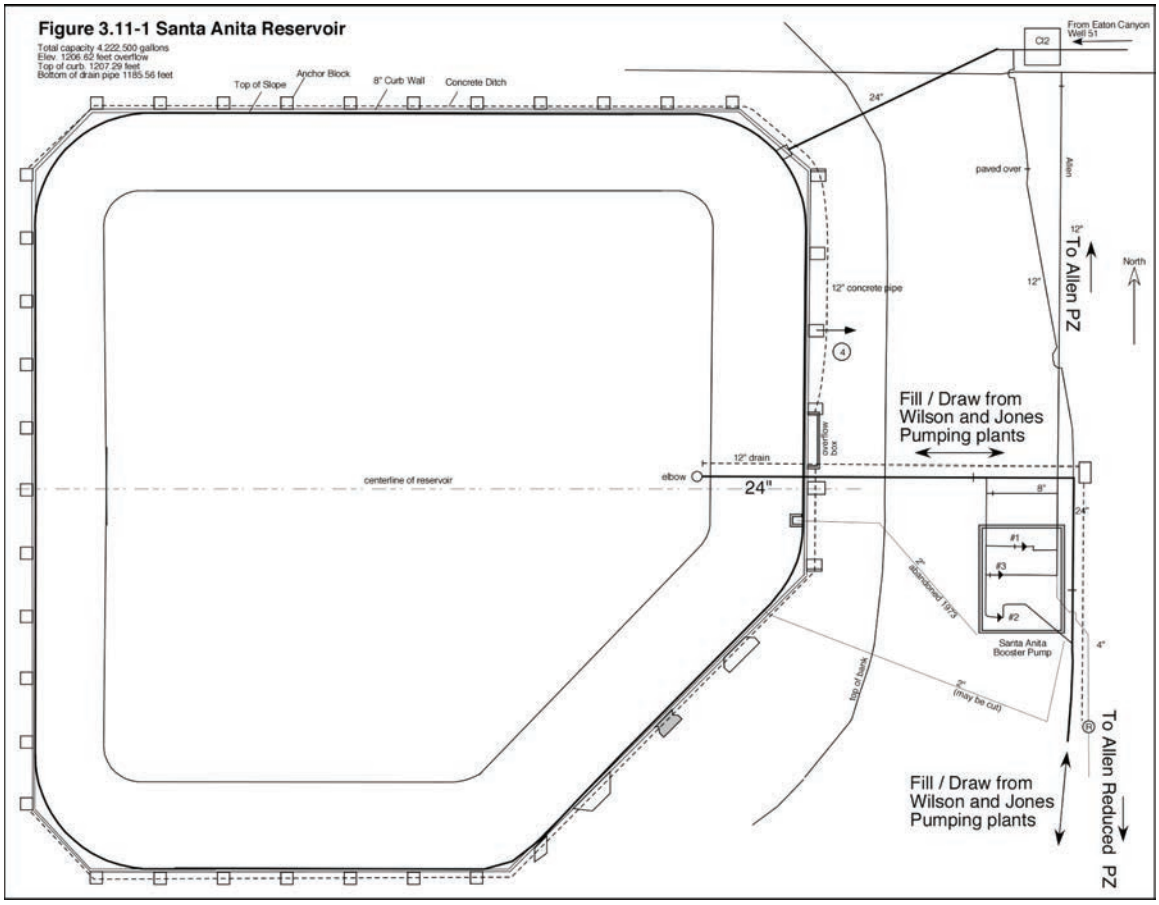
Assuming operation of just the smallest Santa Anita #1 pump, with both inlet-outlet pipes open to each basin, then the time to achieve mixing is 14 hours if the reservoir is cycled between ~67% to ~95% full; or 8.5 hours if using one of the larger Santa Anita pumps.

To reduce the mixing time and reduce the turnover in the reservoir needed to achieve complete mixing, then change the two 24" outlets in the reservoir to 12" outlets. This would increase momentum of water going into the reservoir, reduce mixing time to about 7 hours by using the smaller Santa Anita pump, cycling the reservoir from 81% full to 95% full, and drop pressure in the zone by about 4 psi.

Given these issues, it is recommended to use either the larger Santa Anita pumps #2 or #3 to fill the Allen reservoir.

3.11 Santa Anita Reservoir

Figure 3.11-1 is a plan view of the Santa Anita Reservoir. It is a fill/draw reservoir, with one 24-inch diameter inlet-outlet pipe.

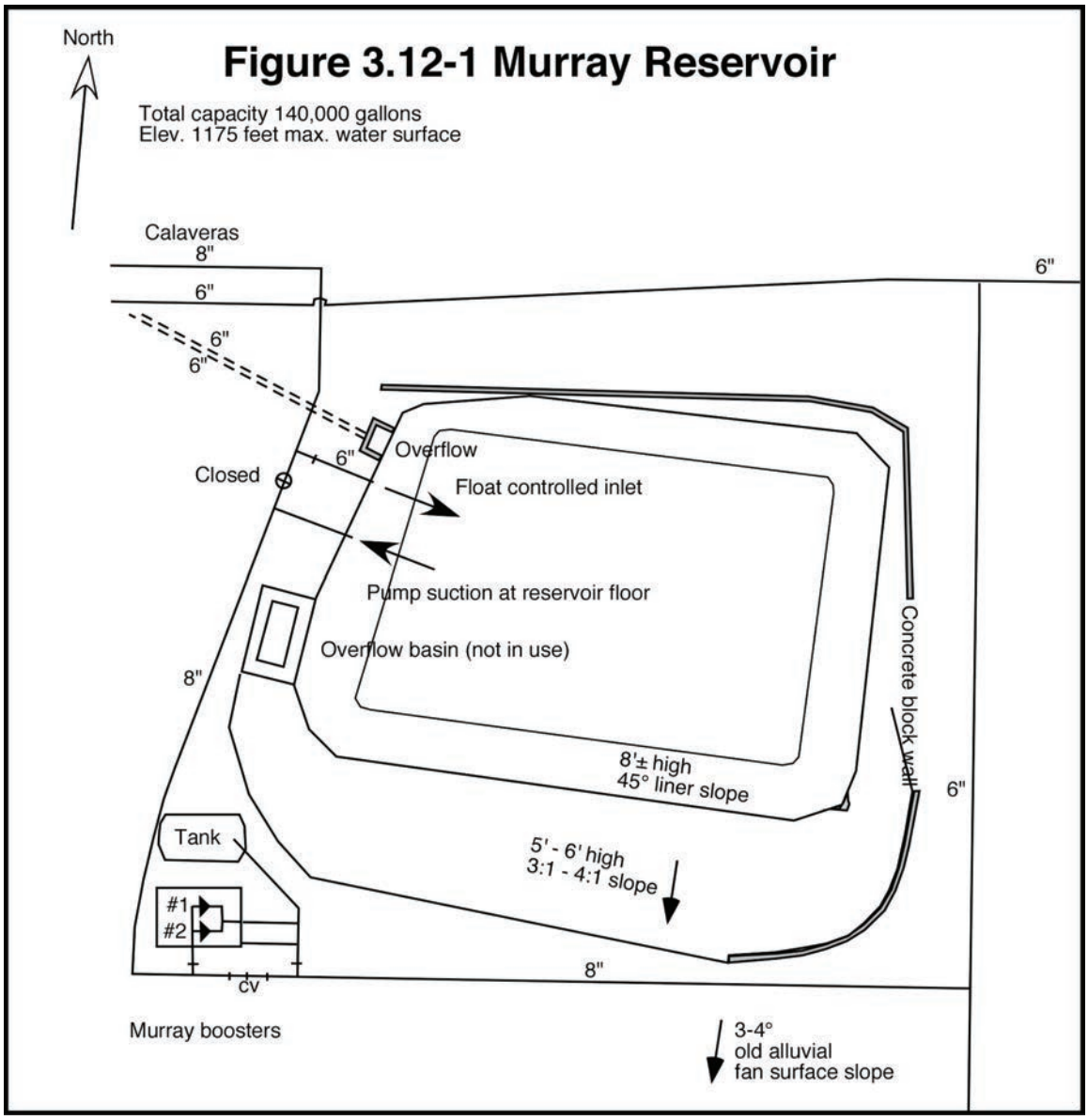


Santa Anita reservoir is normally filled by the Wilson pumping plant. It can also be filled by the smaller pumps at the Jones pumping plant. Assuming it is filled daily using one

Wilson pump when system demand is low, mixing time is about 6.7 hours. If dead zones are suspected, then the reservoir can be filled using two Wilson pumps (supplemented by Jones pumps) turned on at the same time; no physical changes are therefore recommended.

3.12 Murray Reservoir

Figure 3.12-1 is a plan view of the Murray Reservoir. This reservoir is currently not in service; the reservoir overflow elevation is too low so it does not float well in the Calaveras zone; it is small capacity; and reportedly the liner leaks (unconfirmed).



Should Murray reservoir be returned to service, then the following observations are made about mixing times. The reservoir would be normally filled via a 12-inch pipe from the

Jones PP, with water entering the reservoir via a 6" inlet pipe. A float device is used to shut-off inlet flows once the reservoir is filled. Water is drawn out of the reservoir from a nearby outlet pipe, going to the Murray pump station to serve the higher pressure Murray Hydropneumatic tank zone.

Assuming an inflow rate of 396 gpm, complete mixing would be achieved in about 1 hour.

3.13 Don Benito Tanks

Figure 3.13-1 is a plan view of the Don Benito Tanks.

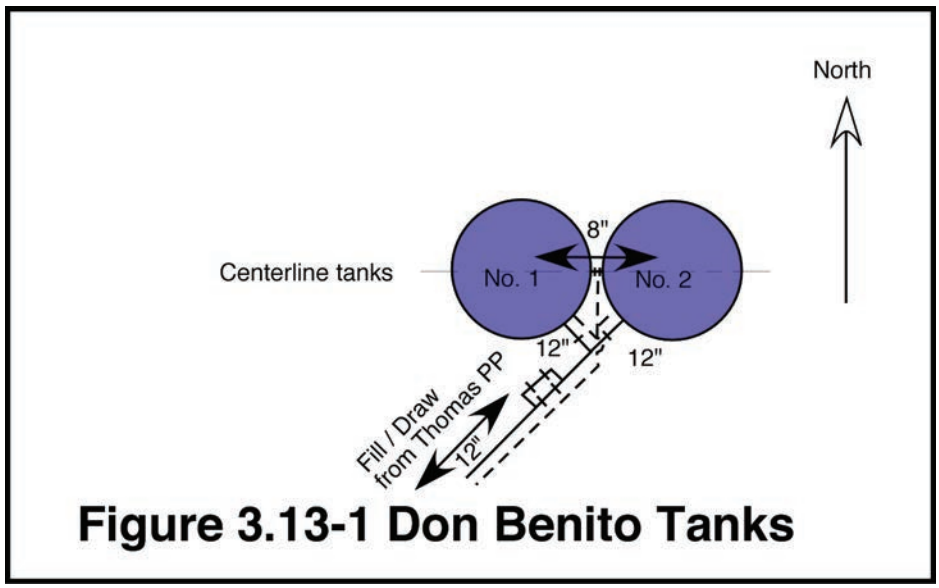


Figure 3.13-1 Don Benito Tanks

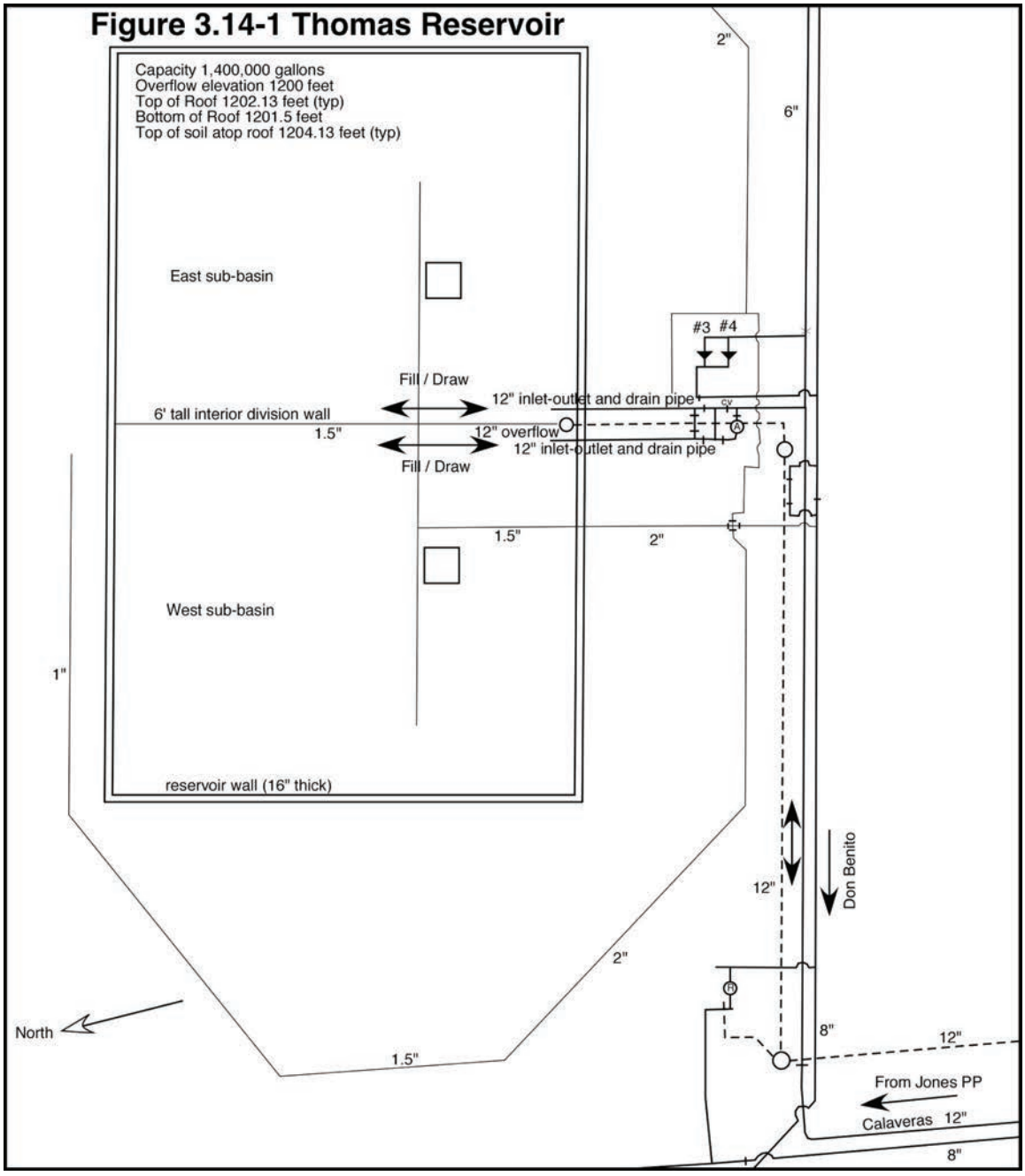
The existing pipeline arrangement allows the tanks to be operated either in fill-draw operation for each tank separately, or as a combined fill-draw operation. based on available drawings, there are no check valves to allow the tanks to be operated in FIFO plug flow (such as water fills Tank 1, goes to Tank 2, and then draws only from Tank 2).

The Don Benito tanks are filled using either pump at the Thomas Pumping Plant. Assuming that only one pump is turned on, and that water is split into the two tanks (both under fill/draw operation), the mixing time is 4.6 hours.

It appears that the existing hardware is adequate for mixing purposes, and no upgrades are suggested.

3.14 Thomas Reservoir

Figure 3.14-1 is a plan view of the Thomas Reservoir. Under normal operations, Thomas reservoir is filled via the Jones Pumping Plant (see Figure 3.9-3) with water drawn from the Jones Reservoir. There is a 6-foot tall dividing wall in the reservoir, allowing it to be operated as two individual separate sub-basins until the reservoir is about half full. Once the water level is higher than the dividing wall, water can mix between the two sub-basins. There are no existing check valves to create a FIFO plug flow arrangement where water can enter one sub-basin, mix, and then leave via the other sub-basin.



Assuming that either the Jones #2 or Jones #5 pumps are used, and assuming the entire reservoir acts as one fill/draw basin, then the time to achieve mixing would be about 4.40 hours (when pumped at times of low in-zone demand). This suggests that no upgrades are needed to improve mixing.

3.15 Jones Reservoir

Figure 3.15-1 is a plan view of the Jones Reservoir. Under normal operation, water fills Jones Reservoir from the MWD turnout (P4) at the north side of the reservoir, and then leaves the reservoir at the southwest corner, where it enters either the Sunset zone (gravity flow) or is pumped into the Sheldon and Calaveras zones. If P4 must be closed, then Jones Reservoir can be filled via MWD turnout P2, located just west of the reservoir, where the water would enter the 36" pipeline between Jones and Sunset Reservoirs; this mode of operation is rare.

The fill rate from P4 can be as low as zero (no water purchased from MWD) to as high as 25 MGD (nominal). Under normal operations, the actual rate of purchase of MWD water at P4 (see Figure 2-1 for location of MWD turnouts) is assumed to be in the 8 MGD range (low range) to 15 MGD (high range). Assuming an 8 MGD rate of inflow, then mixing in the reservoir should occur in 14.4 hours. Since the reservoir is normally operated in FIFO plug flow when water enters at the north end and leaves at the south end, there should be adequate mixing. However, should P4 be closed, then mixing at 8 MGD rate will be difficult to achieve when using just the inlet-outlet pipes at the south end unless the main inlet-outlet pipe is closed, and only the smaller 14" pipe is used.

In summary, assuming FIFO plug flow from PWD P4 to the southwest draw line, there should be adequate mixing when water is purchased at an 8 MGD rate or higher.

If the water purchased from MWD is reduced to much below 5 MGD rate, (possible in the winter time, when many wells are in operation), and P2 is open and P4 is closed, then water mixing cannot be achieved using the normal inlet-outlet pipes in the southwest corner of the reservoir.

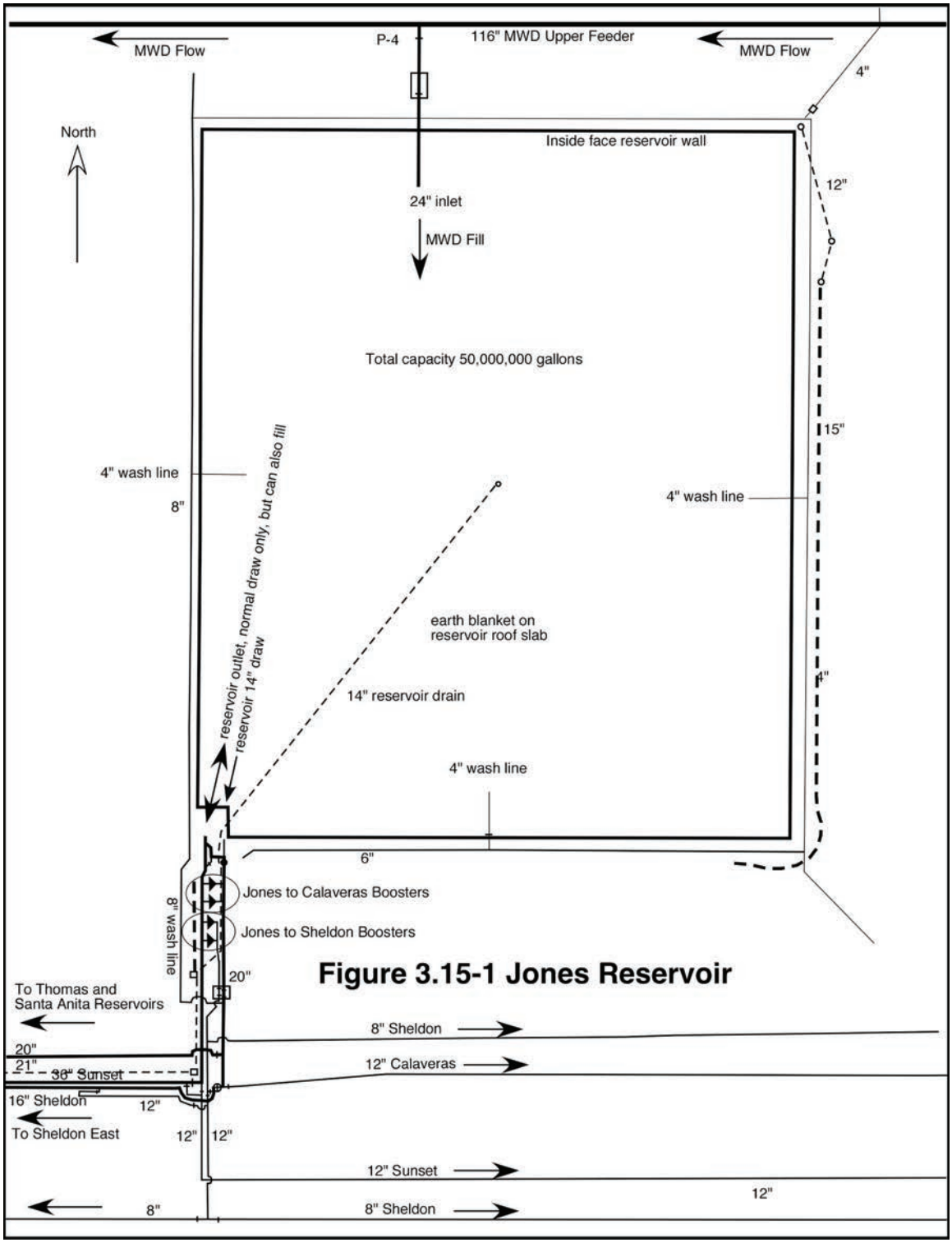


Figure 3.15-1 Jones Reservoir

3.16 Summary, Mixing and Detention Times in Reservoirs

Sections 3.1 through 3.15 discuss the issue of mixing water within each reservoir. Table 3-3 summarizes the issues for each reservoir and highlights the actions needed to improve mixing in the reservoirs.

Table 3-3 also provides the recommended hardware upgrade and costs for improving mixing in Calaveras reservoir.

Reservoir	Mixing Time Suitable?	Recommendations to Improve Mixing	Hardware Cost to Improve Mixing
Allen	Possible	Operate Santa Anita #2 or #3 pumps preferentially	$0
Annandale	Possible	Operate Eagle Rock pumps preferentially	$0
Calaveras	No	Modify inlet-outlet pipes to crate FIFO plug flow; install 16" inlet nozzles	$205,400
Don Benito 1	Yes		$0
Don Benito 2	Yes		$0
Eagle Rock	Yes		$0
Gould 1	No	Take one tank out of service in the winter, operate Arroyo #3 pump, upgraded Arroyo PP	$0
Gould 2	No		
Jones	Possible	Fill at minimum 8 MGD rate from P4	$0
Lida	Yes		$0
Mirador	Possible	Operate Rutherford #1 and #2 pumps	$0
Murray	Yes		$0
Santa Anita	Yes		$0
Sheldon 1	Possible	Operate Glorietta and Wilson pumps to achieve 2,000 gpm inflow during fill cycles	$0
Sheldon 2	Possible		
Sunset 1	Possible	Fill at 10 MGD rate at night time while Glorietta pumps are on	$0
Sunset 2	Possible		
Thomas	Yes		$0
Windsor	Yes		$0

Table 3-3. Actions to Improve Mixing

4.0 Benefit-Cost Analysis

4.1 Overview

The Seismic Vulnerability Assessment (G&E 2006a) for the Pasadena Water System presented four alternative seismic capital improvement packages: P1, P2, P3, and P4. These four packages vary significantly in their scope and cost and thus also vary significantly in their effectiveness in reducing the impacts of future earthquakes on the Pasadena Water System.

In evaluating and choosing between these alternatives, one of the key questions for decision makers is whether or not the increased costs associated with the higher cost packages are worth it. That is, are the reductions in impacts of future earthquakes large enough to justify the extra costs of the high cost packages? What is the "optimum" upgrade alternative for the Pasadena Water System?

Benefit-cost analysis is a powerful tool for exploring these questions quantitatively and can provide a rational, defensible basis for choosing among these alternative packages. Benefit-cost analysis of water system upgrades is based on quantitative calculations of expected damages and losses in the as-is condition of the systems and after implementing each alternative upgrade. This explicit, quantitative evaluation of system performance allows decision makers to compare the relative effectiveness of different upgrade options on improving system performance.

4.2 Benefit-Cost Analysis of Upgrade Packages

The effects of earthquakes on a water system include not only damages to a system's physical infrastructure but also economic impacts on the utility and on customers. For benefit-cost analysis, we consider the following categories of damages and losses:

Impacts on Utility

- Physical damage to reservoirs
- Physical damage to wells and pump stations
- Revenue Loss

Impacts on Customers

- Damages from inundation
- Damages from fire following earthquake
- Economic impacts of loss of water service
- Economic impacts of loss of potability

Physical damages (i.e., the cost to repair or replace) for reservoirs are estimated based on the size of reservoir, type of reservoir, and the seismic fragility of each reservoir.

Physical damages to wells and pump stations (including buildings) are estimated based on replacement value of buildings and equipment, and the seismic fragility of each component.

Revenue losses are estimated based on the average value of water sold and the number of system days of lost service estimated for each scenario earthquake.

Damages from inundation are estimated based on the seismic vulnerability and storage capacity of each reservoir, along with local topography and the value of buildings and contents in downslope areas subject to inundation if damage to a reservoir results in release of stored water.

Damages from fire following earthquake are estimated for the first 24-hours after an earthquake using a simplified FEMA methodology which calculates typical losses per capita of $38.56 (for “dry” climates, as appropriate for Pasadena) associated with lost water supply.

The economic impact of complete loss of water service is calculated on a per capita per day basis, then combined with the number of system days of lost service and the number of customers served. The FEMA per capita per day economic impact for loss of water service is $113.47. This value takes into account the relative importance of water service for each major economic sector and the economic impact of lost time for residents.

The economic impact of loss of water potability is also calculated on a per capita per day basis, on the same basis as above for complete loss of water service. The FEMA per capita per day economic impact for loss of potability is $47.37. For Pasadena, some types of damage such as collapse of reservoir roofs result in longer durations of loss of potability than durations of loss of water service. For economic calculations, loss of potability is assumed only for time periods after water service is restored, but water is not potable.

For benefit-cost analysis of the upgrade packages for the Pasadena Water System, scenario damages and losses for the seven categories of damages and losses listed above (considering impacts on both the utility and on customers) were evaluated for seven scenario earthquakes:

- San Andreas M 7.9
- Sierra Madre M 7.2
- Raymond M 6.5
- Verdugo – Eagle Rock M 6.9
- Upper Elysian Park M 6.4
- Upper Elysian Park M 6.0
- Puente Hills M 7.0

For benefit-cost analysis, the scenario damages and losses for each earthquake (that is, the calculated damages and losses when earthquake occurs) were converted into annualized damages and losses by dividing by the return period of the earthquake. Dividing by the return period is equivalent to considering the annual probability of the specific scenario earthquake.

Damage and loss estimates for the above seven scenario earthquakes, along with the annualized damages and losses are summarized in the following tables.

Tables 4-1 (part 1) and 4-1 (part 2) show the scenario and annualized damages for the seven scenario earthquakes. Figure 4-1 graphs the total losses due to each scenario earthquake.

Table 4-2 illustrates the relative contributions to the total earthquake risk (the potential for damages and losses) for the Pasadena Water System from the various scenario earthquakes and from other earthquakes. We estimate that about 2/3rds of the total seismic risk arises from the seven specified scenario earthquakes, with about 1/3rd of the seismic risk arising from "other" earthquakes. Other earthquakes include potential earthquakes on the specified faults other than the characteristic earthquakes. Thus, for example, the San Andreas fault could produce a M 6.5 or M 7.0 earthquake as well as the characteristic M 7.9 earthquake. The other earthquake category also includes potential impacts from earthquakes on other known or unknown earthquake faults.

As seen in Table 4-2, of the total risk from the seven scenario earthquakes, most of the risk arises from the Sierra Madre M 7.2 and the Raymond M 6.5, which together contribute about 50% of the total seismic risk for the Pasadena Water System. These faults contribute much of the risk because of the combination of relatively large size, short return periods, and proximity to Pasadena.

Earthquake Event	Return Period (years)	System Impacts, Damages and Economic Losses	Impact of Earthquake Event				
			As-Is	P1	P2	P3	P4
San Andreas M7.9	**100**	System Hours of No Water	1.23	1.1	0.55	0.24	0.18
		Economic Impact of No Water	$1,085,120	$970,432	$483,452	$210,743	$158,798
		System Hours of Non-Potable	6.12	5.54	2.86	0.75	0.00
		Economic Impact of Non-Potable	$2,254,007	$2,040,392	$1,054,080	$276,639	$0
		Fire Following Earthquake Losses	$287,812	$248,837	$195,412	$140,368	$86,943
		Physical Damage - Reservoirs	$2,497,016	$2,122,464	$998,806	$374,552	$124,851
		Wells and Pump Stations	$100,000	$20,000	$10,000	$10,000	$10,000
		Lost Revenue	$3,857	$3,449	$1,718	$749	$564
		Total Scenario Damages + Losses	$6,227,811	$5,405,574	$2,743,468	$1,013,051	$381,156
		Annualized Damages + Losses	$62,278	$54,056	$27,435	$10,131	$3,812
Sierra Madre M7.2	**300**	System Hours of Lost Service	106.49	73.06	42.44	25.30	22.03
		Economic Impact of No Water	$93,946,667	$64,454,348	$37,442,806	$22,316,343	$19,435,112
		System Hours of Non-Potable	18.25	19.63	14.92	5.56	0.00
		Economic Impact of Non-Potable	$6,721,507	$7,229,763	$5,494,326	$2,049,260	$0
		Fire Following Earthquake Losses	$4,865,819	$1,801,822	$1,700,908	$1,596,936	$1,496,022
		Physical Damage - Reservoirs	$31,858,349	$27,079,597	$12,743,340	$4,778,752	$1,592,917
		Wells and Pump Stations	$1,200,000	$240,000	$120,000	$120,000	$120,000
		Lost Revenue	$333,891	$229,074	$133,073	$79,313	$69,073
		Inundation Loss	$4,244,750	$3,608,038	$1,697,900	$636,713	$212,238
		Casualty Loss	$2,310,000	$1,963,500	$924,000	$346,500	$115,500
		Total Scenario Damages + Losses	$145,480,983	$106,606,141	$60,256,353	$31,923,818	$23,040,862
		Annualized Damages + Losses	$484,937	$355,354	$200,855	$106,413	$76,803
Raymond M6.5	**300**	System Hours of Lost Service	32.73	24.92	11.95	4.69	3.31
		Economic Impact of No Water	$28,874,772	$21,984,702	$10,545,952	$4,140,252	$2,920,119
		System Hours of Non-Potable	15.5	13.87	9.10	3.05	0.00
		Economic Impact of Non-Potable	$5,708,677	$5,108,345	$3,350,073	$1,122,201	$0
		Fire Following Earthquake Losses	$2,467,387	$1,855,787	$1,350,227	$829,348	$323,788
		Physical Damage - Reservoirs	$19,790,458	$16,821,889	$7,916,183	$2,968,569	$989,523
		Wells and Pump Stations	$800,000	$160,000	$80,000	$80,000	$80,000
		Lost Revenue	$102,622	$78,135	$37,481	$14,715	$10,378
		Inundation Loss	$594,187	$505,059	$237,675	$89,128	$29,709
		Casualty Loss	$150,000	$127,500	$60,000	$22,500	$7,500
		Total Scenario Damages + Losses	$58,488,103	$46,641,417	$23,577,591	$9,266,712	$4,361,018
		Annualized Damages + Losses	$194,960	$155,471	$78,592	$30,889	$14,537
Verdugo - Eagle Rock M6.9	**1000**	System Hours of Lost Service	53.53	45.32	26.12	15.37	13.32
		Economic Impact of No Water	$47,224,764	$39,981,810	$23,043,356	$13,557,821	$11,751,053
		System Hours of Non-Potable	17.46	15.85	11.12	3.93	0.00
		Economic Impact of Non-Potable	$6,430,549	$5,837,583	$4,095,515	$1,448,162	$0
		Fire Following Earthquake Losses	$3,037,015	$2,557,328	$1,973,610	$1,372,203	$788,485
		Physical Damage - Reservoirs	$22,005,657	$18,704,809	$8,802,263	$3,300,849	$1,100,283
		Wells and Pump Stations	$850,000	$170,000	$85,000	$85,000	$85,000
		Lost Revenue	$167,839	$142,097	$81,897	$48,185	$41,764
		Inundation Loss	$942,824	$801,400	$377,130	$141,424	$47,141
		Casualty Loss	$270,000	$229,500	$108,000	$40,500	$13,500
		Total Scenario Damages + Losses	$80,928,647	$68,424,528	$38,566,770	$19,994,144	$13,827,225
		Annualized Damages + Losses	$80,929	$68,425	$38,567	$19,994	$13,827

Table 4-1. Scenario and Annualized Earthquake Damages and Losses (Part 1 of 2)

Earthquake Event	Return Period (years)	System Impacts, Damages and Economic Losses	Impact of Earthquake Event				
			As-Is	P1	P2	P3	P4
Upper Elysian Park M6.4	**3000**	System Hours of Lost Service	1.41	1.37	0.71	0.34	0.27
		Economic Impact of No Water	$1,243,918	$1,208,629	$626,370	$300,305	$238,197
		System Hours of Non-Potable	6.12	5.54	2.88	0.76	0.00
		Economic Impact of Non-Potable	$2,254,007	$2,040,392	$1,060,709	$279,762	$0
		Fire Following Earthquake Losses	$266,826	$230,693	$195,128	$158,485	$122,920
		Physical Damage - Reservoirs	$7,137,755	$6,067,091	$2,855,102	$1,070,663	$356,888
		Wells and Pump Stations	$275,000	$55,000	$27,500	$27,500	$27,500
		Lost Revenue	$4,421	$4,296	$2,226	$1,067	$847
		Total Scenario Damages + Losses	$11,181,926	$9,606,100	$4,767,035	$1,837,782	$746,351
		Annualized Damages + Losses	$3,727	$3,202	$1,589	$613	$249
Upper Elysian Park M6.0	**100**	System Hours of Lost Service	1.41	1.37	0.71	0.34	0.27
		Economic Impact of No Water	$1,243,918	$1,208,629	$626,370	$300,305	$238,197
		System Hours of Non-Potable	6.12	5.54	2.88	0.76	0.00
		Economic Impact of Non-Potable	$2,254,007	$2,040,392	$1,060,709	$279,762	$0
		Fire Following Earthquake Losses	$266,826	$230,693	$195,128	$158,485	$122,920
		Physical Damage - Reservoirs	$3,765,421	$3,200,608	$1,506,168	$564,813	$188,271
		Wells and Pump Stations	$140,000	$28,000	$14,000	$14,000	$14,000
		Lost Revenue	$4,421	$4,296	$2,226	$1,067	$847
		Total Scenario Damages + Losses	$7,674,592	$6,712,617	$3,404,601	$1,318,432	$564,234
		Annualized Damages + Losses	$76,746	$67,126	$34,046	$13,184	$5,642
Puente Hills M7.1	**3000**	System Hours of Lost Service	1.41	1.37	0.71	0.34	0.27
		Economic Impact of No Water	$1,243,918	$1,208,629	$626,370	$300,305	$238,197
		System Hours of Non-Potable	6.12	5.54	2.88	0.76	0.00
		Economic Impact of Non-Potable	$2,254,007	$2,040,392	$1,060,709	$279,762	$0
		Fire Following Earthquake Losses	$266,826	$230,693	$195,128	$158,485	$122,920
		Physical Damage - Reservoirs	$4,582,119	$3,894,801	$1,832,848	$687,318	$229,106
		Wells and Pump Stations	$180,000	$36,000	$18,000	$18,000	$18,000
		Lost Revenue	$4,421	$4,296	$2,226	$1,067	$847
		Total Scenario Damages + Losses	$8,531,290	$7,414,810	$3,735,280	$1,444,937	$609,069
		Annualized Damages + Losses	$2,844	$2,472	$1,245	$482	$203

Table 4-1. Scenario and Annualized Earthquake Damages and Losses (Part 2 of 2)

Earthquake Event	Return Period	Annualized Damages + Losses	
		As-Is	Percent
San Andreas M7.9	**100**	$ 62,278	4.58%
Sierra Madre M7.2	**300**	$484,937	35.67%
Raymond M6.5	**300**	$194,960	14.34%
Verdugo - Eagle Rock 6.9	**1000**	$80,929	5.95%
Upper Elysian Park M6.4	**3000**	$3,727	0.27%
Upper Elysian Park M6.0	**100**	$76,746	5.64%
Puente Hills M7.1	**100**	$2,844	0.21%
Plus 50% for Other Earthquakes	n/a	$453,210	33.33%
Total Annualized Damages	n/a	**$1,359,631**	100.00%

Table 4-2: Relative Contributions of Various Earthquakes to Total Seismic Risk

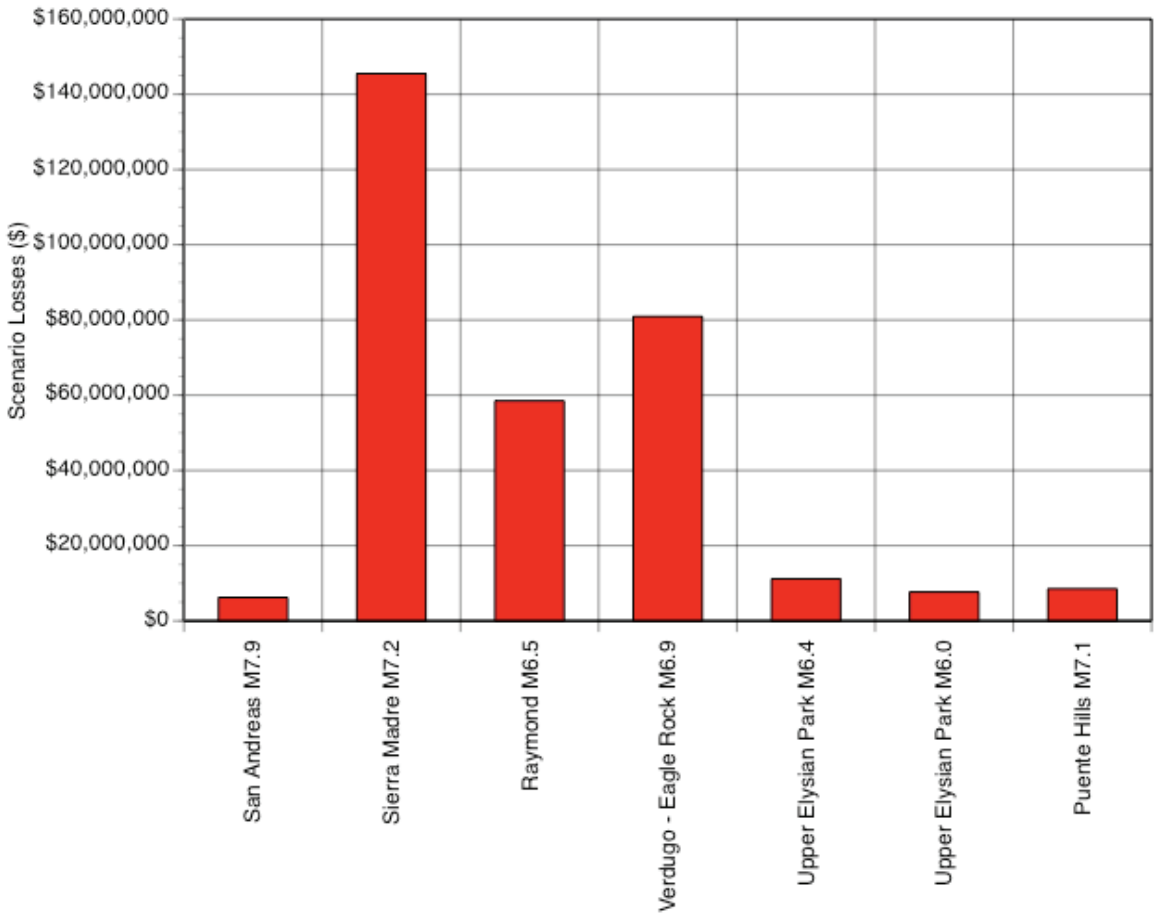


Figure 4-1. Scenario Losses in Pasadena due to Scenario Earthquakes

Figures 4-2 and 4-3 show the breakdown of the losses in Pasadena, given the occurrence of four scenario earthquakes, for the system in its as-is and potentially upgraded conditions.

The reduction in losses in Figure 4-3 assume implementation of the P3 seismic upgrade program plus the emergency response items listed in this report, and assume no surface faulting through the Allen, Santa Anita reservoirs or south of the Don Benito tanks in the Sierra Madre M 7.2 earthquake. If the recommended subsurface investigations for the Allen, Santa Anita and Don Benito sites indicate that more extensive upgrades are required to address the surface faulting hazard, then the P4 costs would be required to justify the reduction in losses in Figure 4-3 for the Sierra Madre M 7.2 earthquake.

Comparison of Figures 4-2 and 4-3 shows that by implementing the seismic upgrade program, losses will be reduced by about 80% to 90%, although not entirely eliminated. The bulk of the residual losses occur due to damage pipelines; the seismic upgrade program does not recommend pipe replacement to reduce this damage, as this is generally not cost effective; instead, somewhat more rapid repairs can be made by implementing the emergency response activities recommended in this report.

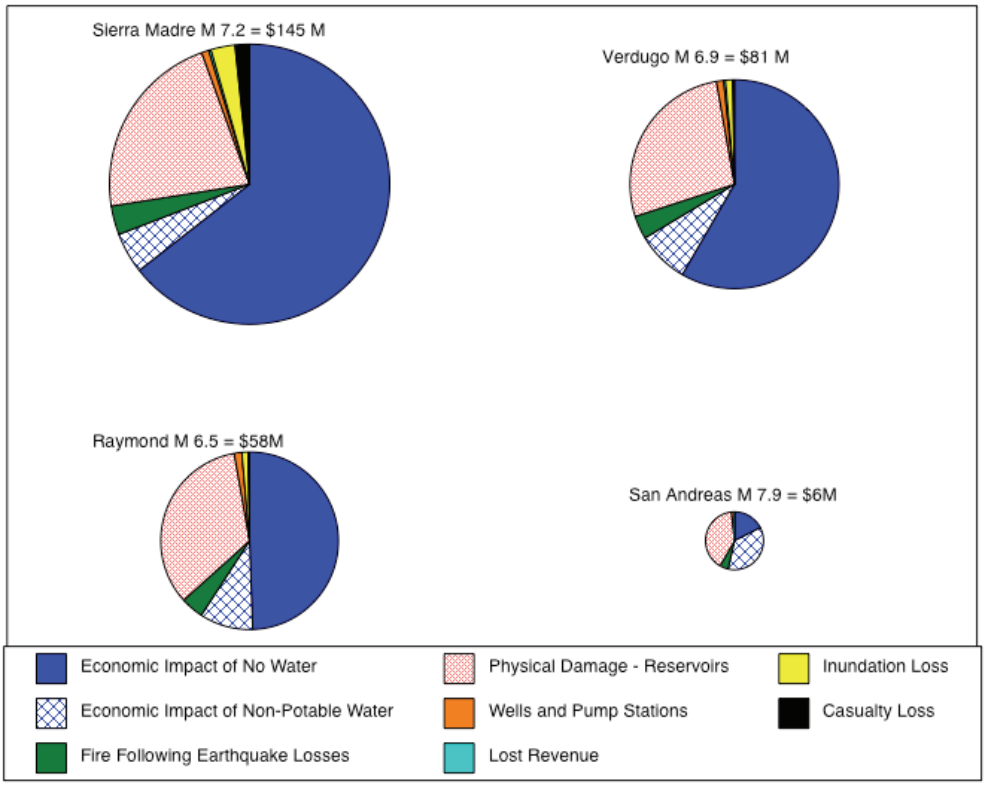


Figure 4-2. Scenario Losses in Pasadena due to Scenario Earthquakes (As Is System)

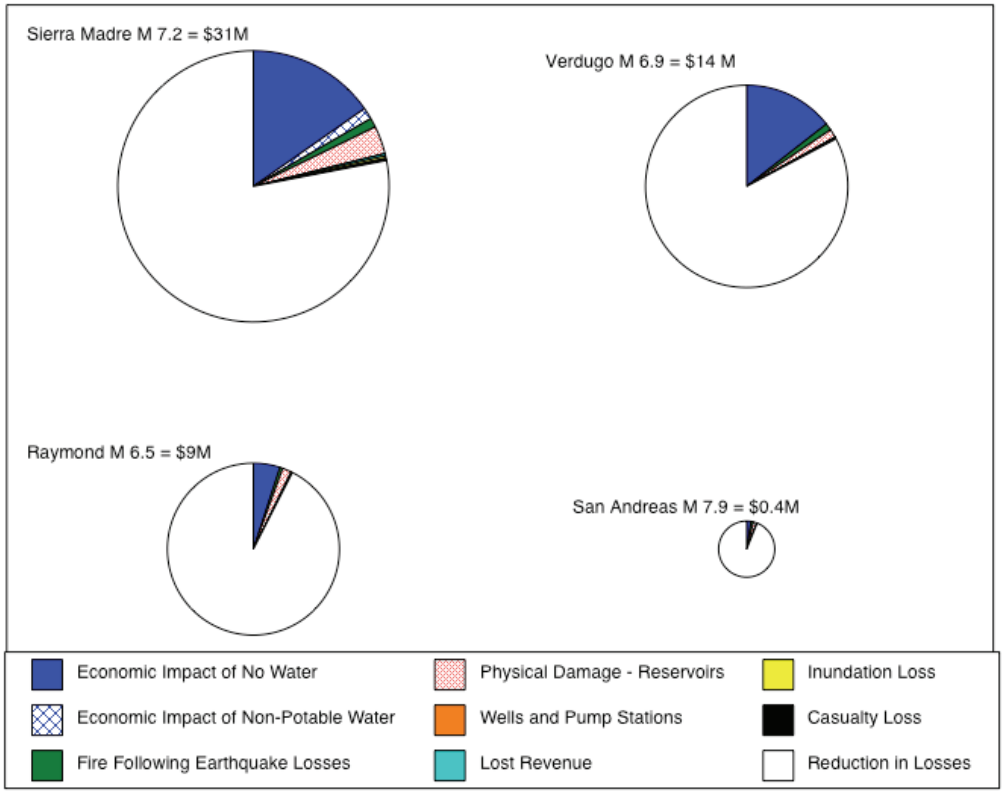


Figure 4-3. Scenario Losses in Pasadena due to Scenario Earthquakes (Upgraded System)

4.3 Benefit-Cost Results and Interpretation

Summary benefit-cost results are shown in Table 4-3. The results shown above in Table 4-3 are for a 5% discount rate, which is the midpoint of plausible discount rates (3% to 7%). The calculation of the net present value of benefits depends strongly on the discount rate selected. The sensitivity of the calculated net present value of benefits and thus of benefit-cost ratios to variations in discount rate is shown below in Table 4-4.

For Benefit-cost calculations take into account the time value of money. In simple terms, the costs of mitigation projects such as a seismic upgrade program are incurred upfront at the time of construction, while the benefits of mitigation (reduced damages and losses) accrue statistically over the useful lifetime of the CIP upgrades. For infrastructure upgrades a useful lifetime of 50-years is commonly assumed.

Earthquake Event	Return Period	Annualized Damages + Losses				
		As-Is	P1	P2	P3	P4
San Andreas M7.9	**100**	$ 62,278	$ 54,056	$ 27,435	$ 10,131	$ 3,812
Sierra Madre M7.2	**300**	$484,937	$355,354	$200,855	$106,413	$76,803
Raymond M6.5	**300**	$194,960	$155,471	$78,592	$30,889	$14,537
Verdugo - Eagle Rock 6.9	**1000**	$80,929	$68,425	$38,567	$19,994	$13,827
Upper Elysian Park M6.4	**3000**	$3,727	$3,202	$1,589	$613	$249
Upper Elysian Park M6.0	**100**	$76,746	$67,126	$34,046	$13,184	$5,642
Puente Hills M7.1	**100**	$2,844	$2,472	$1,245	$482	$203
Subtotal Annualized Damages	n/a	$906,421	$706,105	$382,328	$181,705	$115,073
Plus 50% for Other Earthquakes	n/a	$453,210	$353,053	$191,164	$90,852	$57,536
Total Annualized Damages	n/a	$1,359,631	$1,059,158	$573,492	$272,557	$172,609
Reduction from As-Is (Benefits)	n/a	n/a	$300,473	$786,139	$1,087,074	$1,187,022
Net Present Value of Reduction[1]	n/a	n/a	$5,485,415	$14,351,694	$19,845,534	$21,670,190
CIP Cost (rounded)	n/a	n/a	$2,120,000	$5,880,000	$8,730,000	$17,840,000
Benefit-Cost Ratio[1]	n/a	n/a	**2.59**	**2.44**	**2.27**	**1.21**

Table 4-3: Benefit-Cost Results

For direct comparison to costs, future benefits are discounted to net present value, taking the time value of money into account, by using a "discount rate." For benefit-cost analysis, the proper discount rate is a real discount rate, not considering the impacts of future inflation (which are unknown).

For FEMA-funded mitigation projects, FEMA regulations require use of a 7% discount rate. However, for internally-funded or bond-funded programs, Pasadena would most likely wish to use a lower discount rate. As an example, if a bond were issued at 6% annual interest, and the current annual inflation rate is about 3%, then the real cost of the bond is 3% per year, which corresponds to a real discount rate of 3%. Thus, for bond costs in the range of 5% to 6%, appropriate discount rates would be in the range of 2% to 3%.

Present value coefficients various discount rates (50-years)	PVC
3%	25.73
4%	21.48
5%	18.26
6%	15.76
7%	13.80

Discount Rate	P1	P2	P3	P4
	BCR for Various Discount Rates			
3%	3.65	3.44	3.20	1.71
4%	3.04	2.87	2.67	1.43
5%	2.59	2.44	2.27	1.21
6%	2.23	2.11	1.96	1.05
7%	1.96	1.85	1.72	0.92

Table 4-4. Sensitivity of BCRs to Various Discount Rates

For discount rates of 3% to 6%, all of the upgrade packages have BCRs greater than one, and thus may be deemed economically justified. For the FEMA-mandated discount rate of 7%, P1, P2 and P3 are economically justified while P4 is not (that is, the BCR for P4 is 0.92, which is less than 1.0).

4.4 Interpretation of Benefit-Cost Results

Benefit-cost results provide an important basis for decision making about what level of upgrade program may be appropriate for Pasadena. However, benefit-cost results should not be over interpreted, and other factors may also influence the final decision about which level of upgrade is appropriate.

P1 is a relatively low cost package which addresses obvious and major deficiencies in the as-is water system. Given these attributes and the high benefit-cost ratios, implementation of P1 clearly makes sense. P2 and P3 also have benefit-cost ratios above 1.0 as does P4 (for some discount rates). Further insight into the economic viability of these packages can be obtained by comparing the incremental benefits and incremental costs in going from P1 to P2, from P2 to P3 and from P3 to P4. These results are shown below in Table 4-5.

On the basis of incremental benefits and incremental benefit-cost ratios, going from As-Is to P1 to P2 to P3 are all cost-effective, regardless of discount rate. Going from P3 to P4 is not cost effective, regardless of discount rates because the incremental costs ($9.1 million) are much larger than the incremental benefits ($1.8 million).

The conclusion, drawn from the incremental benefit-cost results, is that P3 clearly makes sense, but a-priori, P4 does not make sense.

Category	Incremental Costs and Benefits			
	As-Is to P1	P1 to P2	P2 to P3	P3 to P4
Benefits	$5,485,415	$14,351,694	$19,845,534	$21,670,190
Incremental Benefits[1]	$5,485,415	$8,866,279	$5,493,840	$1,824,655
Incremental Costs	$2,120,000	$3,760,000	$2,850,000	$9,110,000
Incremental BCR[1]	**2.59**	**2.36**	**1.93**	**0.20**

[1] 5% discount rate, 50-year project useful lifetime

Discount Rate	Incremental BCR for Various Discount Rates			
	As-Is to P1	P1 to P2	P2 to P3	P3 to P4
3%	**3.65**	**3.32**	**2.72**	**0.28**
4%	**3.04**	**2.77**	**2.27**	**0.24**
5%	**2.59**	**2.36**	**1.93**	**0.20**
6%	**2.23**	**2.04**	**1.66**	**0.17**
7%	**1.96**	**1.78**	**1.46**	**0.15**

Table 4-5 Incremental Benefit-Cost Results

If a decision were made solely on benefit-cost results, P3 might be a logical level of upgrade. On the other hand, there are certainly valid factors beyond those considered in benefit-cost analysis. P4 provides a greater reduction in future damages and losses from rare (2,475-year return period) earthquakes and includes budget to deal with the possibility that surface faulting might be a realistic hazard for some reservoirs. A better decision to spend any money for items in the P4 budget will be gained after some additional site investigations are done at the Allen, Santa Anita and Don Benito sites.

5.0 Service Goals

This section of the report describes service goals for the Pasadena water system after earthquakes. Where appropriate, the goals are distinguished between rare Maximum Earthquakes (like a Sierra Madre M 7.2 earthquake) or more common but less severe earthquakes like the 1933, 1971, 1987, 1994 earthquakes or a future San Andreas event that can affect the Pasadena area. The numbering of the goals (1 to 10) is for convenience, and does not indicate that an individual goal is more important than another.

Service goals are a method by which to benchmark how well a water system will perform in earthquakes against deterministic goals. There are no code requirements per se to meet these goals. However, service goals similar to the ones presented in Tables 5-1 and 5-2 are commonly used by other water utilities in California, and have been used as a yardstick to help decide whether or not to upgrade their water systems.

Section 5.1 describes the services goals for the Pasadena water system. Section 5.2 describes how well the as-is water system meets these goals. Section 5.3 describes how well the water system would meet these goals, assuming various seismic upgrade programs are adopted.

5.1 Service Goals Described

1. Minimal Secondary Damage and Risk to the Public

Damage to the infrastructure should pose minimal risk to the public. For example, chlorine releases should not occur, and occupied buildings should not collapse.

2. Limit Extensive Damage to System Facilities

Undue amounts of damage to Pasadena's own facilities could result in the inability for the Maintenance Department to respond after an earthquake. Damage to critical facilities with post-earthquake emergency function should be avoided (such as the designated areas for emergency operations coordination). Damage posing credible life safety threat to Pasadena's own personnel should be avoided.

3. All Water Introduced into the Pasadena System Minimally Disinfected

All water entering the Pasadena water distribution system from the Metropolitan Water District should be at least minimally disinfected prior to introduction, immediately after the earthquake. This means that no "untreated" water should be introduced. Minimal disinfection would include chlorination / chloramination.

4. Provide Limited Fire Service at Fire Hydrants for the First 24 Hours After the Earthquake

This service goal reflects that, after an earthquake, there may be multiple fires on Pasadena. This will be compounded by damage within the Pasadena distribution system, cutting off parts of the water distribution system from the source of water and depleting water in the storage tanks through pipeline breaks.

Maximum Earthquake: The target goal is to be able to provide limited fire flow service throughout most of the service area, for the first 24 hours after the earthquake. The first 24 hours is when most of the fire outbreaks usually occur after earthquakes. By limited, it is meant that 75% of the area served by Pasadena will be within 2,000 feet of a serviceable hydrant. A serviceable hydrant is one with a minimum of 1,000 gpm at 20 psi residual pressure, with consideration of concurrent distribution system leak rates and alternative reliable water supplies. In coordination with the Fire Department, emergency fire flows can be established at any location within 2 to 8 hours after the earthquake.

Probable Earthquake: The target goal is to be able to provide limited fire flow service throughout most of the city, for the first 24 hours after the earthquake. The first 24 hours is when most of the fire outbreaks usually occur after earthquakes. By limited, it is meant that 90% of the area served by Pasadena will be within 2,000 feet of a serviceable hydrant (minimum of 1,000 gpm at 20 psi residual pressure) with consideration of concurrent distribution system leak rates. In coordination with the Fire Department, emergency fire flows can be established at any location within 2 to 8 hours after the earthquake.

5. Provide Normal Fire Service to All Hydrants Within 10 Days After the Earthquake

Maximum Earthquake: This service goal reflects that the City should be able to restore its normal capacity to deliver water to almost all (99%+) fire hydrants, within 10 days after any earthquake.

Probable Earthquake: This service goal reflects that the City should be able to restore its normal capacity to deliver water to all fire hydrants, within 3 days after a probable earthquake.

6. Critical Care, Emergency Relief Facilities: Potable Water Via Distribution System or Truck or Accessible Locations Within 1 Day

The Pasadena water department should be able to deliver (or be confident that others will deliver) potable water to any functioning critical care or emergency relief facility (shelter) within Pasadena within 1 day after any earthquake.

This will require an ability to prioritize repair and restoration activities to restore water deliveries via the distribution system to priority customers. Should sufficient damage

occur that precludes the restoration of water service by the usual underground pipe network, alternative water delivery approaches should be available.

It is likely that some Pasadena area residents will be unable to get potable water via their normal water distribution system following large earthquakes. This will include people who are forced out of their homes because of damage to those structures and due to damage to the underground water distribution network. Suitable delivery points for distribution of potable water should be identified as part of an emergency response plan. Suitable facilities should be available to allow water tanker trucks to be filled from reliable sources of potable water. Potable water hose bibs should be available at several locations throughout the Pasadena service area.

7. Critical Care, Emergency Relief Facilities: Impaired Service Within 3 Days.

Impaired service is defined as the delivery of some amount of water (enough to meet winter time demands, allowing for mandatory halt of irrigation if necessary) via the buried pipe transmission system. Occasional pressure fluctuations or brief outages are possible. For probable earthquakes, within 2 days.

8. Critical Care, Emergency Relief Facilities: Normal Service Within 5 Days.

Normal service is defined as the delivery of amount of water at the same level of reliability as under "normal" pre-earthquake conditions. For probable earthquakes, within 3 days.

9. Impaired Service to Other Customers Within 7 Days

Impaired service is defined as the delivery of some amount of water (enough to meet winter time demands, allowing for mandatory halt of irrigation if necessary) via the buried pipeline system to at least 98% of all customers. Occasional pressure fluctuations or brief outages are possible. For probable earthquakes, within 4 days.

10. Normal Service to Other Customers within 10 Days

Normal service is defined as the delivery of amount of water at the same level of reliability as under "normal" pre-earthquake conditions. For probable earthquakes, within 5 days.

Service Category	Maximum Earthquake	
General	1	Minimal secondary damage and risk to the public
	2	Limit extensive damage to system facilities
	3	All water introduced into the distribution system minimally disinfected
Fire Service	4	Provide limited fire service to 75% of fire hydrants for first 24 hours after the earthquake.
	5	Normal fire service to almost all (99%+) hydrants within 10 days
Critical Care and Emergency Relief Facilities	6	Potable water via distribution system or truck within 1 day.
	7	Impaired service within 3 days
	8	Normal service within 5 days
Other Users	9	Impaired service within 7 days
	10	Normal service within 10 days

Table 5-1. Pasadena Water System Service Goals - Maximum Earthquake

Service Category	Probable Earthquake	
General	1	Minimal secondary damage and risk to the public
	2	Limit extensive damage to system facilities
	3	All water introduced into the distribution system minimally disinfected
Fire Service	4	Provide limited fire service to 90% of fire hydrants for first 24 hours after the earthquake.
	5	Normal fire service to all (99%+) hydrants within 3 days
Critical Care and Emergency Relief Facilities	6	Potable water via distribution system or truck within 1 day.
	7	Impaired service within 2 days
	8	Normal service within 3 days
Other Users	9	Impaired service within 4 days
	10	Normal service within 5 days

Table 5-2. Pasadena Water System Service Goals - Probable Earthquake

Minimally Disinfected	Chlorination or better
Limited Fire Service (Maximum EQ)	Provide fire flows to cover 75% of the service area for the first 24 hours after earthquake with allowance for distribution leak rates, damaged distribution storage, and alternate reliable water supplies.
Limited Fire Service (Probable EQ)	Provide fire flows to cover 90% of the service area for the first 24 hours after earthquake with allowance for distribution leak rates, damaged distribution storage, and alternate reliable water supplies.
Impaired Service	Provide water (adequate to meet winter time demands), possibly at lower pressure than normal to 98%+ of customers
Normal service	Provide water at the same level of reliability as under "normal" pre-earthquake conditions to 99%+ of customers

5.2 Service Goals Met – As Is Water System

Table 5-3 compares how the Pasadena water system, in its current condition, compares with the performance goals after a Maximum Earthquake.

Service Category	Goal	Sierra Madre M 7.2	Verdugo Eagle Rock M 6.9	Raymond 6.5	Upper Elysian Park M 6.4	Puente Hills M 7.1
General	1	No	Yes	Yes	Yes	Yes
	2	No	No	No	Mostly	Mostly
	3	Yes	Yes	Yes	Yes	Yes
Fire Service	4	No	No	No	Yes	Yes
	5	No	No	Yes	Yes	Yes
Critical Care	6	No	No	No	No	No
	7	No	No	No	Yes	Yes
	8	No	No	No	Yes	Yes
Other Users	9	No	No	Mostly	Yes	Yes
	10	No	No	Yes	Yes	Yes
Goals Met		1	2	4+	8+	8+

Table 5-3. Existing System Versus Goals (Maximum Earthquake)

Goal 1. Goal 1 is not met for the Sierra Madre M 7.2. In this event, there is some possibility that surface faulting will result in sudden release of water from reservoirs at the Allen, Santa Anita and Don Benito tank sites. Water releases could result in secondary damage, including inundation and erosion impacts. Release of water at the Allen and Santa Anita reservoirs could result in some risk to the public.

Goal 2. The Sierra Madre, Verdugo – Eagle Rock and Raymond scenarios all result in very strong ground shaking in Pasadena. the high level of shaking will result in significant damage to several reservoir roof systems (very costly to fix); damage to certain well buildings (could impact well operations); and damage to unanchored electrical equipment.

Goal 3. Goal 3 is met in that Pasadena has already seismically upgraded all its chlorine facilities. Assuming that power is available, these facilities should be reliable. Also, water from MWD is assumed to be suitable treated after any earthquake.

Goal 4. Goal 4 is not met for any of the three large nearby earthquakes. The percentage of fire hydrants without water in the first 24 hours is significant after the Sierra Madre M7.2, Verdugo Eagle Rock M 6.9 or Raymond M 6.5 earthquakes. This loss of water is due to damage to the Upper Feeder; loss of power for pumping; and breakage of distribution pipelines that leads to drops in pressure and rapid drawdown of existing storage reservoirs.

Goal 5. Goal 5 is not met for the Sierra Madre and Verdugo-Eagle Rock events, but is met for the others.

Goal 6. Table 5-3 lists "no", as it is assumed that Pasadena is not currently trained to distribute water via tanker truck to critical care facilities within 24 hours after any earthquake. This goal can be improved via suitable training and incorporation into emergency response plans.

Goal 7. Goal 7 is not met for any of the three large nearby earthquakes. This is chiefly due to loss of power supply, loss of Upper Feeder water, pipeline damage, and lack of emergency response directive to dedicate repair crews to restore water to critical care facilities on a priority basis. Providing backup power capability and improved training will largely serve to meet this goal.

Goal 8. Goal 8 is not met for any of the three large nearby earthquakes. This is chiefly due to loss of power supply, loss of Upper Feeder water, and pipeline damage. Providing backup power capability and improved training will largely serve to meet this goal.

Goal 9. Goal 9 is not met for the Sierra Madre and Verdugo – Eagle Rock earthquakes. This is chiefly due to loss of power supply, loss of Upper Feeder water, pipeline damage and limited repair crew size. Providing backup power capability, and expanding the ability to rapidly take on extra pipe repair crews through mutual aid will largely serve to meet this goal.

Goal 10. Goal 10 is not met for the Sierra Madre and Verdugo – Eagle Rock earthquakes. This is chiefly due to loss of power supply, loss of Upper Feeder water, pipeline damage and limited repair crew size. Providing backup power capability, and expanding the ability to rapidly take on extra pipe repair crews through mutual aid will largely serve to meet this goal for the Verdugo – Eagle Rock earthquake. For the Sierra Madre earthquake, either the Upper Feeder must be made more reliable (an MWD project), or there needs to be increased capacity to draw high volumes of water from the East Valley Feeder / Santa Monica Feeder.

Table 5-4 compares how well the as-is Pasadena water system compares to the service goals for the two Probable earthquake scenarios. As can be seen, the as-is system already meets most of the goals.

Service Category	Goal	San Andreas M 7.9	Upper Elysian Park M 6.4
General	1	Yes	Yes
	2	Mostly	Mostly
	3	Yes	Yes
Fire Service	4	Mostly	Mostly
	5	Yes	Yes
Critical Care	6	Yes	Yes
	7	Yes	Yes
	8	Yes*	Yes
Other Users	9	Yes	Yes
	10	Yes*	Yes
Goals Met		8+	8+

Table 5-4. Existing System Versus Goals (Probable Earthquake)

Goal 2. The existing infrastructure, with just a few exceptions, is expected to have at most none or minimal damage in the two probable scenario earthquakes.

Goal 4. Goal 4 is mostly met expect that there may be short term (a few hours) outage in a few hillside pressure zones due to power outages combined with concurrent pipeline damage due to landslides that leads to rapid depletion of in-zone storage.

Goal 8. Goal 8 is likely to be met after probable earthquakes. Providing backup power capability and improved post-earthquake emergency training will largely serve to increase confidence in meeting this goal.

Goal 10. Goal 10 is almost met for the San Andreas M 7.9 earthquake. Providing backup power capability and improved post-earthquake emergency training will largely serve to increase confidence in meeting this goal.

5.3 System Performance – Upgraded Water System

Figures 5-1 through 5-4 show the projected post-earthquake service within Pasadena assuming the occurrence of the scenario earthquakes, under three conditions:

- As-is system (2006).
- As-is system plus implementing seismic upgrade program P1.
- As-is system, plus implementing seismic upgrade program P3 plus the emergency response issues outlined in this report. The performance shown assumes that surface faulting in the Sierra Madre M7.2 scenario does not go through the embankments of the Allen, Santa Anita reservoirs; or south of the Don Benito reservoirs. Subsurface exploration recommended for these reservoirs may show

this not to be the case, in which case the cost to achieve the improvement in Figure 5-1 will be higher (the P4 upgrades for those reservoirs would then be required).

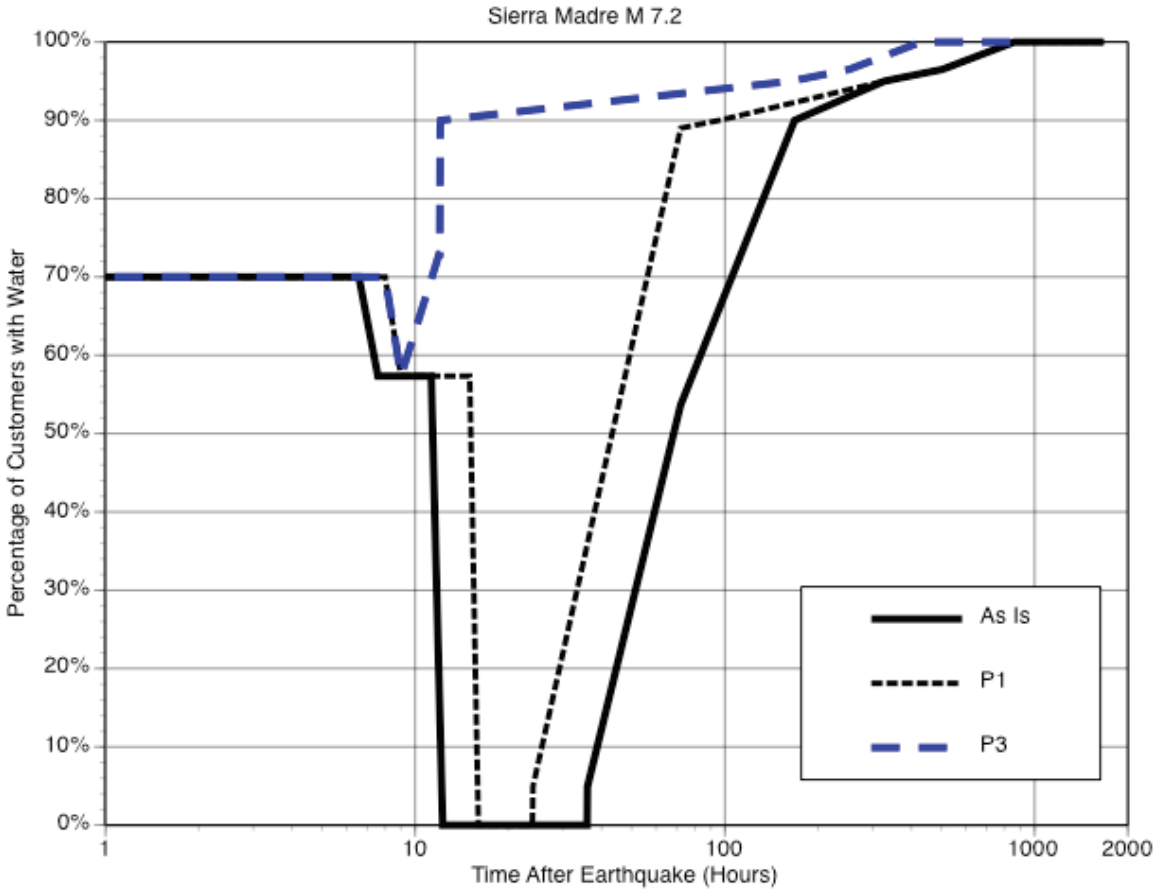


Figure 5-1. System Performance After Sierra Madre M 7.2 Earthquake

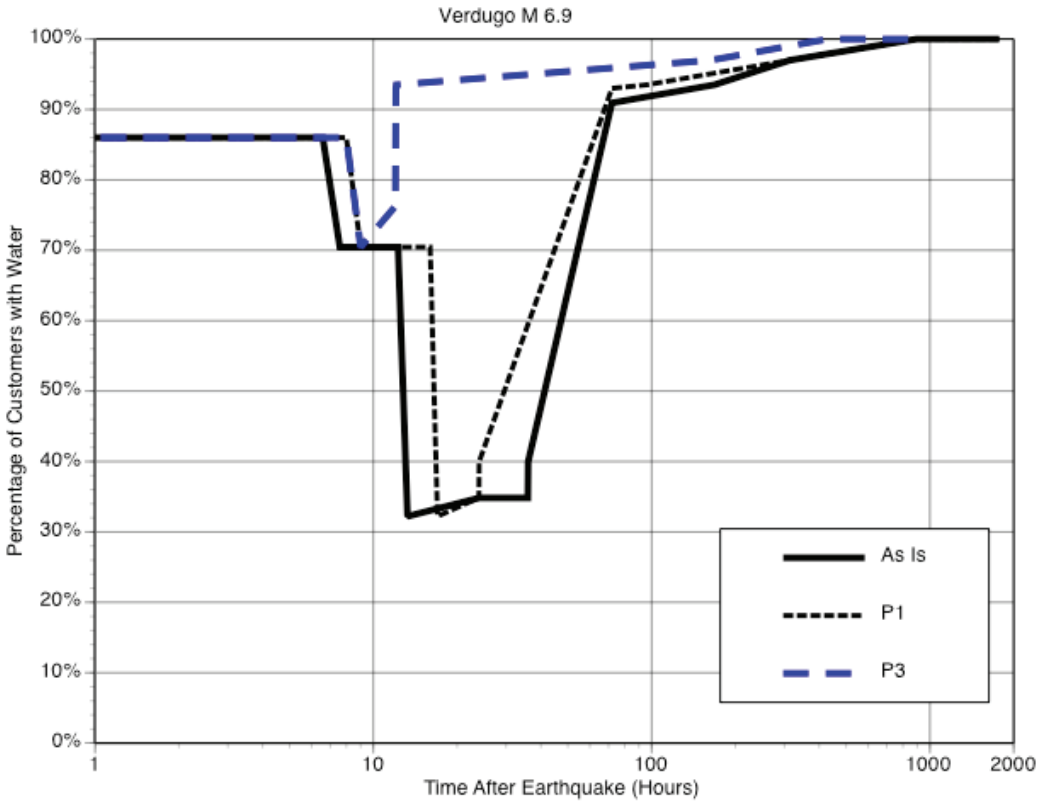


Figure 5-2. System Performance After Verdugo – Eagle Rock M 6.9 Earthquake

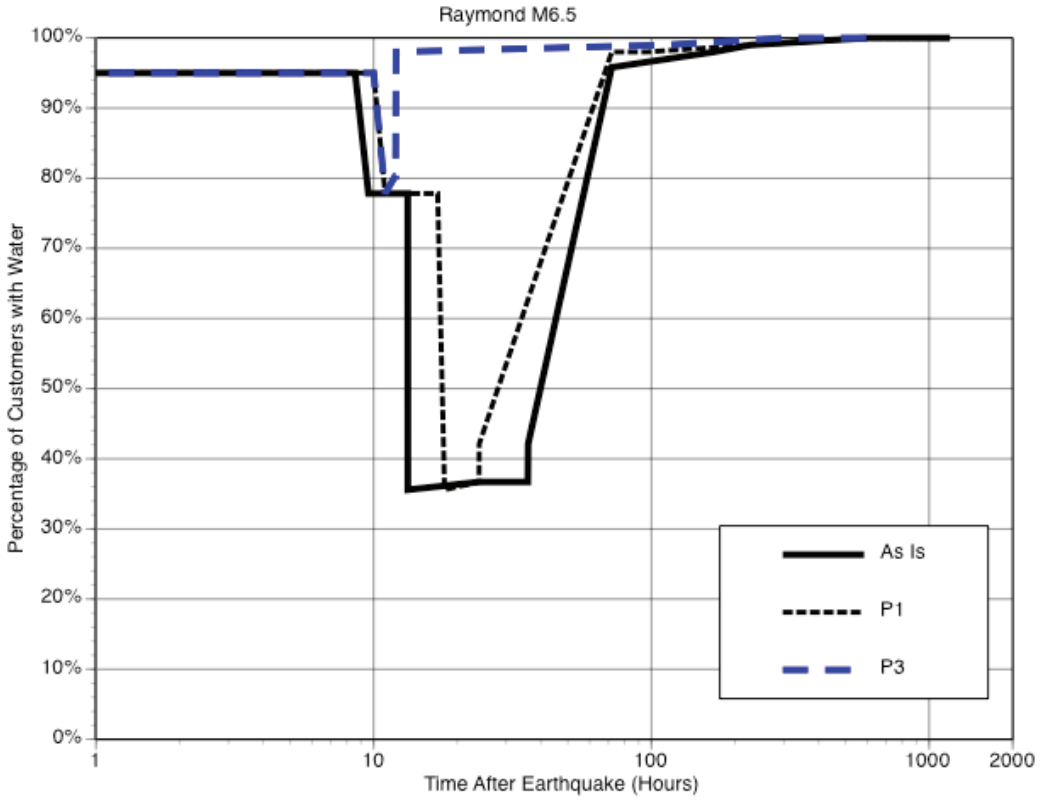


Figure 5-3. System Performance After Raymond – M 6.5 Earthquake

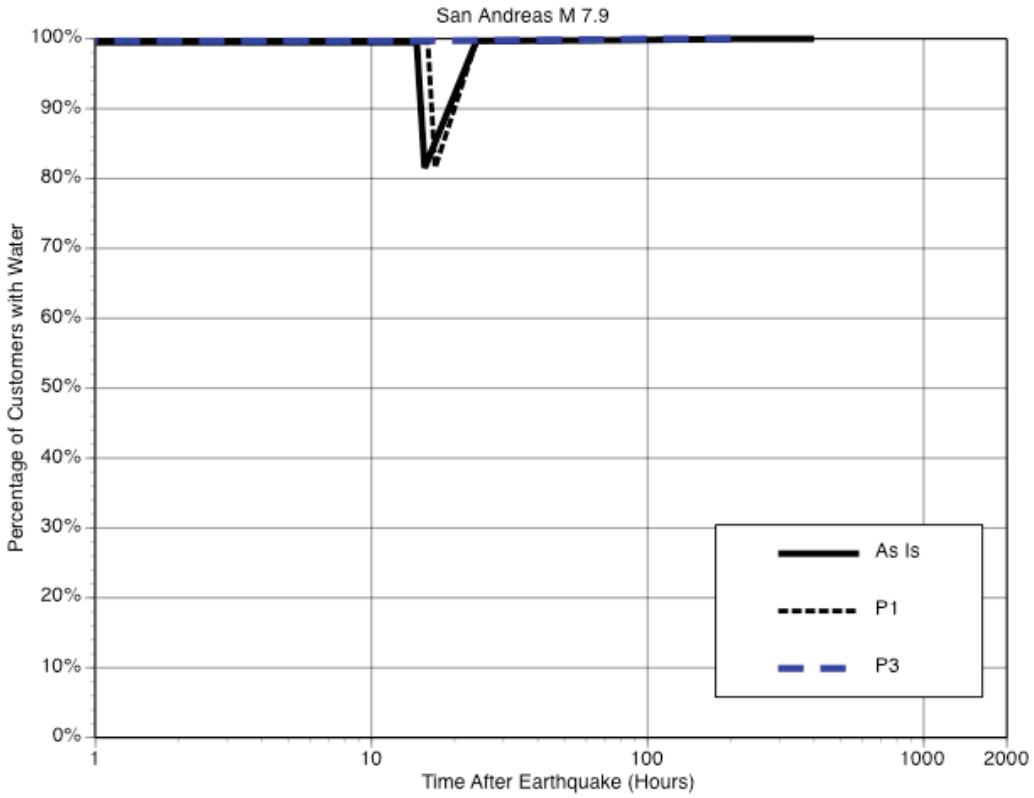


Figure 5-4. System Performance After San Andreas – M 7.9 Earthquake

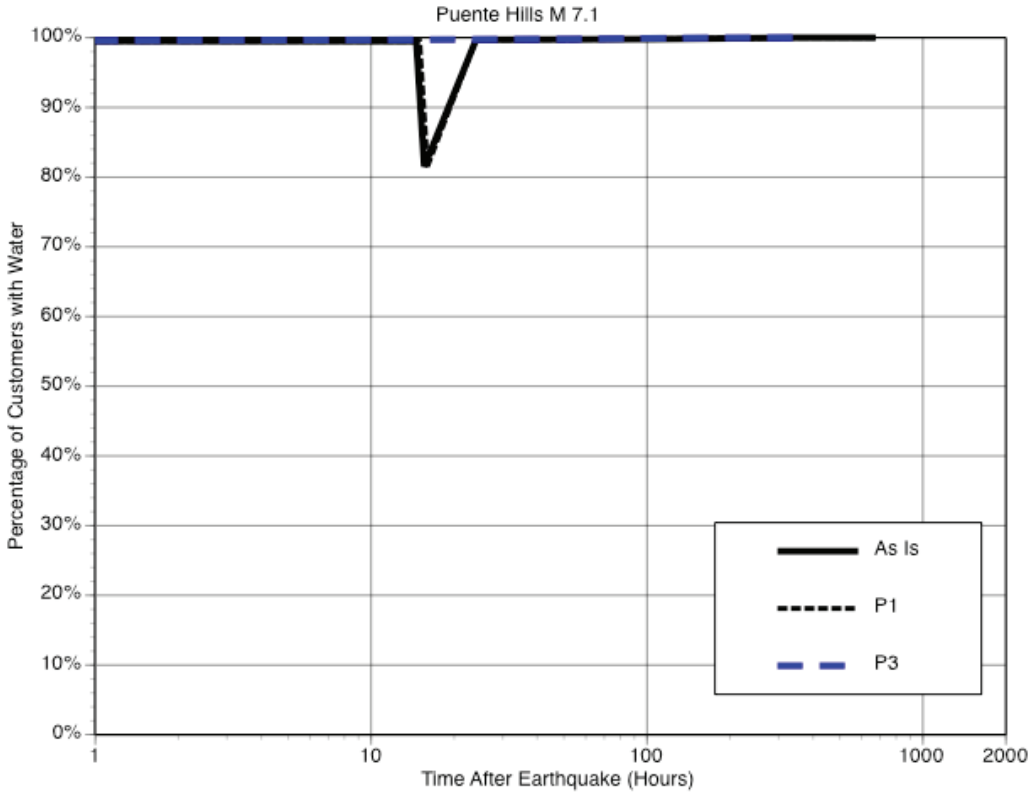


Figure 5-5. System Performance After Puente Hills– M 7.1 Earthquake

6.0 Emergency Planning

Section 6 of the report describes recommended actions to enable Pasadena Water and Power to be better prepared to respond to an earthquake.

6.1 Planning Scenario

Potential damage from seven scenario earthquakes is described in detail G&E (2006a). Because the Sierra Madre M 7.2 event is the scenario earthquake with the largest total earthquake risk to the Pasadena water supply system (see Figures 4-2, 4-3 and 5-1), it is chosen as the primary planning scenario for emergency response. The Verdugo – Eagle Rock M 6.9 scenario earthquake produces somewhat more pipe damage, especially due to fault offset, and this earthquake is also considered in the planning process.

6.2 Estimated Damages

The Sierra Madre M 7.2 earthquake scenario would result in:

- 124 pipeline repairs based on summer conditions. The breaks will occur in all sizes of distribution pipe, and all types of construction, except, possibly, butt-welded, and double-lap welded pipe. Table 6-1 shows the expected breaks by earthquake scenario. Table 6-2 breaks down the damage by pipe type and diameter.
- There will be about 10 to 20% more pipe repairs if the earthquake occurs during winter time (saturated soil) conditions, owing to the increased chance of landslides in hillside pressure zones.
- These total pipe repairs can vary by ±50% from the totals in Tables 6-1 and 6-2, owing to uncertainty and randomness in earthquakes.

The Verdugo – Eagle Rock M 6.9 earthquake scenario would result in about 15% more pipeline damage, with more pipes damaged due to fault offset.

Scenario Earthquake	Total Repairs	Repairs due to Ground Shaking	Repairs due to Liquefaction	Repairs due to Landslide	Repairs due to Fault Offset
San Andreas M 7.9	29	28	0	1	0
Sierra Madre M 7.2	124	103	0	19	2
Raymond M 6.5	76	76	0	7	6
Verdugo-Eagle Rock M 6.9	140	110	0	22	8
Upper Elysian Park M 6.4	50	48	0	2	0
Upper Elysian Park M 6.0	27	26	0	1	0
Puente Hills M 7.1	54	51	0	3	0

Table 6-1. Pipe Repairs Due to Scenario Earthquakes (Summer Time Conditions)

Pipe Diameter	Cast Iron	Ductile Iron	Other
4	10		
6	51	3	3
8	39	3	2
12	3	2	
16		2	
18	1		
30	1		
Total	105	10	5

Table 6-2. Pipe Repairs Due to Sierra Madre M 7.2 Scenario Earthquake

- 4 to 18 pumping plants non-functional due to various causes (2 buildings extensively or completely damaged; 6 pump sets damaged; 18 electrical panels / switchgear / transformers damaged; 11 miscellaneous equipment damaged; and offsite power outages throughout the service area for more than 24 hours)
- Possibly 2 steel tanks that fail and lose all water (meaning none available for fire flows or consumption)
- 4 to 14 open cut lined reservoirs with various types of roof damage, resulting in debris in the water, making water non-potable
- Likely Loss of MWD water supply at P1, P2, P3 and P4.
- Loss of electric power to pumps and wells.
- Failure of several well buildings, damaging the wellhead equipment.

6.3 Planning Assumptions

Repair estimates are divided into short term (temporary bypass to restore service) and long-term (restoring component to its pre-earthquake condition).

The following pipeline repair needs are assumed:

Pipe repair crew (each):

- 1 foreman
- 2 plumbers
- 1 heavy equipment operator (e.g., back hoe operator, heavy dump truck operator, etc.)

Pipe repair equipment (per crew):

- 1 heavy dump truck
- 1 service truck
- 1 backhoe (heavy crane for large pipes)
- 1 pickup truck
- 1 small compactor

Pipeline repair man hours (per pipe repair):

- 321 man hours (48 to 60 inch diameter pipe and larger)
- 241 man hours (24 to 42 inch diameter pipe)
- 95 man hours (12 to 20 inch diameter pipe)
- 38 man hours (10 inch and under diameter pipe, service connections, hydrants)

The pipe repair man hour estimates are based on historical averages of actual efforts by field crews to make pipe repairs. Since recent California earthquakes have been only moderately disruptive to water utilities and their communities as a whole, the above repair estimates reflect potential inefficiencies that may be encountered under very disruptive earthquakes, including poorer than normal communications, non-optimal use of manpower, use of mutual aid crews, etc.

Repair procedure:

- Short term repair and temporary bypass. Locate the damaged pipe. Isolate the damage by closing upstream and downstream valves. Dig up the street to expose the pipe (no trench wall system for most locations). De-water the site. Examine the pipe. Assess type of repair needed (clamp, new pipe, etc.). Install hardware to make the repair. Restore water service to the pipe and verify the pipe works. Leave the street open (with markers) until higher priority repairs are made. If the damage is on a backbone transmission pipeline (a pipeline that has no redundancy and serves hundreds to thousands of customers who will be out of water due to lack or rapid drainage of local storage), install a temporary flex hose bypass pipe between isolated hydrants either

side of the fault offset / pipe break, in order to restore backbone transmission of water (at a rate of at winter time demand) while repairs to the transmission pipeline are made,

- Long term repair. Return to site of short term repair. Bury the pipe in suitable backfill. Compact the fill. Close the street. Restore pavement.

Under normal conditions, the entire pipe repair procedure would be done at one time. Breaking the repair procedure into two steps reflects the assumed urgency in restoring water service to as many customers as possible in as short a time frame as possible, given a large earthquake. For small earthquakes where the extent of customer service disruptions is relatively small (under 10% of all customers) and service disruption restoration times are relatively short (under 3 days), permanent repairs may be made at each pipe site in one step; this would reduce the average repair effort (man hours) per pipe break, but increases the total customer outage times.

Under emergency conditions, repair crews would be placed on 12 hour shifts, 7 days per week on a 24-hour cycle until the transmission system is completely restored; thereafter, repair crews would work 8 hour shifts, 5 days per week.

For temporary bypass needs, the average distance between isolated hydrants will be 750 feet. Assume that six large diameter bypasses will be sufficient to restore the bulk of transmission capacity. Assume that ultra large diameter flex hose (12-inch diameter) is used for the bypass. This type of hose is available from suppliers like Angus, and others. The cost of such hose is currently about $55 per foot, plus additional costs for spare parts and deployment vehicles (flaking boxes on trailers pulled by pickups). The estimated cost for Pasadena to procure such equipment is:

- 4,500 feet of 12-inch hose. $247,500
- Flaking boxes, transport vehicles, spare parts, hydrant adapters. $140,000.
- Total. $387,500.

6.4 Recommendations

The following emergency planning issues are addressed:

1. Materials, equipment and personnel for pipe repair
2. Modifications to wells and pumps to allow quick connection of emergency generators and/or bypass pumps
3. Fixed emergency generators and fuel.
4. Mutual Aid from/to neighboring municipalities.
5. Modifications to the existing Water Delivery Business Unit Contingency Plan dated September 12, 2002

6.4.1 Pipe Repair

While the City maintains an inventory of pipe of various sizes, couplings and other spare parts, Water and Power staff assumes that current inventories would not be sufficient to repair the number of estimated pipeline breaks for the scenario earthquake. Therefore, it must be assumed that additional pipe, couplings and other parts would need to be obtained from vendors or mutual aid sources.

Prior to the 1994 Northridge earthquake, the Metropolitan Water District of Southern California (MWD) placed cargo containers with extra pumps, emergency generators and miscellaneous items such as flashlights, gloves, etc. at critical field locations. Its experience responding to this earthquake indicated that most needed parts and equipment, including specialized parts, could have been delivered overnight from anywhere in the country. Consequently, MWD determined that maintaining large stockpiles of supplies and equipment was not necessary.

We recommend that Pasadena Water and Power maintain a minimum inventory of spare parts sufficient to make pipe repairs for three days after any major earthquake. During the first three days, the City will be concentrating on repairing the largest diameter pipelines in most cases; the City should have on hand sufficient spare parts to make about 4 repairs to medium-large diameter pipelines (16-inch to 36-inch diameter) and 40 repairs to small diameter pipelines (4-inch to 12-inch diameter).

We have not made a detailed inventory of available spare parts owned by Pasadena. For planning purposes, provide an allowance of $50,000 to procure and then maintain this minimum level of inventory of pipe repair parts.

Crew Availability

Assuming that a majority of Pasadena's field personnel are able to report to work following the scenario earthquake, an adequate number of personnel would be available in the first 24 to 48 hours to secure the water system and initiate emergency repairs. However, in order to meet its service restoration goal to all customers, the City should pre-plan the use of mutual aid crews as soon as practical following the earthquake.

Once the system has been secured, 12-hour shift work should be implemented to perform the most critical repairs to the water system as rapidly as feasible. It is recommended that a City foreman be assigned to supervise each mutual aid crew.

As part of its earthquake planning, Pasadena should pre-assign its field personnel to 12-hour A and B shifts, based on job classifications and geographic residence locations (e.g., those living closest to department facilities should be assigned to A shift). Mutual aid crew leaders should also be pre-designated.

The types of repairs to which mutual aid crews would be assigned should be pre-determined, and mutual aid crew packets should be developed. The crew packets should

include local maps, PWP contact information, meal and/or housing vouchers, lists of local hotels, motels and restaurants, and similar reference information. These preparations will facilitate the timely and effective use of mutual aid crews.

A budget of $200,000 is recommended to plan for rapid crew ramp-up and mutual aid; prepare training manuals for crews to use for rapid pipe repair efforts; and purchase supplementary communication hardware for crew deployment.

6.4.2 Emergency Generators

Tables 6-3 and 6-4 shows the recommended addition of emergency generators for the pumping plants and wells.

Overall, we recommend that five sources of water (Ross pumping plant and four wells) have standby power sources available on site at all times. As the exact location of power outages cannot be known with certainty, these emergency generators should be portable (trailer mounted), so that they can be transported to other sites as needed.

For smaller pumping plants and wells, it is likely that suitable-sized emergency generators (4 to 8 additional) and portable pumps (one large 2500 gpm 200 foot lift and one small 400 gpm 300 foot lift) can be obtained within a few hours via mutual aid.

Pumping Plant	Quick Connects	Standby Power	Procure (P) or Mutual Aid (M)	Cost
Ross	Yes	Portable, On Site	P	$500,000
Linda Vista	Yes		M	
Santa Anita	Yes		M	
San Rafael				
Glorietta	Yes		M	
Lida				
Thomas				
Murray	Yes		M	
Atlanta				
Jones	Yes		M	
Eagle Rock	Yes		M	
Allen	Yes		M	
Annandale	Yes		M	
Flint Ridge				
Wilson	Yes		M	
P1				
Devils Gate	Yes			
Rutherford				

Notes:
P = procure
M = mutual aid / contractors or relocate from another site if necessary

Table 6-3. Standby Power Recommendations for Pumping Plants

In Table 6-4, it is suggested that four wells be outfitted with standby portable (trailer mounted) emergency generators. These four wells were selected primarily based on their size (larger flow rates) and locations (three on the eastern part of the system which is more likely to lose MWD water supply in the Sierra Madre M 7.2 earthquake). However, the final decision as to which wells should have the four standby portable generators will also have to take into account site security, local noise issues, site access or other factors. These four emergency generators should be sufficient to provide 10 to 12 MGD flow into the system within a few minutes after a power outage. If Pasadena can supply normal power to these wells, then they can be relocated to the other wells that do have power outages, and hooked into those wells using the quick connect couplings.

For purposes of this report, we have not sized the actual power needs for each well, but this will be done in the design step. For purposes of initial planning and cost estimating, we assume that the larger wells will require large emergency generators (600 kW to 1000 kW range). Emergency generators in this range are commonly available for about $300,000 each (open market), more if purchased new. Given the relatively rarity of large scale power outages, we think that procuring several used emergency generators might be more cost effective than buying a fewer number of new units, if financial resources are limited.

The smaller wells (typically 1 to 1.5 MGD flow rates) can likely be powered using emergency generators (250 kW to 500 kW range) from mutual aid / contractors, so pre-purchase of those is not suggested.

Well	Quick Connects	Standby Power	Procure (P) or Mutual Aid (M)	Cost
Chapman	Yes	Portable, On Site	P	$300,000
Jourdan				
Woodbury	Yes		M	
Monte Vista	Yes	Portable, On Site	P	$300,000
Craig	Yes	Portable, On Site	P	$300,000
Arroyo	Yes	Portable, On site	P	$300,000
52 Well	Yes		M	
Ventura				
Copelin	Yes		M	
Garfield	Yes		M	
Villa	Yes		M	
Sunset	Yes		M	
Windsor	Yes		M	
Bangham	Yes		M	

Notes:
P = procure.
M = mutual aid / contractors or relocate from another site if necessary

Table 6-4. Standby Power Recommendations for Wells

6.5 Fixed Emergency Generators and Fuel

All five new portable emergency generators should be diesel powered, and sufficient fuel to be stored on location for 72 hours continuous operation. If a standby power source is permanently installed, then it can be either diesel- or propane powered.

6.6 Mutual Aid

Most public and private water agencies in California participate in the Water Authority Response Network (WARN), which provides mutual aid personnel and equipment resources on a voluntary basis.

In order to ensure the expeditious receipt of mutual aid resources, it is recommended that Pasadena Water and Power pre-identify potential sources for the numbers and types of personnel and specific equipment that would be needed. In the case of portable pumps, it

is further suggested that Pasadena ensure that appropriate connectors will be available to allow for rapid hook-ups. Planning should consider the following:

- Number of pipe repair teams (including vehicles and equipment) available within 12 hours, 24 hours and 48 hours.
- Materials: pipe, welding supplies, gaskets, flex hose, etc., including specifications to ensure compatibility.
- Emergency generators (size) with compatible quick-connects.
- Bypass pumps (size).
- Fuel for generators.
- Communications protocols.
- Home/cell phones/pagers/radio communicators for key personnel.
- Joint Training exercises and drills to identify any mismatches in equipment and/or supplies.

6.7 Revisions to Existing Contingency Plan

The existing Contingency Plan for Pasadena Water and Power, Water Delivery Business Unit, (September 12, 2002) does not currently contain the information needed to respond effectively to the scenario earthquakes. Specifically, the plan does not describe earthquake-specific procedures for activation, notification, damage assessment, status reporting, action planning, resource deployment and tracking, mutual aid, expenditure tracking, or deactivation.

The California Governor's Office of Emergency Services, in concert with the California Utilities Emergency Association and the American Water Works Association, has prepared "Emergency Planning Guidance for Public and Private Water Utilities" (1998). This document provides excellent planning guidance and function checklists which could be customized by Pasadena Water and Power.

The Contingency Plan for Pasadena Water and Power, Water Delivery Business Unit, September 12, 2002, should be updated as described above including the following:

- A new scenario should be added for earthquakes. The scenario should include an immediate assessment of system damage through pressure and flow measurements.
- The plan should be specific on which supplies are located where (see 6.4.1, above). For example, if pipe, cutting equipment and fittings are to be staged at multiple locations in the district, the locations and supplies should be specified.
- The Mutual Aid Agreements (including WARN) should be included in the Plan, including communications, command and control, and types of aid to be provided or received.
- The California Office of Emergency Services should be included as a contact in the plan.
- Interface protocols with the Pasadena Fire Department should be described.

- Interface with Pasadena Power, Southern California Edison and Los Angeles Department of Water and Power should be established for the purpose of identifying locations with power outages, likely power outage restoration times, and prioritizing power restoration efforts for critical water department wells or pump stations.

6.8 Summary Emergency Response Costs

Table 6-5 summarizes the items to be done as part of emergency response capability.

Item	Section	Cost
Ultra Large diameter 12" Flex Hose	6.3	$387,500
Spare Parts – Pipe Repair Kits	6.4.1	$50,000
Emergency Response Plans	6.4.1	$200,000
Standby Power Supply – Pumping Plants	6.4.2	$500,000
Standby Power Supply – Wells	6.4.2	$1,200,000
	Total	$2,337,500

Table 6-5. Emergency Response Costs

7.0 Hydraulic Analyses

A series of hydraulic analyses were performed to assess the hydraulic issues within the Eagle Rock, Annandale, Lida and Sheldon pressure zones.

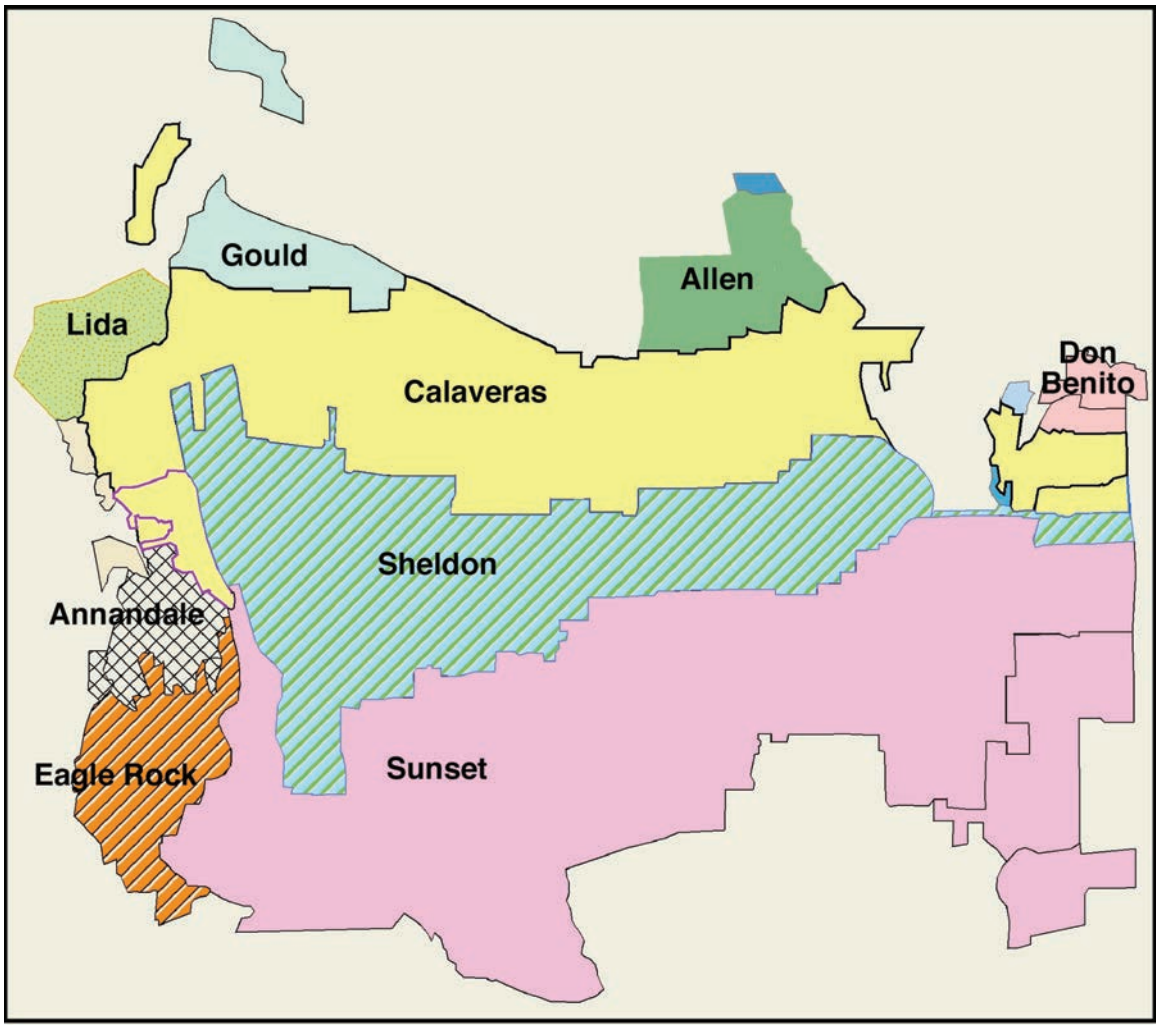


Figure 7-1. Main Pressure Zones in Pasadena Water System

7.1 Eagle Rock Pressure Zone

The Eagle Rock pressure zone is located in the southwest part of the Pasadena water system. The main facilities serving the zone, along with those in adjacent zones, are shown in Figure 7-2.

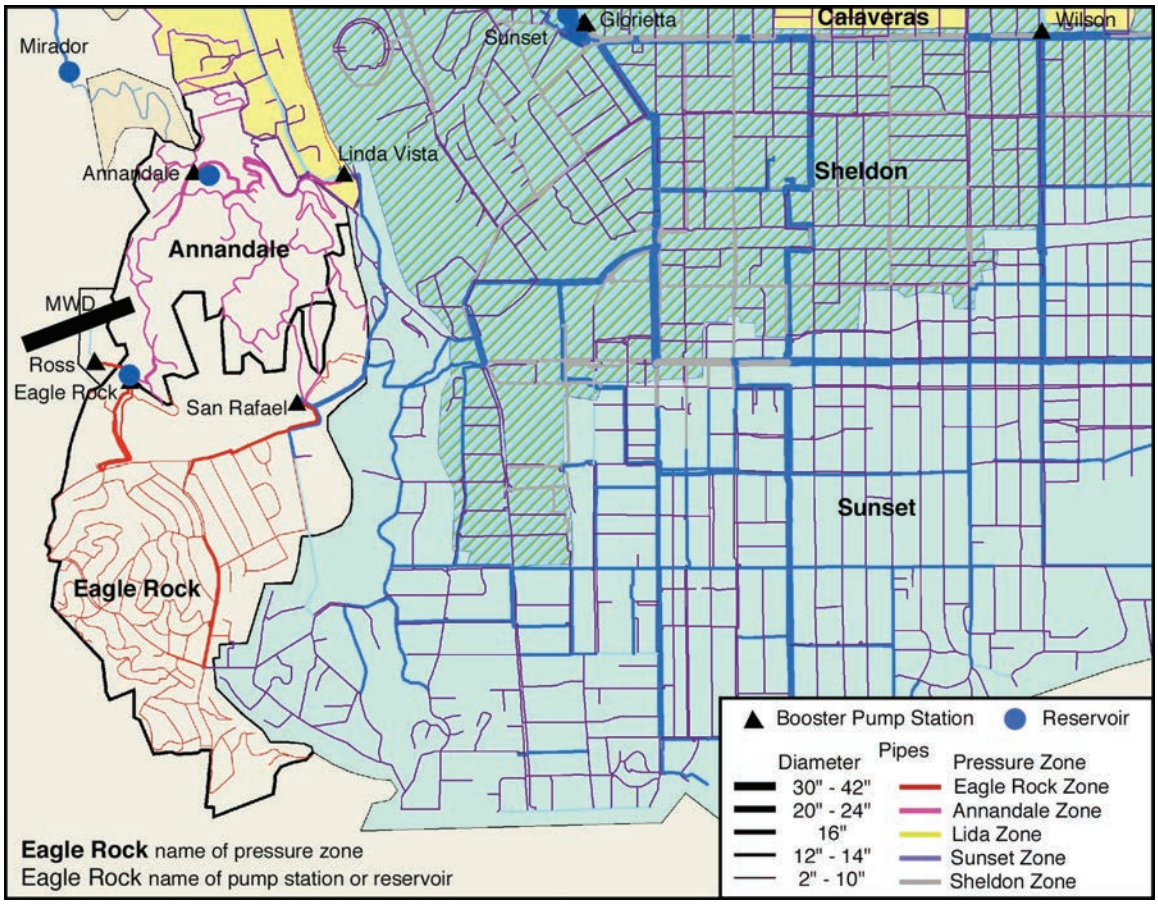


Figure 7-2. Pipes in and Near the Eagle Rock Zone

Hydraulic analysis was performed for the Eagle Rock Zone. The primary purpose of the analyses was to establish what upgrades would be needed in the Eagle Rock zone in order to move between 5 to 8 MGD flow into the Sunset pressure zone, from MWD turnout P5 next to the Ross pumping plant.

The transmission piping from the MWD P-5 turnout and Eagle Rock reservoir was modeled. Approximately 420 feet of 12-inch piping was modeled from the P-5 turnout to the Ross Pumping Plant. Hydraulic loss factors (Hazen Williams C values) were taken from MWH (2002) without adjustment; these factors were assumed to be reasonably calibrated by MWH, to reflect the age of the in-situ pipe. Where we specify new pipes, we assume C values consistent with modern installed lined welded steel, ductile iron or PVC pipe (C=130). The Ross Pumping Plant currently has two 50 horsepower pumps. Up to 5 additional pumps were used for the analysis, each having 100 horsepower useful output.

Base Case. For the base case, in-zone maximum day demands (MDD) for the year 2020 were used. Specific nodal demand data were not available, so equal demand was placed on the 143 nodes below Patrician Way. Pump curves reflecting in-situ conditions for the Ross #1 and Ross #2 pumps were used in the model. With both pumps operating, we found that the head loss was such that the two pumps could not supply the in-zone demand. The pumps can supply a total of approximately 1525 gpm or 2.20 MGD. The 2020 maximum day demand for the zone is 2.60 MGD. Therefore, the Ross Pumping Plant alone is not capable of keeping the Eagle Rock reservoir full at year 2020 MDD.

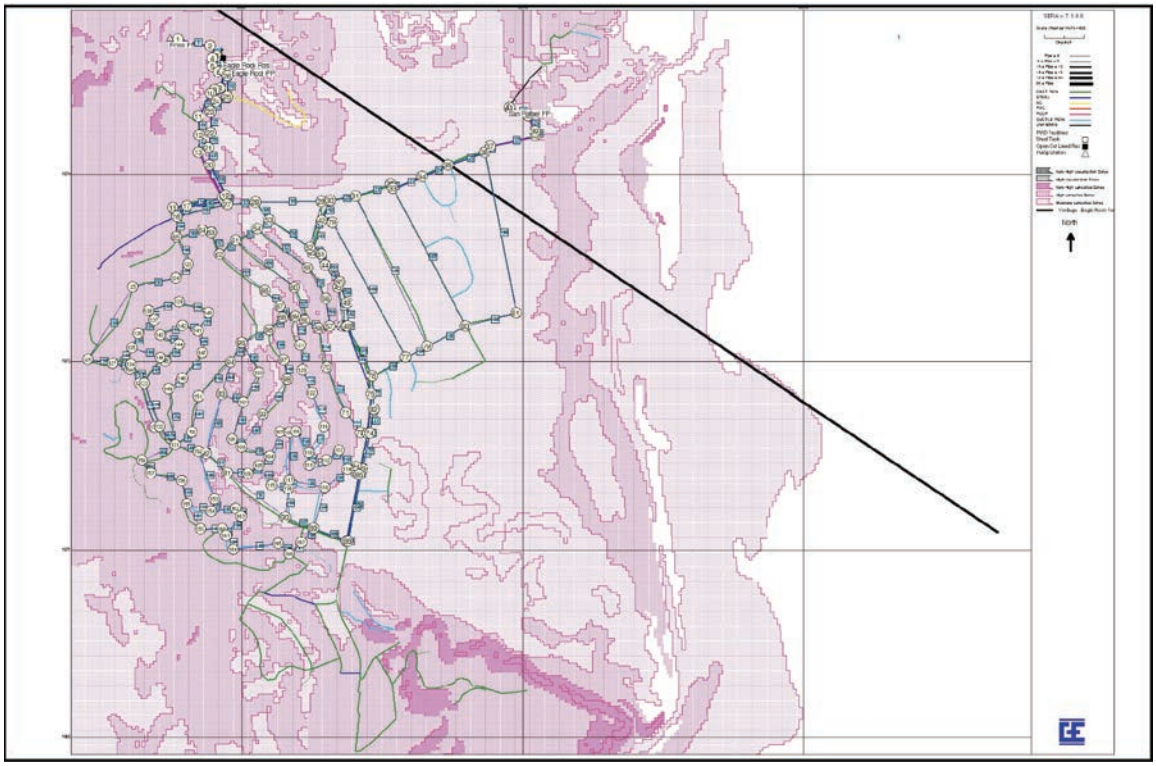


Figure 7-3. Pipes Eagle Rock Zone (Black line is approximate location of Eagle Rock fault, shaded areas show landslide hazard zones of varying severity)

The hydraulic grade line at the P-5 connection was taken as 943 feet. The maximum overflow height of 1132 feet at the Eagle Rock reservoir was used. Losses in the existing Eagle Rock zone piping results in a hydraulic grade of 1074 feet at the San Rafael Pumping Plant, where water can be supplied to the Sunset zone via a pressure reducer. Water can also be supplied to the Sunset zone in the southeastern corner of the zone, at the corner of Avenue 64 and La Loma. The hydraulic grade at this point is 1073 feet.

5 MGD Case. The second hydraulic analysis case applied the year 2020 average day demand (ADD) for the Eagle Rock zone (1.51 MGD), plus drew out another 5 MGD to the Sunset zone. This extra 5 MGD would correspond to a situation where the Upper Feeder was out of service, and all MWD water into Pasadena must be taken at P5. The Eagle Rock-to-Sunset pressure regulator station at the San Rafael Pumping Plant drew 4.5 MGD, and the southeast corner drew 0.5 MGD (see Figure 7-4 for location of zone interconnections). The analysis was first run with the as-is piping, assuming that

additional pumps at the Ross pumping plant would be added to make up the additional demand. If two 100 hp pumps are added, the flow will be about 100 gpm short of the target, or 0.14 MGD. The analysis was performed with three 100 hp pumps to supply the additional 5 MGD to the Sunset zone.

In the as-is configuration, the hydraulic losses in the zone are high, yielding a hydraulic grade of only 566 feet at the San Rafael pumping plant, which is impossibly low. In addition, much of the piping is at negative pressure, which is clearly unacceptable. Therefore, additional piping is needed to transmit the additional water to the Sunset zone via a pressure regulator at the San Rafael pumping plant to preserve the service pressure in the existing system. A 16-inch diameter parallel pipe, of approximately 2150 feet, was added down Patrician Way, as previously recommended by Montgomery Watson (MWH, 2002). Another 16-inch diameter parallel pipe, of approximately 4800 feet, was also assumed to be installed along Colorado Boulevard and up to the San Rafael pumping plant.

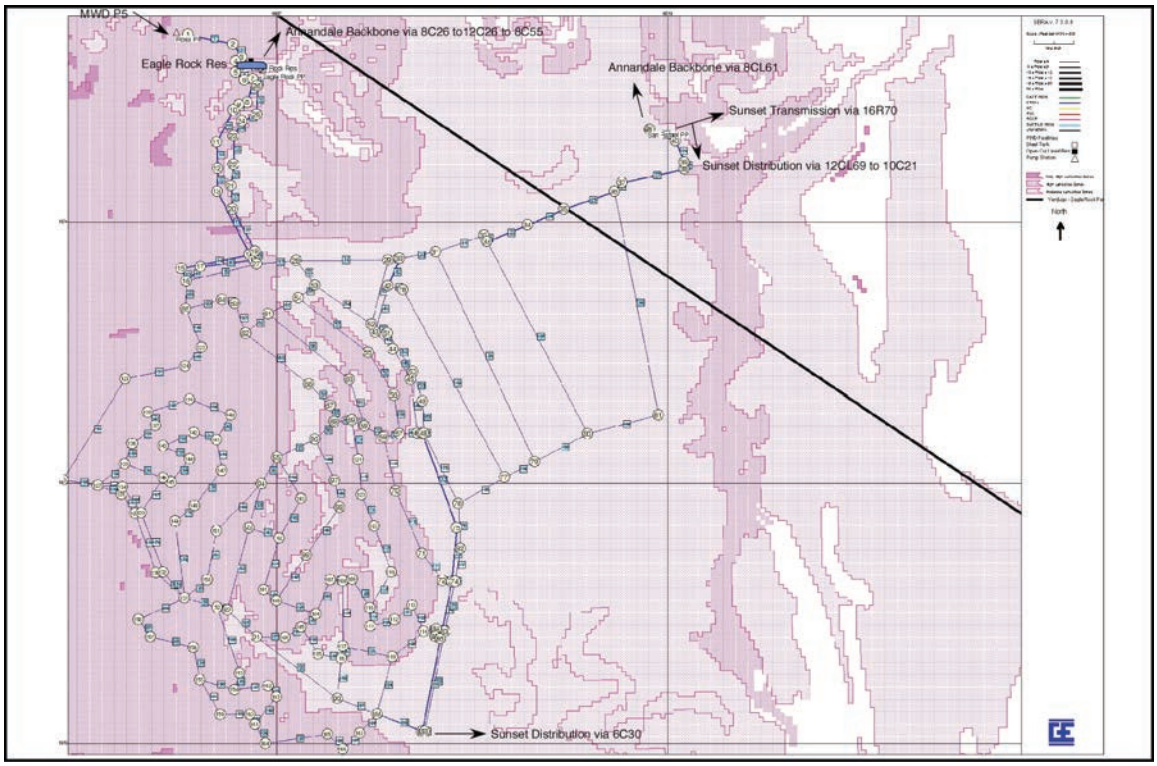


Figure 7-4. Eagle Rock Zone – Hydraulic Model

The addition of the 6950 feet of 16-inch pipe results in an improved hydraulic grade line in the zone. The final hydraulic grade is 1082 feet at the San Rafael pumping plant and 1080 feet at the southeastern corner of the zone. The pressures in the service area appear reasonable; in fact, they are about 5 to 6 feet (2 psi) higher than under current operating conditions.

The pressure in the 12-inch suction pipe between the Ross pumping plant and MWD turnouts is very slightly negative when all 5 pumps are run, due to the high flow in the 12-inch pipe. If Ross Pumps #1 and #2 are turned off, and only the 3 new pumps run, the flow from the MWD turnout will be adequate to supply the demand, plus the pressure in the inlet pipe to the pumping plant will be positive. Flows in the 12-inch pipe are on the order of 13 to 14 fps, which is high but tolerable for the periods of time where the high demand would be in effect. Therefore, for an additional 5 MGD supply to the Sunset zone, it may not necessary to upgrade the piping between the MWD turnout and the top of Patrician Way, but this should be investigated in final design. With the very high flow rates, water hammer forces should be checked in the pipes between the MWD turnouts and the Eagle Rock reservoir; and likely the discharge water under high flow rate should be directly into the Eagle Rock reservoir.

8 MGD Case. The third hydraulic analysis case applied the year 2020 ADD for the Eagle Rock zone, plus another 8 MGD for the Sunset zone. The pressure regulating station at San Rafael pumping plant drew 7 MGD, and the southeast corner drew 1 MGD. First, the upgraded condition for the 5 MGD case was considered. Two additional pumps were added (making 5 additional 100 hp pumps at the Ross pumping plant) to achieve the desired flow through the 12-inch pipe from the MWD turnout. The head loss is so high in the 12-inch pipe that the original two 50 hp pumps are ineffective, and the remaining 5 new pumps must provide the flow. Additionally, there are negative pressures in the pipe between the MWD turnout and the Ross pumping plant, and the velocities in the 12-inch pipe between the MWD turnout and the top of Patrician Way are on the order of 20 fps.

Clearly the 12-inch pipe is too small to transmit the desired flow. Since the right-of-way is too narrow to allow placement of a parallel pipe, the 12-inch pipe was assumed to be replaced by a larger pipe in the hydraulic model. If a larger diameter pipe is used, the hydraulic losses are reduced, allowing more efficient pumping, and fewer pumps can also be added. After a few iterations, the final configuration consists of a 16-inch pipe to replace the 12-inch pipe from the MWD turnout through the top of Patrician Way (where the 16-inch parallel pipe added for the 5 MGD case starts), for approximately 1200 feet. No additional pumps are needed, above the three added for the 5 MGD case. Flows in the 16-inch replacement pipe are on the order of 11 fps, which is acceptable for the limited periods of high flow.

The replacement of the 1200 feet of 12-inch pipe with 16-inch pipe results in a reasonable hydraulic grade line in the zone. The final hydraulic grade is 1054 feet at the San Rafael Pumping Plant and 1053 feet at the southeastern corner of the zone. The pressures in the service area are also reasonable.

Table 7-1 summarizes the recommended upgrades to the system to accommodate the 5 MGD and 8 MGD to the Sunset zone. Figure 7-5 shows the hydraulic grade lines for the various analyses.

Case	No. 100-hp pumps	Length of pipe (ft)	Diameter of pipe (in)
5 MGD	3	6950	16
8 MGD	3	8150	16

Table 7-1. Recommended Upgrades

Given the overall system needs, it would appear that upgrading the Ross pumping plant by an increment of 5 MGD is feasible. Required upgrades will include about 6,950 feet of 16-inch diameter pipe; expanding the pumping plant by adding three 100 HP pumps; and possible allowances for upgrading the pressure regulating station at the San Rafael pumping plant to allow up to 5 MGD flow rates from the Eagle Rock zone to the Sunset zone at that location. The upgraded Ross pumping plant will require provision for emergency standby power (the cost for standby power is covered in Section 6.4.2). To be verified in final design, some allowance for pressure transients should be considered, probably by installing a suitable pressure relief valve at the upgraded Ross pumping plant. It may also be necessary to upgrade the suction pipe from P5 to the Ross pumping plant.

In all these analyses, the additional storage for the Eagle Rock reservoir, as recommended in Section 2, is assumed.

The cost to make these upgrades includes:

- 6,950 feet of 16" pipe at $15 per inch foot (installed). $1.7 million
- Ross pumping plant upgrades. $1.5 million
- Additional in-zone storage. $1.15 million.
- Pressure regulating station upgrade. $0.2 million
- Contingency $0.75 million
- Total $5.30 million (

Of these upgrades, the MWH report (2002) includes 2,150 feet of 16" pipe, so some of this cost is already budgeted in the MWH report.

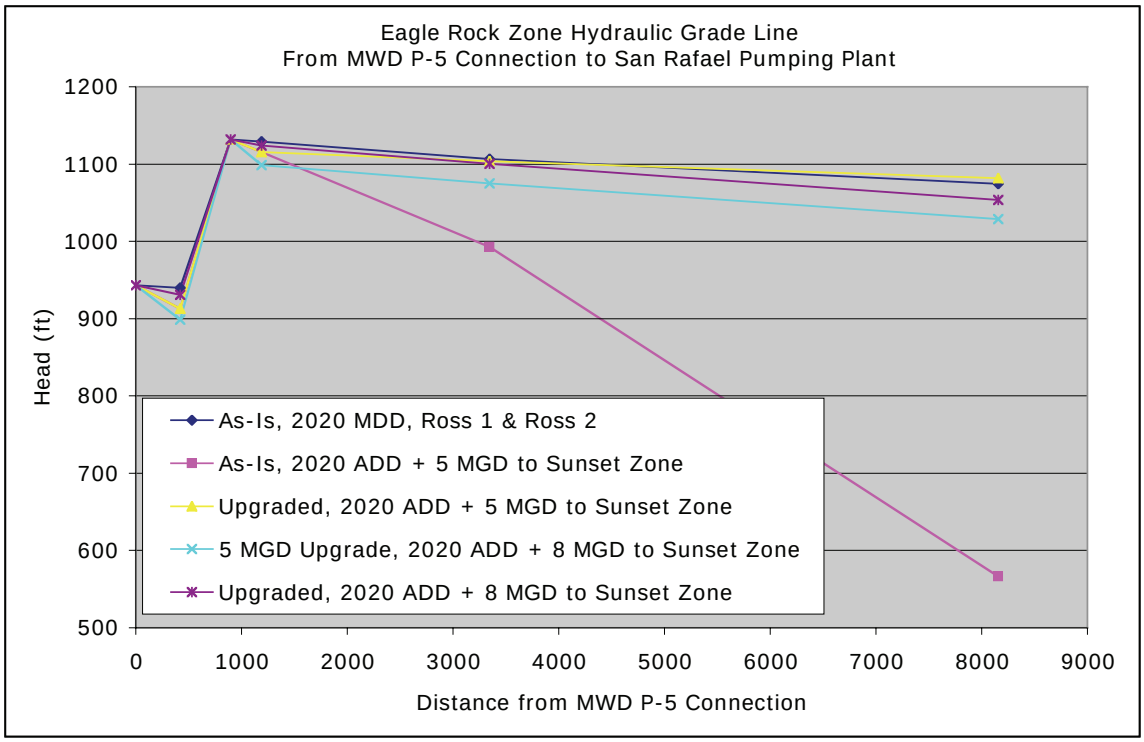


Figure 7-5. Hydraulic Grade Lines

7.2 Annandale Pressure Zone

The Annandale pressure zone is located in the southwest part of the Pasadena water system. The main facilities serving the zone, the hydraulic model nodes and pipes, along with the geologic hazards, are shown in Figure 7-6.

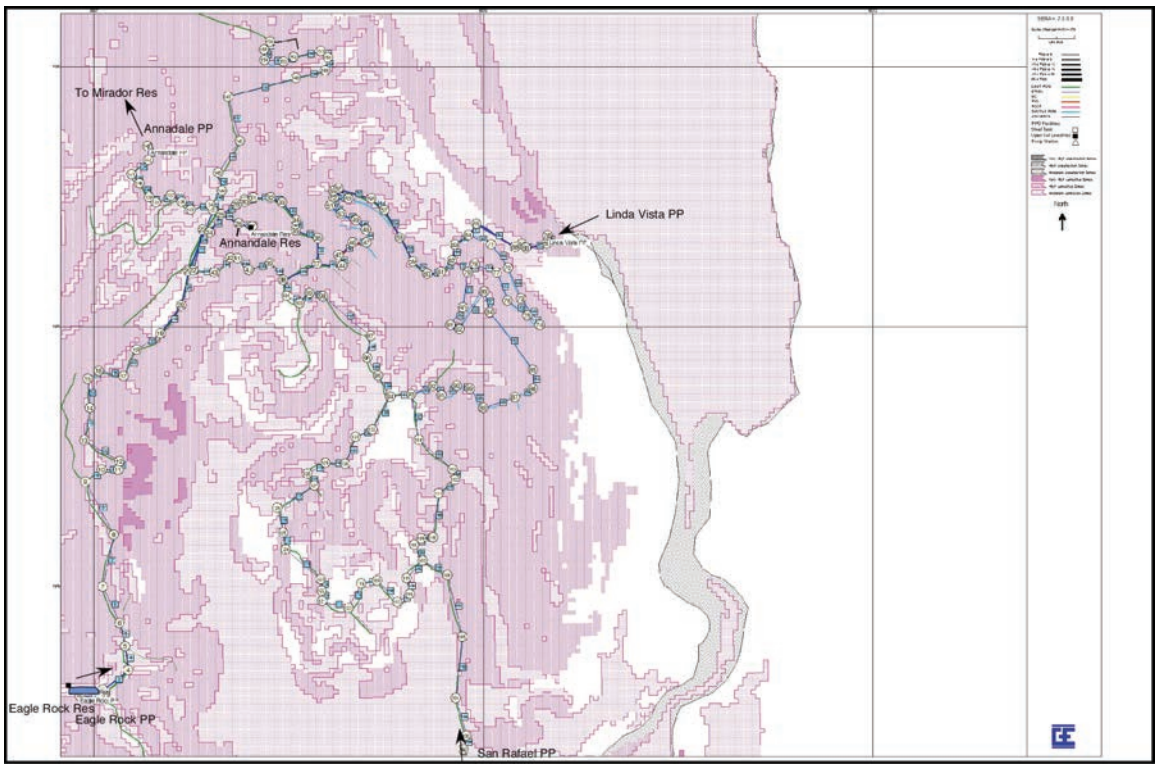


Figure 7-6. Hydraulic Model, Annandale Zone

Hydraulic analysis was performed for the Annandale zone in the as-is configuration. The zone has one reservoir, Annandale, at overflow elevation of 1301 feet. There are three pumping plants which supply the zone. The Eagle Rock pumping plant has one 30 hp and one 40 hp pump and pumps from the Eagle Rock Zone. The Linda Vista Pump #2 supplies the Annandale Zone from the Calaveras Zone and is rated at 20 hp. The San Rafael pump #1 supplies the Annandale zone from the Eagle Rock zone.

In-zone maximum day demands (MDD) for the year 2020 were used. The 0.96 MGD Annandale demand, plus the 0.12 MGD Annandale Reduced demand (total of 750 gpm) was spread evenly on 148 nodes in the model.

Iterative analysis was done to determine the head and flow at the San Rafael pumping plant. Hydraulic analysis on the Eagle Rock zone was performed with an applied demand at the San Rafael pumping plant. The head at the pumping plant was applied in the Annandale hydraulic model, and the resulting flow in the San Rafael pump #1 was checked against the demand applied to the Eagle Rock model. The final flow was about 200 gpm, with a head of 1059 feet.

With all the pumps turned on, the Annandale reservoir fills at a rate of 528 gpm (0.76 MGD). The reservoir has a capacity of 0.64 MG. The Eagle Rock pumping plant puts out 556 gpm (0.80 MGD). The Linda Vista pump #2 puts out 536 gpm (0.77 MGD). The San Rafael pump #1 puts out 185 gpm (0.27 MGD). The head in much of the Annandale zone is about 1300 feet. The head is about 1400 feet in the vicinity of the

Eagle Rock pumping plant and decreases to 1300 feet as the pipe heads up Kenworthy and Patrician Way.

Under gravity feed from the Annandale reservoir (no pumps on), the head remains relatively unchanged for most of the zone, except in the vicinity of the Eagle Rock pumping plant, where the head drops about 25 feet.

Facility	Flow at Year 2020 MDD	Flow at Year 2020 MDD
San Rafael Pump 1	200 gpm	0.29 MGD
Eagle Rock Pumps 1 + 2	556 gpm	0.80 MGD
Linda Vista 2	536 gpm	0.77 MGD
Less Zone Demand	(750 gpm)	(1.08) MGD
Reservoir Fill	528 gpm	0.76 MGD

Table 7-2. Flow Rates Annandale Zone

As described in Section 2 of this report, the Annandale zone has either a surplus of 0.04 MG in storage (using Brisbane formula) or a deficit of between 1.16 MG to 1.67 MG (EBMUD and MWH formula). If reliable standby power is provided to all the pump stations, then it is feasible to provide reasonably reliable service to the Annandale zone, even under maximum day demand (year 2020) combined with a single in-zone structure fire (assuming 0.18 MG storage volume set aside for fire flows). Under this situation, it would take about 8 hours to drain the Annandale reservoir (assuming it was full at the start of the fire, or a drawdown rate of 972 gpm assuming fire flows of 1,500 gpm), which is more than enough time for the fire department to control a typical single structure (or even a single block) fire. Even if the largest pump serving the Annandale zone were out of service at the time of the fire, the drawdown rate would increase to about 1,252 gpm, and it would take about 6 hours to drain the Annandale reservoir under similar assumptions (4.9 hours if the reservoir is 80% full at the start of the fire).

As described in Table 6-3, quick connect couplings are recommended to be installed for the San Rafael, Eagle Rock and Lida Vista pumping plants. The cost to procure several large emergency generators is included in Tables 6-3 and 6-4, and additional emergency generators and portable pumps can be reliably procured from equipment vendors / mutual aid within 2 hours after a major (but non-spreading beyond the first block) fire; or 8 hours after a major earthquake. The Pasadena emergency response plan must address the rapid (under 2 hour) relocation of its emergency generators to pumping plants serving the Annandale zone should a large fire occur in this area.

The cost to install a quick connect at the three pumping plants is included in the seismic upgrade program (G&E 2006a), costing about $113,000 for these three pumping plants. The alternative of adding about 1.16 MG to 1.67 MG storage at the existing Lida reservoir site is likely on the order of $2 million, likely involving the construction of a new partially buried and partially above ground tank to fit within the footprint of the site. To construct such a tank will likely require draining the existing reservoir, installing

standby power at the Linda Vista and Eagle Rock pumping plants, installing a temporary bolted steel tank (or similar) at the site to provide some measure of gravity flow while the old tank is removed/replaced. It is clear that it would be less expensive to rely upon standby power for reliable pumping, even if the cost of procuring emergency generators is considered.

7.3 Lida Pressure Zone

The Lida pressure zone is located in the western part of the Pasadena water system. The main facilities serving the zone and adjacent zones are shown in Figure 7-7. Figure 7-8 shows the hydraulic model for the Lida zone, along with the geologic landslide hazards in the hillside area.

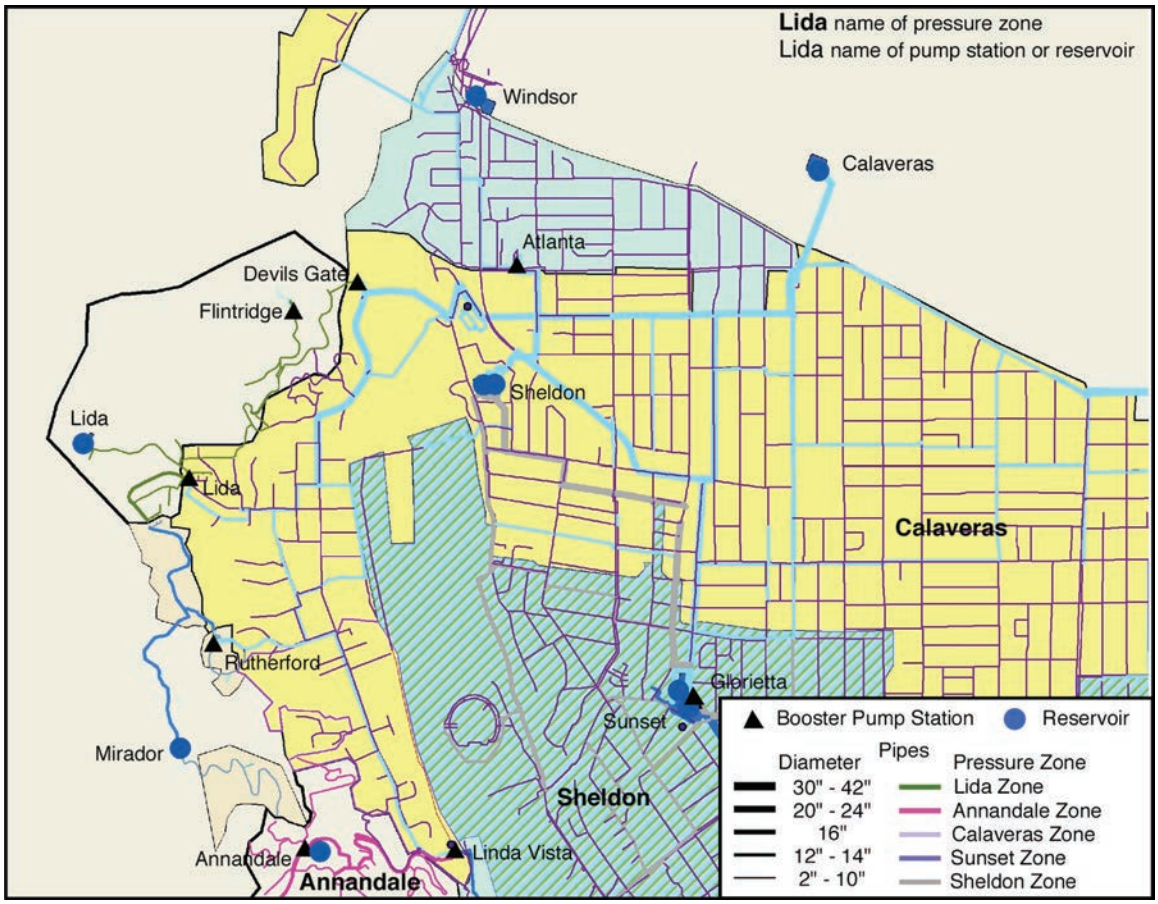


Figure 7-7. Pipes and Facilities, Lida, Sheldon West and Adjacent Zones

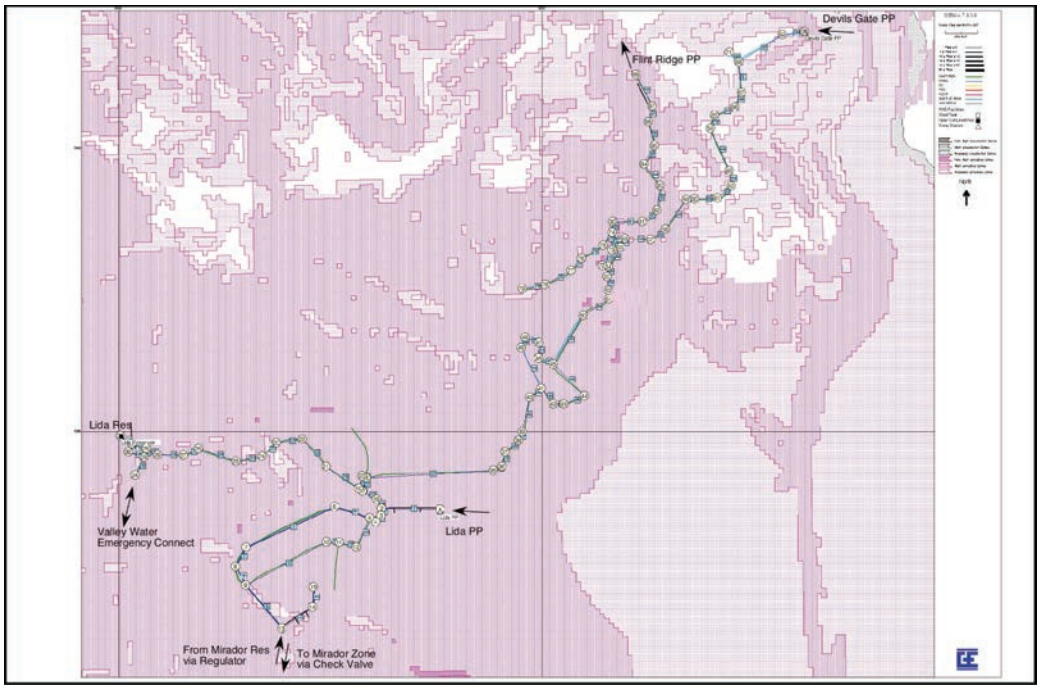


Figure 7-8. Hydraulic Model, Lida Zone

Hydraulic analysis was performed for the Lida zone in its as-is configuration. The zone has one reservoir, Lida, at overflow elevation of 1439 feet. There are two pumping plants with two pumps each which supply the zone, Lida and Devil's Gate. The Lida pumping plant has two 50 hp pumps. The Devil's Gate pumping plant has two 60 hp pumps. Both pump from the Calaveras zone.

In-zone maximum day demands (MDD) for the year 2020 were used. The 0.46 MGD demand (319 gpm) was spread evenly on 71 nodes in the model. Two analyses were run to bound the hydraulic profile of the zone. The first analysis was done with gravity flow from the Lida reservoir supplying the demand. This is the lower bound case (minimum head in the system). The second analysis was done with all four pumps turned on.

Under gravity feed, the zone has fairly constant head throughout the system. The head values range from 1439 feet in the area around the reservoir to 1425 feet in the areas farthest from the reservoir (around the Devil's Gate pumping plant).

With all pumps turned on, the Lida reservoir fills at a rate of 732 gpm or 1.05 MGD. The reservoir has a capacity of 0.43 MG. The Lida pumping plant puts out 165 gpm (0.24 MGD), and the Devil's Gate pumping plant puts out 886 gpm (1.28 MGD). The pressures in the system increase significantly with all pumps on, with the head near the Devil's Gate pumping plant at 1593 feet. Head near the Lida reservoir is 1451 feet, and the head is1483 feet near the Lida pumping plant.

Facility	Flow at Year 2020 MDD	Flow at Year 2020 MDD
Lida Pumps 1 + 2	165 gpm	0.24 MGD
Devils Gate Pumps 1 + 2	886 gpm	1.28 MGD
Less Zone Demand	(319 gpm)	(0.46) MGD
Reservoir Fill Rate	732 gpm	1.05 MGD

Table 7-3. Flow Rates Lida Zone

As described in Section 2 of this report, the Lida zone has either a surplus of 0.04 MG in storage (using Brisbane formula) or a deficit of between 0.45 MG to 1.10 MG (EBMUD and MWH formula). If reliable standby power is provided to all the pump stations, then it is feasible to provide reasonably reliable service to the Lida zone, even under maximum day demand (year 2020) combined with a single in-zone structure fire (assuming 0.18 MG storage volume set aside for fire flows). Under this situation, it would take about 9 hours to drain the Lida reservoir (assuming it was full at the start of the fire, or a drawdown rate of 768 gpm assuming fire flows of 1,500 gpm), which is more than enough time for the fire department to control a typical single structure (or even a single block) fire. Even if the largest pump serving the Lida zone were out of service at the time of the fire, the drawdown rate would increase to about 1,200 gpm, and it would take about 6 hours to drain the Lida reservoir (if full at the start of the fire) or 4.7 hours (if 80% full at the start of the fire).

As described in Table 6-3, quick connect couplings are recommended for the Devils Gate pumping plant. A cost allowance is provided herein to install a quick connect coupling at this pumping plant. The Lida pumping plant already has provision for bypass pumping. The cost to procure several large emergency generators is included in Tables 6-3 and 6-4, and additional emergency generators and portable pumps can be reliably procured from equipment vendors / mutual aid within 2 hours after a major (but non-spreading beyond the first block) fire; or 8 hours after a major earthquake. The Pasadena emergency response plan must address the rapid (under 2 hour) relocation of its emergency generators to pumping plants serving the Lida zone should a large fire occur in this area.

The cost to install a quick connect at the Devils Gate pumping plant is on the order of $37,000. The alternative of adding about 0.45 MG to 1.1 MG storage at the existing Lida reservoir site is likely on the order of $1 million, likely involving the construction of a new partially buried and partially above ground tank to fit within the footprint of the site. To construct such a tank will likely require draining the existing reservoir, installing standby power at the Devils Gate pumping plant, installing a temporary bolted steel tank (or similar) at the site to provide some measure of gravity flow while the old tank is removed/replaced. It is clear that it would be less expensive to rely upon standby power for reliable pumping, even if the cost of procuring an emergency generator is considered.

7.4 Sheldon Pressure Zone

The Sheldon pressure zone is a major pressure zone in the Pasadena water system. It stretches from Jones Reservoir in the east to the base of the San Rafael hills in the west. The main facilities serving the zone and adjacent zones are shown in Figures 7-9 and 7-10. Figure 7-11 shows the hydraulic model for the Sheldon zone, along with the geologic landslide hazards in the hillside area.

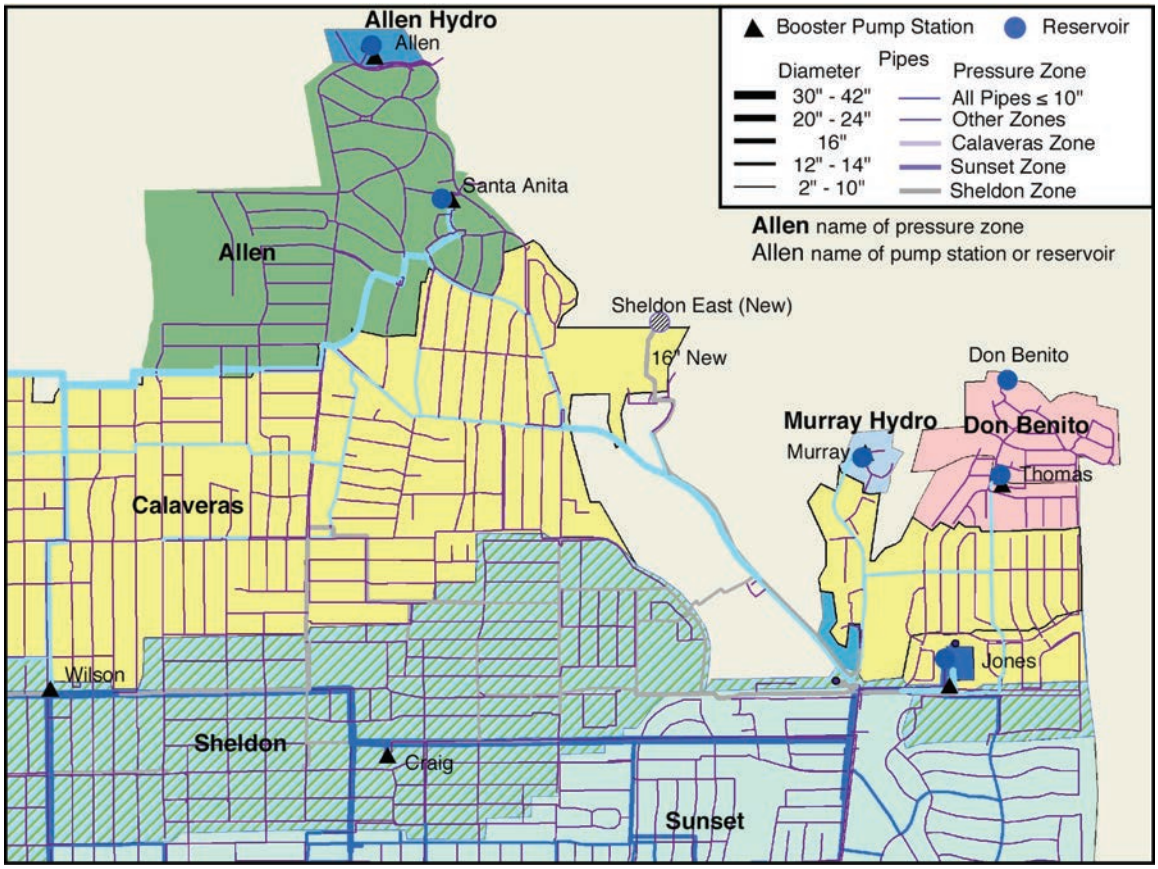


Figure 7-9. Pipes and Facilities, Sheldon East and Adjacent Zones

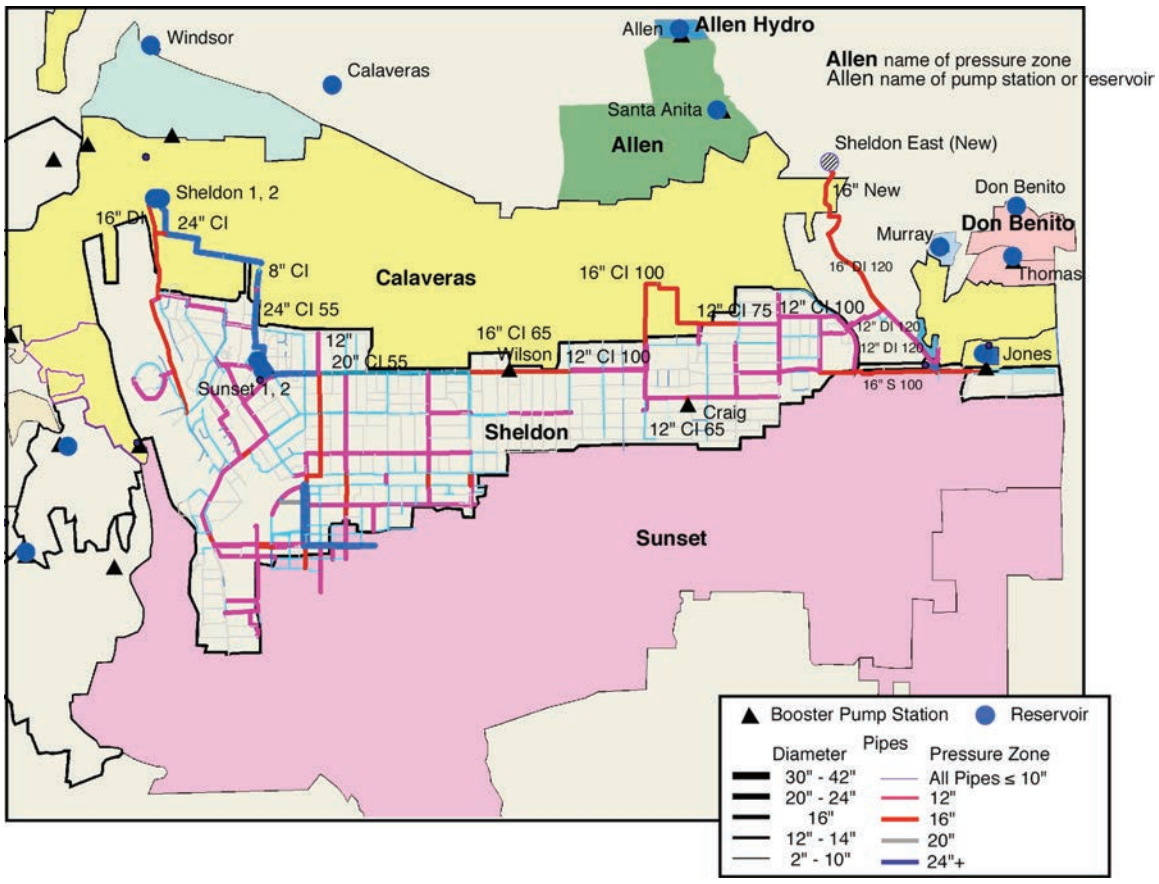


Figure 7-10. Pipes and Facilities, Sheldon Zone

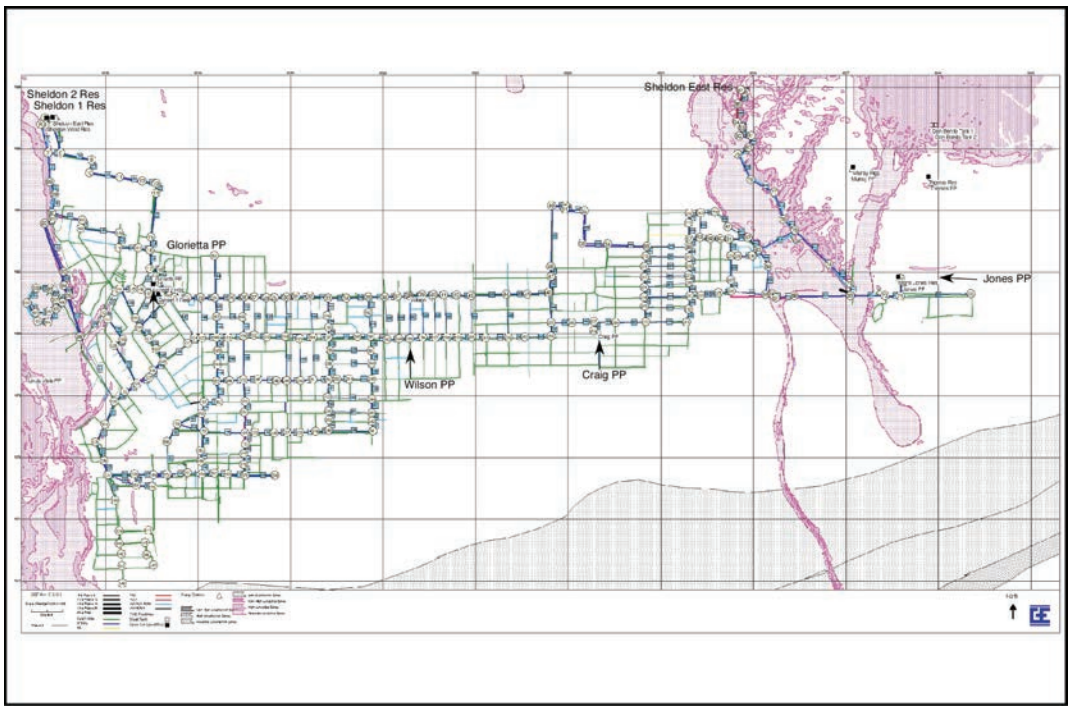


Figure 7-11. Hydraulic Model, Sheldon Zone

In order to better understand the hydraulic considerations of installing a new Sheldon East reservoir, hydraulic analysis was performed for the Sheldon zone. The existing zone has two reservoirs on the western extreme of the zone, Sheldon 1 and 2, at overflow elevation of 1050 feet. There are four pumping plants which supply the zone. The Jones pumping plant on the east side has one 50 hp (Jones #3) and one 125 hp pump (Jones #6) which supply the Sheldon zone. The Craig pumping plant has two 40 hp pumps (Craig #3 and #4). The Wilson pumping plant has two 200 hp pumps (Wilson #1 and #2) which supply the zone. The Craig and Wilson pumping plants are in the center of the zone. The Glorietta pumping plant is in the western part of the zone and has one 150 hp pump (Glorietta #3) which supplies the zone. All pumping plants pump from the Sunset zone. The Sheldon zone can also be supplied from the higher elevation Calaveras zone, but this is rarely done anymore.

In-zone maximum day demand (MDD) for the year 2020 of 14.17 MGD (9840 gpm) was used in the analyses. Specific nodal demand data were not available, so equal demand was placed on 242 nodes in the zone.

Base Case. For the base case, gravity flow from the existing Sheldon reservoirs 1 and 2 was considered. There were negative pressures in much of the zone due to head losses along the substantial length of the transmission path from west to east. This indicates that the zone cannot supply the 2020 MDD demand without concurrent pumping.

When both Jones #3 and Jones #6 pumps were turned on, the pressures in the zone improved substantially, with head in the zone ranging between 1017 feet and 1087 feet. The Jones pumps supply 4010 gpm (5.77 MGD), and the reservoirs supply 5830 gpm (8.40 MGD).

When all the pumps serving the zone are turned on, the head in the entire zone increases well above the 1050 overflow level of the existing reservoir. In the vicinity of the pumping plants, the head is between 1060 feet (at Glorietta pumping plant) and 1127 feet (at Jones pumping plant). The fill rate of the existing reservoir is 1844 gpm (2.66 MGD). This indicates that the existing pumping plants that fill the zone are somewhat too small to support the 2020 MDD demand. Note: once the wells from the Monk basin are returned to service, the Calaveras zone can also be used to supply the Sheldon zone.

Sheldon East Case. To increase reliability under hot summer days, it is advantageous to be able to operate the Sheldon zone by gravity only. An additional reservoir is proposed on the east side of the zone to improve pressure and flow in the zone. An analysis including the proposed Sheldon East reservoir was performed, without pumping. The elevation of the new reservoir was set at 1050 feet, the same elevation of the existing Sheldon 1 and 2 reservoirs. The hydraulic grade line in the zone was greatly improved, with most of the zone with hydraulic grade line between 1000 feet and 1050 feet. The flow rate from the three reservoirs was on the same order: 3676 gpm from Sheldon 1, 3163 gpm from Sheldon 2, and 3000 gpm from Sheldon East. This is somewhat undesirable, as the Sheldon East reservoir is planned to be significantly smaller than

Sheldon 1 and 2. The flow rates indicate that the turnover in Sheldon East will be greater than that of Sheldon 1 and 2, and reservoir turn over and water quality on the west side of the zone will not be as good as on the east side of the zone. Additionally, the hydraulic grade in the middle of the zone is somewhat low (about 1000 feet). If the level of Sheldon East is increased, it will improve the grade line in the middle of the zone, but it will also increase flow from the Sheldon East reservoir.

A few studies were made to see if the addition of pumping could improve the hydraulic grade line in the zone as well as balance out the flow between the existing Sheldon and the proposed new Sheldon East reservoirs. The base case of Sheldon East at overflow elevation of 1050 feet was used. If either of the Jones pumps are turned on, the head in the middle of the zone increases to between 1010 and 1025 feet. In addition, the flow rate from Sheldon East is decreased to 530 and 1700 gpm for Jones #6 and Jones #3, respectively. Another alternative is to add check valves in the east-west transmission pipe to limit the flow from the Sheldon East Reservoir westward.

One additional analysis was performed to bound the hydraulic grade line for the system with the Sheldon East reservoir. The analysis was performed with all pumps turned on to maximize the pressure in the system. Figure 7-12 compares hydraulic grade lines going from west to east for the system without Sheldon East and with Sheldon East.

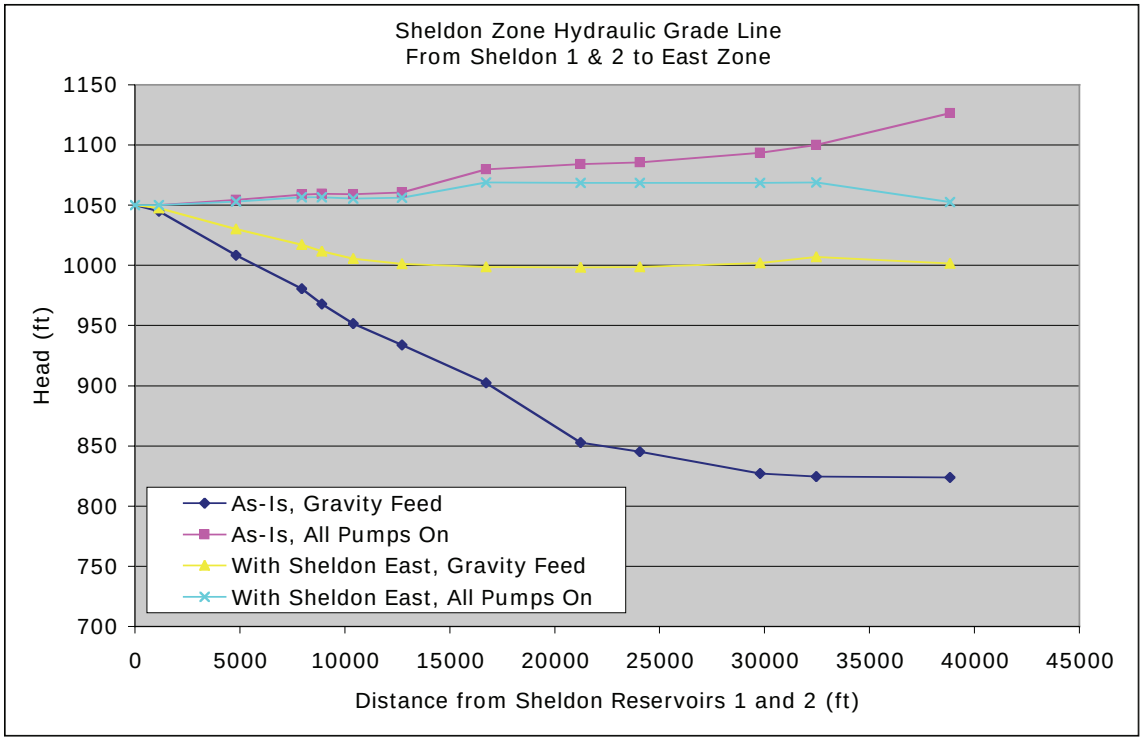


Figure 7-12. Hydraulic Grade Line for Sheldon Zone

Based on these exploratory hydraulic analyses, we make the following observations about the design needs for the new Sheldon East reservoir.

- The acceptable range of hydraulic grade line throughout the Sheldon zone needs to be defined. While we think that keeping the grade line between 1000 and 1050 feet at all locations under winter to summer time demands is likely acceptable, this will need to be confirmed.

- Setting the overflow elevation for the new Sheldon East must consider the topography of the available Sheldon East site, the desired size of the new reservoir, the location of the Sierra Madre fault at the site, and the net hydraulic flows from the new reservoir. If the overflow elevation is set high (as will be the case for a larger reservoir), then water will preferentially flow from the new Sheldon East reservoir (and not the older Sheldon reservoirs), resulting in possible water quality issues on the west side of the zone. Currently, with 11.8 MG total in-zone storage, water turnover ranges from 0.83 days to 1.91 days (see Table 3-1), which should be adequately short; the time needed to pump into the existing Sheldon reservoirs to achieve full mixing is about 8 to 10 hours (Table 3-2) which is a bit long, but likely acceptable.

- Ideally, the new Sheldon East reservoir overflow should be placed at an elevation so that there is no net flow between the existing and new Sheldon reservoirs, when all pumps are turned off, and the outflow from each reservoir should be approximately in the ratio of the volume of the reservoirs, under typical demand situations. In practice, meeting all of these targets might only be achievable by changing the diameter of the inlet-outlet pipe of the new Sheldon East reservoir, or possibly by placing a remotely-operated flow control valve somewhere in the zone along a major east-west pipeline, so that the gradient in the zone can be somewhat modified in near real time so that the Sheldon East reservoir will not over-supply the zone demand. A possible convenient location to place this valve would be near the Wilson pump station, owing to the proximity of a place where switchgear and telemetry for the new rate control station can be placed.

- Final design for the new Sheldon East reservoir should take into account all the hydraulic pipeline upgrades proposed by MWH (2002) for the zone, and to be adopted by PWP.

- The existing site can accommodate a 2 MG Sheldon East tank, with overflow about 1050 feet, while providing a reasonable fault offset design. If a larger Sheldon East reservoir is desired (say 4 MG), then either there will have to be more extensive excavation to make place for a suitably sized reservoir, but this will be partially negated in terms of reliability should the reservoir cross over the fault. The sense of fault offset at this site is likely reverse movement, meaning that fault offset will manifest itself by upward (vertical) offsets, with amount of likely vertical offset as much as 2 to 3 m for a Sierra Madre M 7.2 earthquake. The reservoir would have to be designed to either accommodate this offset (unlikely), avoid the offset (site might be too small, and subsurface investigations may prove inconclusive), or allow a release of water in a way so as to avoid any life safety / inundation potential (possibly the best way to design in this case).

Since the new Sheldon East reservoir is not essential to operate after a Sierra Madre earthquake, as long as there is reliable pumping available into the Sheldon zone, then allowing slight to major damage under this earthquake scenario, while not ideal, might be acceptable.

- Given the current site configuration and topology, a 110 feet x 184 feet x 20 feet deep (overflow about 1050 feet, bottom about 1030 feet) open cut reservoir could hold about 2.5 MG or so. However, this footprint (GeoSoils 1992) might cut through a trace of the Sierra Madre fault. Due to existing soil conditions, it is likely that a large cut into the site will be needed, in order to remove poorly-placed fills that exist. It is conceivable that two circular steel tanks could be placed at the site, with bottom elevation about 1025 feet, and overflow about 1050 feet, and still provide about 2 to 3 MG total storage. The multiple steel tank solution may be better than the single open cut basin, in that it is more likely that at least one tank could be designed to reliably survive a Sierra Madre M 7.2 earthquake.

Given these issues, and even though the Sheldon East site has been investigated and is possibly subject to surface faulting from the Sierra Madre fault, a new 2 million gallon steel tank could be placed at the site, without undue risk; the design would include certain fault-tolerant features. Alternately, the Sheldon east zone could be reliably served (to avoid the pressure fluctuations) by suitable pumping from the Wilson and Jones pumping plants. A third solution is to provide suitable regulating valves to drop water into the east-end of Sheldon zone from the higher elevation Calaveras zone. For purposes of this report, we include an allowance for a new Sheldon East 2 million gallon steel tank reservoir, to be designed with fault tolerant features, costing $2,500,000.

8.0 SCADA

The Supervisory Control and Data Acquisition system (SCADA) in the PWP system includes a number of instruments in the file to measure pressure and flow, level transmitters, security devised, etc.

MWH (2002) provides a list of recommended upgrades to the SCADA system for purposes of normal operations. This report does not duplicate the MWH recommendations, but concentrates only on seismic aspects of the system.

Seismic Ruggedness. As part of the Seismic Vulnerability Assessment (G&E 2006a), we visited essentially all PWP well and pump station and reservoir sites. We found, in general, that the SCADA RTU hardware to be solid state, and therefore not particularly vulnerable to earthquake motions. Also, most enclosure cabinets were bolted to walls, meaning that by definition the cabinets withstand 1g vertical down forces from gravity; past experience suggests that few, if any, of such wall-mounted installations are dislodged in large earthquakes, unless they are mounted on unreinforced masonry walls.

However, we did not find any such installations, so the risk of this type of damage is considered very small, in any scenario earthquake.

Many times, the RTU hardware includes a small battery, whose purpose is to provide continued signal to the hardware, should offsite power be lost. These batteries are often sized to provide perhaps 8 hours of operation, sometimes more. As these batteries get older, their capacity to supply power is often diminished. so that loss of RTU signal will occur sooner than if with a new battery. Also, we observed some batteries to be prone to rattling within their enclosure cabinets; for lead-acid type, the battery could prematurely fail in earthquakes. G&E (2006a) provides a list of facilities where we observed unrestrained batteries, and a budget to go and restrain all such batteries throughout the system.

We did not verify the projected lifetime of batteries of the RTU system. However, G&E (2006b) suggests that in large scenario earthquakes, the offsite power outage could last 18 to 36 hours, even with some minor seismic upgrades to the power system. For most pumping plants and wells, we recommended installation of quick connect couplings, but use of emergency generators only for those sites where pumping water is most critical (i.e., not at all sites). Therefore, even if the existing batteries are restrained, it is likely that telemetry will be lost within 8 hours or so after a major earthquake, leaving PWP operators uncertain as to the operating status of the system. further, the SCADA computers at the Corporate Yard site were unrestrained (monitors) and had unrestrained UPS units; all these should be restrained, and budget for this was provided in G&E (2006a). As batteries are replaced in the system, it is recommended that all batteries be sized for at least 18 hours (preferably 24 hours) service, including those batteries at RTU sites, and the batteries needed to operate the main SCADA computers. All SCADA information on computers should be preserved permanently for the 72 hours after the earthquake, for any earthquake with epicenter within 5 miles of downtown Pasadena with magnitude 6 or larger.

Assuming a long term loss of the Upper Feeder, PWP will need to draw water from MWD P5 turnout for extended times. As described earlier in this report, up to 5 MGD is recommended to be transferred through the Eagle Rock zone, and into the Sunset zone via a pressure regulating station at the San Rafael pumping plant location. We recommend that a new set of SCADA instruments be installed at this site, to report back the upstream and downstream pressures and flow rate going through the pressure regulating station at this location. These instruments should be installed as part of the upgrade of this pressure regulating station described elsewhere in this report. Allow $100,000 for this instrumentation (high priority).

The operation of the Sheldon zone, with (or without) the Sheldon East reservoir has large flows moving east to west. It might be useful to install a flow meter someplace mid-way in the zone (possibly near Wilson pumping plant) to get real time readings of the flow and pressure. These instruments would probably be included with any rate control valve that might be included as part of the Sheldon East reservoir, described earlier in this report. Allow $100,000 for this instrumentation (high priority).

Additional instruments that could be considered would include accelerometers placed at a few locations within the water system. Possibly, these could be paid for and maintained by USGS as part of their overall ShakeMap effort. In any case, these accelerometers can provide very useful information for actual recorded ground motions in small to large earthquakes, helping PWP understand the actual performance of its water system components. Other utilities, such as Bonneville Power Administration, Bay Area Rapid Transit District, etc. have allowed for such instrumentation. Allow $100,000 for this instrumentation (lower priority).

The San Francisco Public Utilities District and the East Bay Municipal Utility District routinely installs accelerometers, pressure and flow sensors at critical pipelines (usually 42 inches and larger) where they cross faults, so that they can tell whether or not they should remotely actuate valves to shut off pipes where they might be damaged at fault offset. The PWP has no such large diameter pipes that cross faults, but conceptually this could be done as part of any new pipes (16 inches or larger) crossing the Sierra Madre fault zone to try to isolate leaking pipes before they adversely depressurize the remaining parts of the water system. The cost for this instrumentation would be included with the design of the new pipelines. At this time, there are no clear locations in the PWP system where such instrumentation need be installed to existing pipes.

9.0 References

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GEOTECHNICAL INVESTIGATION
SUNSET RESERVOIR PERCHLORATE TREATMENT FACILITY
PASADENA, CALIFORNIA

Project No. 2005-017

by

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1.0 INTRODUCTION

This report presents the results of the geotechnical investigation performed by Diaz•Yourman & Associates (DYA) for the proposed ion-exchange treatment system in Pasadena, California. Stetson Engineers, Inc. (Stetson) authorized this work on April 7, 2005. However, the project was then put on hold. Subsequently, Stetson provided a notice to proceed on November 11, 2008, to continue the work. A contact was also provided on November 18, 2008.

The ion-exchange treatment system for perchlorate removal from the Sunset Reservoir will be located at Sunset Reservoir site in Pasadena, California, as shown on the Vicinity Map, Figure 1. The City of Pasadena Water and Power Department (PWP) shut down some of the Sunset Reservoir wells because of perchlorate contamination. The loss of these wells has severely impacted PWP's ability to meet the City of Pasadena's water demand. Therefore, PWP requires a perchlorate treatment system for its Sunset reservoir wells in order to recover some of its production capacity. The proposed perchlorate treatment project is summarized in Table 1.

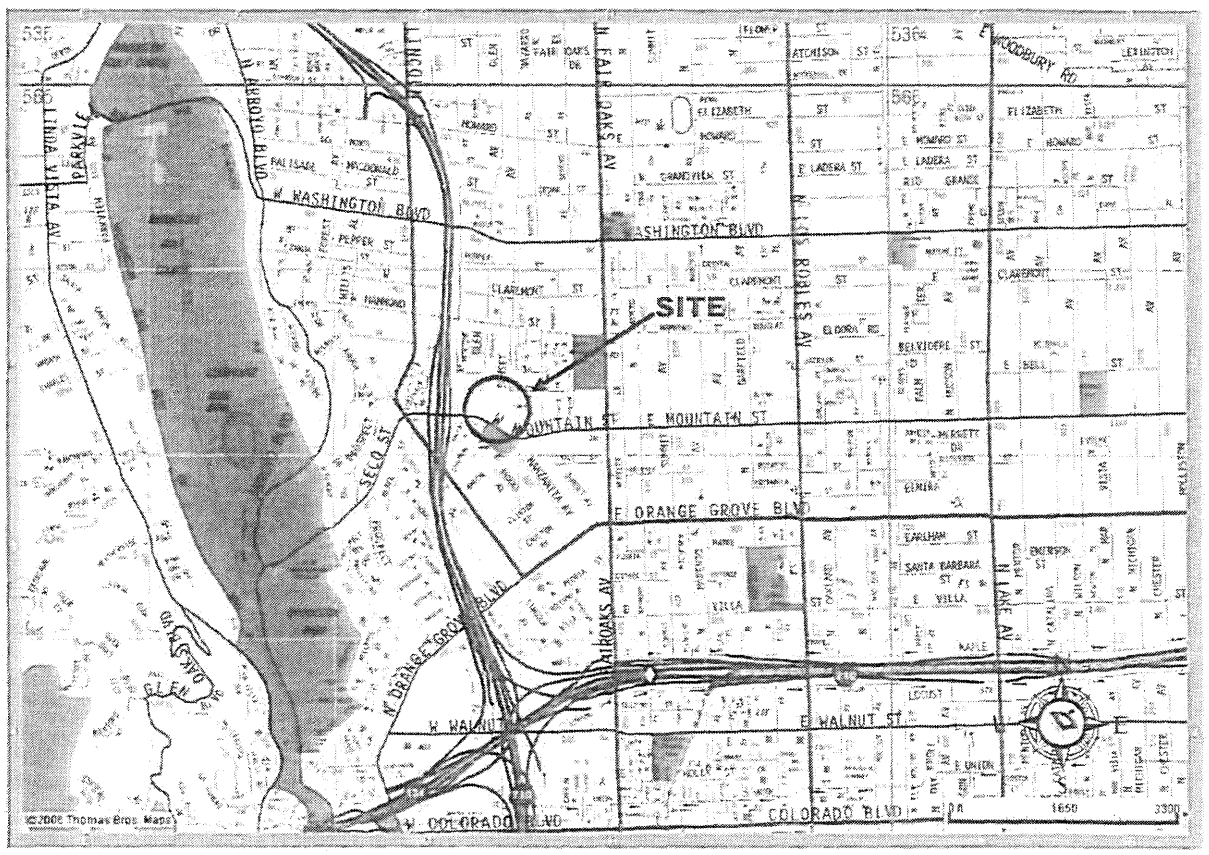


Figure 1 - VICINITY MAP

Table 1 - SUMMARY OF PROPOSED FEATURES

FEATURE	DESCRIPTION	ANTICIPATED STRUCTURAL LOAD
Ion exchange plant	6 units on an 81- by 16-foot mat foundation	150 psf
Pre filters	4 units on an 18- by 12-foot mat foundation	<150 psf
Booster pump station, electrical control room and a wet well	3 pump columns, 10-foot-deep, 16- by 16-foot (plan area) wet well with a control room on top of the wet well	Not known
Disinfection system room	22- by 28-foot building	Not known

Note:
- psf = pounds per square foot.

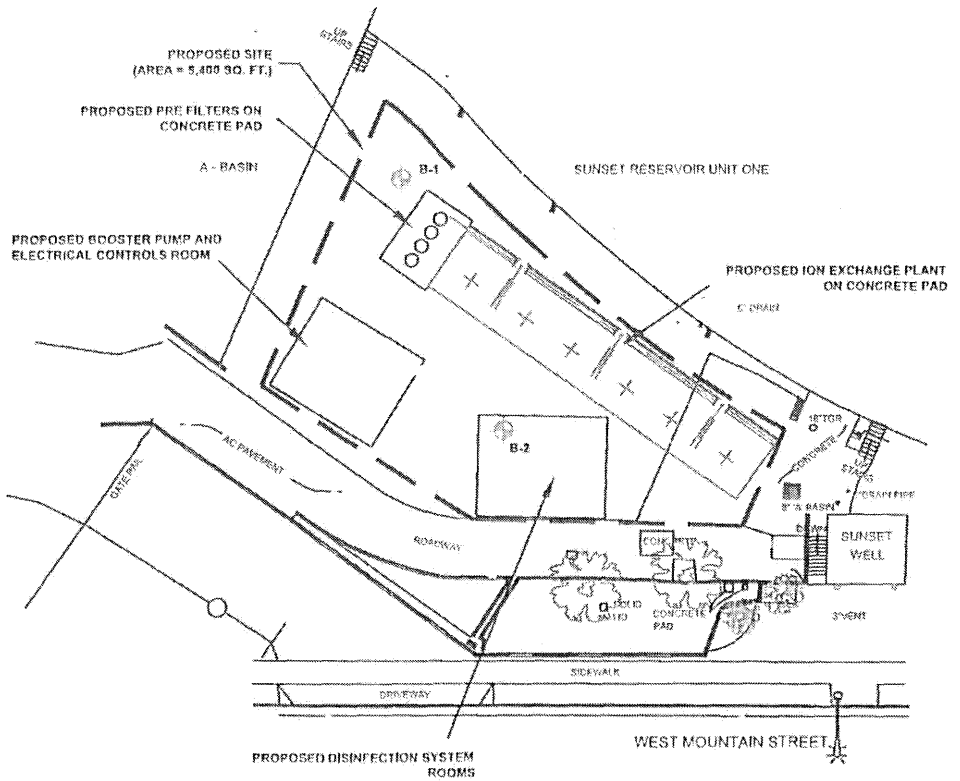
The approximate layout of the proposed project is shown on the Site Plan, Figure 2. The foundation loads of the proposed structures are summarized in Table 1. The proposed grades will be within 1 foot of existing grades, except a 10-foot-deep wet well will be constructed below the booster pump station.

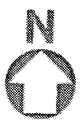
The purpose of DYA's investigation was to provide geotechnical input for the design of the proposed project. The scope of our services consisted of the following tasks:

- Reviewing geotechnical data.
- Conducting a field investigation.
- Performing laboratory tests on selected samples.
- Performing engineering analyses to develop conclusions and recommendations regarding the following:
  - Site preparation and grading
  - Shallow foundation bearing capacity
  - Estimated total and differential foundation settlements
  - Resistance to lateral loads
  - Temporary shoring and lateral earth pressures
  - Slab-on-grade support
  - Asphalt concrete (AC) and Portland cement concrete (PCC) pavement thickness design
  - Soil corrosion potential
- Preparing this report.



2005/2005-017/CADD/Figure 2 - SIT PLAN 12-17-2008.dwg





Scale: 1 inch = 40 feet

0 20 40 feet

EXPLANATION

DYA Boring Locations

Reference: Electronic base map provided by Stetson Engineers (2008)

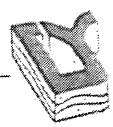
Figure 2 - SITE PLAN

2.0 DATA REVIEW, FIELD INVESTIGATION, AND LABORATORY TESTING

Geotechnical data from the project vicinity presented in previous reports were reviewed to supplement site data collected during this investigation. A list of the documents reviewed is presented in the bibliography (Section 7.0).

The field investigation, conducted on May 12, 2005, consisted of drilling two soil borings at the locations shown on Figure 2. The boring locations were chosen to provide areal coverage of the project site for grading and data for foundation and pavement design. The boring depths, ranging from approximately 41 to 44 feet, were selected to extend to the depth of significant influence of the proposed loads. Details of the field investigation, including sampling procedures and boring logs, are presented in Appendix A.

Soil samples collected from the borings were re-examined in the laboratory to substantiate field classifications. Selected soil samples were tested for moisture content, dry density, grain-size distribution, percent passing the No. 200 sieve, Atterberg limits, shear strength, compaction characteristics, pavement-supporting capacity, and corrosion potential (pH, electrical resistivity, soluble chlorides, and soluble sulfates). Expansion index tests were not performed because the surface soils were visually classified as sands and silty sand. The soil samples tested are identified on the boring logs. Laboratory test data are summarized on the boring logs in Appendix A and presented on individual test reports in Appendix B.



3.0 SITE CONDITIONS

3.1 SURFACE CONDITIONS

The project site included two small single-story buildings that were being used as storage buildings for PWP during our field investigation. The project site was paved with PCC. The thickness of the PCC varied from 5 to 6 inches. Several types of distresses were observed in the pavement surface during the time of our investigation. The existing ground surface elevation was approximately 940 feet above mean sea level (MSL).

3.2 SUBSURFACE CONDITIONS

The subsurface soils encountered during our geotechnical field investigation can be summarized as follows:

- The upper approximately 10 feet of soil consisted of dark/grayish brown, moist, loose to medium dense, fine- to coarse-grained sand with little gravel. The uncorrected standard penetration test (SPT) numbers ranged from 8 to 16 blows per foot (bpf). The average dry density of the insitu soils was approximately 105 pounds per cubic foot (pcf). The insitu moisture content ranged from 9 to 12 percent. Based on the compaction test (ASTM D 1557) performed on soil sample from Boring B-2, the relative compaction[1] of the subgrade soils underneath the PCC slab ranged from 72 to 77 percent. The determination of the dry density and relative compaction is affected by the sample disturbance during the sampling process, transportation, and laboratory testing. Therefore, the dry density and the relative compaction values are considered approximate.
- The deeper soils consisted of medium dense to very dense sands. The uncorrected SPT numbers ranged from 15 to greater than 50 bpf. The average dry density of the insitu soils was 120 pcf and the insitu moisture content ranged from 3 to 10 percent.

Groundwater was encountered at Boring B-1 at 35 feet below the ground surface (bgs) but not in Boring B-2. However, the depth to groundwater near the project has been reported as deep as 150 feet bgs (California Geological Survey [CGS], Open file report 98-05). Therefore, we judge the water encountered at 35 feet bgs in Boring B-1 could be perched water.

[1] Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, as determined by the American Society for Testing Materials (ASTM) D1557-91 test method. Optimum moisture content is the moisture content corresponding to the maximum dry density, as determined by the ASTM D1557-91 test method.



4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on geotechnical considerations, the site is suitable for the proposed project. The primary geotechnical consideration is the looseness and variable density of the upper soils, which would provide uneven foundation support and settle once subjected to the proposed loads. The upper 3 feet of soils should, therefore, be removed and re-compacted. If any fill material is encountered during grading, fill should be removed and re-compacted. We recommend that a registered geologist or geotechnical engineer observe the grading operation. The proposed facilities can be supported on shallow foundations such as mat and/or strip foundation placed on a layer of compacted fill. Excavation for wet well requires shoring. Our recommendations are presented in the following sections.

4.1 SEISMIC/GEOLOGIC HAZARDS

The site, like most of Southern California, will be subject to strong ground shaking during major earthquakes. Seismic design can be performed in accordance with the criteria listed in Table 2.

Table 2 - SEISMIC DESIGN CRITERIA

CHARACTERISTIC	CRITERIA
Site Class	D
S_s - mapped maximum considered earthquake spectral acceleration at short periods (g)	2.43[1]
S_1 - mapped maximum considered earthquake spectral acceleration at 1-second period (g)	0.85[1]
F_a - site coefficient	1.0
F_v - site coefficient	1.5
S_{MS} - adjusted maximum considered earthquake spectral acceleration at short periods (g)	2.43
S_{M1} - adjusted maximum considered earthquake spectral acceleration at 1-second period	1.27
California Seismic Hazards Mapping Act, Liquefaction Zone	Site outside the mapped
California Seismic Hazards Mapping Act, Landslide Zone	Site outside the mapped
Alquist-Priolo Special Study Zone	Site outside special study zones
Peak ground acceleration,[2] (g)	0.65

Notes:
1. ASCE 7-05 mapped values based on Earthquake Ground Motion Tool computer program (U.S. Geological Survey, 2007).
2. California Building Code (CBC) Section 1802.2.7 (S_{DC} /2.5).

Based on the depth to historically highest groundwater levels at the proposed site, we judge that subsurface soils subject to liquefaction will be very low to remote. However, the potential seismic settlement was estimated using procedures presented by Tokimatsu and Seed (1987). Based on our analyses, the seismic settlement is estimated to be less than 1 inch for the existing site

conditions (i.e., without excavation to remove existing loose soils) for a peak ground acceleration (PGA) of 0.65g and moment magnitude of 6.9. Static foundation settlements are noted in Section 4.3 and are in addition to the seismic settlements noted here. The recommended removal and recompaction of the upper 3 feet of existing soils should reduce the potential for seismic settlement by approximately ½ inch.

4.2 EARTHWORK

4.2.1 Site Preparation and Grading

Prior to the start of construction, the following should be performed:

- All utilities should be located in the field and either rerouted, removed, abandoned, or protected.
- PCC should be separated for recycling.

The upper soil should be excavated and replaced with compacted fill as shown on Figure 3. The bottom of the excavation should be

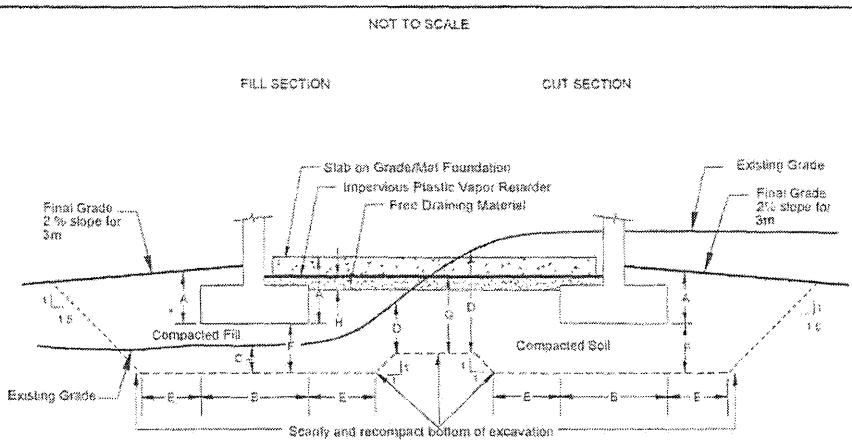
- Scarified to a depth of 8 inches.
- Moisture-conditioned to above-optimum moisture content.
- Compacted to at least 95 percent relative compaction.

Fill and backfill should be compacted by:

- Placing in loose layers less than 8 inches thick.
- Moisture-conditioning to above-optimum moisture content.
- Compacting to at least 95 percent relative compaction.

The wet well mat foundation can be supported on medium dense to dense natural soils. However, if the medium dense to dense natural soils are disturbed during construction (by mechanical means), the disturbed natural soils should be compacted to at least 95 percent relative compaction.





LOCATION	MINIMUM DIMENSIONS (feet)		
	Strip Foundation	Mat Foundation	Wet Well
A. Footing Embedment Below Subgrade	1.5	1	See Table 1
B. Footing Width	1	See Table 1	See Table 1
C. Excavation Below Existing Grade (Footing)	3	--	0
D. Excavation Below Existing Grade (Slab)	3	3	0
E. Excavation Beyond Footing	5	5	0
F. Compacted Soil/Fill Below Footing	2	2	--
G. Compacted Soil/Fill Below Slab	--		0
H. Free-Draining Material	--	0.5	--
PRESSURE (psf)			
Static (net) Allowable Bearing Capacity (FS≥3)	2,000	500	2,000
Increase per Foot of Depth	300	--	300
Increase per Foot of Width	200	--	200
Maximum Static Bearing Capacity (FS≥3)	3,000	500	3,000
Maximum Transient Bearing Capacity (FS≥2)	4,000	650	4,000

Figure 3 - GRADING/FOUNDATION DETAILS

Concrete flatwork (i.e., slabs-on-grade, sidewalks, hardscape, curbs, and gutters) should be underlain by a minimum of 12 inches of compacted engineered soil compacted to at least 95 percent relative compaction.

Import materials for fill and select backfill should meet the criteria in Table 3. Select backfill is material placed within a horizontal distance of 5 feet or one-half of the wall height, whichever is greater, behind retaining/basement walls.

Table 3 - IMPORT FILL AND SELECT BACKFILL CRITERIA

CRITERIA	IMPORT FILL	SELECT BACKFILL
Maximum particle size (inches)	4	1
Maximum liquid limit (%)	10	5
Maximum plasticity index (%)	5	0
Maximum percentage passing the No. 200 sieve (%)	40	30
Minimum sand equivalent	20	20

The soils encountered in the borings are expected to meet the above criteria for select backfill. However, during construction, we recommend to perform laboratory testing to confirm the suitability to use as select backfill criteria.

Site grading may be accomplished with conventional heavy-duty construction equipment. The fill should be compacted using soil compactors or such as a vibratory padded drum roller, as defined by the Caterpillar Performance Handbook (2001), or equivalent. However, to avoid overstressing basement or retaining walls, backfill should be compacted using lightweight compaction equipment or the walls should be braced.

4.2.2 Excavations and Temporary and Permanent Slopes

Temporary excavations as deep as 12 feet will be required for construction of a wet well. Temporary excavations should be sloped or shored. Temporary shoring will be required for the proposed structures adjacent to the existing structures or near property lines.

Stability of temporary excavations is a function of several factors, including the total time the excavation is exposed, moisture condition, soil type and consistency, and contractor's operations. The contractor is responsible for excavation safety. As a guideline, temporary construction excavations greater than 3 feet but less than 12 feet deep should be planned with slopes no steeper than 1.5H:1V (horizontal to vertical). For steeper temporary construction slopes or deeper excavations, shoring should be provided for stability and protection. The soil encountered in the borings indicates that the subsurface materials are highly susceptible to caving.

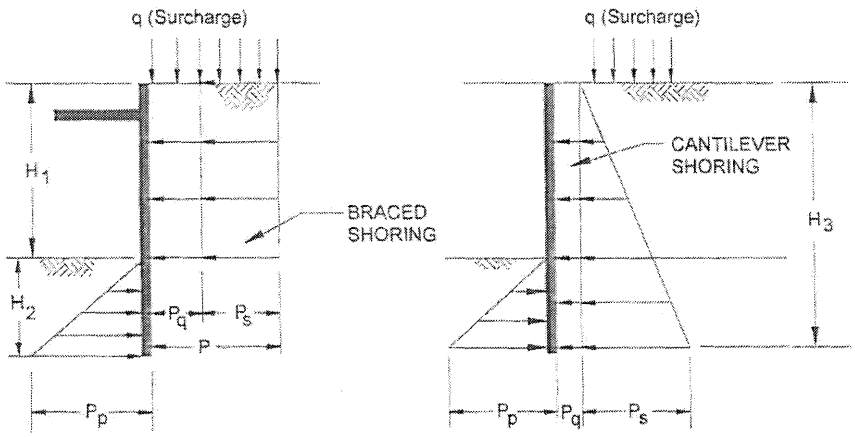
The support of temporary excavations is the responsibility of the contractor. Shoring is usually designed as either cantilever (unbraced) or braced. Cantilever shoring is commonly constructed by either using soldier piles with lagging placed between piles or using sheet piles. If soldier piles and lagging are used, continuous lagging is required. Difficulty in installing the lagging due to caving cohessionless soils should be anticipated.

Soils encountered in the borings were mostly silty sands and sands. Based on the Occupational Safety and Health Administration (OSHA) procedures, the soils can be classified as Soil Type C. Therefore, Soil Type C should be considered when selecting shoring in accordance with OSHA criteria.



In addition, the contractor should strictly adhere to grading requirements of the City of Pasadena and applicable federal and state health and safety regulations such as those of OSHA.

Suggested lateral earth pressures for use in shoring design are presented on Figure 4, which also includes the effect of surcharge and traffic. Temporary shoring design should incorporate the expected construction procedures, sequence, and loads. In particular, the stockpiling of excavated materials should be considered in design, as well as steel plates for cross traffic and the presence of heavy construction equipment or spoil piles next to the trenches. The shoring design is the responsibility of the Contractor and should be designed by a registered engineer retained by the Contractor. We recommend that the design of temporary shoring be performed using shoring pressures equal to or greater than those shown on Figure 4, and passive resistance equal to or less that that shown on Figure 4. The passive pressures shown on Figure 4 assume natural soils.



$P_P = 330\ H_2 < 3{,}500$ psf	BRACED SHORING $P = P_q + P_s$ $P = 0.5q + 35\ H_1$ (300 psf minimum)	CANTILEVER SHORING $P = P_q + P_s$ $= 0.35q + 37\ H_3$

Notes:

- All values of height (H) in feet, and pressure (P) and surcharge (q) in pounds per square foot (psf).
- Values for temporary excavation using flexible walls.
- For traffic surcharge, assume no less than a 100 psf uniform horizontal pressure along the top 10 feet.
- Earth pressure assumes no hydrostatic pressures. If hydrostatic pressures are slowed to building up, the incremental earth pressures below groundwater level should be reduced by 50 percent and added to hydrostatic pressure for total lateral pressure.

Figure 4 - LATERAL EARTH PRESSURE - TEMPORARY SHORING

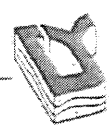
4.3 FOUNDATION DESIGN

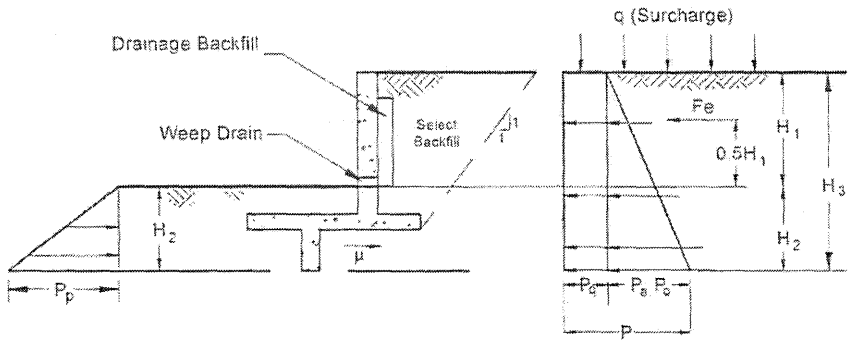
The proposed structures can be supported on shallow foundations placed on a layer of compacted fill or on natural medium dense sandy soils as shown on Figure 3. The static and temporary

allowable bearing capacities include factors of safety of at least 3 and 2, respectively, against shear failure. For properly constructed foundations supported on compacted fill, total static settlement due to the proposed structural loads is estimated to be less than ½ inch. Differential static settlements between similarly loaded footings are expected to be less than ½ inch. Most of the static settlements are expected to occur as the loads are applied or shortly thereafter. The static settlements noted above are in addition to the seismic settlements noted in Section 4.1.

4.4 RESISTANCE TO LATERAL LOADS AND LATERAL EARTH PRESSURES

The lateral resistance may be calculated using 50 percent of passive resistance plus 50 percent of base friction, 100 percent passive resistance only, or 100 percent base friction only. Lateral loads can be resisted by an allowable passive soil pressure and base friction, as outlined on Figure 5 for compacted fill, applied against below-grade walls and foundation elements. Retaining and subterranean walls should be designed to resist lateral earth pressures with the equivalent fluid pressures as illustrated on Figure 5. Lateral earth pressures are presented for walls free to rotate and restrained walls. At-rest earth pressures (restrained walls) should be used for basement walls and where the top of the wall is not expected to move laterally more than 0.001 H_1 (see Figure 5). The lateral earth pressures on Figure 5 are based on site compacted soils. See Figure 6 for typical sections of wall drains.



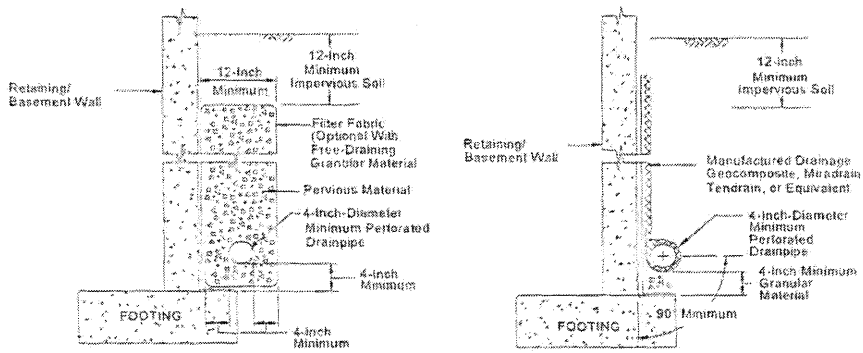


$P_p = 330\ H_2 \leq 3{,}500$ psf $\mu = 0.4$	Cantilever Walls $P = P_a + P_q = 37\ H_3 + 0.35q$ $Fe = 15\ H_1^2$	Restrained Walls $P = P_o + P_q = 55\ H_3 + 0.5q$ $Fe = 29\ H_1^2$

Notes:

- All values of height (H) in feet, pressure (P), and surcharge (q) in pounds per square foot (psf) and force (F) in pounds.
- P_p, P_a, and P_o are the passive, active, and at-rest earth pressures, respectively; Fe is the incremental seismic force.
- P_q is the incremental surcharge pressure, and μ is the allowable friction coefficient applied to dead normal (buoyant) loads. Fe is in addition to the active and at-rest pressures. Below groundwater, active and at-rest pressure should be reduced by 50 percent and hydrostatic pressure should be added to active and at-rest pressures. P_p should be reduced by 50 percent below the groundwater.
- For 2H:1V slopes above the wall, increase the active and at-rest pressures by 50 percent; for 1.5H:1V slope, increase the active and at-rest pressures by 100 percent.
- Neglect the upper 1 foot for passive pressure unless the surface is contained by a pavement or slab.
- Peak ground acceleration (PGA) was used to calculate Fe, 50 percent of the PGA for cantilever walls and 75 percent of PGA for restrained walls was used.
- See Figure 6 for drainage details.

Figure 5 - LATERAL EARTH PRESSURES - PERMANENT



MATERIAL	CALTRANS SPECIFICATIONS	GREENBOOK SPECIFICATIONS
Free-Draining Granular Material	68-1.025 (Class 2)	300-3.5.2
Geotextile Filter Fabric	68-1.03	300-8
Perforated Pipe	68-1.02	207-13.4

Notes:

- Drainpipe should drain to an outlet.
- Filter fabric wraps completely around perforated drainpipe and pervious materials.

Figure 6 - RETAINING OR BASEMENT WALL DRAINAGE

4.5 SLABS-ON-GRADE AND CONCRETE FLATWORK/MAT FOUNDATION

Slabs-on-grade should be underlain by compacted free-draining granular materials as outlined on Figure 3. The free-draining granular material should contain less than 5 percent fines (passing the No. 200 sieve) and should be placed immediately below the slab-on-grade. A modulus of subgrade (compacted subgrade) reaction of 100 pounds per cubic inch (pci) can be used for mat foundation design.

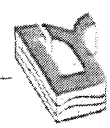
Moisture vapor will tend to migrate through the slab-on-grade. A waterproofing specialist should be consulted. To reduce vapor migration through the floor building slab, the following should be considered:

- Minimum 10-millimeter-thick plastic vapor barrier with joints overlapped by at least 6 inches and taped.
- Sealing the plastic vapor barrier around plumbing, electrical, and other conducts.
- No sand above the plastic vapor barrier.
- Minimum 7-day wet cure with no curing compounds.
- Two-month drying period before floor coverings are placed.
- Concrete mix design, materials, placement, curing, and finishing in conformance with the Greenbook and the American Concrete Institute (ACI; 1996, 1997).

The plastic vapor barrier should satisfy the requirements of ASTM E 1745 (Class "A"). ACI 302.1R-96 defines a vapor barrier as having a water vapor transmission rate (WVTR) of 0.00, plus a testing tolerance generally of a WVTR of 0.008 or less when tested in accordance with ASTM E 96. Note that commonly used "poly" or "visqueen" does not meet ASTM E 1745 requirements. Vapor barriers should be installed in accordance to ASTM E 1643. Care should be taken to seal the plastic vapor barrier and avoid puncturing the plastic vapor barrier during construction.

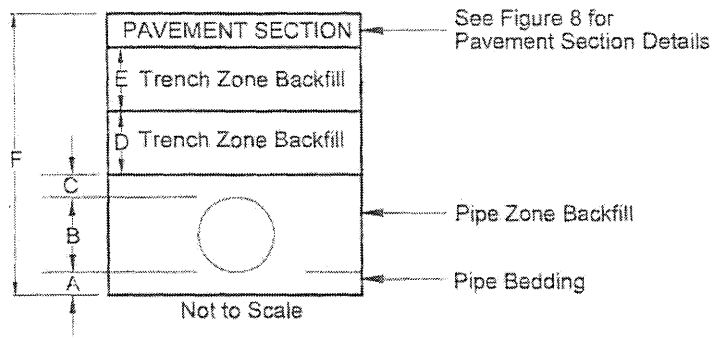
4.6 UTILITY TRENCHES

Utility trenches (either open or backfilled) that parallel structures, pavement, or flatwork should be planned so that they do not extend below a plane with a downward slope of 1.5H:1V from the bottom edge of footings, pavement, or flatwork. Temporary shoring to provide footing, pavement, flatwork, or utility support is recommended unless localized settlements on the order of 1 percent of the trench depth can be tolerated.



All excavations should comply with appropriate safety standards outlined in Section 4.2.2.

Utility pipes should be placed on the bottom of a neatly cut trench on a layer of bedding as outlined on Figure 7 or according to the manufacturer's recommendations, whichever is greater. Jetting should not be allowed for compaction purposes. We anticipate that the near-surface soils will be suitable for use as bedding materials.



MATERIAL	MINIMUM THICKNESS (feet)	MINIMUM RELATIVE COMPACTION[1] (%)	BACKFILL SPECIFICATIONS	
			Caltrans Specifications	Greenbook Specifications
Pipe Bedding	A = 0.33 or B/4	--	19-3.025B	306-1.2.1
Pipe Zone	C = 1	--	19-3.025B	306-1.2.1
Trench Zone	D varies	90[2]	--	--
Trench Zone[3]	E = 2	95	--	--

Notes:
1. Based on ASTM D1557.
2. To reduce settlement, use 95 percent relative compaction.
3. E = 0 if no pavement or settlement-sensitive structures at surface.

• Minimum values; use manufacturer's recommendations if greater.

Figure 7 - PIPELINE BACKFILL SCHEMATIC

Settlement can affect the post-construction performance of trenching projects. Ground behind the shoring can settle (ground loss), yield laterally, and/or the trench backfill can settle. The contractor's operations will significantly affect both types of settlement. Some ground loss is likely with any shoring system. In general, sandy soils will experience more ground loss than clayey soils because of the tendency of sand to ravel or slough immediately upon trench excavation. If there are settlement sensitive structures within approximately 1.5 F (F = the depth of the excavation, see Figure 7), these structures should each be evaluated independently.

Some settlement of the backfill above the pipelines should be expected even when the backfill is properly compacted. Therefore, there should be provisions for periodic resurfacing of the trench area. Post-construction settlement can be reduced if the backfill is compacted wet of the optimum moisture content (typically 1 to 2 percent above). To reduce the potential for future settlement, it is

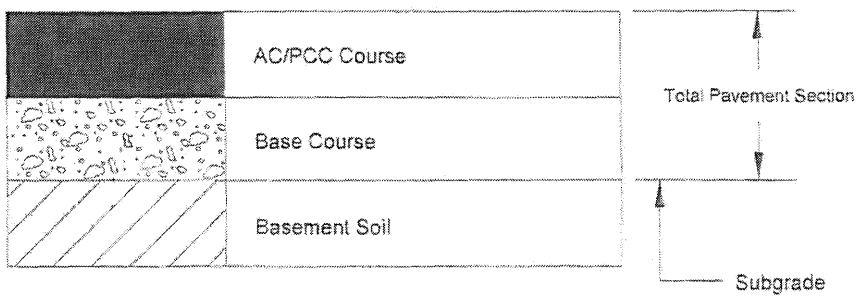
critical that the propoer field quality control (QC) and quality assurance (QA) procedures are implemented to check that the full depth of trench backfill is compacted to at least the required relative compaction of 95 percent.

Using cement slurry backfill can also mitigate settlement. However, significant amounts of slurry are required and it will be necessary to remove and dispose of the trench excavation spoils.

4.7 PAVEMENT THICKNESS DESIGN

Recommended minimum AC and PCC pavement sections are presented on Figure 8. The recommended minimum pavement sections are based on the following:

- R-value of 50.
- Caltrans and American Association of State Highway and Transportation Officials (AASHTO) design methods for AC and PCC, respectively.
- Traffic index (TI) of 5, provided by Stetson.



COURSE	MINIMUM THICKNESS (inches)		
	AC Over Base	Full Depth AC	PCC Over Base
	TI[1] = 5	TI = 5	TI = 5
AC/PCC[2]	3	5	6
Base[3]	5	--	8
Basement Soil[4]	12	12	12

Notes:
1. TI = Traffic Index.
2. Asphalt concrete (AC) and Portland cement concrete (PCC) should satisfy the requirements of Caltrans Standard Specifications Sections 39 and 40, respectively, or Greenbook Sections 203, and 201 and 302, respectively.
3. Base course = Crushed aggregate base or crushed miscellaneous base, in accordance with Caltrans Standard Specifications Section 26 or Greenbook Sections 200-2.2 and 200-2.4, respectively. The minimum relative compaction is 95 percent.
4. Compacted in-place natural soil or fill; the minimum is 95 percent relative compaction.

Figure 8 - PAVEMENT THICKNESS

Generally, rigid PCC pavement costs more for initial construction but requires less maintenance than that for flexible AC pavements. For heavy wheel loads along limited alignments, turning areas, dolly pads, and refuse pickup areas, PCC pavement is preferred. For PCC pavements, the following should be considered:

- Construct pavements in a 15-foot square grid or smaller (20-foot rectangular areas if a square is not practical).
- Expansion joints should extend the full depth of the pavement.
- Potential joints depth of ¼ of the pavement thickness.
- Cure for a minimum of 7 days.
- No traffic until the compressive strength exceeds 2,000 pounds per square inch (psi).
- Minimum compressive strength of 3,000 psi.
- Dowels to strengthen joints.
- Minimum slope of 1 percent.

The minimum thickness of compacted subgrade is outlined on Figure 8. The subgrade soils should be firm, unyielding and not "pumping." Aggregate base requirements and specifications are outlined on Figure 8. The basement soil (subgrade) and aggregate base should be compacted to at least 95 percent relative compaction as shown on Figure 8.

4.8 SOIL CORROSION POTENTIAL

Analytical chemical test results from two tests performed during this investigation indicated 50 to 57 parts per million (ppm) soluble sulfate concentrations in the near-surface soils. Based on these test results, Type II cement should be used in accordance with the section 1904.3 of the California Building Code (CBC) 2007.

Two soil samples were tested for pH, soluble chloride and soluble sulfate, and soil electrical resistivity to check for corrosion potential. The test values are summarized in Table 4. Also presented in Table 4 are Caltrans (2003) corrosion criteria. The corrosion potential test results are presented in Appendix B. Based on Caltrans guidelines, the onsite soils are classified as noncorrosive to buried metal pipes.



Table 4 - CORROSION POTENTIAL

	TEST VALUES	CALTRANS CRITERIA FOR CORROSIVE MATERIALS
pH	7.27 and 7.29	<5.5
Soluble sulfate content (ppm)	50 and 57	>2,000
Soluble chloride content (ppm)	86 and 121	>500
Electrical resistivity (ohm-cm)	8,000 and 11,450	<1,000



5.0 PLAN REVIEW, CONSTRUCTION OBSERVATION, AND TESTING

DYA should be retained to review the finished grading earthwork and foundation plans and specifications for conformance with the intent of our recommendations. The review will enable DYA to modify the recommendations if final design conditions are different than presently understood.

During construction, DYA should provide field observation and testing to check that the site preparation, excavation, foundation installation, and finished grading conform to the intent of these recommendations, project plans, and specifications. This would allow DYA to develop supplemental recommendations as appropriate for the actual soil conditions encountered and the specific construction techniques used by the contractor.

As needed during construction, DYA should be retained to consult on geotechnical questions, construction problems, and unanticipated site conditions.



6.0 LIMITATIONS

This report has been prepared for this project in accordance with generally accepted geotechnical engineering practices common to the local area. No other warranty, expressed or implied, is made.

The analyses and recommendations contained in this report are based on the literature review, field investigation, and laboratory testing conducted in the area. The results of the field investigation indicate subsurface conditions only at the specific locations and times, and only to the depths penetrated. They do not necessarily reflect strata variations that may exist between such locations. Although subsurface conditions have been explored as part of the investigation, we have not conducted chemical laboratory testing on samples obtained or evaluated the site with respect to the presence or potential presence of contaminated soil or groundwater conditions.

The validity of our recommendations is based in part on assumptions about the stratigraphy. Observations during construction can help confirm such assumptions. If subsurface conditions different from those described are noted during construction, recommendations in this report must be re-evaluated. DYA should be retained to observe earthwork construction in order to help confirm that our assumptions and recommendations are valid or to modify them accordingly. In accordance with CBC Chapter 17 Section 1704, DYA cannot assume responsibility or liability for the adequacy of recommendations if we do not observe construction.

This report is intended for use only for the project described. In the event that any changes in the nature, design, or location of the facilities are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by DYA. We are not responsible for any claims, damages, or liability associated with the interpretation of subsurface data or reuse of the subsurface data or engineering analyses without our express written authorization.



7.0 BIBLIOGRAPHY

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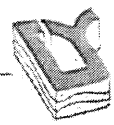
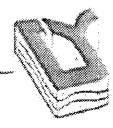


APPENDIX A
FIELD INVESTIGATION



APPENDIX A - FIELD INVESTIGATION

The field investigation for the proposed project consisted of drilling two borings (B-1 and B-2) to depths ranging from approximately 41 to 44 feet. The approximate boring locations are shown on Figure 2.

Borings were drilled by Layne Christensen Company on May 12, 2005, with a truck-mounted CME-75 drill rig using hollow-stem auger drilling techniques. Our field engineer observed the drilling operations and collected drive samples for visual examination and subsequent laboratory testing. Drive samples were collected with a 2.4-inch-inside-diameter (3.0-inch-outside-diameter) modified California split-barrel sample lined with brass tubes and a standard split-spoon penetrometer with dimensions in accordance with ASTM 3550 and 1586, respectively. Both samplers were driven with a 140-pound hammer falling 30 inches. An automatic trip hammer was used. The blows required to drive the modified California sampler were converted to equivalent standard penetration test (SPT) N-values by multiplying by 0.65 (N = 0.65 x modified California blows per foot). The sampler blow counts were recorded in 6-inch increments. Penetration for both the modified California and SPT samplers was terminated if 50 blows were recorded with less than a 6-inch penetration. An approximate equivalent blow count was then calculated by linear extrapolation. For the modified California sampler, the extrapolated blow count was then further modified as noted above to be an equivalent SPT blow count.

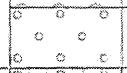
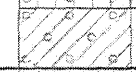
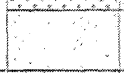
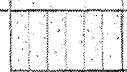
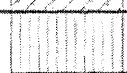
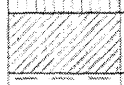
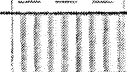
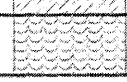
Soils encountered in the borings were classified in general accordance with the ASTM Soil Classification System (ASTM D2487 and 2488), which is summarized on Plate A1. Boring logs presented on Plates A2 through A5 were prepared from visual examination of the samples, cuttings obtained during drilling operations, and results of laboratory tests.

Groundwater was encountered during the field investigation at Boring B-1 at 35 feet below the ground surface but not in Boring B-2; we suspect it could be perched water. Borings were backfilled with soil cuttings.

Boring locations were identified in the field by measuring from known locations using a measuring wheel. The geographic coordinates of the boring locations were recorded using a hand-held differential global positioning system (gps) unit with a 6-foot horizontal accuracy.



SOIL CLASSIFICATION SYSTEM-ASTM D2487

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES LITTLE OR NO FINES
				GP	POORLY GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE-GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS



"Push" Sampler



Split Barrel "Drive" Sampler With Liner



Standard Penetration Test (SPT) Sampler



Bag Sample



Concrete/Rock Core



Groundwater Surface

SP

NP = Nonplastic
EIT = Expansion Index Test
SG = Specific Gravity
SE = Sand Equivalent
UC = Unconfined Comp.
CD = Consol. Drained Comp.
CU = Consol. Undrained Comp.
UU = Undrained, Unconsol. Comp.
RV/CBR = R-Value/California Bearing Ratio
CHEM = Chemical Analysis
DS = Direct Shear
CON = Consolidation
SA = Grain size; HYD = Hydrometer
COMP= Compaction Test
[PID] Reading in ppm above background

KEY TO LOG OF BORINGS

Pasadena Ion Exchange Treatment System for Perchlorate Removal
Project No. 2005-017

PLATE
A1

Template: DYLG1; Prj ID: 2005-017.GPJ

BORING LOCATION:	See Figure 2	**ELEVATION AND DATUM (feet):**	920 MSL
LATITUDE:	34° 9' 25.7" N	**LONGITUDE:**	118° 9' 11.8" W
DRILLING EQUIPMENT:	CME-75	**DRILLING METHOD:**	Hollow Stem Auger
BORING DIAMETER (inches):	6	**BORING DEPTH (feet):**	42
DATE STARTED:	5/12/05	**DATE COMPLETED:**	5/12/05
SPT HAMMER DROP:	30 inches **WT:** 140 lbs	**DRIVE HAMMER DROP:**	30 inches **WT:** 140 lbs
LOGGED BY:	RSZ **CHECKED BY:** SN	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							PORTLAND CEMENT CONCRETE - 5 inches						
							SILTY SAND (SM); dark brown, moist, medium dense, fine-to coarse-grained sand, fine to coarse gravel						
				7 12 10	14								CHEM
915	5			6 6 7	8		loose	100	12			24	
910	10			5 6 8	14		dark brown, moist, medium dense, fine-to coarse-grained sand, fine gravel						
905	15			21 19 12	20		olive brown	122	10				DS
900	20			3 6 21	27		decreased fines					17	
							POORLY GRADED SAND with SILT (SP-SM); olive brown, moist, very dense, fine- to coarse-grained sand, trace fine gravel						
895	25			14 38 50/5 inches	64			128	9				
							SILTY SAND (SM); brown, moist, medium dense, fine-grained sand						

LOG OF BORING B-1

PLATE A2

Pasadena Ion Exchange Treatment System for Perchlorate Removal

Project No. 2005-017

Template: DYLG1; Prj ID: 2005.017.GPJ

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
				12 8 7	15								
885	35			9 14 50/5 inches	48		▽ dense, wet, decreased fines	109	18				
							POORLY GRADED SAND (SP): brown, wet, dense, fine- to coarse-grained sand, trace fine gravel						
880	40			19 24 24	48								
							Bottom of boring at 41.5 feet. Groundwater encountered at 35 feet. Boring backfilled with cement bentonite slurry and cutting. Surface patched with rapid set concrete.						
875	45												
870	50												
865	55												
860	60												
855	65												

LOG OF BORING B- 1

Pasadena Ion Exchange Treatment System for Perchlorate Removal

Project No. 2005-017

PLATE

A3

Template: DYLG1; Prj ID: 2005 017.GPJ

BORING LOCATION:	See Figure 2	**ELEVATION AND DATUM (feet):**	920 MSL
LATITUDE:	34° 9' 25.3" N	**LONGITUDE:**	118° 9' 12.0" W
DRILLING EQUIPMENT:	CME-75	**DRILLING METHOD:**	Hollow Stem Auger
BORING DIAMETER (inches):	6	**BORING DEPTH (feet):**	45
DATE STARTED:	5/12/05	**DATE COMPLETED:**	5/12/05
SPT HAMMER DROP:	30 inches **WT:** 140 lbs	**DRIVE HAMMER DROP:**	30 inches **WT:** 140 lbs
LOGGED BY:	RSZ **CHECKED BY:** SN	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							PORTLAND CEMENT CONCRETE - 6 inches						
							SILTY SAND (SM); dark brown, moist, loose, fine- to medium-grained sand, trace fine gravel						
				3 5 7	8			108	9	19	2	28	COMP CHEM RV
915	5			6 9 14	15		dark gray, medium dense, fine- to coarse-grained sand, trace fine to coarse gravel	95	9				
				7 7 9	16		WELL GRADED GRAVEL with SAND and SILT (GW-GM); grayish brown, medium dense, fine to coarse gravel, fine- to coarse-grained sand						
910	10			12 25 17	27			115	3			5	SA
				11 17 23	40		light olive brown, dense, fine- to coarse-grained sand, trace fine gravel						
905	15			19 36 39	49		SILTY SAND (SM); olive brown, dense, moist, fine- to coarse-grained sand, trace fine gravel	120	4				
				4 7 7	14		light brown, medium dense					21	
900	20			15 29 31	39		dense						
				9 17 17	34								
895	25			14 18 46	42		olive brown	108	6				
				8 20 26	46		dark brown, increased fines						

LOG OF BORING B- 2

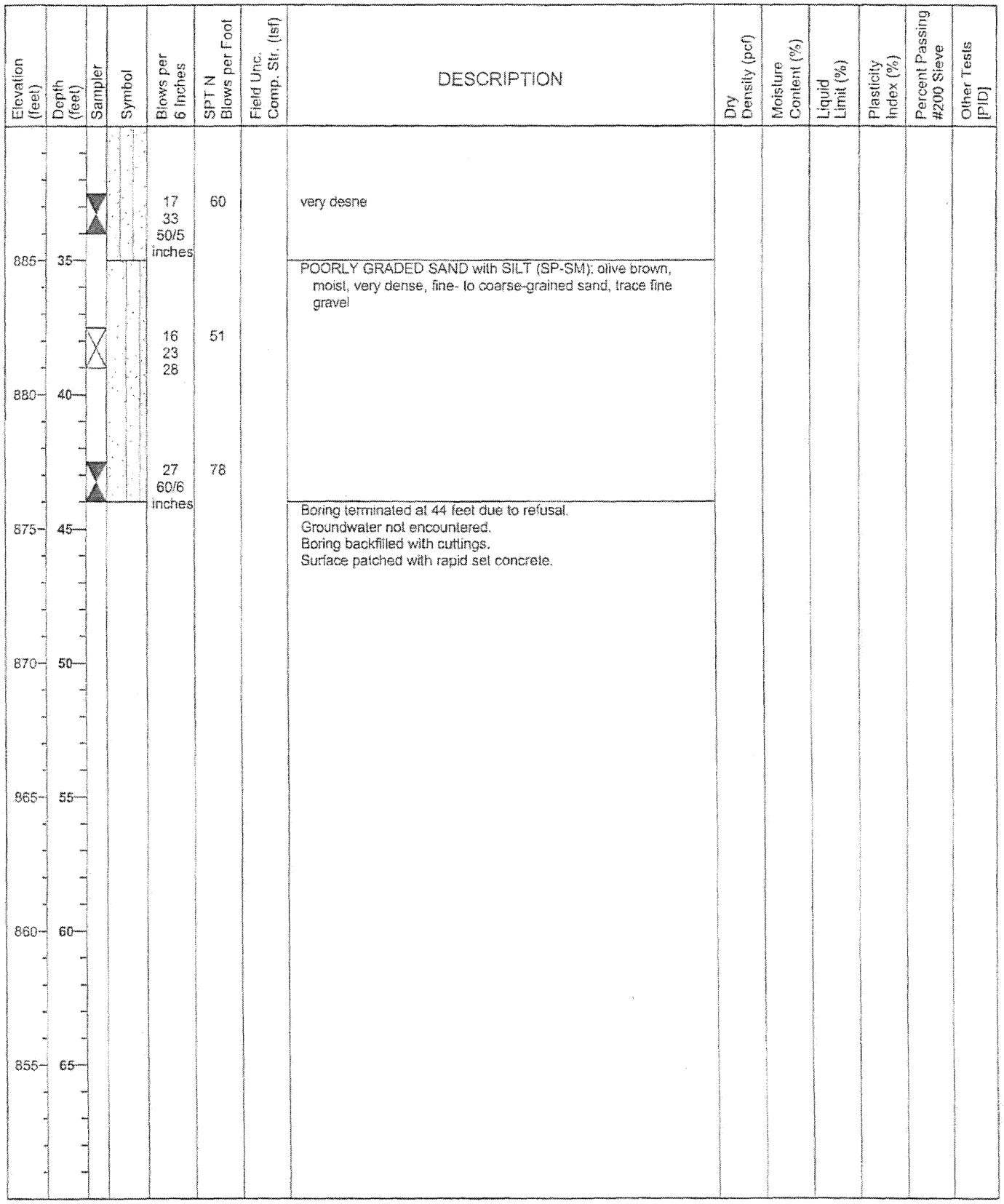
PLATE

A4

Pasadena Ion Exchange Treatment System for Perchlorate Removal

Project No. 2005-017

Template: DYLG1; Prj ID: 2005-017.GPJ



Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
				17 33 50/5 inches	60		very desne						
885	35						POORLY GRADED SAND with SILT (SP-SM): olive brown, moist, very dense, fine- to coarse-grained sand, trace fine gravel						
				16 23 28	51								
880	40												
				27 60/6 inches	78								
875	45						Boring terminated at 44 feet due to refusal. Groundwater not encountered. Boring backfilled with cuttings. Surface patched with rapid set concrete.						
870	50												
865	55												
860	60												
855	65												

LOG OF BORING B- 2

Pasadena Ion Exchange Treatment System for Perchlorate Removal

Project No. 2005-017

PLATE

A5

APPENDIX B - LABORATORY TESTING

Diaz•Yourman & Associates (DYA) selected soil samples to be tested and the tests to be performed on the selected samples. Laboratory testing was performed by Leighton Consulting. Laboratory data are summarized on the boring logs in Appendix A and presented on Plates B1 through B6. We have reviewed and concur with the test results and accept full responsibility for their use in our analysis. A summary of the geotechnical laboratory testing is presented in Table B1. Corrosion potential test results are summarized in Table B2.

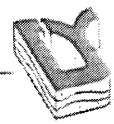
Table B1 - LABORATORY TESTING SUMMARY

TEST NAME	PROCEDURE	PURPOSE	LOCATION
Percent Passing the No. 200 Sieve	ASTM D1140-92	Classification, index properties	Boring Logs
Moisture Content, Dry Density	ASTM D2216-92	Classification, index properties	Boring Logs
Grain-Size Distribution	ASTM D422-63	Classification, index properties	Plate B1
Atterberg Limits	ASTM D-4318-93	Expansion potential, classification, index properties	Plate B2
Direct Shear	ASTM D3080-90	Shear strength	Plate B3
Compaction	ASTM D1557-91	Earthwork	Plate B4
Resistance (R-) Value	ASTM D2844-69 CTM 301	Pavement thickness design	Plate B5
pH	CTM 532	Corrosion potential	Table B2 and Plate B6
Resistivity	CTM 532	Corrosion potential	Table B2 and Plate B6
Soluble Sulfates	CTM 417-B	Corrosion potential	Table B2 and Plate B6
Soluble Chlorides	CTM 422	Corrosion potential	Table B2 and Plate B6

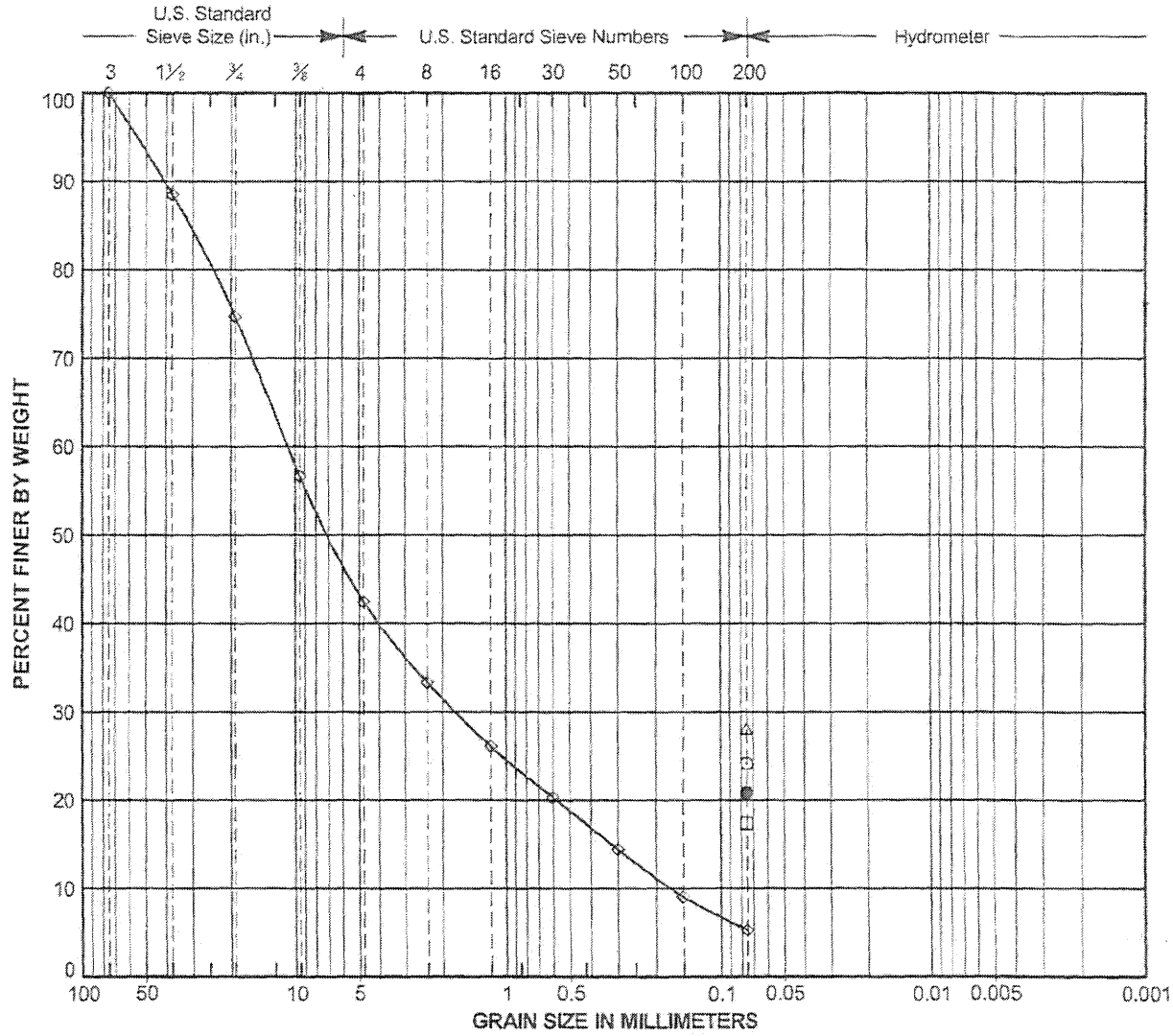
Notes:
- ASTM = American Society for Testing and Materials
- CTM = Caltrans Test Method

Table B2 - LABORATORY TESTING SUMMARY

Boring No.	B-1	B-2
Depth (feet)	0 to 5	0 to 5
pH	7.27	7.29
Water Soluble Sulfate Content (ppm)	57	50
Water Soluble Chloride Content (ppm)	86	121
Minimum Resistivity (ohms-cm)	8,000	11,450



Template: DY_SIEVE_WIN



COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

Laboratory Testing by: Leighton Consulting, Inc.

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	B- 1	5.0	SILTY SAND (SM)	12			24
□	B- 1	20.0	SILTY SAND (SM)				17
△	B- 2	2.5	SILTY SAND (SM)	9	19	2	28
◇	B- 2	10.0	WELL-GRADED GRAVEL with SILT (GW-GM)	3			5
●	B- 2	17.5	SILTY SAND (SM)				21

PARTICLE SIZE ANALYSIS

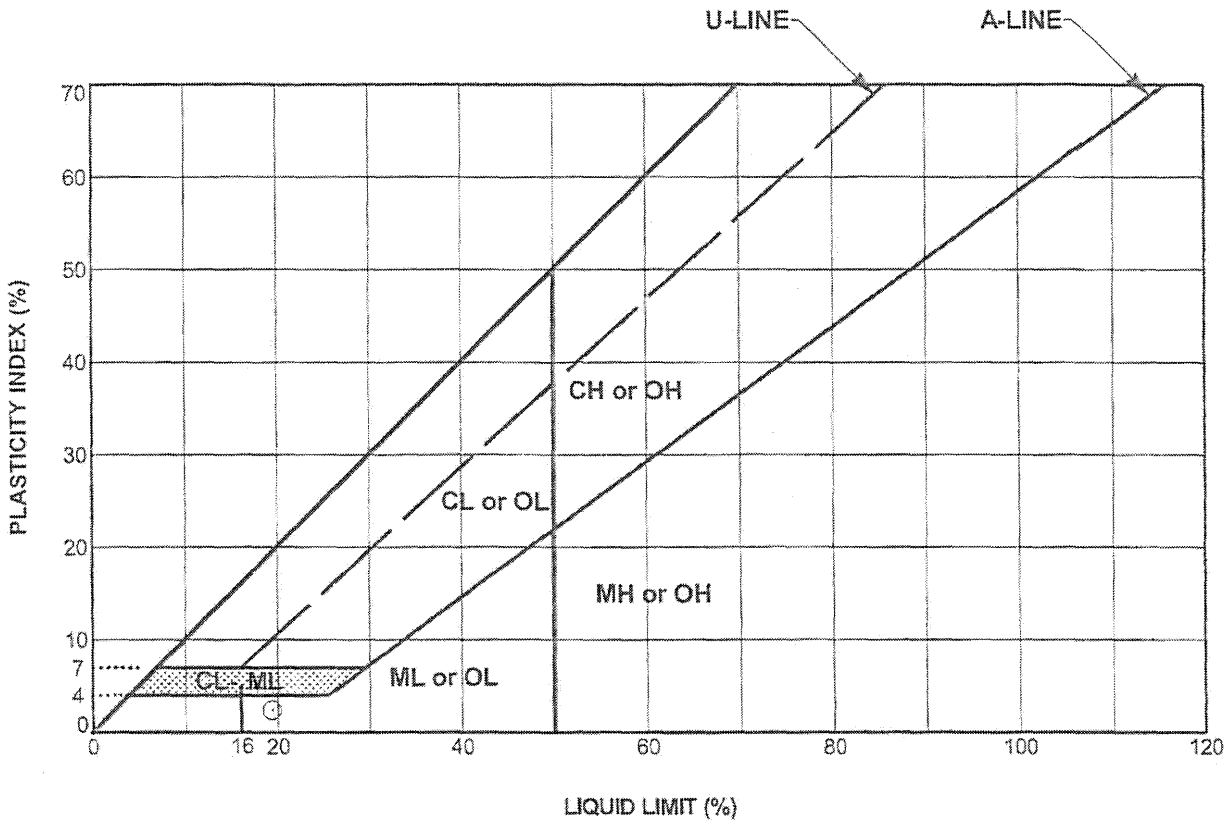
Pasadena Ion Exchange Treatment System for Perchlorate Removal

Project No. 2005-017

PLATE

B1

Template: DY_ATTERBERG_CHART_WIN



Laboratory Testing by: Leighton Consulting, Inc.

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	B-2	2.5	SILTY SAND (SM)	9	19	17	2	28

PLASTICITY CHART

Pasadena Ion Exchange Treatment System for Perchlorate Removal
Project No. 2005-017

PLATE
B2

Leighton

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	Pasadena IX Treatment	Tested By :	PP	Date:	05/21/05
Project No.:	2005-017	Input By :	LF	Date:	05/25/05
Boring No.:	B-2	Depth (ft.)	3		
Sample No. :	N/A				
Soil Identification:	Brown Silty Sand with Gravel (SM)g				

Preparation Method:	X	Moist	Scalp Fraction (%)		Rammer Weight (lb.) = 10.0
		Dry	#3/4	14.7	Height of Drop (in.) = 18.0
Compaction Method	X	Mechanical Ram	#3/8		
		Manual Ram	#4		Mold Volume (ft^3) 0.07513

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	6849.7	7074.8	7278.6	7223.5		
Weight of Mold (g)	2319.0	2319.0	2319.0	2319.0		
Net Weight of Soil (g)	4530.7	4755.8	4959.6	4904.5		
Wet Weight of Soil + Cont. (g)	1238.00	1213.30	1186.90	1061.60		
Dry Weight of Soil + Cont. (g)	1208.10	1161.40	1111.10	980.40		
Weight of Container (g)	72.90	79.40	82.60	74.60		
Moisture Content (%)	2.63	4.80	7.37	8.96		
Wet Density (pcf)	132.9	139.6	145.5	143.9		
Dry Density (pcf)	129.5	133.2	135.5	132.1		

Maximum Dry Density (pcf)	135.5	**Optimum Moisture Content (%)**	7.0
Corrected Dry Density (pcf)	**139.5**	**Corrected Moisture Content (%)**	**6.0**

☐ **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

☐ **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

☒ **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:
GR:SA:FI

Atterberg Limits:
LL,PL,PI

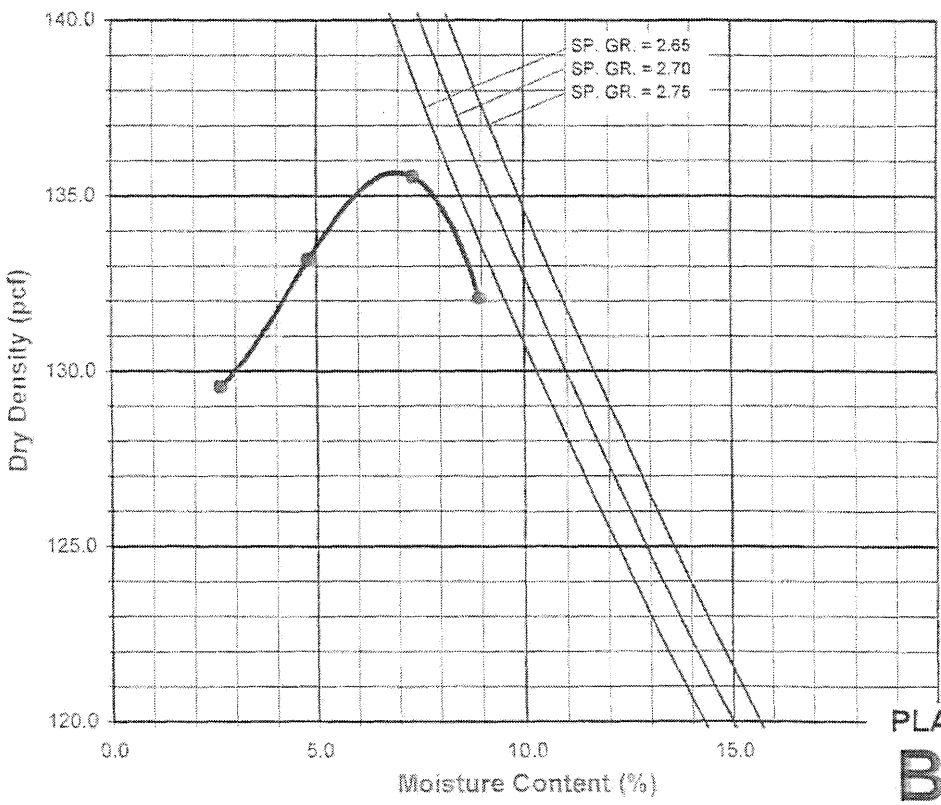
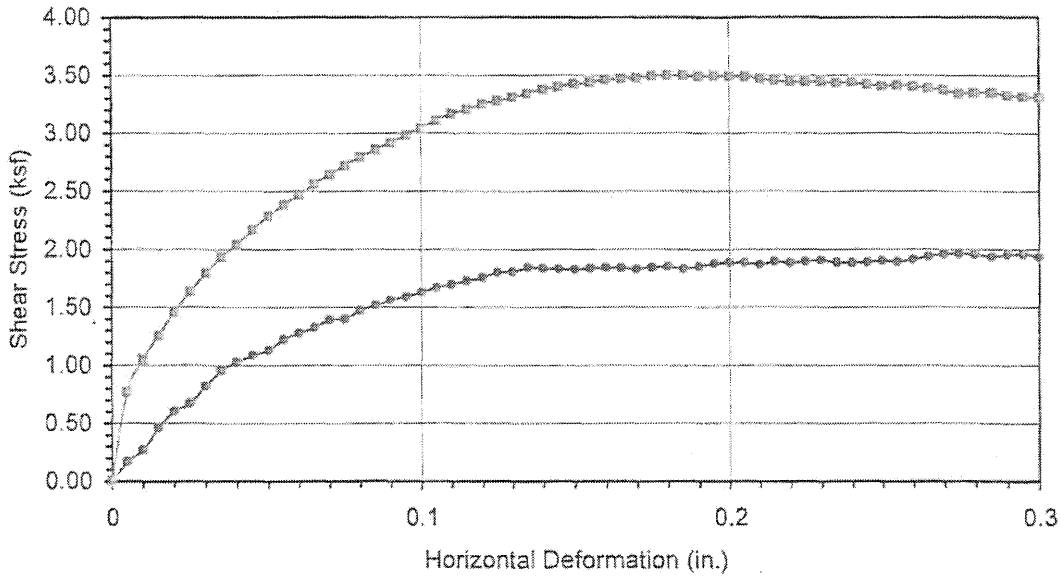
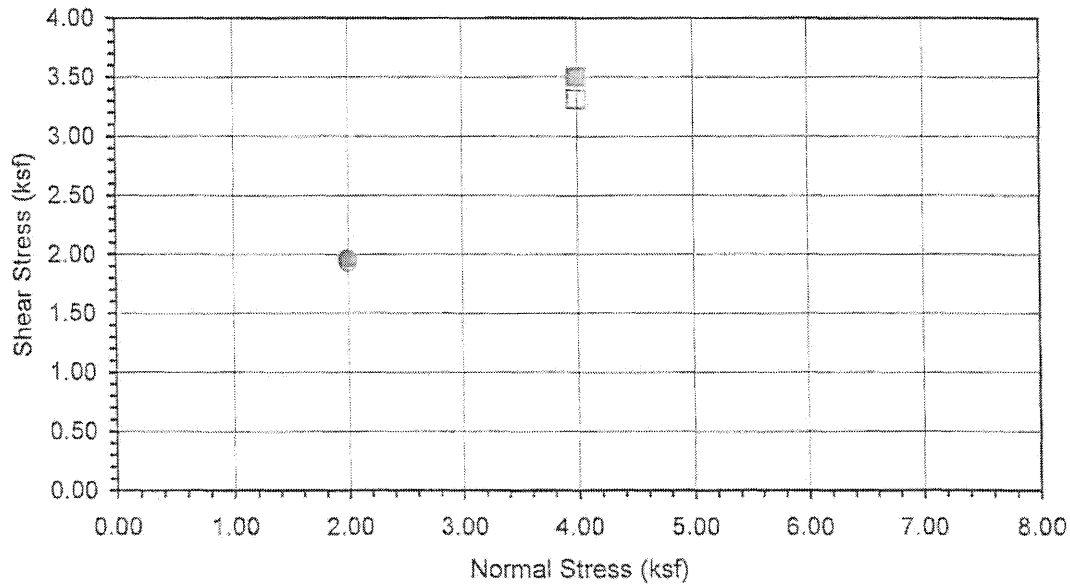


PLATE
B3

MX w Rc Cor b-2 @ 3'





Boring No.	**B-1**
Sample No.	**4**
Depth (ft)	**15**
Sample Type: Drive	
Soil Identification: Olive Silty Sand (SM) / Large Gravel Removed	

Normal Stress (kip/ft²)	2.000	4.000	
Peak Shear Stress (kip/ft²)	● 1.961	■ 3.501	▲
Shear Stress @ End of Test (ksf)	○ 1.930	□ 3.311	△
Deformation Rate (in./min.)	0.0033	0.0033	
Initial Sample Height (in.)	1.000	1.000	
Diameter (in.)	2.415	2.415	
Initial Moisture Content (%)	10.29	10.29	
Dry Density (pcf)	107.6	107.8	
Saturation (%)	49.0	49.4	
Soil Height Before Shearing (in.)	0.9830	0.9715	
Final Moisture Content (%)	18.2	17.8	

Leighton

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 2005-017

Pasadena IX Treatment

PLATE

B4

DS B-1 #4 @ 15

Leighton

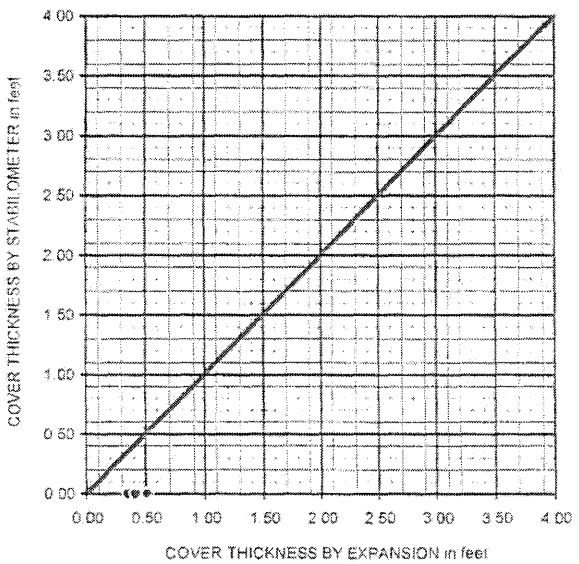
R-VALUE TEST RESULTS

PROJECT NAME:	Pasadena IX Treatment	PROJECT NUMBER:	2005-017
SAMPLE NUMBER:	N/A	SAMPLE LOCATION:	B-2 @ 3
SAMPLE DESCRIPTION:	(SM)g	TECHNICIAN:	SCF
		DATE SAMPLED	5/18/2005

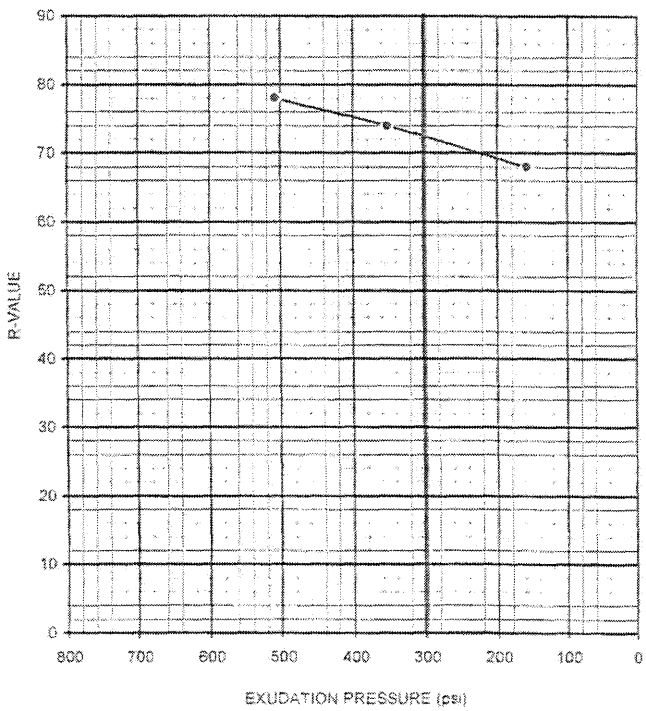
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	8.1	8.3	8.5
HEIGHT OF SAMPLE, Inches	2.44	2.46	2.45
DRY DENSITY, pcf	132.9	132.5	131.8
COMPACTOR PRESSURE, psi	300	260	175
EXUDATION PRESSURE, psi	507	352	157
EXPANSION, Inches x 10exp-4	0	0	0
STABILITY Ph 2,000 lbs (160 psi)	21	26	32
TURNS DISPLACEMENT	4.40	4.62	4.80
R-VALUE UNCORRECTED	79	74	68
R-VALUE CORRECTED	78	74	68

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.35	0.42	0.51
EXPANSION PRESSURE THICKNESS, ft.	0.00	0.00	0.00

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	100
R-VALUE BY EXUDATION:	72
EQUILIBRIUM R-VALUE:	72

PLATE
B5

Leighton

SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

Project Name: Pasadena IX Treatment
Project No. : 2005-017
Boring No.: B-1
Sample No. : N/A
Soil Identification: (SM)g

Tested By : GB Date: 05/21/05
Data Input By: LF Date: 05/24/05
Depth (ft.) : 3.0

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	100	14.74	2200	14841
2	200	22.93	1300	8770
3	300	31.13	1200	8095
4	400	39.32	1300	8770
5				

Moisture Content (%) (MCi)	6.54
Wet Wt. of Soil + Cont. (g)	226.45
Dry Wt. of Soil + Cont. (g)	216.19
Wt. of Container (g)	59.35
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.746
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
8000	**28.0**	**57**	**86**	**7.27**	**21.6**

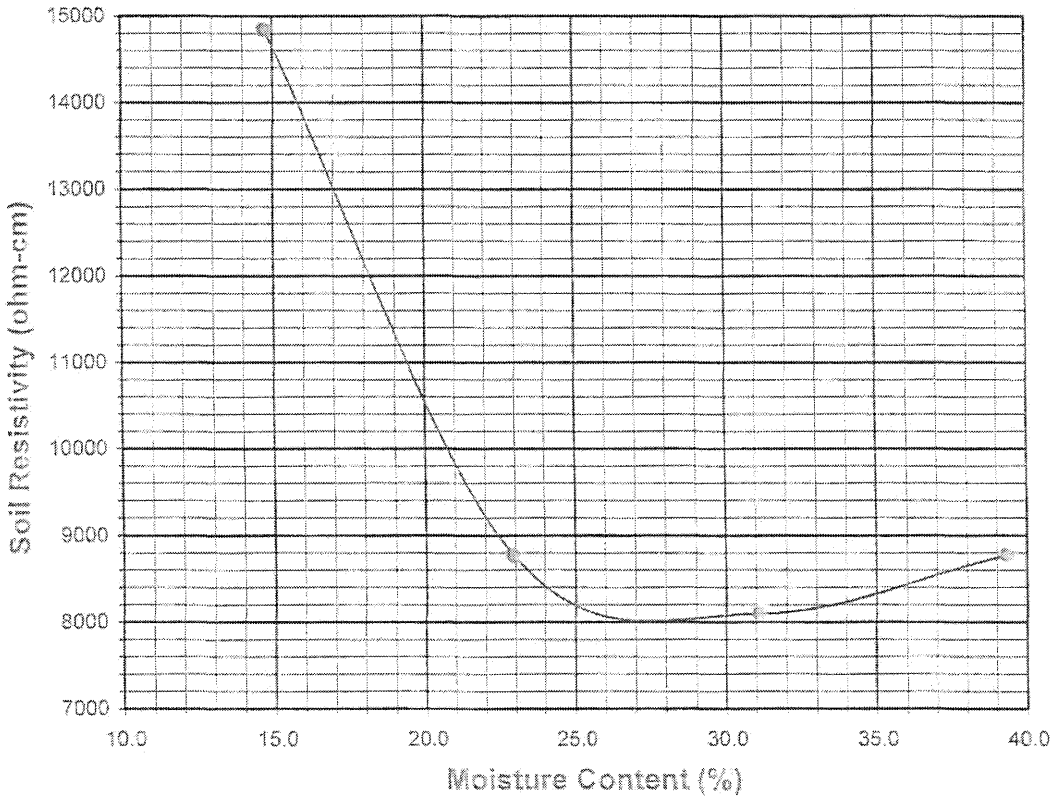


PLATE
B6

Leighton

SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

Project Name: Pasadena IX Treatment
Project No. : 2005-017
Boring No.: B-2
Sample No. : N/A
Soil Identification: (SM)g

Tested By : GB Date: 05/21/05
Data Input By: LF Date: 05/24/05
Depth (ft.) : 3.0

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	100	17.21	1900	12817
2	200	25.58	1700	11468
3	300	33.95	1800	12143
4				
5				

Moisture Content (%) (MCi)	8.83
Wet Wt. of Soil + Cont. (g)	217.11
Dry Wt. of Soil + Cont. (g)	204.17
Wt. of Container (g)	57.68
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.746
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
11450	**26.3**	**50**	**121**	**7.29**	**21.7**

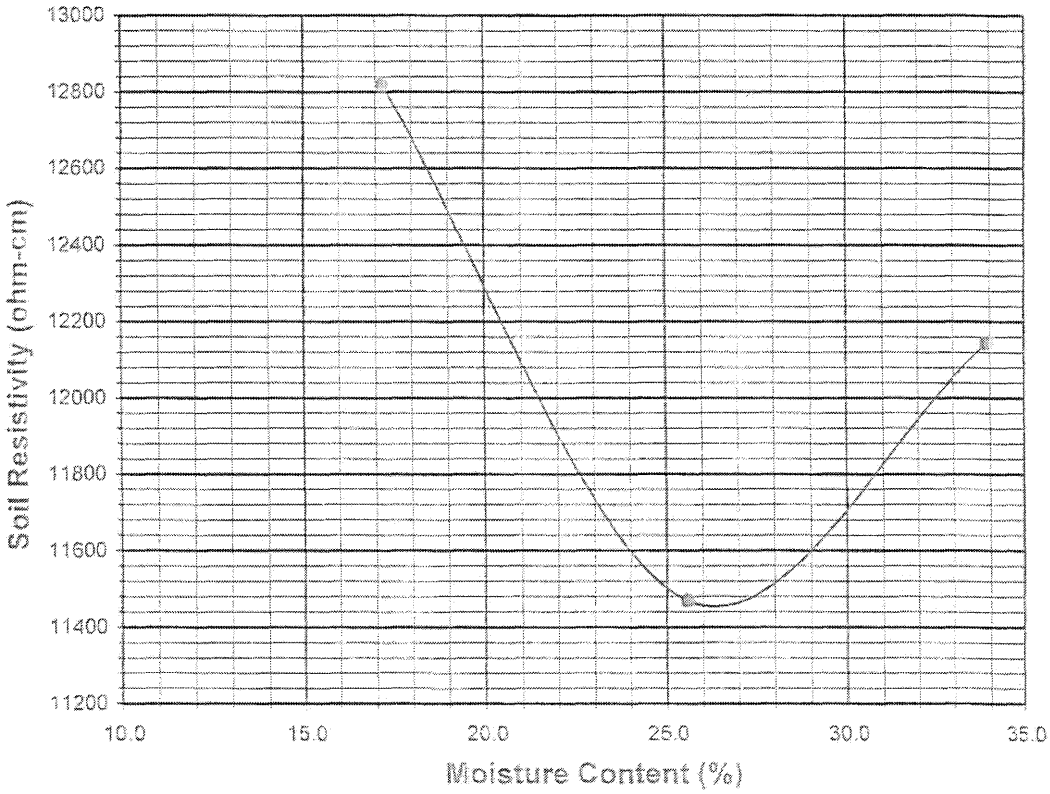


PLATE
B7

DISTRIBUTION

2 copies: Mr. John Cardoza
Stetson Engineering, Inc.
861 Village Oaks Drive, Suite 100
Covina, California 91724

QUALITY CONTROL REVIEWER

Allen M. Yourman, Jr., P.E., G.E.
Principal

AMY/SN:cfp



Appendix A-3

Notice of Preparation Comments

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David Crook

From: Lijin Sun <LSun@aqmd.gov>
Sent: Thursday, May 5, 2022 9:13 AM
To: Lin, Michael
Cc: Michael Morris
Subject: South Coast AQMD Staff NOP Comments for the Sunset Complex Project
Attachments: LAC220407-06 NOP Sunset Complex Project_20220505.pdf

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Dear Mr. Lin,

Attached are South Coast AQMD staff's comments on the Notice of Preparation of an Environmental Impact Report for the Sunset Complex Project (South Coast AQMD Control Number: LAC220407-06).

Thank you,
Lijin Sun
Program Supervisor, CEQA IGR
South Coast Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765
Direct: (909) 396-3308
Fax: (909) 396-3324
**Please note that the building is closed to the public.*

South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 • www.aqmd.gov

SENT VIA E-MAIL: May 5, 2022

mlin@cityofpasadena.net
Michael Lin, P.E.
City of Pasadena, Water and Power Department
150 South Los Robles Avenue, Suite 200
Pasadena, California 91101

Notice of Preparation of an Environmental Impact Report for the Sunset Complex Project (Proposed Project)

South Coast Air Quality Management District (South Coast AQMD) staff appreciates the opportunity to comment on the above-mentioned document. Our comments are recommendations on the analysis of potential air quality impacts from the Proposed Project that should be included in the Environmental Impact Report (EIR). Please send a copy of the EIR upon its completion and public release directly to South Coast AQMD as copies of the EIR submitted to the State Clearinghouse are not forwarded. **In addition, please send all appendices and technical documents related to the air quality, health risk, and greenhouse gas analyses and electronic versions of all emission calculation spreadsheets, and air quality modeling and health risk assessment input and output files (not PDF files). Any delays in providing all supporting documentation for our review will require additional review time beyond the end of the comment period.**

CEQA Air Quality Analysis

Staff recommends that the Lead Agency use South Coast AQMD's CEQA Air Quality Handbook and website[1] as guidance when preparing the air quality and greenhouse gas analyses. It is also recommended that the Lead Agency use the CalEEMod[2] land use emissions software, which can estimate pollutant emissions from typical land use development and is the only software model maintained by the California Air Pollution Control Officers Association.

South Coast AQMD has developed both regional and localized significance thresholds. South Coast AQMD staff recommends that the Lead Agency quantify criteria pollutant emissions and compare the emissions to South Coast AQMD's CEQA regional pollutant emissions significance thresholds[3] and localized significance thresholds (LSTs)[4] to determine the Proposed Project's air quality impacts. The localized analysis can be conducted by either using the LST screening tables or performing dispersion modeling.

The Lead Agency should identify any potential adverse air quality impacts that could occur from all phases of the Proposed Project and all air pollutant sources related to the Proposed Project. Air quality impacts from both construction (including demolition, if any) and operations should be calculated. Construction-related air quality impacts typically include, but are not limited to, emissions from the use of heavy-duty equipment from grading, earth-loading/unloading, paving, architectural coatings, off-road

[1] South Coast AQMD's CEQA Handbook and other resources for preparing air quality analyses can be found at: http://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis-handbook.
[2] CalEEMod is available free of charge at: www.caleemod.com.
[3] South Coast AQMD's CEQA regional pollutant emissions significance thresholds can be found at: http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf.
[4] South Coast AQMD's guidance for performing a localized air quality analysis can be found at: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/localized-significance-thresholds.

mobile sources (e.g., heavy-duty construction equipment) and on-road mobile sources (e.g., construction worker vehicle trips, material transport trips, and hauling trips). Operation-related air quality impacts may include, but are not limited to, emissions from stationary sources (e.g., boilers and air pollution control devices), area sources (e.g., solvents and coatings), and vehicular trips (e.g., on- and off-road tailpipe emissions and entrained dust). Air quality impacts from indirect sources, such as sources that generate or attract vehicular trips, should be included in the analysis. Furthermore, emissions from the overlapping construction and operational activities should be combined and compared to South Coast AQMD's regional air quality CEQA ***operational*** thresholds to determine the level of significance.

If the Proposed Project generates diesel emissions from long-term construction or attracts diesel-fueled vehicular trips, especially heavy-duty diesel-fueled vehicles, it is recommended that the Lead Agency perform a mobile source health risk assessment[5].

In the event that implementation of the Proposed Project requires a permit from South Coast AQMD, South Coast AQMD should be identified as a Responsible Agency for the Proposed Project in the EIR. The assumptions in the air quality analysis in the EIR will be the basis for evaluating the permit under CEQA and imposing permit conditions and limits. Questions on permits should be directed to South Coast AQMD's Engineering and Permitting staff at (909) 396-3385.

Mitigation Measures

In the event that the Proposed Project results in significant adverse air quality impacts, CEQA requires that all feasible mitigation measures that go beyond what is required by law be utilized to minimize these impacts. Any impacts resulting from mitigation measures must also be analyzed. Several resources to assist the Lead Agency with identifying potential mitigation measures for the Proposed Project include South Coast AQMD's CEQA Air Quality Handbook[1], South Coast AQMD's Mitigation Monitoring and Reporting Plan for the 2016 Air Quality Management Plan[6], and Southern California Association of Government's Mitigation Monitoring and Reporting Plan for the 2020-2045 Regional Transportation Plan/Sustainable Communities Strategy[7].

South Coast AQMD staff is available to work with the Lead Agency to ensure that air quality, greenhouse gas, and health risk impacts from the Proposed Project are accurately evaluated and mitigated where feasible. If you have any questions regarding this letter, please contact me at lsun@aqmd.gov.

Sincerely,

Lijin Sun

Lijin Sun
Program Supervisor, CEQA IGR
Planning, Rule Development & Area Sources

LS
LAC220407-06
Control Number

[5] South Coast AQMD's guidance for performing a mobile source health risk assessment can be found at: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/mobile-source-toxics-analysis.
[6] South Coast AQMD's 2016 Air Quality Management Plan can be found at: http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2017/2017-mar3-035.pdf (starting on page 86).
[7] Southern California Association of Governments' 2020-2045 RTP/SCS can be found at: https://www.connectsocal.org/Documents/PEIR/certified/Exhibit-A_ConnectSoCal_PEIR.pdf.

David Crook

From: IGR – Intergovernmental Review <IGR@scag.ca.gov>
Sent: Monday, May 9, 2022 7:34 AM
To: Lin, Michael
Cc: Anita Au; Frank Wen
Subject: SCAG Comments on the NOP of a DEIR for the Sunset Complex Project [SCAG NO. IGR10605]
Attachments: IGR10605 NOP Sunset Complex Project.pdf

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Good morning Michael,

Please find attached SCAG Comments on the Notice of Preparation of a Draft Environmental Impact Report for the Sunset Complex Project [SCAG NO. IGR10605].

Please contact me at (213) 630-1427 or IGR@scag.ca.gov if you have any questions or difficulties with the attached file.

In light of the coronavirus and other public health concerns, please be advised that a majority of SCAG staff are teleworking with limited access to the SCAG offices. Therefore, if you wish to submit documents for IGR review, please submit it online via the IGR webpage or via email to IGR@scag.ca.gov.

Thank you!

Intergovernmental Review (IGR) Program
Annaleigh Ekman (she/her), Assistant Regional Planner
Tel: (213) 630-1427
IGR@scag.ca.gov

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS
900 Wilshire Blvd., Ste. 1700, Los Angeles, CA 90017



Join us May 5-6 for SCAG's **57th Annual Regional Conference & General Assembly** at the JW Marriott Desert Springs Resort & Spa in Palm Desert, CA.

Please visit scag.ca.gov/ga2022 for more information or register today!

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May 9, 2022

Mr. Michael Lin, P.E.
City of Pasadena Department of Water and Power
150 South Los Robles Avenue, Suite 200
Pasadena, California 91101
Phone: (626) 744-4468
E-mail: mlin@cityofpasadena.net

RE: SCAG Comments on the Notice of Preparation of a Draft Environmental Impact Report for the Sunset Complex Project [SCAG NO. IGR10605]

Dear Mr. Lin,

Thank you for submitting the Notice of Preparation of a Draft Environmental Impact Report for the Sunset Complex Project ("proposed project") to the Southern California Association of Governments (SCAG) for review and comment. SCAG is responsible for providing informational resources to regionally significant plans, projects, and programs per the California Environmental Quality Act (CEQA) to facilitate the consistency of these projects with SCAG's adopted regional plans, to be determined by the lead agencies.[1]

Pursuant to Senate Bill (SB) 375, SCAG is the designated Regional Transportation Planning Agency under state law and is responsible for preparation of the Regional Transportation Plan (RTP) including the Sustainable Communities Strategy (SCS). SCAG's feedback is intended to assist local jurisdictions and project proponents to implement projects that have the potential to contribute to attainment of Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) goals and align with RTP/SCS policies. Finally, SCAG is the authorized regional agency for Intergovernmental Review (IGR) of programs proposed for Federal financial assistance and direct Federal development activities, pursuant to Presidential Executive Order 12372.

SCAG staff has reviewed the Notice of Preparation of a Draft Environmental Impact Report for the Sunset Complex Project in Los Angeles County. The proposed project would replace existing cracked and leaking reservoirs; construct two replacement reservoirs (Reservoir 1 would have a capacity of 4.9 million gallons and Reservoir 2 would hold 6.1 million gallons) and associated appurtenances including piping connections through the floor and tank with a concrete encasement beneath the floor, a removable silt stop, exterior and interior ladders; and install a new on-site groundwater treatment plant on a 6.3-acre site.

When available, please email environmental documentation to IGR@scag.ca.gov providing, at a minimum, the full public comment period for review.

If you have any questions regarding the attached comments, please contact the Intergovernmental Review (IGR) Program, attn.: Anita Au, Senior Regional Planner, at (213) 236-1874 or IGR@scag.ca.gov. Thank you.

Sincerely,

Frank Wen, Ph.D.
Manager, Planning Strategy Department

[1] Lead agencies such as local jurisdictions have the sole discretion in determining a local project's consistency with the 2020 RTP/SCS (Connect SoCal) for the purpose of determining consistency for CEQA.

COMMENTS ON THE NOTICE OF PREPARATION OF A DRAFT ENVIRONMENTAL IMPACT REPORT FOR THE SUNSET COMPLEX PROJECT [SCAG NO. IGR10605]

CONSISTENCY WITH CONNECT SOCAL

SCAG provides informational resources to facilitate the consistency of the proposed project with the adopted 2020-2045 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS or Connect SoCal). For the purpose of determining consistency with CEQA, lead agencies such as local jurisdictions have the sole discretion in determining a local project's consistency with Connect SoCal.

CONNECT SOCAL GOALS

The SCAG Regional Council fully adopted Connect SoCal in September 2020. Connect SoCal, also known as the 2020 – 2045 RTP/SCS, builds upon and expands land use and transportation strategies established over several planning cycles to increase mobility options and achieve a more sustainable growth pattern. The long-range visioning plan balances future mobility and housing needs with goals for the environment, the regional economy, social equity and environmental justice, and public health. The goals included in Connect SoCal may be pertinent to the proposed project. These goals are meant to provide guidance for considering the proposed project. Among the relevant goals of Connect SoCal are the following:

SCAG CONNECT SOCAL GOALS	
Goal #1:	*Encourage regional economic prosperity and global competitiveness*
Goal #2:	*Improve mobility, accessibility, reliability and travel safety for people and goods*
Goal #3:	*Enhance the preservation, security, and resilience of the regional transportation system*
Goal #4:	*Increase person and goods movement and travel choices within the transportation system*
Goal #5:	*Reduce greenhouse gas emissions and improve air quality*
Goal #6:	*Support healthy and equitable communities*
Goal #7:	*Adapt to a changing climate and support an integrated regional development pattern and transportation network*
Goal #8:	*Leverage new transportation technologies and data-driven solutions that result in more efficient travel*
Goal #9:	*Encourage development of diverse housing types in areas that are supported by multiple transportation options*
Goal #10:	*Promote conservation of natural and agricultural lands and restoration of habitats*

For ease of review, we encourage the use of a side-by-side comparison of SCAG goals with discussions of the consistency, non-consistency or non-applicability of the goals and supportive analysis in a table format. Suggested format is as follows:

	Goal	Analysis
Goal #1:	*Encourage regional economic prosperity and global competitiveness*	*Consistent: Statement as to why;* *Not-Consistent: Statement as to why;* *Or* *Not Applicable: Statement as to why;* *DEIR page number reference*
Goal #2:	*Improve mobility, accessibility, reliability and travel safety for people and goods*	*Consistent: Statement as to why;* *Not-Consistent: Statement as to why;* *Or* *Not Applicable: Statement as to why;* *DEIR page number reference*
etc.		etc.

Connect SoCal Strategies

To achieve the goals of Connect SoCal, a wide range of land use and transportation strategies are included in the accompanying twenty (20) technical reports. Of particular note are multiple strategies included in Chapter 3 of Connect SoCal intended to support implementation of the regional Sustainable Communities Strategy (SCS) framed within the context of focusing growth near destinations and mobility options; promoting diverse housing choices; leveraging technology innovations; supporting implementation of sustainability policies; and promoting a Green Region. To view Connect SoCal and the accompanying technical reports, please visit the Connect SoCal webpage. Connect SoCal builds upon the progress from previous RTP/SCS cycles and continues to focus on integrated, coordinated, and balanced planning for land use and transportation that helps the SCAG region strive towards a more sustainable region, while meeting statutory requirements pertinent to RTP/SCSs. These strategies within the regional context are provided as guidance for lead agencies such as local jurisdictions when the proposed project is under consideration.

DEMOGRAPHICS AND GROWTH FORECASTS

A key, formative step in projecting future population, households, and employment through 2045 for Connect SoCal was the generation of a forecast of regional and county level growth in collaboration with expert demographers and economists on Southern California. From there, jurisdictional level forecasts were ground-truthed by subregions and local agencies, which helped SCAG identify opportunities and barriers to future development. This forecast helps the region understand, in a very general sense, where we are expected to grow, and allows SCAG to focus attention on areas that are experiencing change and may have increased transportation needs. After a year-long engagement effort with all 197 jurisdictions one-on-one, 82 percent of SCAG's 197 jurisdictions provided feedback on the forecast of future growth for Connect SoCal. SCAG also sought feedback on potential sustainable growth strategies from a broad range of stakeholder groups – including local jurisdictions, county transportation commissions, other partner agencies, industry groups, community-based organizations, and the general public. Connect SoCal utilizes a bottom-up approach in that total projected growth for each jurisdiction reflects feedback received from jurisdiction staff, including city managers, community development/planning directors, and local staff. Growth at the neighborhood level (i.e., transportation analysis zone (TAZ) reflects entitled projects and adheres to current general and specific plan maximum densities as conveyed by jurisdictions (except in cases where entitled projects and development agreements exceed these capacities as calculated by SCAG). Neighborhood level growth projections also feature strategies that help to reduce greenhouse gas emissions (GHG) from automobiles and light trucks to achieve Southern California's GHG reduction target, approved by the California Air Resources Board (CARB) in accordance with state planning law. Connect SoCal's Forecasted Development Pattern is utilized for long range modeling purposes and does not supersede actions taken by elected bodies on future development, including entitlements and development agreements. SCAG does not have the authority to implement the plan -- neither through decisions about what type of development is built where, nor what transportation projects are ultimately built, as Connect

SoCal is adopted at the jurisdictional level. Achieving a sustained regional outcome depends upon informed and intentional local action. To access jurisdictional level growth estimates and forecasts for years 2016 and 2045, please refer to the Connect SoCal Demographics and Growth Forecast Technical Report. The growth forecasts for the region and applicable jurisdictions are below.

	Adopted SCAG Region Wide Forecasts				Adopted City of Pasadena Forecasts			
	Year 2020	**Year 2030**	**Year 2035**	**Year 2045**	**Year 2020**	**Year 2030**	**Year 2035**	**Year 2045**
Population	19,517,731	20,821,171	21,443,006	22,503,899	143,845	148,449	150,849	155,525
Households	6,333,458	6,902,821	7,170,110	7,633,451	57,819	61,013	62,434	65,083
Employment	8,695,427	9,303,627	9,566,384	10,048,822	118,236	127,798	132,631	140,241

MITIGATION MEASURES

SCAG staff recommends that you review the Final Program Environmental Impact Report (Final PEIR) for Connect SoCal for guidance, as appropriate. SCAG's Regional Council certified the PEIR and adopted the associated Findings of Fact and a Statement of Overriding Considerations (FOF/SOC) and Mitigation Monitoring and Reporting Program (MMRP) on May 7, 2020 and also adopted a PEIR Addendum and amended the MMRP on September 3, 2020 (please see the PEIR webpage and scroll to the bottom of the page for the PEIR Addendum). The PEIR includes a list of project-level performance standards-based mitigation measures that may be considered for adoption and implementation by lead, responsible, or trustee agencies in the region, as applicable and feasible. Project-level mitigation measures are within responsibility, authority, and/or jurisdiction of project-implementing agency or other public agency serving as lead agency under CEQA in subsequent project- and site- specific design, CEQA review, and decision-making processes, to meet the performance standards for each of the CEQA resource categories.

STATE OF CALIFORNIA — Gavin Newsom, Governor

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NAHC.ca.gov

April 15, 2022

Michael Lin, P.E.
City of Pasadena
150 South Los Robles Avenue, Suite 200
Pasadena, CA 91101

Re: 2022040167, Sunset Complex Project, Los Angeles County

Dear Mr. Lin:

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.

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

Andrew Green
Cultural Resources Analyst

cc: State Clearinghouse

David Crook

From: Huffman, Mandy <mandyhuffman@lacsd.org>
Sent: Friday, May 6, 2022 10:29 AM
To: Lin, Michael
Subject: NOP Response to Sunset Complex Project
Attachments: DMS-#6541122-v2-Response Letter to City of Pasadena re_ NOP for Sunset Complex Project.PDF

You don't often get email from mandyhuffman@lacsd.org. Learn why this is important

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Dear Mr. Lin:

Attached please find Los Angeles County Sanitation Districts' response to the subject project.

Sincerely,

Mandy Huffman
Environmental Planner | Wastewater Planning
562-908-4288 ext. 2743
mandyhuffman@lacsd.org

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SANITATION DISTRICTS
Converting Waste Into Resources

Robert C. Ferrante
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(562) 699-7411 • www.lacsd.org

May 6, 2022

Ref. DOC 6508378

Mr. Michael Lin, P.E.
City of Pasadena
Department of Water and Power
150 South Los Robles Avenue
Suite 200
Pasadena, CA 91101

Dear Mr. Lin:

NOP Response to Sunset Complex Project

The Los Angeles County Sanitation Districts (Districts) received a Notice of Preparation (NOP) of a Draft Environmental Impact Report for the subject project on April 7, 2022. The proposed project is located within the jurisdictional boundaries of District No. 16. We offer the following comments regarding sewerage service:

1. Initial Study, Section 4.10.2 Hydrology and Water Quality Impact Analysis, pages 4-30 and 4-31 stated that "… Project-related wastewater discharges are anticipated to be treated at the Los Angeles-Glendale Wastewater Treatment Plant (LAGWRP)…." However, the wastewater generated by the proposed project will be treated at one or more of the following: San Jose Creek Water Reclamation Plant (WRP) located adjacent to the City of Industry, which has a capacity of 100 mgd and currently processes an average flow of 61.2 mgd; the Whittier Narrows WRP located near the City of South El Monte, which has a capacity of 15 mgd and currently processes an average flow of 9.9 mgd; and/or the Los Coyotes WRP located in the City of Cerritos, which has a capacity of 37.5 mgd and currently processes an average flow of 23.1 mgd.

2. The wastewater flow originating from the proposed project will discharge to local sewer lines, which are not maintained by the Districts, for conveyance to one or more of the following Districts' trunk sewers:

Name	Location	Size (dia.)*	Capacity (mgd)**	Peak Flow (mgd)	Last Measured
Pasadena East-West Interceptor	W. Maple St. at N. Marengo Ave.	30	10.6	2.6	2015
Arroyo Seco Section 4	Northern terminus of Garfield Ave.	21	17.2	2.0	2015
Joint Outfall B Unit 6J	N. Arroyo Blvd., north of W. Holly St.	24	9.9	1.9	2018

*diameter in inches
**million gallons per day

3. As described in the Initial Study, the expected average wastewater flow from the project site, which includes an on-site groundwater treatment plant, is 6,000 gallons per day.

4. The proposed project may require an amendment to a Districts' permit for Industrial Wastewater Discharge. Project developers should contact the Districts' Industrial Waste Section at (562) 908-4288, extension 2900, to reach a determination on this matter. If this update is necessary, project developers will be required to forward copies of final plans and supporting information for the proposed project to the Districts for review and approval before beginning project construction.

5. The Districts are empowered by the California Health and Safety Code to charge a fee to connect facilities (directly or indirectly) to the Districts' Sewerage System or to increase the strength or quantity of wastewater discharged from connected facilities. This connection fee is used by the Districts for its capital facilities. Payment of a connection fee may be required before this project is permitted to discharge to the Districts' Sewerage System. For more information and a copy of the Connection Fee Information Sheet, go to www.lacsd.org, under Services, then Wastewater (Sewage) and select Rates & Fees. In determining the impact to the Sewerage System and applicable connection fees, the Districts will determine the user category (e.g. Condominium, Single Family Home, etc.) that best represents the actual or anticipated use of the parcel(s) or facilities on the parcel(s) in the development. For more specific information regarding the connection fee application procedure and fees, the developer should contact the Districts' Wastewater Fee Public Counter at (562) 908-4288, extension 2727. If an Industrial Wastewater Discharge Permit is required, connection fee charges will be determined by the Industrial Waste Section.

6. In order for the Districts to conform to the requirements of the Federal Clean Air Act (CAA), the capacities of the Districts' wastewater treatment facilities are based on the regional growth forecast adopted by the Southern California Association of Governments (SCAG). Specific policies included in the development of the SCAG regional growth forecast are incorporated into clean air plans, which are prepared by the South Coast and Antelope Valley Air Quality Management Districts in order to improve air quality in the South Coast and Mojave Desert Air Basins as mandated by the CAA. All expansions of Districts' facilities must be sized and service phased in a manner that will be consistent with the SCAG regional growth forecast for the counties of Los Angeles, Orange, San Bernardino, Riverside, Ventura, and Imperial. The available capacity of the Districts' treatment facilities will, therefore, be limited to levels associated with the approved growth identified by SCAG. As such, this letter does not constitute a guarantee of wastewater service, but is to advise the developer that the Districts intend to provide this service up to the levels that are legally permitted and to inform the developer of the currently existing capacity and any proposed expansion of the Districts' facilities.

If you have any questions, please contact the undersigned at (562) 908-4288, extension 2743, or mandyhuffman@lacsd.org.

Very truly yours,

Mandy Huffman

Mandy Huffman
Environmental Planner
Facilities Planning Department

MNH:mnh

cc: L. Smith

David Crook

From: Herrera, Karen@DOT <Karen.Herrera@dot.ca.gov>
Sent: Monday, May 2, 2022 2:13 PM
To: Lin, Michael
Cc: State.Clearinghouse@opr.ca.gov
Subject: SCH# 2022040167: Sunset Complex Project (NOP)
Attachments: LA-2022-03908 Sunset Complex Project - NOP.pdf

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Good afternoon Michael,

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the Notice of Preparation of a Draft EIR (SCH# 2022040167). Attached is Caltrans' response letter.

If you have any questions, please feel free to contact me and refer to GTS #07-LA-2022-03908.

Best,
Karen Herrera
Transportation Planner
Division of Planning, Caltrans District 7
100 S. Main Street
Los Angeles, CA 90012
(213) 505-5003

DEPARTMENT OF TRANSPORTATION
DISTRICT 7
100 S. MAIN STREET, MS 16
LOS ANGELES, CA 90012
PHONE (213) 505-5003
FAX (213) 897-1337
TTY 711
www.dot.ca.gov

Making Conservation a California Way of Life

May 2, 2022

Michael Lin, P.E.
City of Pasadena
150 South Los Robles Avenue, Suite 200
Pasadena, CA 91101

RE: Sunset Complex Project
Notice of Preparation (NOP) of an
Environmental Impact Report (EIR)
SCH # 2022040167
Vic. LA-210/PM: R24.08
GTS # 07-LA-2022-03908

Dear Michael Lin:

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the above referenced NOP. The proposed project includes replacement of two existing reservoirs (SR1 and SR2) with two new prestressed concrete reservoirs and associated appurtenances at the site. The Project would also construct a new on-site groundwater treatment plant (GWTP). Proposed Reservoir 1 would have a capacity of 4.9 MG, Reservoir 2 of 6.1 MG, for a total water storage capacity of 11.0 MG. The GWTP would allow for a total treatment capacity of 3,000 gallons per minute (gpm) and would treat for perchlorate and TCP. The GWTP would be designed to allow for future expansion to increase the total treatment capacity to 4,500 gpm and to add 800 gpm of sidestream for biological treatment for nitrate removal. The City of Pasadena is the Lead Agency under the California Environmental Quality Act (CEQA).

The project site is approximately 0.3 mile from Interstate 210 (I-210). After further review of the Initial Study, the project involves upgrades to the existing Sunset Reservoir facility and would not result in a significant increase of operational trips. Therefore, the Project would not conflict or be inconsistent with Section 15064.3(b) of the State CEQA Guidelines. There would be a less than significant impact on transportation, and no further analysis in the EIR is required. The following information is included for your consideration.

The mission of Caltrans is to provide a safe and reliable transportation network that serves all people and respects the environment. Furthermore, Caltrans encourages Lead Agencies to implement Transportation Demand Management (TDM) strategies that reduce Vehicle Miles Traveled (VMT) and Greenhouse Gas (GHG) emissions. For TDM

strategies that the Lead Agency may want to consider integrating into this project to further reduce VMT, please refer to:

- The 2010 Quantifying Greenhouse Gas Mitigation Measures report by the California Air Pollution Control Officers Association (CAPCOA), available at http://www.capcoa.org/wpcontent/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf, and/or
- Integrating Demand Management into the Transportation Planning Process: A Desk Reference (Chapter 8) by the Federal Highway Administration (FHWA), available at https://ops.fhwa.dot.gov/publications/fhwahop12035/index.htm

If there are any significant impacts to the State Highway System, the implementation of multimodal mitigation measures and other TDM strategies should be considered to reduce the number of vehicle trips generated by the project. Also, signal synchronization and other Transportation System Management should be considered to improve transportation flow.

Any transportation of heavy construction equipment and/or materials which requires use of oversized-transport vehicles on State Highways will need a Caltrans transportation permit. Caltrans recommends that the Project limit construction traffic to off-peak periods to minimize the potential impact on State facilities. If construction traffic is expected to cause issues on any State facilities, please submit a construction traffic control plan detailing these issues for Caltrans' review.

Finally, any work completed on or near Caltrans' right of way may require an encroachment permit. However, the final determination on this will be made by Caltrans' Office of Permits. This work would require additional review and may be subject to additional requirements to ensure current design standards and access management elements are being addressed. For more information on encroachment permits, see: https://dot.ca.gov/programs/traffic-operations/ep.

If you have any questions, please feel free to contact Karen Herrera, the project coordinator, at Karen.Herrera@dot.ca.gov and refer to GTS # 07-LA-2022-03908.

Sincerely,

Miya Edmonson

MIYA EDMONSON
LDR/CEQA Branch Chief

cc: State Clearinghouse

David Crook

From: REDACTED<REDACTED>
Sent: Sunday, April 10, 2022 10:26 AM
To: Lin, Michael
Subject: Sunset reservoir

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Dear Mr Lin

As a resident of Bradbury Oaks and neighborhood watch captain. I have some concerns about the work you are planning on doing on the Sunset reservoir.

When the project was announced I spoke to your predecessor and requested a camera at the Sunset entrance to be able to capture the traffic on Sunset Avenue. The reason for this is that we often have shootings and crime from Robinson Park in which the criminals make a left turn onto Sunset and then go on to the freeway. Currently there is a camera at that parking lot but it is focused on the inside of the parking lot. This would also help you monitor such things as trucks stoping at the entrance with the engine running near the water. There is a sign that says no backup however there are often trucks parked near the entrance that are running and polluting. Recently there was another shooting in which the perpetrator drove down Sunset to Mountain to then get onto the freeway and away from the police.

Sunset Avenue is a very narrow Street. The trees also are rather low. The houses on Sunset are old and not insulated against the sound. We would like to request that all of the trucks and operational equipment not take the north side of Sunset where residents live. They should approach Sunset through the Mountain Avenue entrance to the city yards. Or they can take Sunset just to Glorietta and not have to annoy the north neighbors.

Please be advised that the corner of Sunset and Hammond Avenue has been very dangerous. There are many accidents on this corner. Plus drivers seldom stop at the stop signs. We also have small children in the area who cross these streets. Whereas you are aware that this corner is dangerous we hereby suggest that you not use it at all because it would be a liability for your contractors and the city.

Please also know that as long as I have lived here it has been the promise of the City of Pasadena and Pasadena Water and Power that they do not open the gates on Hammond avenue. The road on Hammond Svenue under the freeway is in serious disrepair from the PWP trucks and other trucks that park under the freeway. The extra strain of trucks and equipment on Hammond could totally destroy the road completely.

We also ask that the roads if they are broken by these trucks to be repaved with the latest smooth technology like that has been done on the south side of Sunset between Mountain Avenue and Orange Grove.

When the offices were built in the city yards the contractor gave the residents his phone number to contact him in case of problems. The heavy machinery and excavations did cause some of the land to shift affecting nearby homeowners. We think there should be a easy to access phone number to contact in case of violations of neighborhood protocols.

And other thing that typically happens on a construction site is that the workers park on neighboring streets and then run their engines while they're in the cars eating lunch or sit on people's fences. Sometimes they play loud music which can be disturbing to the neighbors.

Currently the pump at Sunset is loud when it is operating. We would like the pump insulated so that it is not louder than 55 DB at the sidewalk. I have gotten readings as high as 75 decibels near on the sidewalk by the pump.

I am hoping to be able to attend the meeting on April 21st.

I hope all these issues will be addressed.

REDACTED

Please do not print my address, email or name in any public documents whereas contractors have confronted me directly in the past inappropriately.

David Crook

From: Renee Bellaruso <bellaprovence@gmail.com>
Sent: Tuesday, May 3, 2022 2:06 PM
To: Lin, Michael
Subject: Sunset Complex Project
Attachments: CEQA Comments Form.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

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Hi Michael,

I have concerns regarding water recycling. Will that be done at the Sunset Complex reservoir when completed? Will there be water recycling? Will there be biogas increases? Is Pasadena working with the Los Angeles County Sanitation District? With the new reservoir will Pasadena work with the Los Angeles County Sanitation District? Please advise and respond to my questions when you can.

Is the new reservoir going to be using green energy? This is key to our water problems. If non of this applies to the Sunset Complex, please let me know what green energy and recycling we are utilizing.

Please see my Comments attached.

Looking forward to hearing from you regarding my inquiries. Please continue to notify me of all meetings. Thank you.

Renee Morgan-Hampton (Renee Bellaruso)

PASADENA WATER AND POWER

SCOPING MEETING FOR THE SUNSET COMPLEX PROJECT DRAFT ENVIRONMENTAL IMPACT REPORT

APRIL 21, 2022

Written Comment Form

The purpose of the public scoping meeting is to obtain input from the public regarding the scope of issues that will be analyzed in the Draft EIR for the Sunset Complex Project (the "Project"). The proposed Project includes replacement of two existing reservoirs (SR1 and SR2) with two new prestressed concrete reservoirs and associated appurtenances at the site. The Project would also construct a new on-site groundwater treatment plant (GWTP). Proposed Reservoir 1 would have a capacity of 4.9 MG, Reservoir 2 of 6.1 MG, for a total water storage capacity of 11.0 MG. The GWTP would allow for a total treatment capacity of 3,000 gpm and would treat for perchlorate and TCP. The GWTP would be designed to allow for future expansion to increase the total treatment capacity to 4,500 gpm and to add 800 gpm of sidestream for biological treatment for nitrate removal.

Comments can be provided verbally at the scoping meeting ***(please fill out the sign-in sheet)*** *or in written form. The deadline for submitting written comments to the City is* ***May 9, 2022****. In the space below (and on additional pages, if necessary), please provide any written comments you may have concerning the scope of the Draft EIR for the Project. Your comments will then be considered during preparation of the Draft EIR.*

Name: Renee Morgan-Hampton

Address: 111 SUNSET AVENUE
PASADENA CA 91103
626-354-7059
Email: bellaprovence@gmail.com

My concerns are: Solar Panels on top of new Reservoirs, Reservoir Protection re: Contamination WATER CONSERVATION — How will that be handled? Will WATER BE recycled in conjunction with WATER CONSERVATION CAN WATER BE CONSERVED and given back to the CITIZENS/COMMUNITY OF PASADENA? IF we are preserving water, IS there a way that this reservoir can work in tandem to help all the people of Pasadena conserve water AND reduce our WATER BILL?

Please leave this form in the box provided or mail to ***Mr. Michael Lin, P.E., City of Pasadena Department of Water and Power, 150 South Los Robles Avenue, Suite 200, Pasadena, California 91101.*** *You may also e-mail your comments to mlin@cityofpasadena.net. This pre-addressed form can simply be folded and placed in a mailbox. Please remember to add postage.*

David Crook

From: Paul Chau <PaulChau@kennedyjenks.com>
Sent: Monday, April 25, 2022 11:28 AM
To: Lin, Michael; Takara, Gary; David Crook
Subject: Sunset Scoping Meeting Questions

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All,

Here are the questions/comments I noted from the scoping meeting:

- Is a hard copy submission required for questions?
- What tribal cultures are involved with CEQA consultation?
- Does construction impact local parking & traffic?
- PWP service trucks carry gravel & sand without covers, which impacts local streets
- How will construction dust be handled?
- Will a contact person/number be made available to the public during construction?
- Is there a risk of perchlorate exposure when spent IX resin is removed from site?
- Is noise mitigation for Glorieta PS included in project?
- Don't want truck traffic to travel north on Sunset Ave from site
- Want a "no left turn" sign at Sunset Ave exit
- City service trucks don't stop at stop sign at Glorieta St intersection
- Want security cameras to be included that view streets from project site
- Will trucks be coming on site at off peak traffic times?
- Which site entrance will be utilized by service trucks?
- Is Jon Hamblen (City Parking Manager) involved with project?
- Is the chain link fence being replaced?
- Will fence have rust issues?
- Will runoff from Bangham Well pit be addressed?
- Has a decision been made on temporary parking for employees during construction?
- How is project being funded?

Regards,
Paul

Kennedy Jenks

Appendix A-4

Scoping Meeting Comments

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CITY OF PASADENA DEPARTMENT OF WATER AND POWER
PUBLIC SCOPING MEETING
APRIL 21, 2022 – 5:00 PM
SUNSET COMPLEX PROJECT

Name	Affiliated Organization (if applicable)	Address	City, Zip Code	Phone	E-mail
Michael Cullins	WD Edson	306 Barthe Dr.	Pasadena 91103	626-622-3015	MacJGP@cbell.net
ERNESTINE BLUE		884 Sunset Ave	"	626-429-7556	blue.ernestine@yahoo.com
LYNN WATFORD		1132 SUNSET	91103	(626 345-9611	freelancewriternow@gmail.com
Joan Chien		1009 Eucalyptus Lane	91103		
Renée MORGAN-HAMPTON	BANBURY OAKS	1111 SUNSET AVE. PASADENA, CA 91103	91103	626-354-7059	bellaprovence@gmail.com

David Crook

From: Paul Chau <PaulChau@kennedyjenks.com>
Sent: Monday, April 25, 2022 11:28 AM
To: Lin, Michael; Takara, Gary; David Crook
Subject: Sunset Scoping Meeting Questions

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- Is the chain link fence being replaced?
- Will fence have rust issues?
- Will runoff from Bangham Well pit be addressed?
- Has a decision been made on temporary parking for employees during construction?
- How is project being funded?

Regards,
Paul

Kennedy Jenks

Appendix B

AQ/GHG Calculations

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Pasadena Sunset Complex Detailed Report

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1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Pasadena Sunset Complex
Construction Start Date	5/15/2026
Operational Year	2029
Lead Agency	City of Pasadena
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.50
Precipitation (days)	23.4
Location	34.162362100318646, -118.15548129301305
County	Los Angeles-South Coast
City	Pasadena
Air District	South Coast AQMD
Air Basin	South Coast
TAZ	4988
EDFZ	7
Electric Utility	Pasadena Water & Power
Gas Utility	Southern California Gas
App Version	2022.1.1.29

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
General Heavy Industry	6.93	1000sqft	6.21	6,935	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	4.29	39.1	43.1	0.07	1.62	7.94	9.56	1.49	4.01	5.50	—	8,007	8,007	0.35	0.35	5.03	8,055
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	4.29	39.1	42.9	0.07	1.62	7.94	9.56	1.49	4.01	5.50	—	7,993	7,993	0.33	0.18	0.06	8,024
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.35	21.4	25.7	0.04	0.84	3.69	4.53	0.77	1.79	2.56	—	5,031	5,031	0.20	0.10	0.56	5,065
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.43	3.91	4.69	0.01	0.15	0.67	0.83	0.14	0.33	0.47	—	833	833	0.03	0.02	0.09	839

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	4.29	39.1	43.1	0.07	1.62	7.94	9.56	1.49	4.01	5.50	—	8,007	8,007	0.35	0.35	5.03	8,055

2027	4.16	37.5	42.5	0.07	1.51	7.94	9.45	1.39	4.01	5.39	—	8,001	8,001	0.33	0.18	2.44	8,033
2028	2.63	23.7	31.6	0.06	0.88	3.22	4.10	0.81	1.45	2.26	—	6,362	6,362	0.26	0.17	2.24	6,423
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	4.29	39.1	42.9	0.07	1.62	7.94	9.56	1.49	4.01	5.50	—	7,993	7,993	0.33	0.08	0.03	8,024
2027	4.15	37.5	42.3	0.07	1.51	7.94	9.45	1.39	4.01	5.39	—	7,987	7,987	0.32	0.18	0.06	8,018
2028	2.62	23.7	31.5	0.06	0.88	3.22	4.10	0.81	1.45	2.26	—	6,351	6,351	0.26	0.17	0.06	6,409
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	1.78	16.5	17.7	0.03	0.66	2.55	3.21	0.61	1.16	1.77	—	3,596	3,596	0.15	0.08	0.51	3,625
2027	2.35	21.4	25.7	0.04	0.84	3.69	4.53	0.77	1.79	2.56	—	5,031	5,031	0.20	0.10	0.56	5,065
2028	0.69	6.24	8.41	0.01	0.23	0.77	1.00	0.21	0.35	0.56	—	1,671	1,671	0.07	0.04	0.24	1,686
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	0.33	3.02	3.24	0.01	0.12	0.46	0.59	0.11	0.21	0.32	—	595	595	0.03	0.01	0.08	600
2027	0.43	3.91	4.69	0.01	0.15	0.67	0.83	0.14	0.33	0.47	—	833	833	0.03	0.02	0.09	839
2028	0.13	1.14	1.54	< 0.005	0.04	0.14	0.18	0.04	0.06	0.10	—	277	277	0.01	0.01	0.04	279

2.4. Operations Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.12	4.04	2.60	< 0.005	0.13	0.00	0.13	0.13	0.00	0.13	7.71	1,439	1,447	1.27	0.07	1.81	1,501
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.07	4.04	2.30	< 0.005	0.13	0.00	0.13	0.13	0.00	0.13	7.71	1,438	1,446	1.27	0.07	1.81	1,499

Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.23	0.13	0.28	< 0.005	< 0.005	0.00	< 0.005	< 0.005	0.00	< 0.005	7.71	992	1,000	1.25	0.06	1.81	1,052
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.04	0.02	0.05	< 0.005	< 0.005	0.00	< 0.005	< 0.005	0.00	< 0.005	1.28	164	166	0.21	0.01	0.30	174

2.5. Operations Emissions by Sector, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Sector	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	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
Area	0.22	< 0.005	0.30	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.24	1.24	< 0.005	< 0.005	—	1.24
Energy	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	974	974	0.47	0.06	—	1,003
Water	—	—	—	—	—	—	—	—	—	—	3.07	2.05	5.12	0.32	0.01	—	15.3
Waste	—	—	—	—	—	—	—	—	—	—	4.63	0.00	4.63	0.46	0.00	—	16.2
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.81	1.81
Stationary	0.90	4.04	2.30	< 0.005	0.13	—	0.13	0.13	—	0.13	—	462	462	0.02	< 0.005	—	463
Total	1.12	4.04	2.60	< 0.005	0.13	0.00	0.13	0.13	0.00	0.13	7.71	1,439	1,447	1.27	0.07	1.81	1,501
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	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
Area	0.17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Energy	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	974	974	0.47	0.06	—	1,003
Water	—	—	—	—	—	—	—	—	—	—	3.07	2.05	5.12	0.32	0.01	—	15.3
Waste	—	—	—	—	—	—	—	—	—	—	4.63	0.00	4.63	0.46	0.00	—	16.2

Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.81	1.81
Stationary	0.90	4.04	2.30	< 0.005	0.13	—	0.13	0.13	—	0.13	—	462	462	0.02	< 0.005	—	463
Total	1.07	4.04	2.30	< 0.005	0.13	0.00	0.13	0.13	0.00	0.13	7.71	1,438	1,446	1.27	0.07	1.81	1,499
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	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
Area	0.20	< 0.005	0.21	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	0.85	0.85	< 0.005	< 0.005	—	0.85
Energy	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	974	974	0.47	0.06	—	1,003
Water	—	—	—	—	—	—	—	—	—	—	3.07	2.05	5.12	0.32	0.01	—	15.3
Waste	—	—	—	—	—	—	—	—	—	—	4.63	0.00	4.63	0.46	0.00	—	16.2
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.81	1.81
Stationary	0.03	0.13	0.08	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	15.2	15.2	< 0.005	< 0.005	—	15.2
Total	0.23	0.13	0.28	< 0.005	< 0.005	0.00	< 0.005	< 0.005	0.00	< 0.005	7.71	992	1,000	1.25	0.06	1.81	1,052
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	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
Area	0.04	< 0.005	0.04	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	0.14	0.14	< 0.005	< 0.005	—	0.14
Energy	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	161	161	0.08	0.01	—	166
Water	—	—	—	—	—	—	—	—	—	—	0.51	0.34	0.85	0.05	< 0.005	—	2.53
Waste	—	—	—	—	—	—	—	—	—	—	0.77	0.00	0.77	0.08	0.00	—	2.68
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.30	0.30
Stationary	0.01	0.02	0.01	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	2.51	2.51	< 0.005	< 0.005	—	2.52
Total	0.04	0.02	0.05	< 0.005	< 0.005	0.00	< 0.005	< 0.005	0.00	< 0.005	1.28	164	166	0.21	0.01	0.30	174

3. Construction Emissions Details

3.1. Demolition (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.29	20.7	19.0	0.03	0.84	—	0.84	0.78	—	0.78	—	3,427	3,427	0.14	0.03	—	3,438
Demolition	—	—	—	—	—	1.49	1.49	—	0.23	0.23	—	—	—	—	—	—	—
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.41	3.73	3.44	0.01	0.15	—	0.15	0.14	—	0.14	—	620	620	0.03	0.01	—	622
Demolition	—	—	—	—	—	0.27	0.27	—	0.04	0.04	—	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.08	0.68	0.63	< 0.005	0.03	—	0.03	0.03	—	0.03	—	103	103	< 0.005	< 0.005	—	103
Demolition	—	—	—	—	—	0.05	0.05	—	0.01	0.01	—	—	—	—	—	—	—
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	0.06	0.06	0.97	0.00	0.00	0.20	0.20	0.00	0.05	0.05	—	203	203	0.01	0.01	0.69	206
Vendor	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
Hauling	0.03	2.20	0.87	0.01	0.02	0.50	0.52	0.02	0.14	0.16	—	1,833	1,833	0.10	0.29	4.11	1,927
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.16	0.00	0.00	0.03	0.03	0.00	0.01	0.01	—	35.4	35.4	< 0.005	< 0.005	0.05	35.8
Vendor	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
Hauling	0.01	0.42	0.16	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.03	—	332	332	0.02	0.05	0.32	348
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.03	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	5.85	5.85	< 0.005	< 0.005	0.01	5.93
Vendor	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
Hauling	< 0.005	0.08	0.03	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	0.01	—	54.9	54.9	< 0.005	0.01	0.05	57.6

3.3. Site Preparation (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	3.14	29.2	28.8	0.05	1.24	—	1.24	1.14	—	1.14	—	5,298	5,298	0.21	0.04	—	5,316
Dust From Material Movement	—	—	—	—	—	7.67	7.67	—	3.94	3.94	—	—	—	—	—	—	—
Onsite truck	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

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	3.14	29.2	28.8	0.05	1.24	—	1.24	1.14	—	1.14	—	5,298	5,298	0.21	0.04	—	5,316
Dust From Material Movement	—	—	—	—	—	7.67	7.67	—	3.94	3.94	—	—	—	—	—	—	—
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.85	7.88	7.78	0.01	0.34	—	0.34	0.31	—	0.31	—	1,431	1,431	0.06	0.01	—	1,436
Dust From Material Movement	—	—	—	—	—	2.07	2.07	—	1.06	1.06	—	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.15	1.44	1.42	< 0.005	0.06	—	0.06	0.06	—	0.06	—	237	237	0.01	< 0.005	—	238
Dust From Material Movement	—	—	—	—	—	0.38	0.38	—	0.19	0.19	—	—	—	—	—	—	—
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.06	0.07	1.13	0.00	0.00	0.23	0.23	0.00	0.05	0.05	—	237	237	0.01	0.01	0.80	241
Vendor	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

Hauling	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.06	0.08	0.96	0.00	0.00	0.23	0.23	0.00	0.05	0.05	—	225	225	0.01	0.01	0.02	228
Vendor	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
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.27	0.00	0.00	0.06	0.06	0.00	0.01	0.01	—	61.6	61.6	< 0.005	< 0.005	0.09	62.4
Vendor	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
Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.05	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	10.2	10.2	< 0.005	< 0.005	0.02	10.3
Vendor	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
Hauling	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

3.5. Site Preparation (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	3.05	28.0	28.3	0.05	1.17	—	1.17	1.08	—	1.08	—	5,298	5,298	0.21	0.04	—	5,316
Dust From Material Movement	—	—	—	—	—	7.67	7.67	—	3.94	3.94	—	—	—	—	—	—	—
Onsite truck	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

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	3.05	28.0	28.3	0.05	1.17	—	1.17	1.08	—	1.08	—	5,298	5,298	0.21	0.04	—	5,316
Dust From Material Movement	—	—	—	—	—	7.67	7.67	—	3.94	3.94	—	—	—	—	—	—	—
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.90	8.27	8.36	0.01	0.35	—	0.35	0.32	—	0.32	—	1,566	1,566	0.06	0.01	—	1,571
Dust From Material Movement	—	—	—	—	—	2.27	2.27	—	1.16	1.16	—	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.16	1.51	1.53	< 0.005	0.06	—	0.06	0.06	—	0.06	—	259	259	0.01	< 0.005	—	260
Dust From Material Movement	—	—	—	—	—	0.41	0.41	—	0.21	0.21	—	—	—	—	—	—	—
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.06	0.06	1.05	0.00	0.00	0.23	0.23	0.00	0.05	0.05	—	233	233	0.01	0.01	0.72	236
Vendor	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

Hauling	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.06	0.08	0.89	0.00	0.00	0.23	0.23	0.00	0.05	0.05	—	220	220	< 0.005	0.01	0.02	223
Vendor	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
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.28	0.00	0.00	0.07	0.07	0.00	0.02	0.02	—	66.1	66.1	< 0.005	< 0.005	0.09	67.0
Vendor	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
Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.05	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	10.9	10.9	< 0.005	< 0.005	0.02	11.1
Vendor	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
Hauling	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

3.7. Grading (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.59	14.2	17.3	0.03	0.60	—	0.60	0.55	—	0.55	—	2,960	2,960	0.12	0.02	—	2,970
Dust From Material Movement	—	—	—	—	—	2.76	2.76	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	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

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.59	14.2	17.3	0.03	0.60	—	0.60	0.55	—	0.55	—	2,960	2,960	0.12	0.02	—	2,970
Dust From Material Movement	—	—	—	—	—	2.76	2.76	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.66	5.96	7.23	0.01	0.25	—	0.25	0.23	—	0.23	—	1,240	1,240	0.05	0.01	—	1,244
Dust From Material Movement	—	—	—	—	—	1.16	1.16	—	0.56	0.56	—	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.12	1.09	1.32	< 0.005	0.05	—	0.05	0.04	—	0.04	—	205	205	0.01	< 0.005	—	206
Dust From Material Movement	—	—	—	—	—	0.21	0.21	—	0.10	0.10	—	—	—	—	—	—	—
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.05	0.05	0.90	0.00	0.00	0.20	0.20	0.00	0.05	0.05	—	199	199	0.01	0.01	0.62	202
Vendor	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

Hauling	0.01	0.89	0.35	0.01	0.01	0.21	0.22	0.01	0.06	0.07	—	753	753	0.04	0.12	1.60	792
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.05	0.06	0.76	0.00	0.00	0.20	0.20	0.00	0.05	0.05	—	189	189	< 0.005	0.01	0.02	191
Vendor	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
Hauling	0.01	0.93	0.36	0.01	0.01	0.21	0.22	0.01	0.06	0.07	—	754	754	0.04	0.12	0.04	791
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.03	0.34	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	80.3	80.3	< 0.005	< 0.005	0.11	81.3
Vendor	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
Hauling	< 0.005	0.39	0.15	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.03	—	315	315	0.02	0.05	0.29	331
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.06	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	13.3	13.3	< 0.005	< 0.005	0.02	13.5
Vendor	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
Hauling	< 0.005	0.07	0.03	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	0.01	—	52.2	52.2	< 0.005	0.01	0.05	54.9

3.9. Grading (2028) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.56	13.8	17.3	0.03	0.57	—	0.57	0.52	—	0.52	—	2,961	2,961	0.12	0.02	—	2,971
Dust From Material Movement	—	—	—	—	—	2.76	2.76	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	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

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.56	13.8	17.3	0.03	0.57	—	0.57	0.52	—	0.52	—	2,961	2,961	0.12	0.02	—	2,971
Dust From Material Movement	—	—	—	—	—	2.76	2.76	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.37	3.26	4.10	0.01	0.13	—	0.13	0.12	—	0.12	—	701	701	0.03	0.01	—	704
Dust From Material Movement	—	—	—	—	—	0.65	0.65	—	0.32	0.32	—	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.07	0.60	0.75	< 0.005	0.02	—	0.02	0.02	—	0.02	—	116	116	< 0.005	< 0.005	—	116
Dust From Material Movement	—	—	—	—	—	0.12	0.12	—	0.06	0.06	—	—	—	—	—	—	—
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.05	0.05	0.85	0.00	0.00	0.20	0.20	0.00	0.05	0.05	—	196	196	< 0.005	0.01	0.56	198
Vendor	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

Hauling	0.01	0.87	0.34	0.01	0.01	0.21	0.22	0.01	0.06	0.07	—	736	736	0.04	0.12	1.49	774
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.05	0.06	0.72	0.00	0.00	0.20	0.20	0.00	0.05	0.05	—	186	186	< 0.005	0.01	0.01	188
Vendor	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
Hauling	0.01	0.90	0.35	0.01	0.01	0.21	0.22	0.01	0.06	0.07	—	737	737	0.04	0.12	0.04	773
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.18	0.00	0.00	0.05	0.05	0.00	0.01	0.01	—	44.6	44.6	< 0.005	< 0.005	0.06	45.2
Vendor	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
Hauling	< 0.005	0.22	0.08	< 0.005	< 0.005	0.05	0.05	< 0.005	0.01	0.02	—	174	174	0.01	0.03	0.15	183
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.03	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	7.38	7.38	< 0.005	< 0.005	0.01	7.48
Vendor	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
Hauling	< 0.005	0.04	0.01	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	28.9	28.9	< 0.005	< 0.005	0.03	30.3

3.11. Building Construction (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.07	9.85	13.0	0.02	0.38	—	0.38	0.35	—	0.35	—	2,397	2,397	0.10	0.02	—	2,405
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	1.07	9.85	13.0	0.02	0.38	—	0.38	0.35	—	0.35	—	2,397	2,397	0.10	0.02	—	2,405
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.48	4.45	5.86	0.01	0.17	—	0.17	0.16	—	0.16	—	1,084	1,084	0.04	0.01	—	1,087
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.09	0.81	1.07	< 0.005	0.03	—	0.03	0.03	—	0.03	—	179	179	0.01	< 0.005	—	180
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.19	0.00	0.00	0.04	0.04	0.00	0.01	0.01	—	39.5	39.5	< 0.005	< 0.005	0.13	40.0
Vendor	< 0.005	0.04	0.02	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	35.4	35.4	< 0.005	0.01	0.10	37.1
Hauling	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.16	0.00	0.00	0.04	0.04	0.00	0.01	0.01	—	37.4	37.4	< 0.005	< 0.005	< 0.005	37.9
Vendor	< 0.005	0.04	0.02	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	35.5	35.5	< 0.005	0.01	< 0.005	37.0
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	0.01	0.08	0.00	0.00	0.02	0.02	0.00	< 0.005	< 0.005	—	17.2	17.2	< 0.005	< 0.005	0.03	17.4
Vendor	< 0.005	0.02	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	16.0	16.0	< 0.005	< 0.005	0.02	16.7
Hauling	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

Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	2.84	2.84	< 0.005	< 0.005	< 0.005	2.88
Vendor	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	2.65	2.65	< 0.005	< 0.005	< 0.005	2.77
Hauling	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

3.13. Building Construction (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.03	9.39	12.9	0.02	0.34	—	0.34	0.31	—	0.31	—	2,397	2,397	0.10	0.02	—	2,405
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.03	9.39	12.9	0.02	0.34	—	0.34	0.31	—	0.31	—	2,397	2,397	0.10	0.02	—	2,405
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.74	6.71	9.24	0.02	0.24	—	0.24	0.22	—	0.22	—	1,712	1,712	0.07	0.01	—	1,718
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.13	1.22	1.69	< 0.005	0.04	—	0.04	0.04	—	0.04	—	283	283	0.01	< 0.005	—	284

Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.17	0.00	0.00	0.04	0.04	0.00	0.01	0.01	—	38.7	38.7	< 0.005	< 0.005	0.12	39.3
Vendor	< 0.005	0.04	0.02	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	34.8	34.8	< 0.005	< 0.005	0.09	36.3
Hauling	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.15	0.00	0.00	0.04	0.04	0.00	0.01	0.01	—	36.7	36.7	< 0.005	< 0.005	< 0.005	37.1
Vendor	< 0.005	0.04	0.02	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	34.8	34.8	< 0.005	< 0.005	< 0.005	36.2
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.11	0.00	0.00	0.03	0.03	0.00	0.01	0.01	—	26.6	26.6	< 0.005	< 0.005	0.04	26.9
Vendor	< 0.005	0.03	0.01	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	24.8	24.8	< 0.005	< 0.005	0.03	25.9
Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.02	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	4.40	4.40	< 0.005	< 0.005	0.01	4.46
Vendor	< 0.005	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	4.11	4.11	< 0.005	< 0.005	< 0.005	4.29
Hauling	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

3.15. Building Construction (2028) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.99	8.92	12.9	0.02	0.30	—	0.30	0.28	—	0.28	—	2,397	2,397	0.10	0.02	—	2,406
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.99	8.92	12.9	0.02	0.30	—	0.30	0.28	—	0.28	—	2,397	2,397	0.10	0.02	—	2,406
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.27	2.46	3.57	0.01	0.08	—	0.08	0.08	—	0.08	—	662	662	0.03	0.01	—	664
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.05	0.45	0.65	< 0.005	0.02	—	0.02	0.01	—	0.01	—	110	110	< 0.005	< 0.005	—	110
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.16	0.00	0.00	0.04	0.04	0.00	0.01	0.01	—	38.0	38.0	< 0.005	< 0.005	0.11	38.5
Vendor	< 0.005	0.04	0.02	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	33.9	33.9	< 0.005	< 0.005	0.09	35.5
Hauling	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	0.01	0.01	0.14	0.00	0.00	0.04	0.04	0.00	0.01	0.01	—	36.0	36.0	< 0.005	< 0.005	< 0.005	36.5
Vendor	< 0.005	0.04	0.02	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	34.0	34.0	< 0.005	< 0.005	< 0.005	35.4
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.04	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	10.1	10.1	< 0.005	< 0.005	0.01	10.2
Vendor	< 0.005	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	9.37	9.37	< 0.005	< 0.005	0.01	9.78
Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.67	1.67	< 0.005	< 0.005	< 0.005	1.69
Vendor	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	1.55	1.55	< 0.005	< 0.005	< 0.005	1.62
Hauling	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

3.17. Paving (2028) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.69	6.63	9.91	0.01	0.26	—	0.26	0.24	—	0.24	—	1,511	1,511	0.06	0.01	—	1,516
Paving	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.03	0.27	0.41	< 0.005	0.01	—	0.01	0.01	—	0.01	—	62.1	62.1	< 0.005	< 0.005	—	62.3
Paving	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.05	0.07	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	10.3	10.3	< 0.005	< 0.005	—	10.3
Paving	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.05	0.05	0.85	0.00	0.00	0.20	0.20	0.00	0.05	0.05	—	196	196	< 0.005	0.01	0.56	198
Vendor	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
Hauling	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.03	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	7.74	7.74	< 0.005	< 0.005	0.01	7.84
Vendor	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
Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.28	1.28	< 0.005	< 0.005	< 0.005	1.30
Vendor	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
Hauling	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

4. Operations Emissions Details

4.1. Mobile Emissions by Land Use

4.1.1. Unmitigated

Mobile source emissions results are presented in Sections 2.6. No further detailed breakdown of emissions is available.

4.2. Energy

4.2.1. Electricity Emissions By Land Use - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	—	974	974	0.47	0.06	—	1,003
Total	—	—	—	—	—	—	—	—	—	—	—	974	974	0.47	0.06	—	1,003
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	—	974	974	0.47	0.06	—	1,003
Total	—	—	—	—	—	—	—	—	—	—	—	974	974	0.47	0.06	—	1,003
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	—	161	161	0.08	0.01	—	166
Total	—	—	—	—	—	—	—	—	—	—	—	161	161	0.08	0.01	—	166

4.2.3. Natural Gas Emissions By Land Use - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	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
Total	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	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
Total	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	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
Total	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

4.3. Area Emissions by Source

4.3.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Source	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Consumer	0.15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	0.02	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Landscape Equipment	0.05	< 0.005	0.30	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.24	1.24	< 0.005	< 0.005	—	1.24
Total	0.22	< 0.005	0.30	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.24	1.24	< 0.005	< 0.005	—	1.24
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	0.15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	0.02	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	0.17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	0.03	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Landscape Equipment	0.01	< 0.005	0.04	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	0.14	0.14	< 0.005	< 0.005	—	0.14
Total	0.04	< 0.005	0.04	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	0.14	0.14	< 0.005	< 0.005	—	0.14

4.4. Water Emissions by Land Use

4.4.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	3.07	2.05	5.12	0.32	0.01	—	15.3
Total	—	—	—	—	—	—	—	—	—	—	3.07	2.05	5.12	0.32	0.01	—	15.3
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	3.07	2.05	5.12	0.32	0.01	—	15.3
Total	—	—	—	—	—	—	—	—	—	—	3.07	2.05	5.12	0.32	0.01	—	15.3
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	0.51	0.34	0.85	0.05	< 0.005	—	2.53
Total	—	—	—	—	—	—	—	—	—	—	0.51	0.34	0.85	0.05	< 0.005	—	2.53

4.5. Waste Emissions by Land Use

4.5.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

General Heavy Industry	—	—	—	—	—	—	—	—	—	—	4.63	0.00	4.63	0.46	0.00	—	16.2
Total	—	—	—	—	—	—	—	—	—	—	4.63	0.00	4.63	0.46	0.00	—	16.2
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	4.63	0.00	4.63	0.46	0.00	—	16.2
Total	—	—	—	—	—	—	—	—	—	—	4.63	0.00	4.63	0.46	0.00	—	16.2
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	0.77	0.00	0.77	0.08	0.00	—	2.68
Total	—	—	—	—	—	—	—	—	—	—	0.77	0.00	0.77	0.08	0.00	—	2.68

4.6. Refrigerant Emissions by Land Use

4.6.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.81	1.81
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.81	1.81
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

General Heavy Industry	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.81	1.81
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.81	1.81
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.30	0.30
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.30	0.30

4.7. Offroad Emissions By Equipment Type

4.7.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.8. Stationary Emissions By Equipment Type

4.8.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Emergency Generator	0.90	4.04	2.30	< 0.005	0.13	—	0.13	0.13	—	0.13	—	462	462	0.02	< 0.005	—	463
Total	0.90	4.04	2.30	< 0.005	0.13	—	0.13	0.13	—	0.13	—	462	462	0.02	< 0.005	—	463
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Emergency Generator	0.90	4.04	2.30	< 0.005	0.13	—	0.13	0.13	—	0.13	—	462	462	0.02	< 0.005	—	463
Total	0.90	4.04	2.30	< 0.005	0.13	—	0.13	0.13	—	0.13	—	462	462	0.02	< 0.005	—	463
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Emergency Generator	0.01	0.02	0.01	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	2.51	2.51	< 0.005	< 0.005	—	2.52
Total	0.01	0.02	0.01	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	2.51	2.51	< 0.005	< 0.005	—	2.52

4.9. User Defined Emissions By Equipment Type

4.9.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Remove	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
Demolition	Demolition	5/15/2026	8/15/2026	5.00	66.0	—
Site Preparation	Site Preparation	8/16/2026	5/31/2027	5.00	206	—
Grading	Grading	6/1/2027	4/30/2028	5.00	239	—
Building Construction	Building Construction	5/15/2026	5/20/2028	5.00	526	—
Paving	Paving	5/1/2028	5/20/2028	5.00	15.0	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor

Demolition	Rubber Tired Dozers	Diesel	Average	2.00	8.00	367	0.40
Demolition	Concrete/Industrial Saws	Diesel	Average	1.00	8.00	33.0	0.73
Demolition	Excavators	Diesel	Average	3.00	8.00	36.0	0.38
Site Preparation	Tractors/Loaders/Backhoes	Diesel	Average	4.00	8.00	84.0	0.37
Site Preparation	Rubber Tired Dozers	Diesel	Average	3.00	8.00	367	0.40
Grading	Graders	Diesel	Average	1.00	8.00	148	0.41
Grading	Tractors/Loaders/Backhoes	Diesel	Average	3.00	8.00	84.0	0.37
Grading	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
Grading	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
Building Construction	Forklifts	Diesel	Average	3.00	8.00	82.0	0.20
Building Construction	Cranes	Diesel	Average	1.00	7.00	367	0.29
Building Construction	Tractors/Loaders/Backhoes	Diesel	Average	3.00	7.00	84.0	0.37
Building Construction	Generator Sets	Diesel	Average	1.00	8.00	14.0	0.74
Building Construction	Welders	Diesel	Average	1.00	8.00	46.0	0.45
Paving	Pavers	Diesel	Average	2.00	8.00	81.0	0.42
Paving	Paving Equipment	Diesel	Average	2.00	8.00	89.0	0.36
Paving	Rollers	Diesel	Average	2.00	8.00	36.0	0.38

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Demolition	—	—	—	—
Demolition	Worker	15.0	18.5	LDA,LDT1,LDT2
Demolition	Vendor	—	10.2	HHDT,MHDT
Demolition	Hauling	27.0	20.0	HHDT

Demolition	Onsite truck	—	—	HHDT
Site Preparation	—	—	—	—
Site Preparation	Worker	17.5	18.5	LDA,LDT1,LDT2
Site Preparation	Vendor	—	10.2	HHDT,MHDT
Site Preparation	Hauling	0.00	20.0	HHDT
Site Preparation	Onsite truck	—	—	HHDT
Grading	—	—	—	—
Grading	Worker	15.0	18.5	LDA,LDT1,LDT2
Grading	Vendor	—	10.2	HHDT,MHDT
Grading	Hauling	11.3	20.0	HHDT
Grading	Onsite truck	—	—	HHDT
Building Construction	—	—	—	—
Building Construction	Worker	2.91	18.5	LDA,LDT1,LDT2
Building Construction	Vendor	1.14	10.2	HHDT,MHDT
Building Construction	Hauling	0.00	20.0	HHDT
Building Construction	Onsite truck	—	—	HHDT
Paving	—	—	—	—
Paving	Worker	15.0	18.5	LDA,LDT1,LDT2
Paving	Vendor	—	10.2	HHDT,MHDT
Paving	Hauling	0.00	20.0	HHDT
Paving	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Control Strategies Applied	PM10 Reduction	PM2.5 Reduction
Water unpaved roads twice daily	55%	55%

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (cy)	Material Exported (cy)	Acres Graded (acres)	Material Demolished (Building Square Footage)	Acres Paved (acres)
Demolition	0.00	0.00	0.00	154,646	—
Site Preparation	—	—	309	0.00	—
Grading	—	21,600	239	0.00	—
Paving	0.00	0.00	0.00	0.00	0.00

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%
Water Demolished Area	2	36%	36%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
General Heavy Industry	0.00	0%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2026	0.00	68.5	0.03	< 0.005

2027	0.00	66.3	0.03	< 0.005
2028	0.00	66.3	0.03	< 0.005

5.9. Operational Mobile Sources

5.9.1. Unmitigated

Land Use Type	Trips/Weekday	Trips/Saturday	Trips/Sunday	Trips/Year	VMT/Weekday	VMT/Saturday	VMT/Sunday	VMT/Year
Total all Land Uses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

5.10. Operational Area Sources

5.10.1. Hearths

5.10.1.1. Unmitigated

5.10.2. Architectural Coatings

Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)
0	0.00	10,403	3,468	—

5.10.3. Landscape Equipment

Season	Unit	Value
Snow Days	day/yr	0.00
Summer Days	day/yr	250

5.11. Operational Energy Consumption

5.11.1. Unmitigated

Electricity (kWh/yr) and CO2 and CH4 and N2O and Natural Gas (kBTU/yr)

Land Use	Electricity (kWh/yr)	CO2	CH4	N2O	Natural Gas (kBTU/yr)
General Heavy Industry	5,188,000	68.5	0.0330	0.0040	0.00

5.12. Operational Water and Wastewater Consumption

5.12.1. Unmitigated

Land Use	Indoor Water (gal/year)	Outdoor Water (gal/year)
General Heavy Industry	1,603,719	0.00

5.13. Operational Waste Generation

5.13.1. Unmitigated

Land Use	Waste (ton/year)	Cogeneration (kWh/year)
General Heavy Industry	8.60	—

5.14. Operational Refrigeration and Air Conditioning Equipment

5.14.1. Unmitigated

Land Use Type	Equipment Type	Refrigerant	GWP	Quantity (kg)	Operations Leak Rate	Service Leak Rate	Times Serviced
General Heavy Industry	Other commercial A/C and heat pumps	R-410A	2,088	0.30	4.00	4.00	18.0

5.15. Operational Off-Road Equipment

5.15.1. Unmitigated

Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor

5.16. Stationary Sources

5.16.1. Emergency Generators and Fire Pumps

Equipment Type	Fuel Type	Number per Day	Hours per Day	Hours per Year	Horsepower	Load Factor
Emergency Generator	Diesel	2.00	0.25	3.00	1,100	0.73

5.16.2. Process Boilers

Equipment Type	Fuel Type	Number	Boiler Rating (MMBtu/hr)	Daily Heat Input (MMBtu/day)	Annual Heat Input (MMBtu/yr)

5.17. User Defined

Equipment Type	Fuel Type
—	—

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	17.8	annual days of extreme heat
Extreme Precipitation	7.50	annual days with precipitation above 20 mm
Sea Level Rise	0.00	meters of inundation depth
Wildfire	0.00	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	N/A	N/A	N/A	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	N/A	N/A	N/A	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	N/A	N/A	N/A	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	N/A	N/A	N/A	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	N/A	N/A	N/A	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	N/A	N/A	N/A	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	76.9

AQ-PM	60.1
AQ-DPM	89.9
Drinking Water	71.1
Lead Risk Housing	79.3
Pesticides	0.00
Toxic Releases	64.4
Traffic	77.3
Effect Indicators	—
CleanUp Sites	0.00
Groundwater	22.1
Haz Waste Facilities/Generators	16.6
Impaired Water Bodies	23.9
Solid Waste	66.7
Sensitive Population	—
Asthma	63.8
Cardio-vascular	45.0
Low Birth Weights	98.3
Socioeconomic Factor Indicators	—
Education	78.2
Housing	34.8
Linguistic	53.4
Poverty	69.6
Unemployment	14.4

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—

Above Poverty	25.24060054
Employed	29.51366611
Median HI	39.39432824
Education	—
Bachelor's or higher	42.93596818
High school enrollment	100
Preschool enrollment	33.99204414
Transportation	—
Auto Access	17.91351213
Active commuting	68.98498653
Social	—
2-parent households	13.73027076
Voting	20.17194919
Neighborhood	—
Alcohol availability	41.25497241
Park access	52.29051713
Retail density	57.83395355
Supermarket access	51.03297831
Tree canopy	63.4800462
Housing	—
Homeownership	29.11587322
Housing habitability	31.15616579
Low-inc homeowner severe housing cost burden	23.54677274
Low-inc renter severe housing cost burden	76.04260234
Uncrowded housing	18.76042602
Health Outcomes	—
Insured adults	24.27819838
Arthritis	38.0

Asthma ER Admissions	29.1
High Blood Pressure	27.5
Cancer (excluding skin)	63.4
Asthma	19.7
Coronary Heart Disease	28.5
Chronic Obstructive Pulmonary Disease	25.1
Diagnosed Diabetes	11.3
Life Expectancy at Birth	26.1
Cognitively Disabled	41.3
Physically Disabled	47.8
Heart Attack ER Admissions	52.5
Mental Health Not Good	22.6
Chronic Kidney Disease	27.1
Obesity	17.0
Pedestrian Injuries	79.2
Physical Health Not Good	18.5
Stroke	13.0
Health Risk Behaviors	—
Binge Drinking	80.1
Current Smoker	26.7
No Leisure Time for Physical Activity	24.7
Climate Change Exposures	—
Wildfire Risk	0.0
SLR Inundation Area	0.0
Children	69.7
Elderly	63.3
English Speaking	27.0
Foreign-born	66.8

Outdoor Workers	44.9
Climate Change Adaptive Capacity	—
Impervious Surface Cover	72.9
Traffic Density	78.7
Traffic Access	23.0
Other Indices	—
Hardship	75.4
Other Decision Support	—
2016 Voting	22.7

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	74.0
Healthy Places Index Score for Project Location (b)	25.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	Yes
Project Located in a Low-Income Community (Assembly Bill 1550)	Yes
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Construction: Construction Phases	Schedule provided by Kennedy Jenks
Construction: Off-Road Equipment	—
Land Use	Site area is 6.21 acres
Operations: Energy Use	Energy consumption provided by Kennedy Jenks

Appendix C

Cultural Resources Assessment Report

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Pasadena Sunset Complex Project

Cultural Resources Assessment Report

June 2021 | 00407.00036.001

Submitted to:

City of Pasadena
Water and Power Department
150 South Los Robles Avenue, Suite #200
Pasadena, California 91101

Prepared for:

Kennedy Jenks
300 North Lake Avenue, Suite 1020
Pasadena, California 91101

Mary Robbins-Wade
Cultural Resources Group Manager

Prepared by:

HELIX Environmental Planning, Inc.
7578 El Cajon Boulevard
La Mesa, CA 91942

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Prepared by:

HELIX Environmental Planning, Inc.
7578 El Cajon Boulevard
La Mesa, CA 91942

June 2021 | 00407.00036.001

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National Archaeological Database Information

Authors:	Trevor Gittelhough, M.A., RPA, and Mary Robbins-Wade, M.A., RPA
Firm:	HELIX Environmental Planning, Inc.
Client/Project:	Kennedy Jenks / Pasadena Sunset Complex Project
Report Date:	June 2021
Report Title:	Cultural Resources Assessment for the Pasadena Sunset Complex Project, Pasadena, Los Angeles County, California
Submitted to:	City of Pasadena
Type of Study:	Cultural Resources Assessment
New Sites:	None
Updated Sites:	None
USGS Quad:	Pasadena 7.5' Quadrangle
Acreage:	9.15 acres
Key Words:	Los Angeles County; Township 1 North, Range 12 West; City of Pasadena; Sunset Reservoir; Arroyo Seco; negative archaeological survey; sensitivity assessment; no resources found.

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ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
APE	Area of Potential Effects
APN	Assessor's Parcel Number
BLM	Bureau of Land Management
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CHRIS	California Historical Resources Information System
City	City of Pasadena
CLG	Certified Local Government
CRHR	California Register of Historical Resources
GLO	General Land Office
HELIX	HELIX Environmental Planning, Inc.
HRER	Historical Resources Evaluation Report
HRG	Historic Resources Group
I-	Interstate
JPL	Jet Propulsion Lab
NAHC	Native American Heritage Commission
NHPA	National Historic Preservation Act
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
OHP	Office of Historic Preservation
PRC	Public Resources Code
project	Sunset Complex Project
PWP	Pasadena Water and Power Department
SCCIC	South Central Coastal Information Center
SHPO	State Historic Preservation Officer
SR	Sunset Reservoir
TCP	Traditional Cultural Properties
TCR	Tribal Cultural Resources
USGS	U.S. Geological Survey
VOCs	Volatile Organic Compounds

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EXECUTIVE SUMMARY

HELIX Environmental Planning, Inc. (HELIX) was contracted by Kennedy Jenks to provide cultural resources services for the Sunset Complex Project (project) in the City of Pasadena, Los Angeles County, California. The project is a proposed replacement of existing reservoirs and associated structures that includes the demolition of existing structures and hardscape within the approximately 9.15-acre project site. 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), Section 106 of the National Historic Preservation Act (NHPA), as amended, and City of Pasadena cultural resources guidelines. A separate Historical Resources Evaluation Report (HRER) is being prepared to address the existing built environment resources.

The records search received from the South Central Coastal Information Center (SCCIC) in May 2021 indicated that six previous cultural resources studies have been conducted within a half-mile of the project area, none of which occurred within the project site. The records search results also indicated that a total of 84 cultural resources have been previously recorded within a half-mile of the project area, all of them are historic built environment resources; however, no resources have been recorded within the project area prior to this survey.

The field investigations included a pedestrian survey of the project area by a HELIX archaeologist on June 3, 2021. Due to the completely developed nature of the project site, exposed ground surfaces were quite limited. The survey did not result in the identification of any cultural material within the project area.

Based on the results of the current study, no historic properties per the National Historic Preservation Act of historical resources per the California Environmental Quality Act would be affected by the project. However, due to the cultural sensitivity of the project region and the alluvial setting of the project area, it is recommended that grading and other ground-disturbing activities be monitored by a qualified archaeologist and a Native American monitor, as discussed in this report. 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 project archaeologist will coordinate with the Monitoring Tribe and Pasadena Water and Power Department staff to develop and implement appropriate avoidance or mitigation measures.

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1.0 INTRODUCTION

HELIX Environmental Planning, Inc. (HELIX) was contracted by Kennedy Jenks to provide cultural resources services for the Pasadena Sunset Complex Project (project) in the City of Pasadena (City), Los Angeles County, California. The project is a proposed upgrade and replacement of reservoirs, including the demolition of existing structures and hardscape. 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 area. 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), as well as Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and City guidelines and regulations.

1.1 PROJECT LOCATION

The project is located in the City of Pasadena in Los Angeles County (Figure 1, *Regional Location*). The project is located 250 feet east of Interstate- (I-)210 (Foothill Freeway) and 0.75 mile north of State Route 134 (Ventura Freeway) within an unsectioned portion of Township 1 North, Range 12 West, on the U.S. Geological Survey (USGS) 7.5' Pasadena quadrangle (Figure 2, *USGS Topography*). The approximately 9.15-acre project site is located within Assessor's Parcel Number (APN) 5728-021-916 and is bordered by Sunset Avenue to the east, East Mountain Street to the south, Glen Avenue to the west, and mixed residential and commercial properties to the north (Figure 3, *Aerial Photograph*).

1.2 PROJECT DESCRIPTION

The project proposes the demolition of the existing Sunset Reservoir complex and replacement with new reservoirs, along with a groundwater treatment facility. Both reservoirs will be removed and replaced with new prestressed concrete reservoirs. As the "A" Basin (where water has been previously blended) is to be demolished, an inlet clearwell will be installed upstream of the reservoirs. Additionally, a new ground water treatment plant will be developed, in order to treat for perchlorate and volatile organic compounds (VOCs). Replacement and construction of associated piping, inlet and outlet, valves, and hardscaping will also occur across the project area.

1.3 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 to the California Register of Historical Resources (CRHR) or National Register of Historic Places (NRHP), as applicable.

1.3.1 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 NHPA and its implementing regulations (16 United States Code 470 et seq., 36 Code of Federal Regulations [CFR] 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.

Significant resources must retain enough of their historic character or appearance to be recognizable as historical resources and to convey the reasons for their significance. Resource 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, 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 NRHP criteria under which it is proposed for eligibility.

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.

1.3.2 California Environmental Quality Act

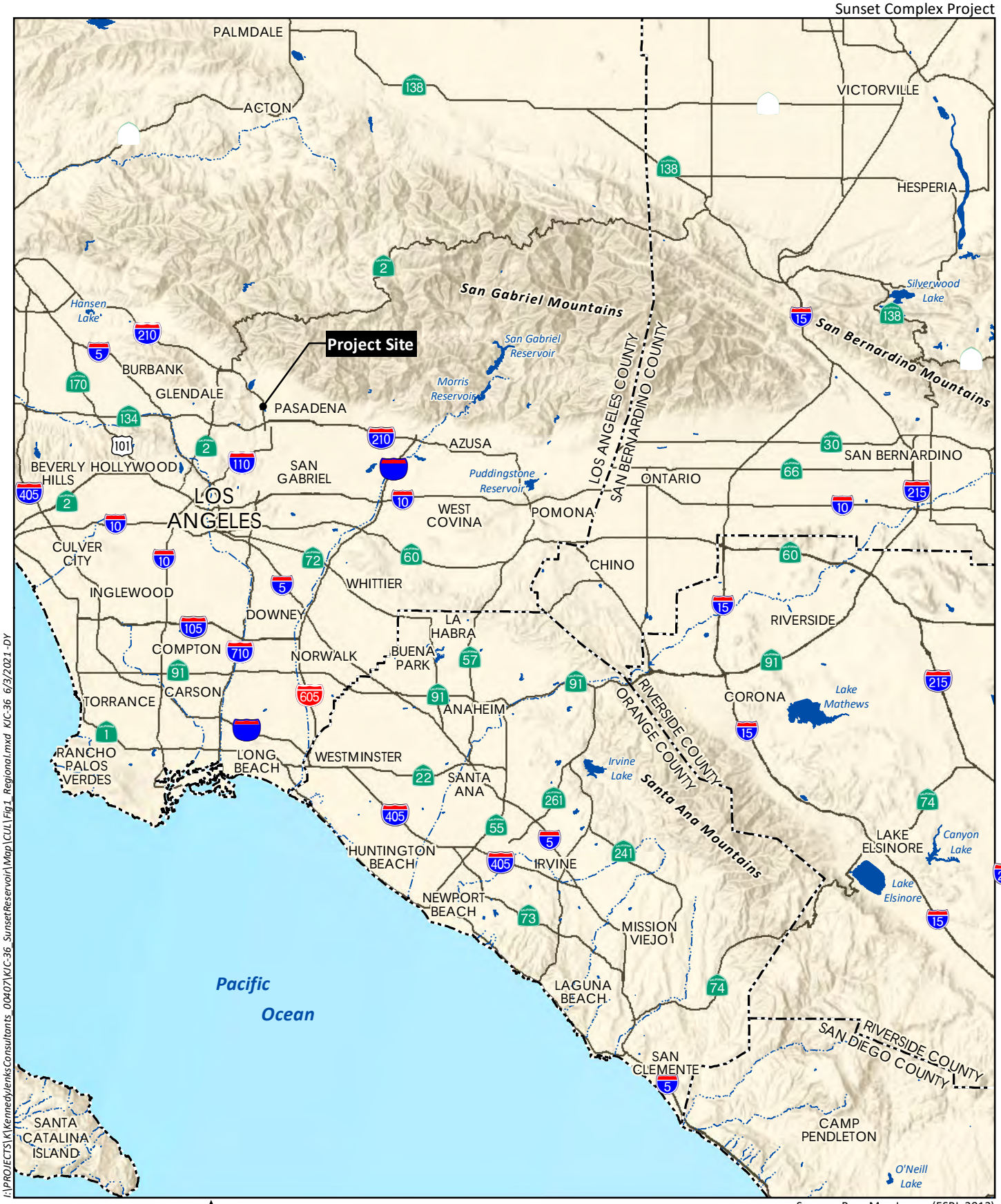
CEQA, Public Resources Code (PRC) 21084.1, and California Code of Regulations (CCR) Title 14 Section 15064.5, address determining the significance of impacts to archaeological and historic resources and discuss significant cultural resources as "historical resources," which are defined as:

- resource(s) listed 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 National Register of Historic Places (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 on the CRHR (14 CCR Section 15064.5[a][3])

Sunset Complex Project



I:\PROJECTS\K\KennedyJenksConsultants_00407\KJC-36_SunsetReservoir\Map\CUL\Fig1_Regional.mxd KJC-36 6/3/2021 -DY

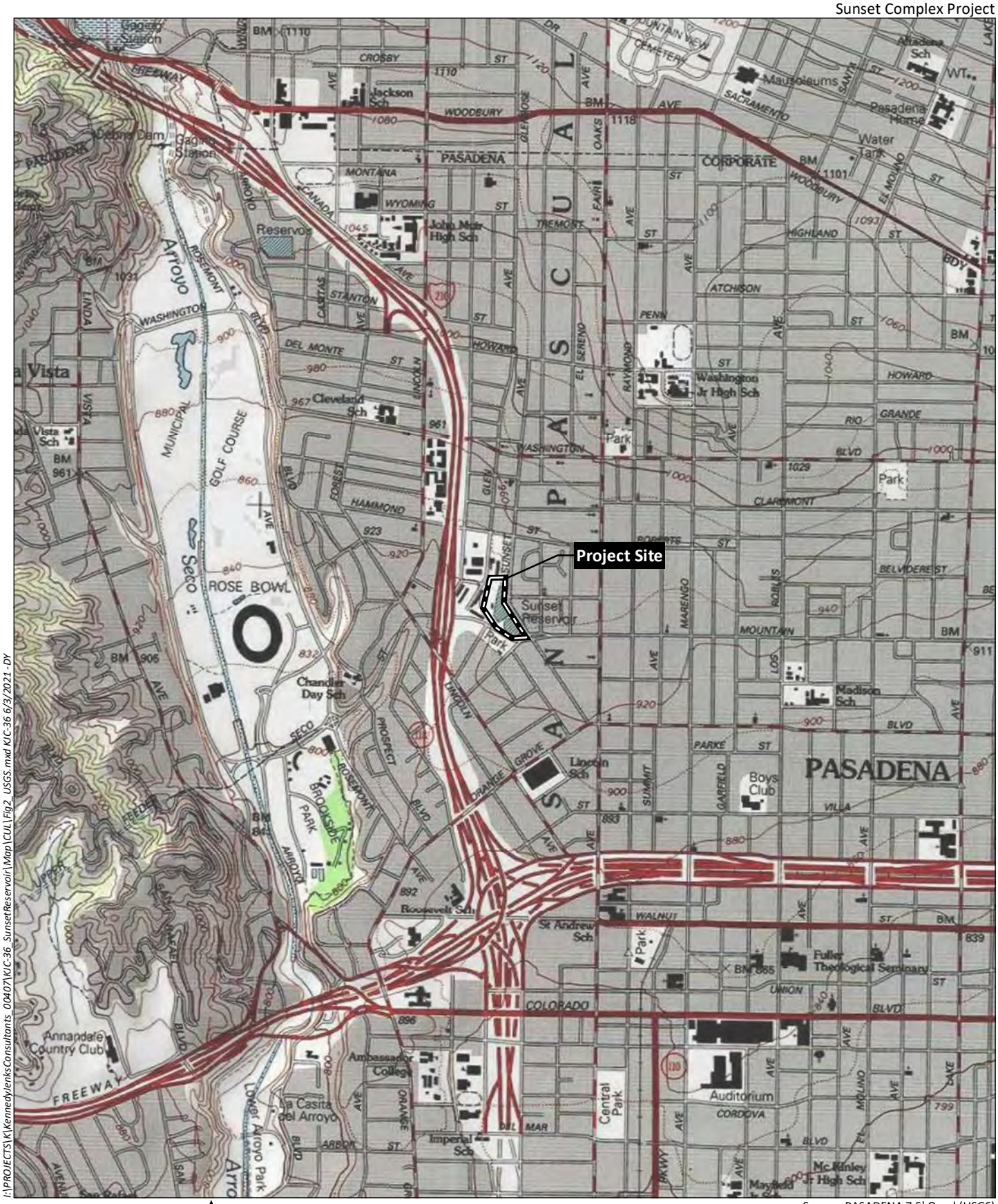
0 10 Miles

Source: Base Map Layers (ESRI, 2013)

HELIX Environmental Planning

Regional Location

Figure 1



I:\PROJECTS\K\KennedyJenksConsultants_00407\KJC-36_SunsetReservoir\Map\CUL\Fig2_USGS.mxd KJC-36 6/3/2021 - DY

0 2,000 Feet

Source: PASADENA 7.5' Quad (USGS)

HELIX Environmental Planning

USGS Topography

Figure 2



I:\PROJECTS\K\KennedyJenksConsultants_00407\KJC-36_SunsetReservoir\Map\CUL\Fig3_Aerial.mxd KJC-36 6/3/2021 - DY

0 200 Feet

Source: Aerial (Nearmap, 2020)

HELIX Environmental Planning

Aerial Photograph

Figure 3

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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.

1.3.3 Pasadena General Plan

Pasadena's General Plan Land Use Element was adopted in 2015, and consists of a collection of objectives, policies, and implementation measures designed to define and implement the vision of the community in narrative and graphic terms using established development criteria and standards that help guide land use actions. It describes the allowed intensities, types, configurations, and locations of land uses throughout the City, which include residential, commercial, mixed-use, industrial, open space, recreation, and public uses.

Identified as part of the General Plan, was the significance of historic buildings, properties, districts, landscapes, and civic places on the identity and character of Pasadena. Goal 8, Historic Preservation, was designed in order to preserve and enhance Pasadena's cultural and historic resources, the policies of which are detailed below;

> Goal Eight. Historic Preservation. Preservation and enhancement of Pasadena's cultural and historic buildings, landscapes, streets and districts as valued assets and important representations of its past and a source of community identity, and social, ecological, and economic vitality.
>
> - **8.1:** Identify and Protect Historic Resources. Identify and protect historic resources that represent significant examples of the City's history.
>
> - **8.2:** Historic Designation Support. Provide assistance and support for applicants applying for designation of a historic resource through a clear, thorough, and equitable process that identifies if monuments, individual or landmark districts, historic signs or landmark trees are eligible for designation based on adopted evaluation criteria.
>
> - **8.3:** Preservation Efforts. Support preservation and restoration efforts through education, facilitation, and incentive programs.

- **8.4**: Adaptive Reuse. Encourage sensitive adaptive re-use including continuing the historic use of historic resources to achieve their preservation, sensitive rehabilitation, and continued economic and environmental value.

- **8.5**: Scale and Character of New Construction in a Designated Landmark and Historic Districts. Promote an architecturally sensitive approach to new construction in Landmark and Historic districts. Demonstrate the proposed project's contextual relationship with land uses and patterns, spatial organization, visual relationships, cultural and historic values, and relationships in height, massing, modulation, and materials.

- **8.6:** Infrastructure and Street Design Compatibility. Encourage street design, public improvements, and utility infrastructure that preserves and is compatible with historic resources.

- **8.7:** Preservation of Historic Landscapes. Identify, protect, and maintain cultural and natural resources associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values.

- **8.8:** Evolving Preservation Practices. Continue to implement practices for historic preservation consistent with community values and conformance with the Secretary of the Interior's Standards for the Treatment of Historic Properties, California Historical Building Code, State laws, and best practices.

- **8.9:** Maintenance. Support and encourage maintenance and upkeep of historic resources to avoid the need for major rehabilitation and to reduce the risk of demolition, loss through fire, deterioration by neglect, or impacts from natural disasters.

- **8.10:** Enforcement. Ensure that City enforcement procedures and activities comply with local, State, and Federal historic preservation requirements and fosters the preservation of historic resources.

1.3.4 Local Regulations

Sections 17.62.010 et seq. of the Pasadena Municipal Code specify significance criteria for the designation of historic resources, procedures for designation, and review procedures to encourage, enhance, and promote historic preservation. The historic preservation program establishes criteria for the designation of historic monuments, landmarks, historic signs, landmark trees, or landmark districts, consistent with the National Register of Historic Places for evaluating historic properties. These criteria are intended to promote the adaptive reuse of the City's historic resources, enhance and preserve historically significant structures, and stabilize and improve property values. These sections also serve to fulfill the City's responsibility as a Certified Local Government (CLG) under federal preservation laws and conducting Section 106 and CEQA reviews. They promote tourism and public awareness of conservation through rehabilitation, restoration, and maintenance of existing buildings.

The Certified Local Government Program is jointly administered by the National Park Service and State Historic Preservation Offices to certify local communities in becoming recognized as a CLG. Pasadena is a

CLG, and as such, is committed to preserving, protecting, and increasing awareness of historic places. As a CLG, Pasadena must continually improve its preservation programs and is eligible for state and federal grants to support efforts such as preservation plans, historic resources surveys, and preservation education and outreach programs.

Any property in Pasadena that is found eligible for designation as a local landmark is considered to meet the definition of historical resource as defined by State CEQA Guidelines Section 15064.5. Pursuant to Municipal Code Section 17.62.040, a landmark meets one or more of the following criteria:

- It is associated with events that have made a significant contribution to the broad patterns of the history of the City, region, or state.
- It is associated with the lives of persons who are significant in the history of the City, region, or state.
- It embodies the distinctive characteristics of a type, architectural style, period, or method of construction, or represents the work of an architect, designer, engineer, or builder whose work is of significance to the City or the region, or possesses artistic values of significance to the City or to the region.
- It has yielded or may be likely to yield, information important locally in prehistory or history.

1.3.5 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 (TCP) 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.

California State Assembly Bill (AB) 52 revised PRC Section 21074 to include Tribal Cultural Resources (TCRs) as an area of CEQA environmental impact analysis. 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. Per PRC Section 21080.3, a CEQA lead agency must consult with any California Native American tribe that requests consultation, and that is traditionally and culturally affiliated with the geographic area of a proposed project, to identify resources of cultural or spiritual value to the tribe, even if such resources are already eligible as historical resources as a result of cultural resources studies. A TCR may be considered significant if it is (i) included in a local or state register of historical resources; (ii) determined by the lead agency to be significant pursuant to criteria set forth in PRC Section 5024.1; (iii) a geographically defined cultural landscape that meets one or more of these criteria; (iv) a historical resource described in PRC Section 21084.1 or a unique archaeological resource described in PRC Section 21083.2; or (v) a non-unique archaeological resource if it conforms with the above criteria.

1.4 AREA OF POTENTIAL EFFECT

Pursuant to 36 CFR 800.16(d), the Area of Potential Effect (APE) is the geographic area within which an undertaking may directly or indirectly alter the character or use of historic properties. The APE for the project consists of the project property, totaling approximately 9.15 acres (see Figure 3). The Sunset Reservoir complex is owned and operated by the City of Pasadena Water and Power Department (PWP).

1.5 PROJECT PERSONNEL

A cultural resources survey was conducted by HELIX in 2021 to assess whether the project would have any effects on cultural resources. Mary Robbins-Wade, M.A., RPA served as the Cultural Resources Task Lead and Principal Investigator; she provided senior technical oversight and contributed to this report. Trevor Gittelhough M.A., RPA is the primary report author, and Kassie Sugimoto, M.A., RPA conducted the field survey. Ms. Robbins Wade and Ms. Sugimoto meet the qualifications of the Secretary of Interior's Standards and Guidelines for archaeology. Mx. Gittelhough meets the qualification of the Secretary of Interior's Standards and Guidelines for archaeology and history. Resumes for key project personnel are presented in Appendix A.

2.0 PROJECT SETTING

2.1 NATURAL SETTING

The project area is located south of the San Gabriel Mountains, in the City of Pasadena. The San Gabriel Mountains are on a thin slice of crust, bounded by the San Andreas and San Gabriel fault zones, that include Proterozoic and Mesozoic bedrock (Barth 1990). Following the emplacement of the bedrock, movement along the major bounding faults from the Late Cretaceous to the Paleocene resulted in the initiation of uplift of the mountains (Barth 1990). Ongoing tectonic activity, in the form of compressional deformation from the large restraining bend in the San Andreas fault zone, results in the steep terrane and high erosional rates characteristic of the mountains today (Dixon et al. 2012). Geologically, the project area is underlain by alluvial fan gravel and sand derived from the San Gabriel Mountains, dating to the Pleistocene (Dibblee 1989). Soils consist of soils from the Urban land-Palmview-Tujunga complex (0 to 5 percent slopes); this series consists of well-drained soils formed in stable and competent alluvium, derived primarily from granite (NRCS 2017a, 2017b).

The project area is set within an alluvial fan formed from streams flowing from the San Rafael Hills, depositing soils from at the base of dissected hills to the south and above the Santa Clarita River floodplain. The south-flowing Arroyo Secco is located approximately 0.8 mile west. The project area is currently occupied by the Sunset Reservoir No. 1 and No. 2, along with associated facilities, and has been developed since at least 1888 (see History of the Project Area section below). The project area is relatively flat and has little topographic relief, and the vicinity has been heavily developed with residential neighborhoods.

Soil conditions in the project area are described in the Sunset Reservoir Perchlorate Treatment Facility geotechnical report (Diaz, Yourman, & Associates 2009). The geotechnical investigation included a review of previous reports, as well as the excavation of two bores sampled across the project area. Soil profiles were recorded for each of the bores. The upper ten feet of subsurface sediments consist of dark grayish brown, moist, loose to medium dense, fine to coarse-grained sands with little gravel, with sediments below that comprised of dark brown and olive brown, moist, medium dense to very dense, fine- to coarse-grained sands (Diaz, Yourman, & Associates 2009). These sediments are designated by the Natural Resources Conservation Service (NRCS) as part of the Palmview-Tujunga complex, sandy loam series, which consists, of well-drained soils formed in stable and competent alluvium, derived primarily from granite (NRCS 1999).

2.2 CULTURAL SETTING

2.2.1 Prehistoric Period

Archaeological research in Southern California has identified several distinct chronological sequences that are used to understand cultural shifts within the region. Wallace (1955, 1978) developed a prehistoric chronology for the southern California coastal region that was built on early studies and data synthesis, which is widely used to this day and is also applicable to many near-coastal and inland areas. Divided into four distinct periods, Wallace's prehistoric sequence is as follows: Early Man, Milling Stone, Intermediate Prehistoric, and Late Prehistoric. Though the sequence originally did not have a high level of chronological precision from the lack of absolute date information (Moratto 1984), this has been alleviated by the plethora of radiocarbon dates that have been collected in the past four decades by southern California researchers (Byrd and Raab 2007). Since its creation, several revisions have been made to Wallace's (1955) synthesis using these dates, as well as projectile point assemblages (e.g., Koerper and Drover 1983; Koerper et al. 2002; Mason and Peterson 1994).

Chronological Period	Characteristics	Date Range
Early Man	Diverse mixtures of subsistence combining hunting and gathering but with a greater emphasis on hunting in many places.	Circa 10,000–6000 B.C.
Milling Stone	Subsistence strategies shift from hunting/gathering to those centered on collecting plant foods and the hunting of small animals. Begin to see both extended and loosely flexed burials.	6000–3000 B.C.

Chronological Period	Characteristics	Date Range
Intermediate	Shifts in strategies to a heavier emphasis on maritime subsistence strategies, along with a wider use of plant foods, that trend towards adaptations to regional and local resources. Fully flexed burials, often placed face-down or face-up, and oriented toward the north or west.	3000 B.C.–A.D. 500
Late Prehistoric	The increased usage of bow and arrow technology, a matching increase in land and sea mammal hunting, along with the continuation of wide-ranging uses of plant foods. Both the diversity and complexity of material culture increases dramatically. Increase in populations, accompanied by the presence of larger, more permanent villages.	A.D. 500–Historic Contact

2.2.2 Ethnohistory

2.2.2.1 Gabrieliño

The project site is located within the region that has traditionally been occupied by the Gabrieleño people (also spelled as Gabrieleno or Gabrielino; Bean and Smith 1978:538; Kroeber 1925: Plate 57). Other Indigenous groups in the surrounding areas include the Chumash to the north and northwest, the Tataviam/Alliklik to the north, the Serrano to the east, and the Luiseño and Juaneño to the south. Interactions between these groups are well-documented, comprised primarily of trade and intermarriage.

The name Gabrieleño identifies the Indigenous people who were administered by the Spanish missionaries settled at Mission San Gabriel. This group is now considered to have a regional dialect of the Gabrielino language, along with the Santa Catalina Island and San Nicolas Island dialects (Bean and Smith 1978:538). In the post-European contact period, Mission San Gabriel included natives of the greater Los Angeles area, while also including members of surrounding Indigenous groups from other areas such as Kitanemuk, Serrano, and Cahuilla. There is little evidence that the people we call Gabrieleño had a broad term for their group (Dakin 1978:222); rather, they identified themselves as an inhabitant of a specific community with locational suffixes (e.g., a resident of Yaanga was called a Yabit, much the same way that a resident of New York is called a New Yorker; Johnston 1962:10).

Several native words have been suggested as labels for the broader group of Indigenous people from the Los Angeles region. These include Tongva (or Tong-v; Merriam 1955:7–86) and Kizh (Kij or Kichereno; Heizer 1968:105), though evidence indicated that these terms referred to local places or smaller groups of people within the larger group that we now call Gabrieleño. Nevertheless, many present-day descendants of these people have taken on Tongva as a preferred group name because it has a native rather than Spanish origin (King 1994:12). Thus, the term Gabrieleño /Tongva is used in the remainder of this report when discussing the Indigenous people of the Los Angeles Basin and their descendants.

The Gabrieleño/Tongva subsistence economy was centered on hunting and gathering. Due to the rich and varied nature of their environment, the Indigenous population exploited mountains, foothills, valleys, deserts, riparian, estuarine, and open and rocky coastal eco-niches. Acorns served as the staple

food, supplemented by the roots, leaves, seeds, and fruits of a variety of flora (e.g., islay, cactus, yucca, sages, and agave). Freshwater and saltwater fish, shellfish, birds, reptiles, and insects, as well as both large and small mammals, were also hunted or collected and served as a large part of their diet (Bean and Smith 1978:546; Kroeber 1925:631–632; McCawley 1996:119–123, 128–131).

A wide variety of tools and implements were used by the Gabrieleño/Tongva to gather and collect food resources. These included the bow and arrow, traps, nets, blinds, throwing sticks and slings, spears, harpoons, and hooks for hunting and fishing. Those groups located near the ocean used oceangoing plank canoes, or *ti'at*, and tule balsa canoes for fishing, travel, and trade between the mainland and the Channel Islands (McCawley 1996:7). Gabrieleño/Tongva people processed their resources with a variety of tools, including hammerstones and anvils, mortars and pestles, manos and metates, strainers, leaching baskets and bowls, knives, bone saws, and wooden drying racks. Food was likewise consumed from a variety of vessels, with Catalina Island steatite used to make ollas and cooking vessels (Blackburn 1963; Kroeber 1925:629; McCawley 1996:129–138).

At the time of Spanish contact, the basis of Gabrieleño/Tongva religious life was the Chinigchinich cult, centered on the last of a series of heroic mythological figures. Chinigchinich gave instruction on laws and institutions, and also taught the people how to dance, the primary religious act for this society. He later withdrew into heaven, where he rewarded the faithful and punished those who disobeyed his laws (Kroeber 1925:637–638). The Chinigchinich religion seems to have been relatively new when the Spanish arrived. It was spreading south into the southern Takic groups even as Christian missions were being built and may represent a mixture of native and Christian beliefs and practices (McCawley 1996:143–144).

The burial practices of the Gabrieleño/Tongva included both burials and cremations, with inhumation the more common practice on the Channel Islands and the adjacent mainland coastal areas, while cremation was the primary practice on the remainder of the coast and through the inland areas (Harrington 1942; McCawley 1996:157). Remains were buried in distinct burial areas, sometimes associated with villages and sometimes with no clear village association (Altschul et al. 2007). Cremation ashes have been found in archaeological contexts buried within stone bowls and in shell dishes (Ashby and Winterbourne 1966:27), as well as scattered among broken ground stone implements (Cleland et al. 2007). Archaeological data corresponds with ethnographic descriptions of an elaborate mourning ceremony that occurred over several days and included a variety of offerings, such as seeds, stone grinding tools, animal skins, baskets, wood tools, shell beads, bone and shell ornaments, and projectile points and knives. Offerings varied, both with the sex of the deceased individual as well as their status (Dakin 1978:234–365; Johnston 1962:52–54; McCawley 1996:155–165).

2.2.2.2 Tataviam

Boundaries between different Indigenous groups are fluid, moving as groups gain and lose status and power. The Tataviam are the next closest Indigenous group near the project, and their territory was located primarily in the upper drainage of the Santa Clara River, with lands extending east to the southern fringe of Antelope Valley, but centered on the south sides of the Liebre, Sawmill, and Sierra Pelona Mountains.

Like the Gabrieleño/Tongva, the Tataviam language is a part of the Takic branch of the Uto-Aztecan language family (Mithun 2001:540). The Tataviam language probably began to differentiate itself from the others in the language group around 1000 B.C. (King and Blackburn 1978:535). The name "Tataviam"

itself, is derived from the Kitanemuks' name for them (King and Blackburn 1978:535). Similarly, the Ventureño Chumash referred to them as the "Alliklik" in order to separate them from the Beñeme Serrano in the western Mojave Desert and Antelope Valley, and both names are used by ethnographers and archaeologists (Kroeber 1925:614).

Information about Tataviam social organization and political structure is limited, but there is no evidence to indicate a substantial difference between their structure and those of the Kitanemuk and Gabrieleño/Tongva groups. Tataviam villages ranged from large centers of around 200 individuals to small settlements of 10 to 15 people (King and Blackburn 1978:536). Intermediate-sized villages were dispersed between the larger centers, with smaller villages spaced around the larger villages. It was estimated that the Tataviam population at contact was no more than 1,000 people. Mortuary practices probably included cremation, as well as a mourning ceremony practiced in late summer or early fall (King and Blackburn 1978:535). With the construction of the San Fernando Mission in 1797, the Tataviam were forced to settle within the Mission, though some were also taken to Mission San Gabriel as well.

Archaeological data, the primary source of information available, indicate broad similarities among the Tataviam, Chumash, and Gabrieleño/Tongva (King and Blackburn 1978:536). Considering their environment and geographical range, it is likely that Tataviam relied more heavily on yucca as a staple than acorns. Other foods most likely included sage seeds, juniper seeds, and islay berries, with hunting focused on small mammals such as rabbits and rodents but also included deer and antelope. Extensive trade networks existed between the Indigenous groups in the region, and the Tataviam traded lithic material and large game animals with coastal groups for marine resources, shell, asphaltum, and steatite.

2.2.2.3 Indigenous Communities in Pasadena

The project is located within the territory of the Gabrieleño/Tongva, which was rich in villages of various sizes (King 2004; McCawley 1996:36–40). In general, however, it has been very difficult to determine the precise location of any specific Indigenous village occupied in the Ethnohistoric period (McCawley 1996:31–32). Traditional place names referred to at the time of Spanish contact did not necessarily represent a continually occupied settlement at a single location, and in many cases, these communities were in fact representative of several smaller camps scattered across a general area, shaped by the local geography and subject to change over generations (Johnston 1962:122). By the time ethnographers, anthropologists, and historians began efforts to document their locations, many of the villages had been abandoned, their locations already heavily affected by agricultural and urban development, and Indigenous lifeways had been changed forever. Additionally, alternative names and spellings for historic communities, conflicting reports on their meaning, and differing geographic reference points, from different informants, further confound relocation attempts.

Even with the growing collection of archaeological evidence, making a conclusive determination on whether a specific assemblage represents the remains of a former village site can be difficult. Although the precise location of any given village is subject to much speculation, the vicinity of Pasadena once contained many Gabrieleño/Tongva villages, including several concentrated along the banks of the Arroyo Seco and its offshoots. This type of settlement pattern concentrated along waterways is reflected in historical maps published by the Southwest Museum (1962; reprinted in Johnston 1962) and George Kirkman (1938). Maps such as these convey a general sense of significant historical areas based

on the geographic information available at the time and are considered as a representational depiction of these locations rather than explicit geographic points.

Known ethnographically documented villages within the Pasadena vicinity included *Akuronga*, *Alyeupkigna*, *Hahamon'ga*, *Haramoknga*, *Puntitavjatngna*, and *Sisitkanonga*. The closest of these villages to the project site is *Hahamon'ga* (alternative spellings and names include *Hahmogna*, *Hahamog-na*, and *Xaxaamonga*). Current ethnographic thought places this settlement in the upper part of the Arroyo Seco, in the area now owned by the Jet Propulsion Lab (JPL), approximately 2.65 miles north-northwest of the project site. Another village of the same name is located in Glendale, and it is possible that these were two separate locations used by the same band. The village of *Akuronga* (or *Akuuronga*) is purported to be located near La Presa Drive and Huntington Drive, approximated 4.65 miles southeast of the project site. *Sonaanga* has been identified as being located at the current location of San Marino High School, approximately 4.15 miles southeast, while *Alyeupkigna* (or *Aluupkenga*) is located six miles east-southeast near Baldwin Lake on the Santa Anita Ranch, and *Sisitkanonga* (or *Sisitcanonga*) is located along the banks of Eaton Creek, approximately 4.8 miles northeast of the project. Like *Hahamon'ga*, these other villages were described in ethnographic accounts, but the exact locations are unknown (McCawley 1996).

2.2.3 Historical Background

2.2.3.1 Spanish Period

The first European explorers to reach southern California were the members of Juan Rodriguez Cabrillo's 1542 expedition. Between that time and 1769, Spanish, British, and Russian explorers made only limited excursions into Alta (upper) California, and none established permanent settlements in the region (Starr 2007).

In 1769, the San Diego Presidio was established by Gaspar de Portolá, marking the first Spanish settlement in Alta California. At the same time, Mission San Diego de Alcalá was established by the Franciscan Father Junipero Serra, the first of 21 missions built by Spanish Franciscan monks in Alta California between 1769 and 1823. Portolá proceeded north, exploring the Arroyo Seco as he passed through the Los Angeles Basin, before heading through the San Fernando Valley, then reaching the San Francisco Bay on October 31, 1769. On September 4, 1781, 12 years after Portolá's initial visit, a dozen families from Sonora, Mexico, founded El Pueblo de la Reina de los Angeles de la Porciúncula ("The Town of the Queen of Angels on the Portiuncula River"; or simply El Pueblo de la Reina de los Angeles, "The Town of the Queen of Angels") under the specific directions of Governor Felipe de Neve.

The Portolá expedition marked the beginning of Spanish military supply routes that serviced the newly established missions, including Mission San Gabriel de Arcángel (1771), the first permanent European settlement in the area. In 1772, Spanish Commander Pedro Fages explored a canyon that passed through the mountains north of present-day Gorman and named the area Cañada de Las Uvas, or Grapevine Canyon. Friar Francisco Garces further explored the region in 1776, and Spanish settlers began establishing ranchos in the San Fernando Valley by the 1790s (Beck and Haase 1974:15).

Almost immediately, the Franciscan padres began attempts at converting the local Indigenous populations to Christianity through baptism, as well as relocating them to mission grounds (Engelhardt 1927a). Twenty-six years after the establishment of Mission San Gabriel de Arcángel, the San Fernando Mission was founded in 1797, as a stopping point between the San Gabriel and San Buenaventura

missions (Engelhardt 1927b). Most of the Indigenous population in the Los Angeles Basin, as well as the surrounding foothill and mountain ranges, were persuaded or forced to settle near the two missions. These included Tataviam, Chumash, the Gabrieleño, the Serrano, many Cahuilla as far as the Coachella and San Jacinto valleys, and even some Luiseño of the San Jacinto Valley, as well as Indigenous groups from the southern Channel Islands.

2.2.3.2 Mexican Period

The primary focus of the Spanish during their occupation of California was the construction of the mission system and associated presidios for the purpose of integrating the Native American population into Christianity. While there were incentives provided by the Spanish monarchy to entice settlers to pueblos or towns, only three pueblos were established during the Spanish period, of which only two were successful and remain as California cities (San José and Los Angeles). Several factors hindered growth within Alta California, including the threat of foreign invasion, political dissatisfaction, and unrest among the Indigenous population. In 1821, after more than a decade of intermittent rebellion and warfare, New Spain (Mexico and the California territory) won independence from Spain. A year later, in 1822, the Mexican legislative body in California ended the Spanish isolationist policies of the region, and decreed California ports open to foreign merchants.

Although Mexico had gained its independence in 1821, Spanish patterns of culture and influence remained for some time. The missions continued, operating in mostly the same fashion as they had previously, and most of the laws related to the distribution of land did not change throughout the 1820s. Beginning in the 1820s, extensive land grants were established in the interior, partly to increase the population inland and away from the more settled coastal areas where the Spanish had concentrated their colonization efforts. Furthermore, the secularization of the missions in 1834 resulted in the subdivision of former mission lands and the establishment of additional ranchos. These massive swaths of land were granted to prominent and well-connected individuals as ranchos, 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. During the age of the ranchos (1834–1848), landowners focused their resources on the cattle industry and devoted large tracts to grazing. Cattle hides were the primary southern California export during this time, used to trade for goods from the east and other areas in the United States and Mexico. The influx of explorers, trappers, and ranchers associated with the land grants increased the number of non-native inhabitants of the region, and this rising population contributed further to the decimation of the Indigenous population, from the introduction and rise of diseases foreign to them, and from the violence enacted against them.

2.2.3.3 American Period

The United States took control of California in 1846, seizing Monterey, San Francisco, San Diego, and Los Angeles with little resistance. Los Angeles soon slipped from American control, however, and needed to be retaken in 1847. Approximately 600 U.S. sailors, Marines, Army dragoons, and mountain men converged under the leadership of Colonel Stephen W. Kearney and Commodore Robert F. Stockton in early January of that year to challenge the California resistance, which was led by General Jose Maria Flores. The American party scored a decisive victory over the Californios in the Battle of the Rio San Gabriel and at the Battle of La Mesa the following day, effectively ending the war and opening the door for increased American immigration (Harlow 1992:193–218). Hostilities officially ended with the signing

of the Treaty of Guadalupe Hidalgo in 1848, in which the United States agreed to pay Mexico $15 million for the conquered territory, including California, Nevada, Utah, and parts of Colorado, Arizona, New Mexico, and Wyoming, representing nearly half of Mexico's pre-1846 holdings. California joined the Union in 1850 as the 31st state (Wilkman and Wilkman 2006:15). Though the discovery of gold in northern California in 1848 gave rise to the California Gold Rush, the first California gold was found in Los Angeles County in 1842. The large strike at Sutter's Creek seven years later led to an enormous influx of American citizens in the 1850s and 1860s, and these "forty-niners" rapidly displaced the old rancho families. One year after the discovery of gold, nearly 90,000 people journeyed to the California gold fields. With most miners drawn to central California by its well-known strikes, Los Angeles attracted people who were largely peripheral to the Gold Rush.

Pasadena

Originally a part of Rancho del Rincon de San Pascual, the area that is now Pasadena was sold by Manuel Garfias to Benjamin Eaton and Dr. John S. Griffin (Wood 1917). In 1874, the California Colony of Indiana, formed by Dr. Thomas B. Elliott and consisting of a group of families from Indiana, purchased land from Dr. John S. Griffin and established the community of Pasadena (Reid 1895). In 1886, the same year that saw the completion of the Santa Fe Railroad, Pasadena was incorporated. With the railroad, the region's Mediterranean climate brought in a growing number of Eastern tourists, which Pasadena began to capitalize upon. They built sewers, paved streets, and added electric lighting to support the growing tourist industry, along with numerous hotels and guest houses (Carpenter 1984). In addition, the land boom instigated by the completion of the railroad created a growing population in Los Angeles that used Pasadena as a suburb. The use of local rail lines and electric streetcar lines, developed by such individuals as Henry Huntington, made such growth possible.

With the advent, and subsequent popularity, of the automobile industry, Pasadena and Los Angeles formed a partnership to construct the Colorado Street Bridge. Completed in 1913, this bridge was the first of many that allowed easy access across the Arroyo Seco and was soon followed by others such as the San Rafael Bridge and the Holly Street Bridge. The growth of automobile use further impacted Pasadena, as the city saw an increase in population from 45,000 in 1920 to over 76,000 by 1930 (Historic Resources Group [HRG] 2007). This culminated with the construction of not only California's but the United States' first freeway, the Arroyo Seco Parkway (also known as the Pasadena Freeway or CA-110), completed in 1940. By 1939, however, the Depression had devastated the tourism industry, and many of Pasadena's grand hotels were shuttered.

Like most of the United States, Pasadena saw a revival as World War II began. As California became a major staging area for the Pacific Theater of the war, high-tech manufacturing and scientific companies took advantage of the utilities and development of Pasadena and made it their home. This soon included NASA's Jet Propulsion Laboratory, which is still in use today. After the war, Pasadena saw further growth and diversification, with an influx of immigrants from Central America and Armenia, and African-Americans as part of the Second Great Migration.

Sunset Reservoir

The Sunset Reservoir Complex is part of the Pasadena Water & Power water distribution system and consists of two reservoirs, Sunset Reservoir No. 1 (SR-1) and Sunset Reservoir No. 2 (SR-2), that are supplied by a common inlet facility, referred to as A-Basin. SR-1 was constructed in 1888 as an open reservoir but was updated in 1899 to include a wood-framed roof and corrugated steel deck, while SR-2

was constructed in 1900; however, documents of its construction are difficult to obtain. In 1934, a four-foot concrete wall was constructed along the perimeters of both reservoirs in order to increase their storage capacity, and the roof on SR-1 was raised to accommodate the increase by splicing the original posts with new posts (Carollo 2015). The same year, a facility to aerate the water received from San Gabriel was built adjacent to the reservoirs. A full history of the project site and its structures is addressed in a Historical Resources Evaluation Report (HRER) prepared by HELIX and submitted under separate cover (McCausland 2021).

3.0 METHODS

3.1 RECORDS SEARCH

HELIX staff requested a record search of the California Historical Resources Information System (CHRIS) at the South Central Coastal Information Center (SCCIC) on April 5, 2021. The records search covered a 0.5-mile radius around the project area and included the identification of previously recorded cultural resources and locations and citations for previous cultural resources studies. A review of the CRHR, the state Office of Historic Preservation (OHP) historic properties directory, and Local Register was also conducted. The records search summary is included as Appendix B (Confidential Appendices, bound separately).

3.2 NATIVE AMERICAN CONTACT PROGRAM

HELIX contacted the Native American Heritage Commission (NAHC) on April 6, 2021, for a Sacred Lands File search and a list of Native American contacts for the project area. Letters were sent on May 17, 2021, to the eight Native American representatives and interested parties identified by the NAHC. Native American correspondence is included as Appendix C (Confidential Appendices, bound separately).

3.3 OTHER ARCHIVAL RESEARCH

Various archival sources were also consulted, focused on property-specific historical information and ethnographic literature to identify relevant background for the project area and its historical inhabitants. Research focused on a variety of primary and secondary materials, including historical maps, aerial and ground photographs, ethnographic reports, and technical reports prepared for the project. Sources consulted include the following: Huntington Library Digital Archives (plats); University of California, Santa Barbara Digital Library (aerial photographs); USGS historical topographic maps; and the Bureau of Land Management (BLM) General Land Office (GLO) Records. The purpose of this research was to identify historic structures and land use in the area.

3.4 ARCHAEOLOGICAL SURVEY

A pedestrian survey of the project site was conducted on June 3, 2021, by HELIX staff archaeologist Kassie Sugimoto. Due to the completely develop nature of the project site, standard transects were not used, although the survey consisted of a systematic inspection of all areas of exposed ground surface for evidence of the presence of prehistoric artifacts, historic artifacts, sediment discoloration that might indicate the presence of cultural middens or subsurface features, roads and trails, and depressions and other features that might indicate the former presence of structures or buildings. The project area was

photographed using a digital camera. All field notes, photographs, and records related to the current study are on file at the HELIX office in La Mesa, California.

3.5 SENSITIVITY ASSESSMENT

In circumstances where a known archaeological or tribal cultural resource is not present, HELIX assessed the potential for the presence of an undocumented resource (i.e., sensitivity). Careful consideration of the broad historical use of the project vicinity and the specific physical setting of the project, including an assessment of the likelihood of whether or not the area could contain buried material, was undertaken by a qualified HELIX archaeologist. As no subsurface archaeological investigations were undertaken as part of this assessment, the resulting sensitivity determination is by nature qualitative, ranging along a scale of probability for encountering cultural resources, designated here as low, moderate, and high. In general, for areas in which there are few indicators of prehistoric habitability, such as water sources or known sites, and poor physical integrity within the project site due to historic and modern disturbances, the resulting sensitivity assessment would be low. Areas near natural features or known sites affiliated with Native Americans, and that may have sediments present dating to the time period, would have a sensitivity assessment that would be moderate to high.

4.0 RESULTS

4.1 PREVIOUS SURVEYS

The results of records search received from SCCIC on May 10, 2011, identified six previous cultural resource studies within the half-mile record search limits, none of which occurred within the project site (Table 1, *Previous Studies within Half Mile of the Project Area*). Five of the studies were archaeological surveys or site visits, one of which included a historic resources survey; the remaining report title does not indicate the type of study but appears to have been a site visit/survey as well. These reports are summarized below in Table 1.

Table 1
PREVIOUS STUDIES WITHIN HALF MILE OF THE PROJECT AREA

Report Number (LA-)	Year	Author	Report Title
00375	1978	David M. Van Horn	Ultrasystems Project: Archaeological Report
05249	2000	Philomene C. Smith	Negative Archaeological Survey Report: Route 210:kp30.3/40.2-170-129971
07441	2005	Wayne H. Bonner	Cultural Resource Records Search and Site Visit Results for Cingular Telecommunications Facility Candidate La-987-01 (sv-025-01) Cingular Collocation, 369 West Washington Boulevard, Pasadena, Los Angeles County, California.
07457	2006	Lorna Billat	Pintoresca Park/la-0121a
08814	2006	Wayne H. Bonner and Sarah A. Williams	Cultural Resources Records Search Results and Site Visit for Cingular Wireless Candidate Lsancac155, 1190 North Fairoaks, Avenue, Pasadena, Los Angeles County, California
12284	2013	Carrie Chasteen	Historical Resources and Archaeological Survey Report for the Installation of Soundwall on I-210 Project

4.2 PREVIOUSLY RECORDED RESOURCES

The SCCIC has a record of 84 previously recorded cultural resources within a 0.5-mile radius of the project, but none have been recorded within the project area (Table 2, *Previously Recorded Resources within Half Mile of the Project Area*). All the resources recorded within the 0.5-mile search radius consist of historic built environment resources, including historic buildings and structures, districts and their contributing elements, and a park. This includes the Bungalow Courts of Pasadena, a historic district, and 82 other historic buildings with addresses on the OHP Historic Property list. All resources are summarized below in Table 2.

Table 2
PREVIOUSLY RECORDED RESOURCES WITHIN HALF MILE OF THE PROJECT AREA

Primary Number (P-19-##)	Trinomial (CA-LA-#)	Age	Description	Recorder, Date
179697	N/A	Historic	Billson House	J F Merritt, City of Pasadena, 1977
180076	N/A	Historic	950 N Marengo	C McAvoy, HRG, 1991
180085	N/A	Historic	Prospect Historic District	J. C. Terell, Pasadena Heritage, 1981
180088	N/A	Historic	Samuel Merrill House; Voided - 19-183241; Other - Merrill-Grider House	T. Gregory, The Building Biographer, 2000
180107	N/A	Historic	Sarah A Menning House	C McAvoy, HRG, 1993
180108	N/A	Historic	Dowling-Rodriguez House	C McAvoy, HRG, 1993
180109	N/A	Historic	Edwin Michner House	C. McAvoy, HRG, 1993
180110	N/A	Historic	Don Ferguson House	C. McAvoy, HRG, 1993
180112	N/A	Historic	581 N Raymond	C McAvoy, HRG, 1993
180113	N/A	Historic	Hugh B Rice House	C. McAvoy, HRG, 1993
180115	N/A	Historic	666 N Raymond	C. McAvoy, HRG, 1993
180116	N/A	Historic	Bell House	C. McAvoy, HRG, 1993
180117	N/A	Historic	Card House	C. McAvoy, HRG, 1993
180225	N/A	Historic	Sinclair House	G. Sullivan, Pasadena Cultural Heritage Program, 1978

Table 2 (cont.)
PREVIOUSLY RECORDED RESOURCES WITHIN HALF MILE OF THE PROJECT AREA

Primary Number (P-19-##)	Trinomial (CA-LA-#)	Age	Description	Recorder, Date
180227	N/A	Historic	524 N Fair Oaks	W. & M. Dean, Cultural Heritage Program, 1977
180235	N/A	Historic	40 W Peoria	C. McAvoy, HRG, 1993
180236	N/A	Historic	48 W Peoria	C. McAvoy, HRG, 1993
180237	N/A	Historic	58 W Peoria	C. McAvoy, HRG, 1993
180238	N/A	Historic	66 W Peoria	C. McAvoy, HRG, 1993
180239	N/A	Historic	78 W Peoria	C. McAvoy, HRG, 1993
180691	N/A	Historic	N Lincoln Court; Other - Bungalow Court; Voided - 19-184328; Voided - 19-183847	L. Kliwinski, Thirtieth Street Architects, 1994
180695	N/A	Historic	1274-1282 N Raymond Court; Other - Bungalow Court	L. Kliwinski, Thirtieth Street Architects, 1994
180737	N/A	Historic	Kosy Knook Court; Other - Bungalow Court	L. Kliwinski, Thirtieth Street Architects, 1994
180882	N/A	Historic	895-899 N Fair Oaks Ave	D. Miller, Urban Conservation, 1982
180883	N/A	Historic	889-893 N Fair Oaks Ave	D. Miller & N. Impostato, Urban Conservation, 1982
180884	N/A	Historic	867-875 N Fair Oaks Ave	D. Miller, Urban Conservation, 1983
180885	N/A	Historic	841 N Fair Oaks Ave	D. Miller, Urban Conservation, 1983
180887	N/A	Historic	Anderogg Residence	D. Miller, Urban Conservation, 1983
180888	N/A	Historic	735 N Fair Oaks Ave	D. Miller, Urban Conservation, 1982

Table 2 (cont.)
PREVIOUSLY RECORDED RESOURCES WITHIN HALF MILE OF THE PROJECT AREA

Primary Number (P-19-##)	Trinomial (CA-LA-#)	Age	Description	Recorder, Date
180889	N/A	Historic	F Mull Residence	H. J. McCreight, Urban Conservation, 1982
180890	N/A	Historic	886 N Fair Oaks Ave	H. McCreight & D. Miller, Urban Conservation, 1982
180891	N/A	Historic	Doane Residence	D. Miller & N. Impostato, Urban Conservation, 1983
180892	N/A	Historic	790 N Fair Oaks Ave	Unknown
180893	N/A	Historic	820 N Fair Oaks Ave	Unknown
180894	N/A	Historic	832 N Fair Oaks Ave	Unknown
180895	N/A	Historic	790, 820, 832 N Fair Oaks Ave	D. Miller, Urban Conservation, 1983
181066	N/A	Historic	Decker residence; Resource Name - Frank Decker House	D. Miller, Urban Conservation, 1983
182119	N/A	Historic	St Barnabas Church	D. Miller, Urban Conservation, 1985
182168	N/A	Historic	Court @ 940-948 N Raymond Ave; Voided - 19-187069; Voided - 19-180694	L. Kliwinski, 1994
182169	N/A	Historic	Clarence McMillian House	D. Miller, Urban Conservation, 1985
182184	N/A	Historic	George Wharton & Emma James House	D. Miller, Urban Conservation, 1985
182202	N/A	Historic	Bungalow Courts	D. Miller, Urban Conservation, 1985
182230	N/A	Historic	1036 Summit Ave	D. Miller, Urban Conservation, 1985

Table 2 (cont.)
PREVIOUSLY RECORDED RESOURCES WITHIN HALF MILE OF THE PROJECT AREA

Primary Number (P-19-##)	Trinomial (CA-LA-#)	Age	Description	Recorder, Date
183111	N/A	Historic	La Pintoresca Library	M. Valentine, Urban Conservation, 1984
183112	N/A	Historic	La Pintoresca Park	M. Valentine, Urban Conservation, 1984
183420	N/A	Historic	H L Huntington	J. Draeger & C. Anderson, Urban Conservation, 1989
183827	N/A	Historic	Raymond Court	L. Kliwinski, 1994
183828	N/A	Historic	Raymond Court	Unknown
183829	N/A	Historic	Raymond Court	Unknown
183830	N/A	Historic	Raymond Court	Unknown
183831	N/A	Historic	Raymond Court	Unknown
184209	N/A	Historic	534 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184210	N/A	Historic	Carroll Building	S. DeWolfe, Urban Conservation, 1990
184242	N/A	Historic	546 N. Fair Oaks Drive	Unknown
184243	N/A	Historic	547 N. Fair Oaks Drive	Unknown
184244	N/A	Historic	559 N. Fair Oaks Drive	Unknown
184245	N/A	Historic	565 N. Fair Oaks Drive	Unknown
184246	N/A	Historic	650 N. Fair Oaks Drive	Unknown
184300	N/A	Historic	566-572 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184301	N/A	Historic	574-578 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184302	N/A	Historic	584 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184303	N/A	Historic	587-589 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184304	N/A	Historic	590 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184305	N/A	Historic	599 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184306	N/A	Historic	600 N. Fair Oaks Drive	C. McAvoy, HRG, 1993

Table 2 (cont.)
PREVIOUSLY RECORDED RESOURCES WITHIN HALF MILE OF THE PROJECT AREA

Primary Number (P-19-##)	Trinomial (CA-LA-#)	Age	Description	Recorder, Date
184307	N/A	Historic	604 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184308	N/A	Historic	512 N. Fair Oaks Drive	C. McAvoy, HRG, 1993
184325	N/A	Historic	520 Lincoln	C. McAvoy, HRG, 1993
184326	N/A	Historic	Wampler Apts.	C. McAvoy, HRG, 1993
184327	N/A	Historic	527 Lincoln	C. McAvoy, HRG, 1993
184329	N/A	Historic	557-559 Lincoln	C. McAvoy, HRG, 1993
184330	N/A	Historic	94 W. Peoria	C. McAvoy, HRG, 1993
184331	N/A	Historic	100 W. Peoria	C. McAvoy, HRG, 1993
184333	N/A	Historic	41 W. Villa	C. McAvoy, HRG, 1993
184334	N/A	Historic	55 W. Villa	C. McAvoy, HRG, 1993
184348	N/A	Historic	47 W. Villa	Unknown
184715	N/A	Historic	Rose & Capatano Confectionary	S. DeWolfe, Urban Conservation, 1990
184716	N/A	Historic	Patterson-Sanders Garage	S. DeWolfe, Urban Conservation, 1990
184717	N/A	Historic	J B Asman Barber Shop	S. DeWolfe, Urban Conservation, 1990
189992	N/A	Historic	New Fair Oaks Historic District	Unknown
189997	N/A	Historic	Bristol-Cypress Historic District	Unknown
190332	N/A	Historic	Gossett Residence	Carrie Chasteen, Parsons, 2013
190590	N/A	Historic	Pasadena Arroyo Parks and Recreation District, NRHP Registered District	Carrie Chasteen, Parsons, 2013
190680	N/A	Historic	Bungalow Courts of Pasadena, Historic District	Teresa Grimes, Pasadena Heritage, 2007

4.3 NATIVE AMERICAN CONTACT PROGRAM

HELIX contacted the NAHC on April 6, 2021, for a Sacred Lands File search and a list of Native American contacts for the project area. The NAHC indicated in a response dated April 21, 2021, that no known sacred lands or Native American cultural resources are within the project area, but that the absence of specific site information in the Sacred Lands File does not indicate the absence of cultural resources in the project area. Letters were sent on May 17, 2021, to the eight Native American contacts identified by the NAHC. The only response received to date is from the Gabrieleno Band of Mission Indians - Kizh Nation, requesting contact information for the lead agency. If any additional responses are received, they will be forwarded to PWP staff. PWP is undertaking AB 52 notifications to those Tribes who have requested notification and will initiate consultation if requested by those Tribes. Information resulting from these consultations will be used to help assess project impacts and will be incorporated into this report, as appropriate (only non-confidential material will be included). Native American correspondence is included as Appendix C (Confidential Appendices, bound separately).

4.4 OTHER ARCHIVAL RESEARCH

Historic aerials from 1928, 1944, 1956, 1960, 1962, and 1973 were reviewed, as were historic USGS topographic maps, including the 1894 Los Angeles, 1896 Pasadena, and 1900 Pasadena (1:62,500), along with the 1928 Altadena (1:24,000), and 1953, 1966, 1972, and 1988 Pasadena (1:24,000) topographic maps. Also reviewed were seven BLM plat survey maps (two from 1870 and one each from 1871, 1876, 1893, 1900, and 1904), along with several other historic maps of the area.

The early survey plat maps showed the project area within the western boundary of Rancho San Pasqual, and when referencing historic maps of the area, the Sunset Reservoir is visible in multiple maps. This includes Henry Hancock's 1858 "Map of Rancho San Pascual finally confirmed to Manuel Garfias", which shows three structures surrounding the project area, a trail that runs along the north, west, and south edges of the project area, and a ditch or waterway that runs from the reservoir east. A map from 1876, "Map Showing the Property of the Lake Vineyard Land and Water Association", places the reservoir within land owned by the San Gabriel Orange Grove Association, and Hancock's 1880 "Rancho San Pasqual: Pasadena" supports this, with the addition of a north/south road that runs just to the east of the reservoir.

By the 1894 Los Angeles quadrangle map, the reservoir is surrounded by four roads, with a few structures to the east. There is no change in the 1896 and the 1900 Pasadena topographic maps, and by the 1928 Altadena quadrangle map, the reservoir has expanded as a single large reservoir, and the surrounding area has been developed much more, with structures recorded around the area. In the 1953 topographic map, the reservoir receives its first label as Sunset Reservoir, with the entire area coded as a residential neighborhood, which changes in 1966 to the areas directly west of the reservoir being coded as commercial. Additionally, both SR-1 and SR-2 are recorded on the map, and a park is now present south of the reservoir. The 1972 Pasadena map shows the expansion of the I-210 freeway to the east of the project, and by 1988 it is shown as completed, with East Mountain Avenue being re-routed to its current alignment. The aerial photographs show the changes from 1928 onward, with both reservoirs visible in the heavily populated neighborhoods, as well as the construction of the I-210 freeway and Mountain Avenue re-alignment visible in the 1973 aerial.

4.5 SURVEY RESULTS

No archaeological sites have been previously documented within the project area, and the survey did not identify any new cultural resources within the project area. Visibility was excellent for the project area; however, ground surface visibility was almost non-existent due to existing structures and asphalt. Based on the sediments present along the edges and in areas of ornamental vegetation, it is estimated that fill dirt, or disturbed redeposited sediment, is present across the entirety of the project area.

5.0 SUMMARY AND MANAGEMENT RECOMMENDATIONS

A study was undertaken to identify the cultural resources that are present in the Sunset Complex Project area and to determine the effects of the project on historical resources per CEQA and historic properties per the NHPA. The cultural resources survey did not identify any cultural resources within the project area other than built environment resources, which are addressed in a separate HRER (McCausland 2021). Therefore, no impacts to non-built-environment cultural resources are anticipated.

The entire APE has been disturbed by the development of the existing Sunset Reservoir and associated buildings beginning in the nineteenth century and continuing into the twentieth century. The 84 resources recorded within a half-mile of the project area are all historic structures, districts, and contributing elements to the historic districts.

5.1 SENSITIVITY ASSESSMENT

While no archaeological resources were identified in the CHRIS records search within the project site and a 0.5-mile radius, and the Sacred Lands File records search did not identify any sacred lands or TCRs in the project area, review of ethnographic literature and historical maps did identify the documentation of significant Native American villages and sites nearby.

The project site is east of the Arroyo Seco, currently located approximately 0.8 mile to the west of the project area, within the river's historical floodplain. Minor shifts in the main channel of the river have occurred numerous times in recorded history, including two significant shifts in 1862 and 1884. The general proximity of the project site to areas of known habitation, the river, and broad travel corridors has the effect of an overall increase in the sensitivity for unknown archaeological sites and tribal cultural resources, at least higher than low background levels, particularly for the archaeological remains of temporary open camps. Such camps are typically identified by the presence of hearth features, ground stone, and other types of artifact assemblages. However, additional factors related to the preservation of such materials are considered with respect to alluvial depositional settings within the area, as discussed below.

The Tataviam village known as *Hahamon'ga* is the closest ethnographically documented Indigenous community to the project site. *Hahamon'ga* is estimated to be located in the upper part of the Arroyo Seco, in the area now owned by the JPL, approximately 2.65 miles north-northwest of the project site. Archival research has also identified several other nearby ethnographic villages, including *Akuronga,* which is theorized to be approximately 4.65 miles southeast of the project site, near La Presa Drive and Huntington Drive; *Sonaangaha*, which is described as being located at the current location of the San

Marino High School, approximately 4.15 miles southeast; *Alyeupkigna* which is located approximately six miles east-southeast, near Baldwin Lake on the Santa Anita Ranch; and *Sisitkanonga*, which is estimated to be located along the banks of Eaton Creek, approximately 4.8 miles northeast of the project. Like *Hahamon'ga*, these other villages were described in ethnographic accounts, but the exact locations are unknown (McCawley 1996).

The project site is on the south-central portion of the City's original 1849 annexation boundary. Maps and historical accounts characterize the project site and surroundings as open fields, likely used for livestock grazing and agriculture. However, the reservoir is present on historic maps as early as 1858 and has continued to be expanded and updated ever since. The project site was subject to updates and additional construction in 1888, 1899, 1900, and 1934. These construction episodes have compromised the integrity of the physical setting and likely destroyed or displaced any archaeological resources that may have been deposited on the surface or shallowly buried. However, it has been demonstrated elsewhere, both in Pasadena and portions of Los Angeles, that deeply buried archaeological deposits can exist within alluvium below Historic-period disturbances and may also be intermixed with Historic-period debris. Alluvial deposits within the geographic region can be massive, extending well below the surface, and may contain sediments deposited before human occupation of North America. Furthermore, most accumulations of alluvial sediments were formed by a combination of high- and low-energy depositional events. High-energy events are less likely to have preserved any material remains left on the surface by Native Americans, while low-energy floods tend to produce more favorable environments for the preservation of cultural materials. Thus, low-energy alluvial sediments dating to the Late Pleistocene or Holocene time periods have the greatest potential for preserving archaeological resources. There is no absolute measure of depth below the surface in which sediments with these properties occur, and site-specific conditions must be considered. Also, such soil conditions are an indicator of a setting favorable for preservation, but the presence of soils with these properties is not an absolute indicator of the presence of archaeological or tribal cultural resources.

Another important consideration is the amount of past disturbance that has affected the project site. During the field visit on June 3, 2021, discussions with PWP staff indicated that ground disturbances beneath the project site are predicted to be between 60 and 70 feet beneath the ground surface. A pipeline was placed under the site and within the public right of way to provide water from Devils Gate Dam to the project site during the early part of the twentieth century (the dam was constructed in 1920). This pipe was dug up during World War II in order to repurpose the metal for airplane material. Over the decades, the project site has been the subject of a great deal of excavation to update the facilities and the subsurface infrastructure, disrupting the integrity of any subsurface resources that might have been present at one time. Based on this, HELIX finds the sensitivity for unidentified archaeological and tribal cultural resources within the project site to be low.

5.2 MANAGEMENT RECOMMENDATIONS

Based on the results of the current study, no known historic properties per the NHPA or historical resources per CEQA will be affected by the Sunset Complex Project in terms of archaeological or tribal cultural resources; historic built environment resources are addressed separately in the HRER (McCausland 2021). Due to the extensive disturbances to the project site over many decades, the potential for subsurface cultural resources is considered to be low. Therefore, no mitigation measures are required, and construction monitoring is not recommended.

In the event that cultural material is encountered during construction, ground-disturbing activities in the immediate area of the find should be halted until a qualified archaeologist is notified and assesses the resources. If significant cultural material is encountered, the qualified archaeologist will coordinate with the Consulting Tribe(s) and PWP staff to develop and implement appropriate avoidance or mitigation measures.

In the unlikely event that human remains are discovered, the County Coroner shall be contacted. If the remains are determined to be of Native American origin, the Most Likely Descendant, as identified by the NAHC, shall be contacted in order to determine proper treatment and disposition of the remains. All requirements of Health & Safety Code §7050.5 and PRC §5097.98 shall be followed.

Should the project limits change to incorporate new areas of proposed disturbance, an archaeological survey of these areas will be required.

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Appendix A

Resumes of Key Personnel

Trevor Gittelhough, RPA

Cultural Resources Assistant Project Manager

HELIX Environmental Planning

Summary of Qualifications

Trevor H. Gittelhough is an archaeological assistant project manager, specializing in underwater cultural resources, with over a decade of experience in archaeology, including both cultural resources management and academic projects. This experience includes site monitoring; surveys and excavations; laboratory sorting, cataloging, and analysis; and conservation. He has conducted environmental, paleontological, and cultural resources work throughout California, Nevada, Oregon, and Florida in support of compliance with California Environmental Quality Act (CEQA), National Environmental Policy Act (NEPA) and Sections 106 and 110 of the National Historic Preservation Act (NHPA) for public and private sector clients including a range of local, state, and federal agencies such as Southern California Edison, the United States Navy and Air Force, Caltrans, and FEMA.

He has experience in team management in the terrestrial and underwater archaeological management sectors, with expertise in implementation of mitigation and monitoring projects, report production, and coordination with Indigenous groups. Underwater and Indigenous archaeology are Mr. Gittelhough's specialties, which are enhanced by his skill and experience in sailing, diving, and prehistoric technology construction. His research interests include maritime technologies and practices, settlement patterns, trade and exchange, colonial interactions, prehistoric technologies, and anthropological/ archaeological theory. In addition, he has expertise in illustration of artifacts, stratigraphic and excavation unit profiles, site maps, GIS, remote sensing, and underwater excavation and mapping techniques.

Mr. Gittelhough's technical skills include terrestrial and submerged archaeological survey, excavation, and site testing. He has authored numerous site records and technical reports detailing the results of cultural resources work, as well as academic articles. He has also had thorough training in artifact analysis and specializes in lithic analysis and maritime conservation. His academic background includes advanced training in conservation and underwater archaeology. He has extensive training at the graduate level and earned his M.A. from East Carolina University. Mr. Gittelhough is Registered Professional Archaeologist, a member of the Society for American Archaeology (SAA), a member of the Society for Historical Archaeology (SHA), and a member of the Society for California Archaeology (SCA).

Selected Project Experience

Bouquet Canyon Road Project, Los Angeles County, CA (2021). Cultural Resource Specialist serving as lead archaeological monitor and technical report writer for this project in the City of Santa Clarita. This work included monitoring all ground-disturbing

Education

Master of Arts, Maritime Studies, East Carolina University, 2019

Bachelor of Arts, Archaeology, University of California, Santa Barbara, 2011

Registrations/ Certifications

Register of Professional Archaeologists, 2018

HAZWOPER Certification; 2018 – 2021

ESRI GIS Certification
AAUS Scientific Diver
Red Cross First AID
Red Cross CPR DAN
Divers First Aid

Professional Affiliations

Society for American Archaeology
Society for Historical Archaeology
Society for California Archaeology

activities associated with geotechnical studies, such as drilling and trenching. Monitoring was also undertaken during ground penetrating radar studies of portions of the project area.

California Crossings, Attisha Trust Parcel, San Diego County, CA (2021). Cultural Resource Specialist for a cultural resources study in support of biological mitigation measures (burrowing owl habitat creation) for the proposed Project in the County of San Diego. Prepared an archaeological resources assessment in compliance with state and federal regulations. Scope included a cultural resources records search, review of historic maps and aerials, and preparation of a technical report.

Enchanted Hills Park Project, Perris, Riverside County, CA (2021). Cultural Resource Specialist for a monitoring program during initial sitework for this project in the City of Perris, in Riverside County. Prepared monitoring letter report.

Mission Basin Groundwater Purification Facility Well Expansion and Brine Minimization Project, Oceanside, San Diego County, CA (2021). Cultural Resource Specialist for a cultural resources study in support of the proposed Project in the City of Oceanside, in northern San Diego County. Prepared a monitoring results memo for monitoring of geotechnical investigations and assisted with preparation of the cultural resources technical report in compliance with state and federal regulations. Scope included a cultural resources records search, preparation of a letter report/memo, and assistance with the technical report.

Oak Shores/Lake Morena Views MWC Consolidation Project, San Diego County, CA (2021). Cultural Resource Specialist for a cultural resources study in support of the proposed Project in eastern San Diego County. Assisted with preparation of a cultural resources technical report in compliance with state and federal regulations, as well as State Water Resources Control Board. Scope included a cultural resources records search, review of historic maps and aerials, and assistance with preparation of a technical report.

Archaeological Monitoring for the P-586 Missile Assembly Building - San Nicolas Island, Ventura County, CA (2021). Cultural Resource Specialist serving as archaeological monitor and technical report writer. This work included monitoring all ground-disturbing activities, including grubbing, grading, and trenching. Monitoring included close involvement with United States Navy personal and Tribal Members and Observers.

Shady View Residential Project Environmental Impact Report, Chino Hills, San Bernardino County, CA (2021). Cultural Resource Specialist for a cultural resources study in support of the proposed Project in the City of Chino Hills in San Bernardino County. Assisted in the preparation of the technical report in compliance with state and federal regulations. Project scope included a cultural resources records search, review of historic maps and aerials, field survey, and preparation of a technical report.

Trevor Gittelhough, RPA

Cultural Resources Assistant Project Manager

Previous Project Experience

Los Angeles County Natural History Museum Center for History and Cultural Project, Los Angeles County, CA. Assistant Project Manager for a cultural resources study in support of the proposed Project in the downtown area of the City Los Angeles. Prepared an archaeological and tribal cultural resources assessment in compliance with CEQA, specifically Assembly Bill 52. Scope included a cultural resources records search, review of historic maps and aerials, and preparation of a technical study for submittal to the Department of City Planning.

Environmental Services Support for the Villages at The Alhambra Project, Los Angeles County, CA. Assistant Project Manager for a cultural resources study in support of the proposed Project in the downtown area of the City Los Angeles. Prepared an archaeological and tribal cultural resources assessment in compliance with CEQA, specifically Assembly Bill 52. Scope included a cultural resources records search, review of historic maps and aerials, and preparation of a technical study for submittal to the Department of City Planning.

Tierra Crossing Tribal Cultural Resource and Archaeological Assessment, Los Angeles, CA. Assistant Project Manager for a cultural resources study in support of the proposed Project in the downtown area of the City Los Angeles. Prepared an archaeological and tribal cultural resources assessment in compliance with CEQA, specifically Assembly Bill 52. Scope included a cultural resources records search, review of historic maps and aerials, and preparation of a technical study for submittal to the Department of City Planning.

Tribal Cultural Resources Assessment for the 17346 Sunset Project, Los Angeles, CA. Assistant Project Manager for a cultural resources study in support of the proposed Project in the downtown area of the City Los Angeles. Prepared a tribal cultural resources assessment in compliance with CEQA, specifically Assembly Bill 52. Scope included a cultural resources records search, review of historic maps and aerials, and preparation of a technical study for submittal to the Department of City Planning.

Mary Robbins-Wade, RPA

Cultural Resources Group Manager

Summary of Qualifications

Ms. Robbins-Wade has 41 years of 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 under the California Environmental Quality Act (CEQA), as well as numerous archaeological studies under various federal jurisdictions, addressing Section 106 compliance and National Environmental Policy Act (NEPA) issues. She has excellent relationships with local Native American communities and the Native American Heritage Commission (NAHC), as well as has supported a number of local agency clients with Native American consultation under State Bill 18 and assistance with notification and Native American outreach for Assembly Bill 52 consultation. Ms. Robbins-Wade is a Registered Professional Archaeologist (RPA) and meets the U.S. Secretary of the Interior's Professional Qualifications for prehistoric and historic archaeology.

Selected Project Experience

12 Oaks Winery Resort. Project Manager/ Principal Investigator for a cultural resources survey of approximately 650 acres for a proposed project in the County of Riverside. Oversaw background research, field survey, site record updates, Native American coordination, and report preparation. Met with Pechanga Cultural Resources staff to discuss Native American concerns. Worked with applicant and Pechanga to design the project to avoid impacts to cultural resources. Work performed for Standard Portfolio Temecula, LLC.

28th Street between Island Avenue and Clay Avenue Utilities Undergrounding Archaeological Monitoring. Project Manager/Principal Investigator for a utilities undergrounding project in a historic neighborhood of East San Diego. Responsible for project management; coordination of archaeological and Native American monitors; coordination with forensic anthropologist, Native American representative/Most Likely Descendent, and City staff regarding treatment of possible human remains; oversaw identification of artifacts and cultural features, report preparation, and resource documentation. Work performed for the City of San Diego.

Archaeological Testing F11 Project. Project Manager for a cultural resources study for a proposed mixed-use commercial and residential tower in downtown San Diego. Initial work included an archaeological records search and a historic study, including assessment of the potential for historic archaeological resources. Subsequent work included development and implementation of an archaeological testing plan, as well as construction monitoring and the assessment of historic archaeological resources encountered. Work performed for the Richman Group of Companies.

Education

Master of Arts, Anthropology, San Diego State University, California, 1990

Bachelor of Arts, Anthropology, University of California, Santa Barbara, 1981

Registrations/ Certifications

Caltrans, Professionally Qualified Staff-Equivalent Principal Investigator for prehistoric archaeology, , Bureau of Land Management Statewide Cultural Resource Use Permit (California), permit #CA-18-35, , Register of Professional Archaeologists #10294, 1991

County of San Diego, Approved CEQA Consultant for Archaeological Resources, 2007

, Orange County Approved Archaeologist, 2016

Blended Reverse Osmosis (RO) Line Project. Project Manager/ Principal Investigator for cultural resources monitoring during construction of a 24-inch recycled water pipeline in the City of Escondido. Oversaw monitoring program, including Worker Environmental Awareness Training; responsible for Native American outreach/coordination, coordination with City staff and construction crews, and general project management. Work performed for the City of Escondido.

Buena Sanitation District Green Oak Sewer Replacement Project. Project Manager/Principal Investigator for a cultural resources testing program in conjunction with a proposed sewer replacement project for the City of Vista. Oversaw background research, fieldwork, site record update, Native American coordination, and report preparation. Work performed for Harris & Associates, Inc., with the City of Vista as the lead agency.

Cactus II Feeder Transmission Pipeline IS/MND. Cultural Resources Task Lead for this project in the City of Moreno Valley. Eastern Municipal Water District proposed to construct approximately five miles of new 30-inch to 42 inch-diameter pipeline; the project would address existing system deficiencies within the City and provide supply for developing areas. Oversaw background research, field survey, and report preparation. Responsible for Native American outreach for cultural resources survey. Assisted District with Native American outreach and consultation under AB 52. Work performed under an as-needed contract for Eastern Municipal Water District.

Dale 2199C Pressure Zone Looping Pipeline Project. Cultural Resources Task Lead for this project in Moreno Valley. Eastern Municipal Water District proposed construction of a new pipeline to connect two existing pipelines in the District's 2199C Pressure Zone. The pipeline would consist of an 18-inch-diameter pipeline between Kitching Street and Alta Vista Drive that would connect to an existing 12-inch-diameter pipeline in the northern end of Kitching Street and to an existing 18-inch-diameter pipeline at the eastern end of Alta Vista Drive. The project will improve reliability and boost the Dale Pressure Zone's baseline pressure and fire flow availabilities. Four potential alignments were under consideration; three of these bisect undeveloped land to varying degrees, while the other is entirely situated within developed roadways. Oversaw background research and field survey. Responsible for Native American outreach for cultural resources survey and co-authored technical report. Work performed under an as-needed contract for Eastern Municipal Water District.

Downtown Riverside Metrolink Station Track & Platform Project. Cultural Resources Task Lead for this project involving changes to and expansion of the Downtown Riverside Metrolink Station. Overseeing records search and background information, archaeological survey, and report preparation. Responsible for coordination with Native American Heritage Commission, Riverside County Transportation Commission (RCTC), and Federal Transportation Authority (FTA) on Native American outreach. Work performed for Riverside County Transportation Commission as a subconsultant to HNTB Corporation.

Emergency Storage Pond Project. Project Manager/Principal Investigator for a cultural resources testing program in conjunction with the Escondido Recycled Water Distribution System - Phase 1. Two cultural resources sites that could not be avoided through project design were evaluated to assess site significance and significance of project impacts. Work included documentation of bedrock milling

features, mapping of features and surface artifacts, excavation of a series of shovel test pits at each site, cataloging and analysis of cultural material recovered, and report preparation. The project is located in an area that is sensitive to both the Kumeyaay and Luiseño people, requiring close coordination with Native American monitors from both groups. Work performed for the City of Escondido.

Escondido Brine Line Project. Project Manager/Principal Investigator for cultural resources monitoring during construction of approximately 2.3 miles of a 15-inch brine return pipeline in the City of Escondido. The project, which is part of the City's Agricultural Recycled Water and Potable Reuse Program, enables discharge of brine recovered from a reverse osmosis facility that is treating recycled water; it is one part of the larger proposed expansion of Escondido's recycled water distribution to serve eastern and northern agricultural land. The project is located in an area that is sensitive to both the Kumeyaay and Luiseño people, requiring close coordination with Native American monitors from both groups. Oversaw monitoring program, including Worker Environmental Awareness Training; responsible for Native American outreach/coordination, coordination with City staff and construction crews, and general project management. Work performed for the City of Escondido.

Hacienda del Mar EIR. Senior Archaeologist for a proposed commercial development project for a senior care facility in Del Mar. Assisted in the preparation of associated permit applications and an EIR. Oversaw background research, updated records search and Sacred Lands File search, monitoring of geotechnical testing, coordination with City staff on cultural resources issues, and preparation of updated report. Prior to coming to HELIX, served as Cultural Resources Task Lead for the cultural resources survey for the project, conducted as a subcontractor to HELIX. Work performed for Milan Capital Management, with the City of San Diego as the lead agency.

Lilac Hills Ranch. 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. Oversaw background research, field survey, testing, recording of archaeological sites and historic structures, and report preparation. Responsible for development of the research design and data recovery program, preparation of the preservation plan, and Native American outreach and coordination. 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 cultural resource. The project changed over time, so additional survey areas were included, and a variety of off-site improvement alternatives were addressed. Work performed for Accretive Investments, Inc. with County of San Diego as the lead agency.

Moulton Niguel Water District Regional Lift Force Main Replacement. Cultural Resources Task Lead/Principal Investigator for the replacement of a regional lift station force main operated by Moulton Niguel Water District (MNWD). The project comprises an approximately 9,200 linear foot alignment within Laguna Niguel Regional Park in Orange County, in an area that is quite sensitive in terms of cultural resources. HELIX is supporting Tetra Tech throughout the preliminary design, environmental review (CEQA), and final design, including permitting with applicable state and federal regulatory agencies. The cultural resources survey will inform project design, in order to avoid or minimize potential impacts to cultural resources. Oversaw background research and constraints analysis, Native American

coordination, cultural resources survey, coordination with MNWD and Tetra Tech, and report preparation. Work performed for MNWD, as a subconsultant to Tetra Tech.

Murrieta Hot Springs Road Improvements Project. Principal Investigator/Cultural Resources Task Lead for cultural resources survey in support of an Initial Study/Mitigated Negative Declaration (IS/MND) for the widening of Murrieta Hot Springs Road in the City of Murrieta. The project would widen or restripe Murrieta Hot Springs Road between Winchester Road and Margarita Road from a 4-lane roadway to a six-lane roadway to improve traffic flow, as well as provide bike lanes in both directions along this segment. A new raised median, light poles, signage, stormwater catch basins, retaining walls, and sidewalks would also be provided on both sides of the roadway, where appropriate. The project area is in a location that is culturally sensitive to the Native American community. The cultural resources study included tribal outreach and coordination to address this cultural sensitivity.

Park Circle - Cultural Resources. Project Manager/Principal Investigator of a cultural resources survey and testing program for a proposed 65-acre residential development in the Valley Center area of San Diego County. The project is located along Moosa Creek, in an area that is culturally sensitive to the Luiseño people. Oversaw background research, historic study, field survey, testing, recording archaeological sites and historic structures, and report preparation. Responsible for Native American outreach and coordination. The cultural resources study included survey of the project area, testing of several archaeological sites, and outreach and coordination with the Native American community, as well as a historic study that addressed a mid-20th century dairy barn and a late 19th century vernacular farmhouse. Work performed for Touchstone Communities.

Peacock Hill Cultural Resources. Project Manager/Principal Investigator of a cultural resources study update for a residential development in Lakeside. Oversaw updated research, fieldwork, lab work, analysis by forensic anthropologists, report preparation, and Native American coordination. In the course of outreach and coordination with the Native American (Kumeyaay) community, possible human remains were identified, prompting additional fieldwork, as well as coordination with the Native American community and forensic anthropologists. Work performed for Peacock Hill, Inc.

Sky Canyon Sewer Environmental Consulting. Cultural Resources Task Lead for this project adjacent to the City of Murrieta in southwestern Riverside County. Eastern Municipal Water District (District) proposed to implement the Sky Canyon Sewer Main Extension Project to construct approximately 6,700 linear feet of new gravity-fed 36-inch-diameter sewer main to provide additional sewer capacity for planned development. The proposed 36-inch-diameter sewer main would extend the existing 36-inch-diameter French Valley Sewer at Winchester Road further downstream to Murrieta Hot Springs Road. Oversaw background research and field survey. Responsible for Native American outreach for cultural resources survey and co-authored technical report. Assisted District with Native American outreach and consultation under AB 52. Work performed under an as-needed contract for Eastern Municipal Water District.

Kassie Sugimoto, M.A.

Cultural Resources Project Manager I

HELIX Environmental Planning

Summary of Qualifications

Ms. Sugimoto has 10 years of professional experience in archaeology. She has worked in Southern California archaeology for 6 years, including work in historic archaeology, prehistoric archaeology, human osteology, and close coordination with Native American tribes. She has directed test and data recovery investigations, monitoring programs, and archaeological site surveys, and has prepared reports for various cultural resource management projects. She is well-versed in National Historic Preservation Act, National Environmental Policy Act (NEPA), and California Environmental Quality Act (CEQA) regulations and processes.

Selected Project Experience

Darco Project (TTM 31589) (2021). Archaeologist for cultural services provided in support of the Darco Residential Development Project, located in the City of Moreno Valley (City), Riverside County, California. HELIX was contracted by D.R. Horton to provide a Phase I archaeological study to meet the requirements of the City. The study included a records search from the Eastern Information Center; a Sacred Lands File search through the NAHC; tribal outreach with the local Native American community, as identified by the NAHC; review historic maps and aerial photographs of the project area; a field survey of approximately 36 acres; and preparation of a cultural resources survey report detailing the methods and results of the study, as well as recommendations.

Morningstar Village (2021). Archaeologist for cultural services provided in support of the Morningstar Village Project located in the community of French Valley, unincorporated Riverside County, California. HELIX was contracted by Morningstar Village LLC to provide a cultural resource study in support of a 404 Pre-Construction Notification application for a Nationwide Permits; the report addressed both CEQA and Section 106 of the National Historic Preservation Act to support agency permitting. The study included a records search from the Eastern Information Center; a Sacred Lands File search through the NAHC; tribal outreach with the local Native American community, as identified by the NAHC; review historic maps and aerial photographs of the project area; a field survey of the United States Army Corp of Engineers (USACE) permit area; and preparation of a cultural resources report detailing the methods and results of the study, as well as recommendations. An additional letter report was prepared for the USACE to summarize the cultural resources within the USACE permitting area, and additional tribal outreach was conducted at the request of USACE.

Education

Master of Arts, Anthropology, North Carolina State University, Raleigh, 2015

Bachelor of Arts, Archaeology, California State University Dominguez Hills, 2013

Professional Affiliations

Member, Project Management Institute (PMI), 2019-Present

Member, Society for American Archaeology, 2013-Present

Kassie Sugimoto, M.A.

Cultural Resources Project Manager I

Oak Valley Town Center (2021). Archaeologist for cultural services provided in support of the Oak Valley Town Center Project located in the City of Calimesa (City), Riverside County (County), California. HELIX was contracted by Oak Valley Development Company to provide a Phase 1 cultural resources study to the standards of the City of Calimesa; the report will address both CEQA and Section 106 of the National Historic Preservation Act, to support agency permitting. The study included a records search from the Eastern Information Center; a Sacred Lands File search through the NAHC; tribal outreach with the local Native American community, as identified by the NAHC; review historic maps and aerial photographs of the project area; conduct a field survey of approximately 244 acres; and prepare a cultural resources report detailing the methods and results of the study, as well as recommendations.

Sandalwood Commercial Development Project (2021). Archaeologist for cultural services provided in support of the Sandalwood Commercial Development Project, located in the City of Calimesa (City), Riverside County, California. HELIX was contracted by J&T Investments to provide a Phase I archaeological study to meet the requirements of the City. The study included a records search from the Eastern Information Center; a Sacred Lands File search through the NAHC; tribal outreach with the local Native American community, as identified by the NAHC; review historic maps and aerial photographs of the project area; conduct a field survey of approximately 10 acres; and prepare a cultural resources survey report detailing the methods and results of the study, as well as recommendations.

Sky Canyon Sewer Main Extension (2021). Archaeologist for cultural services provided in support of the Sky Canyon Sewer Main Extension Project located in the city of Murrieta, Riverside County, California. A Cultural Resources Monitoring Plan (CRMP) was developed in consultation with the consulting Tribe for the construction of approximately 6,700 linear feet of new gravity-fed 36 inch diameter sewer main proposed by the lead agency, the Eastern Municipal Water District. HELIX provided cultural services, including Native American Outreach and Coordination, development of a CRMP, Cultural Resources Monitoring, and a letter report upon completion of the archaeological monitoring program.

McCanna Hills Addendum to an Environmental Impact Report, Riverside County, California. Archaeologist for preparation of an addendum to EIR319 previously prepared for the McCanna Ranch Specific Plan near Lake Perris in western Riverside County.

Archaeological Studies for a Riverside County Parcel (APN 436-360-009), Riverside County, California. Project Manager and Project Archaeologist for execution and management of the project contract with the client, conducted field and archival research, prepared technical documents for the City of San Jacinto. Work performed for Panorama Properties, Inc.

Lincoln Van Buren Project, Riverside, California. Archaeologist for Phase I studies for the development of a gas station. Field archaeologist for archaeological survey. Work performed for Psomas.

University of California Riverside (UCR), Riverside, California. Archaeologist for Phase I studies for as needed contract. Field archaeologist for archaeological and historic surveys. Work performed for Psomas.

Cultural Resources Studies for the City of San Jacinto, San Jacinto, California. Project Manager and Project Archaeologist. Executed and managed the project's contract with the client, conducted field and archival research, prepared technical documents for the City for Assessor Parcel Numbers 439-112-032, 033, 034, 036, 003, 004, 007, 008, and 009. Work performed for Mark Development.

Appendix B

Records Search
(Confidential, bound separately)

Appendix C

Native American Correspondence
(Confidential, bound separately)

Appendix D

Historic Resources Evaluation Report

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HELIX Environmental Planning

Pasadena Sunset Reservoir Complex Project

Historic Resources Evaluation Report

June 2022; Revised February 2025 | 00407.00036.001

Submitted to:

City of Pasadena
Department of Water and Power
150 South Los Robles Avenue, Suite 200
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Prepared for:

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Prepared by:

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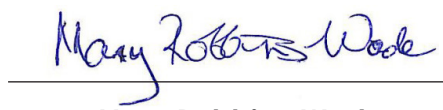

Mary Robbins-Wade
Cultural Resources Group Manager

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National Archaeological Database Information

Authors:	Debi Howell-Ardila, M.H.P., Annie McCausland, M.A., and Teri Delcamp, M.A.
Firm:	HELIX Environmental Planning, Inc.
Client/Project:	Kennedy-Jenks / Pasadena Sunset Reservoir Complex Project
Report Date:	February 2025
Report Title:	Historic Resources Evaluation Report, Pasadena Water and Power, Sunset Reservoir Complex Project, Pasadena, Los Angeles County, California
Submitted to:	City of Pasadena Water and Power Department
Type of Study:	Intensive-Level Historic Resources Evaluation
New Sites:	Sunset Reservoir Complex
Updated Sites:	None
USGS Quad:	Pasadena 7.5' Quadrangle
Acreage:	Approximately 9.15 acres
Key Words:	Los Angeles County; Township 1 North, Range 12 West; City of Pasadena; Sunset Avenue; West Mountain Street; West Hammond Street; Glen Avenue; Sunset Reservoir Complex Historic District; architect Breo Freeman

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EXECUTIVE SUMMARY

PURPOSE AND SCOPE

HELIX Environmental Planning, Inc. (HELIX) was retained by Kennedy-Jenks Consultants (Client) to provide historic resource consulting services in support of the Sunset Reservoir Complex Project (project) in the City of Pasadena, Los Angeles County, California. Located in northwest Pasadena at the intersection of West Mountain Street and Sunset Avenue (Assessor's Parcel Number 5728-021-916), the project is located in Township 1 North, Range 12 West on the U.S. Geological Survey (USGS) 7.5 minute Pasadena quadrangle.

The Sunset Reservoir Complex has operated as a facility of Pasadena's Department of Water and Power from the late nineteenth century through the present. With a span of 350 feet for Reservoir No. 1 and 525 feet for Reservoir No. 2, this surviving remnant of Pasadena's early water history spans nearly 160,000 square feet, roughly equivalent to three football fields. The proposed project would demolish and replace Reservoirs No. 1 and No. 2, constructed in circa 1888 and 1900, respectively, along with several associated structures occupying the 9.15-acre parcel.

The purpose of this report is to provide the substantial evidence necessary to determine whether any of the of-age components of the Sunset Reservoir Complex, in whole or in part, meet federal, state, or local eligibility criteria and therefore qualify as historical resources pursuant to the California Environmental Quality Act (CEQA). This report has also been prepared to comply with Section 106 of the National Historic Preservation Act (NHPA), as amended, in support of a potential funding application to a federal agency. A project under Section 106 is known as an undertaking. For the purposes of this report, the project area, or the undertaking's Area of Potential Effects (APE), is 9.15 acres.

This intensive-level historic resource evaluation report (HRER) builds on and supplements a previous study, completed in 2017, by architectural historian Jenna Snow. As a result of the 2017 evaluation, seven structures over 50 years of age within the Sunset Reservoir Complex were found eligible for listing in the California Register of Historical Resources (CRHR) and as local City Landmarks. Updates to the 2017 report provided in this evaluation include an analysis of historic integrity of the complex and its components; a consideration of the complex as a potential historic district; the establishment of a period of significance; the identification of primary and secondary contributors; recommended mitigation measures; and recordation of the resource on California Department of Parks and Recreation (DPR) Series 523 forms. A total of seven subject properties, which include buildings, structures, and features, are assessed in this report according to the criteria of the National Register of Historic Places (NRHP), the CRHR, and the City of Pasadena Municipal Code.

All activities were conducted in accordance with the requirements of the NHPA, NRHP, California Public Resources Code (PRC) and CEQA, as well as applicable best practices and regulations. The Pasadena Department of Water and Power (PWP) is the lead agency under CEQA. The federal lead agency under Section 106 is the Environmental Protection Agency (EPA).

DATES OF INVESTIGATION

On June 4, 2021, HELIX Architectural Historian Annie McCausland, M.A., and Archaeologist Kassie Sugimoto, M.A., conducted a site visit. Ms. McCausland meets and exceeds the Secretary of the

Interior's Professional Qualification Standards for architectural history, as codified in 36 CFR Part 61. HELIX staff requested a record search of the California Historical Resources Information System (CHRIS) at the South Central Coastal Information Center (SCCIC) on April 5, 2021. HELIX staff were accompanied by staff of the Pasadena Department of Water and Power to provide information on the facility's history, components, and changes over time. Field investigation consisted of examination and photography of the exterior of the subject properties within the reservoir complex. Field notes included resource descriptions, current conditions, alterations/integrity, and character-defining features.

On September 9, 2021, a follow-up site visit was conducted by HELIX Senior Architectural Historian Debi Howell-Ardila, with staff of the City of Pasadena and Pasadena Department of Water and Power. The goal of this follow-up site visit was to inspect changes made to the facility over time in order to expand the integrity analysis and consideration of the period of significance of the facility. All evaluation results were documented in this report; the compiled DPR set follows this report in Appendix A, and key staff resumes follow as Appendix B.

SUMMARY OF FINDINGS

As a result of this evaluation, the Sunset Reservoir Complex **appears eligible as a historic district under NHPA Section 106 in accordance with NRHP Criterion A, and under CRHR Criterion 1, and is also a City of Pasadena Landmark under Criterion a**. As the oldest extant reservoir in Pasadena, the Sunset Reservoir Complex represents an intact, early municipal water facility that catalyzed the City's rapid growth and expansion from the late nineteenth through the twentieth centuries. The facility remained in continuous use for over a century, from circa 1888 through the present day.

The Sunset Reservoir Complex has a strong, well-documented association with the early water history of the City of Pasadena, beginning with the construction of Reservoir No. 1 in circa 1888 by the Pasadena Lake Vineyard Land and Water Company, and including its expansion in 1900 with Reservoir 2 and other related facilities at the site over time. The Sunset Reservoir Complex exemplifies the water history of Pasadena from the late nineteenth century through the mid-twentieth century, after which time Pasadena's water use was managed through the regional provider, the Metropolitan Water District. In this way, the Sunset Reservoir Complex exemplifies the context of Public Institutional Development/Government Infrastructure and the theme of Municipal Water and Power/Water Supply Infrastructure. The contributors to the Sunset Reservoir Complex Historic District are as follows:

1. Reservoir No. 1
2. Reservoir No. 2
3. Basin "A"
4. Well No. 20
5. Sheldon Booster House
6. Historic stream-rock retaining wall

Collectively, the six contributing properties are referred to in this report as the Sunset Reservoir Complex Historic District. The period of significance for the historic district is circa 1888, the year Reservoir No. 1 and the stream-rock retaining wall were constructed on the property, to 1941, until water arrived in Pasadena via the Metropolitan Water District and the Colorado River Aqueduct. (The Glorieta Pumping House is not a contributor to the district, since its 1947 construction date falls outside the period of significance. In addition, the Glorieta Pumping House does not appear individually eligible under the applicable criteria.)

As a historic district eligible for the NRHP, CRHR, and as a local landmark, the Sunset Reservoir Complex Historic District **qualifies as a historical resource pursuant to NHPA Section 106 and CEQA**. The demolition and replacement of the primary contributors, Reservoir No. 1 and Reservoir No. 2, along with several other primary and secondary contributing elements, **would be expected to cause a significant adverse impact and material impairment to the resource** as defined by CEQA Guidelines Section 15064.5(b). Further, pursuant to Section 106, the undertaking would be expected to cause adverse effects that diminish the characteristics that qualify the historic district for inclusion in the NRHP. As a result, the historic district would no longer convey the reasons for its significance (and no longer be eligible for national, state, or local listing).

MITIGATION MEASURES

Measures proposed to mitigate the project's impacts to the resource include (1) a documentation program to be undertaken prior to commencement of the project to document the Sunset Reservoir to the standards of the Historic American Engineering Record (HAER); and (2) an interpretive program to be installed prior to the notice of completion on or adjacent to the project site to provide a visual historical record for the general public. These measures are detailed in this report.

The proposed Project would result in a significant adverse impact and material impairment to cultural resources. Although some of the district's character-defining features will remain, primary significant character-defining features of the Sunset Reservoir historic district will be demolished as part of the project. The new project design will also completely alter the feeling of the reservoir site through the installation of two new individually capped reservoirs, uncovered parking areas and perimeter landscaping, etc. The proposed mitigation measures CUL-1 and CUL-2 will document the Sunset Reservoir for future research and help relate the site's history to the public through an interpretive program, but these mitigation measures are not sufficient to reduce impacts on cultural resources to a less than significant level. Therefore, impacts related to cultural resources would be significant with project implementation.

Should federal funding be sought for the undertaking, agency consultation with other parties will need to occur to explore whether adverse effects can be further avoided, minimized or mitigated. If measures to resolve the adverse effects cannot be agreed upon, the agency will need to obtain formal advisory comments from the Advisory Council on Historic Preservation (ACHP) to consider prior to a final decision on the funding application.

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1.0 INTRODUCTION

HELIX Environmental Planning, Inc. (HELIX) was retained by Kennedy-Jenks Consultants (Client) to provide historic resource consulting services in support of the Sunset Reservoir Complex Project (project) in the City of Pasadena, Los Angeles County, California. Located in northwest Pasadena at West Mountain Street and Sunset Avenue (Assessor's Parcel Number 5728-021-916), the Sunset Reservoir Complex has operated as a facility of Pasadena's Department of Water and Power from the late nineteenth century through the present day. With a span of 350 feet for Reservoir No. 1 and 525 feet for Reservoir No. 2, this surviving remnant of Pasadena's early water history spans nearly 160,000 square feet, roughly equivalent to three football fields. The proposed project would demolish and replace Reservoirs No. 1 and No. 2, constructed in circa 1888 and 1900, respectively, along with several associated structures occupying the 9.15-acre parcel.

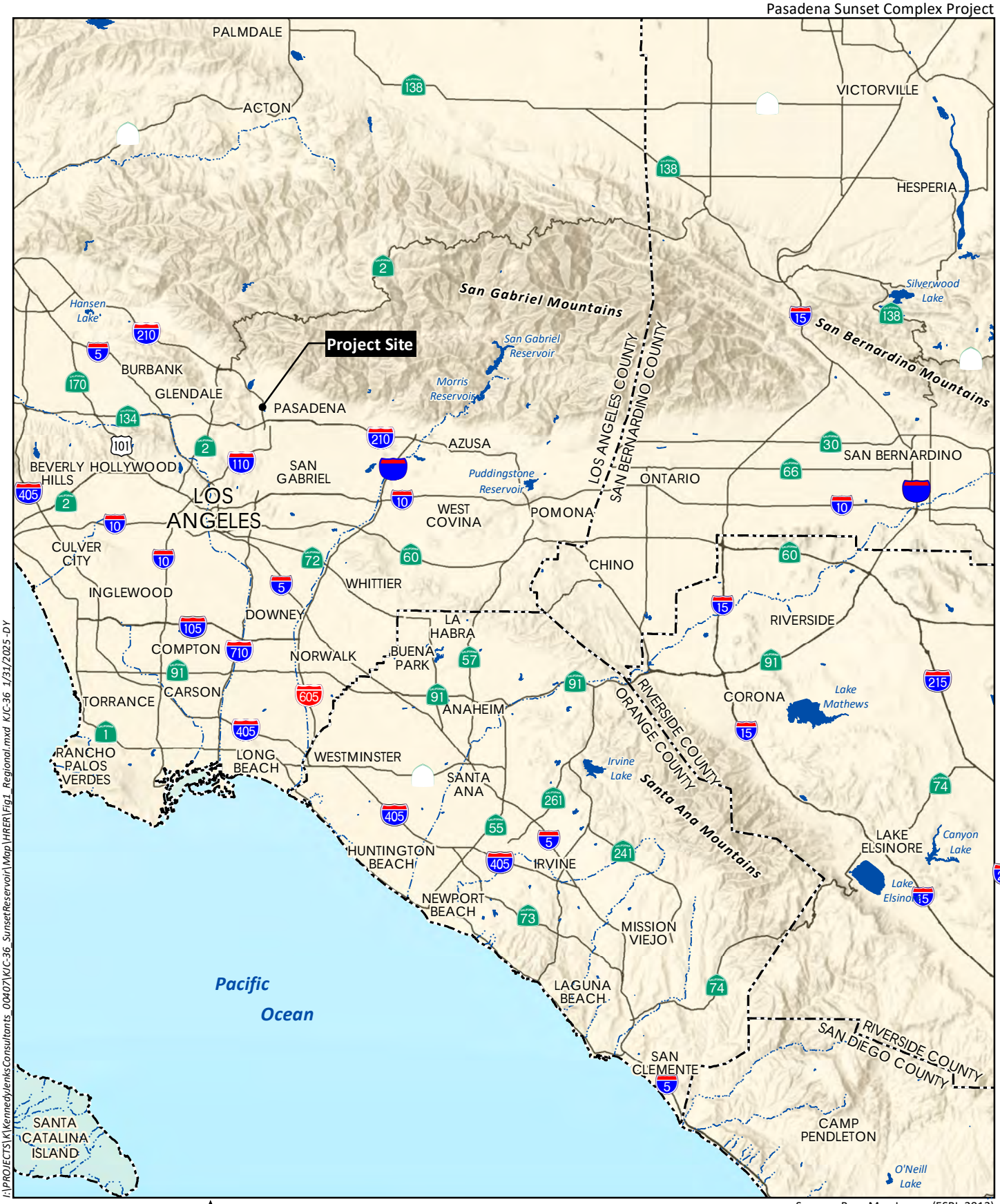
The purpose of this report is to provide the substantial evidence necessary to determine whether any of the of-age components of the Sunset Reservoir Complex, in whole or in part, meet federal, state, or local eligibility criteria as a historic landmark or historic district and therefore qualify as a historical resource pursuant to the California Environmental Quality Act (CEQA). This intensive-level historic resource evaluation report (HRER) builds on a previous study, completed in 2017, by architectural historian Jenna Snow. As a result of the 2017 evaluation, seven structures over 50 years of age within the Sunset Reservoir Complex were found eligible for listing in the California Register of Historical Resources (CRHR) and as local City Landmarks. This HRER updates and expands on the 2017 report. The same subject properties, which include buildings, structures, and features, are assessed in this report in accordance with the criteria of the National Register of Historic Places (NRHP), the California Register of Historical Resources (CRHR), and the City of Pasadena Municipal Code. Updates to the 2017 report provided in this evaluation include an analysis of the historic integrity of the complex and its components, a consideration of the complex as a potential historic district, the establishment of a period of significance, the identification of primary and secondary contributors, and recordation of the resource on Department of Parks and Recreation (DPR) Series 523 forms.

All activities were conducted in accordance with the requirements of the National Historic Preservation Act (NHPA), Public Resources Code (PRC) and California Environmental Quality Act (CEQA) as well as applicable best practices and regulations. The Pasadena Department of Water and Power is the lead agency under CEQA. The federal lead agency under Section 106 is the Environmental Protection Agency (EPA).

1.1 PROJECT LOCATION AND DESCRIPTION

The subject property is located in the City of Pasadena, Los Angeles County (Figure 1, *Regional Location*), just east of Interstate 210 and north of State Route 134 (Figure 2, *USGS Topography*). The project site and Area of Potential Effects (APE) is bordered by Sunset Avenue (east), East Mountain Street (south), Glen Avenue (west), and mixed residential and commercial properties to the north (Figure 3, *Aerial Photograph*).

The proposed project would demolish Reservoirs No. 1 and 2, constructed in circa 1888 and 1900, respectively, and add a new groundwater treatment facility. Reservoirs No. 1 and No. 2 would be replaced with new pre-stressed concrete reservoirs. As Basin "A" is to be demolished, an inlet clearwell will be installed upstream of the reservoirs. Additionally, a new groundwater treatment plant will be



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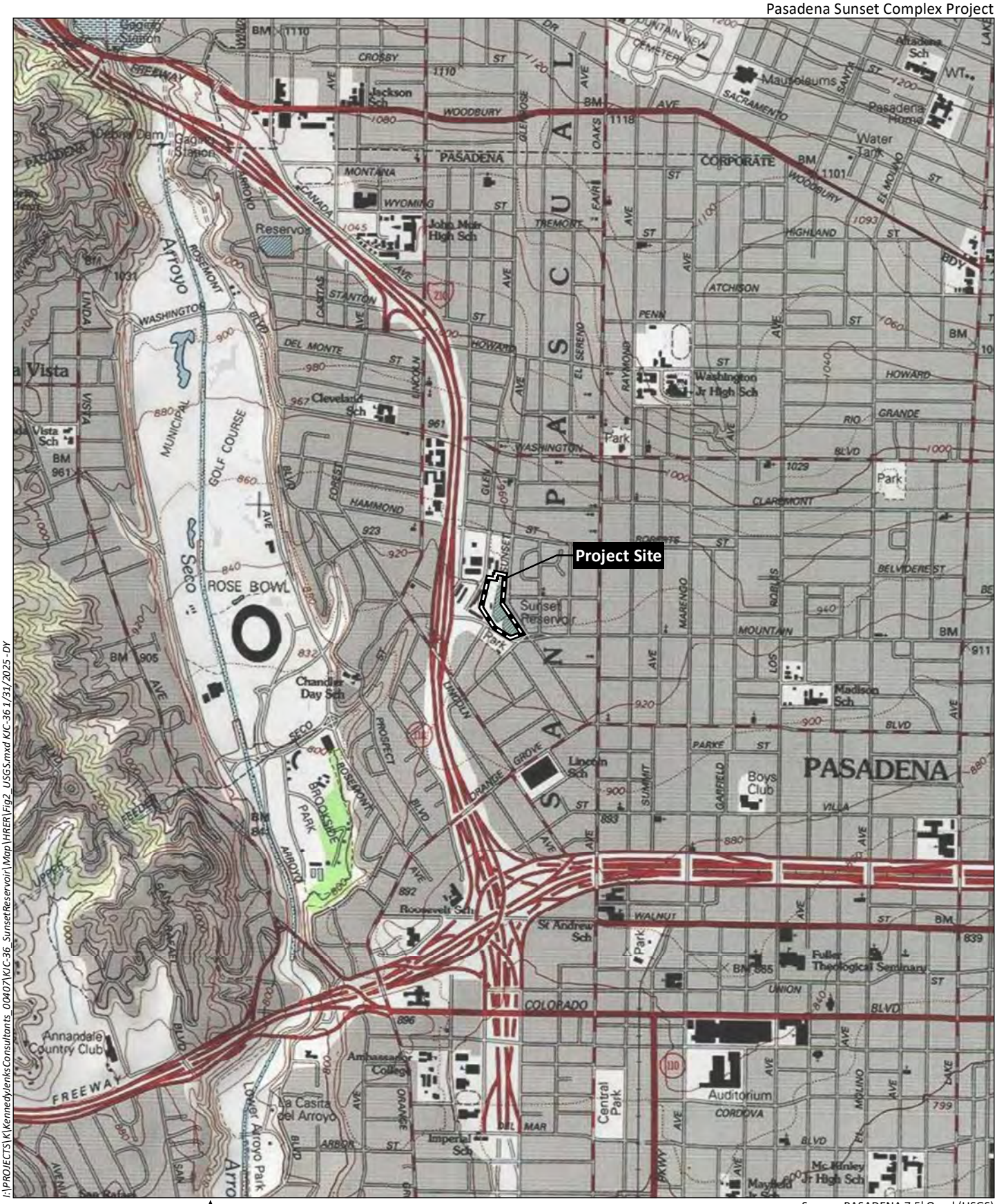
0 10 Miles

Source: Base Map Layers (ESRI, 2013)

HELIX Environmental Planning

Regional Location

Figure 1



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HELIX Environmental Planning

USGS Topography

Figure 2



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0 200 Feet

Source: Aerial (Nearmap, 2020)

HELIX Environmental Planning

Aerial Photograph

Figure 3

developed. Replacement and construction of associated piping, inlet and outlet, valves, and hardscaping will also occur across the project area. Figure 3 provides an overview of the project site and existing facilities of the complex. Figure 4, *Sunset Reservoir Complex Historic District Map*, provides the boundary of the Sunset Reservoir Complex Historic District and the locations of the district's contributing primary and secondary resources. The project also proposes a landscaped parklet in the southernmost corner of the parcel, at the intersection of Mountain Street and Sunset Avenue. An interpretive program, including signage, will be installed, which will convey the history of the property for the public, in an area easily accessible for the public.

2.0 REGULATORY FRAMEWORK

This section describes the applicable regulatory framework considered in this study.

2.1 FEDERAL

2.1.1 National Historic Preservation Act of 1966

The National Historic Preservation Act (NHPA) of 1966 (16 United States Code [USC] 470), enacted in 1966, declared a national policy of historic preservation and instituted a multifaceted program, administered by the Secretary of the Interior, to encourage the achievement of preservation goals at the federal, state, and local levels. The NHPA authorized the creation of the NRHP, established the position of State Historic Preservation Officer (SHPO) and provided for the designation of State Review Boards, set up a mechanism to certify local governments to carry out the purposes of the NHPA, assisted Native American tribes in preserving their cultural heritage, and created the Advisory Council on Historic Preservation (ACHP).

2.1.2 Section 106

Section 106 of the NHPA states that federal agencies with direct or indirect jurisdiction over federally funded, assisted, or licensed projects, known as "undertakings", within Section 106, must take into account the effect of the undertaking on any historic property that is included in or eligible for inclusion in the NRHP, and that the ACHP must be afforded an opportunity to comment on such undertakings through a process outlined in 36 CFR Part 800. The Section 106 process involves the identification of historic properties within the APE; the determination of whether the undertaking will cause an adverse effect on historic properties; and the resolution of those adverse effects through consultation with parties to the Section 106 review process, most prominently including the California SHPO and Native American tribes.

According to 36 CFR Part 800.5, "an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register." The process of determining potential effects results in either a "no historic properties affected", "no adverse effects", or "adverse effects" finding for each historic property. Any finding of adverse effects requires consultation with the SHPO and other consulting parties to discuss if there are any ways to avoid, minimize, or mitigate the potential adverse effects to historic properties. The focus of the discussion is on those effects that would alter the characteristics that qualify the property for inclusion in the NRHP.



HELIX Environmental Planning

Sunset Reservoir Complex Historic District Map

Figure 4

2.1.3 Native American Heritage Values

Federal 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 (TCP) 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.

2.1.4 Area of Potential Effects

Pursuant to 36 CFR 800.4(a)(1), the APE is the geographic area within which an undertaking may directly or indirectly alter the character or use of historic properties. The APE for the project includes the 9.15-acre project site encompassed in the undertaking.

2.1.5 National Register of Historic Places

The National Register of Historic Places (NRHP) was established by the National Historic Preservation Act of 1966 as "an authoritative guide to be used by Federal, State, and local governments, private groups and citizens to identify the Nation's cultural resources and to indicate what properties should be considered for protection from destruction or impairment" (CFR 36 CFR 60.2). The NRHP recognizes properties that are significant at the national, state, and local levels. To be eligible for listing in the NRHP, a resource must be significant in American history, architecture, archaeology, engineering, or culture. A property is eligible for the NRHP if it:

Criterion A Is associated with events that have made a significant contribution to the broad patterns of our history; or

Criterion B Is associated with the lives of persons significant in our past; or

Criterion C Embodies the distinctive characteristics of a type, period, or method of installation, or represents the work of a master, possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual distinction; or

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

In addition to meeting these criteria, a property must retain historic integrity, which is defined in National Register Bulletin 15 as the "ability of a property to convey its significance" (National Park Service 1990). In order to assess integrity, the National Park Service recognizes seven aspects or qualities that, considered together, define historic integrity.

To retain integrity, a property must possess several, if not all, of these seven qualities, which are defined in the following manner in National Register Bulletin 15:

1. **Location.** The place where the historic property was constructed or the place where the historic event occurred.

2. **Design.** The combination of elements that create the form, plan, space, structure, and style of a property.

3. **Setting.** The physical environment of a historic property.

4. **Materials** are the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property.

5. **Workmanship.** The physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.

6. **Feeling.** A property's expression of the aesthetic or historic sense of a particular period of time.

7. **Association.** The direct link between an important historic event or person and a historic property.

Some aspects of integrity may be accorded more weight than others, depending on the type of resource being evaluated and the applicable eligibility criteria. Integrity can be assessed only after it has been concluded that a resource is significant.

2.1.6 Secretary of the Interior's Standards for Rehabilitation

In accordance with the National Park Service and CEQA Guidelines, projects that comply with the *Secretary's Standards for the Treatment of Historic Properties* and *Secretary's Standards for Rehabilitation* (*Secretary's Standards*) are projects that retain the historic integrity of the resource. According to CEQA Guidelines, a project that complies with the *Secretary's Standards* is generally considered to be a project that will not cause a significant adverse impact to a historical resource.

The goal of the *Secretary's Standards* is to outline treatment approaches that allow for the retention of and/or sensitive changes to the distinctive materials and features that lend a historical resource its significance. The *Secretary's Standards* and Guidelines offer general recommendations for preserving, maintaining, repairing, and replacing historical materials and features, as well as designing new additions or making alterations. These standards also provide guidance on new construction adjacent to historic districts and properties, in order to ensure that there are no indirect adverse effects to historic properties.

Rehabilitation is the most flexible treatment approach of the *Secretary's Standards*. The ten *Secretary's Standards for Rehabilitation* are:

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.

2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.

3. Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.

4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.

5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.

6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires the replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.

7. Chemical or physical treatments, such as sandblasting, that cause damage to historic materials, shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.

8. Significant archeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.

9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.

10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

The *Secretary's Standards and Guidelines* offer general recommendations for preserving, maintaining, repairing, and replacing historical materials and features, as well as designing new additions or making alterations. The *Secretary's Standards for Rehabilitation* also provide guidance on new construction adjacent to historic districts and properties, in order to ensure that there are no adverse indirect impacts to integrity as a result of a change in setting. Applying the *Secretary's Standards* to new construction adjacent to historic resources helps ensure avoidance of indirect impacts and retention of the setting and feeling of the historic resource and its surrounding environment.

Secretary's Standards compliance begins with the identification and documentation of the "character-defining," or historically significant, features of the historical resource. According to Preservation Brief 17, *Architectural Character: Identifying the Visual Aspects of Historic Buildings as an Aid to Preserving Their Character*, there is a three-step process to identifying character-defining features (Nelson, 1982). Step 1 involves assessing the physical aspects of the building exterior as a whole, including its setting, shape and massing, orientation, roof and roof features, projections, and openings. Step 2 looks at the building more closely—at materials, trim, secondary features, and craftsmanship. Step 3 encompasses the interior, including individual spaces, relations or sequences of spaces (floor plan), surface finishes and materials, exposed structure, and interior features and details. Alterations and replacement of character-defining features over time can impair a historic property's integrity and result in a loss of historic status. Therefore, to ensure that a historic property remains eligible after the implementation of projects, character-defining features should be identified and preserved.

2.2 STATE

The policies of the NHPA are implemented at the state level by the California Office of Historic Preservation, a division of the California Department of Parks and Recreation. The Office of Historic Preservation is also tasked with carrying out the duties described in the Public Resources Code (PRC) and maintaining the California Historic Resources Inventory and CRHR. The state-level regulatory framework also includes CEQA, which requires the identification and mitigation of substantial adverse impacts that may affect the significance of eligible historical and archeological resources.

2.2.1 California Register of Historical Resources

Created in 1992 and implemented in 1998, the CRHR is "an authoritative guide in California to be used by state and local agencies, private groups, and citizens to identify the state's historical resources and to indicate what properties are to be protected, to the extent prudent and feasible, from substantial adverse change" (PRC Sections 21083.2 and 21084.1). Certain properties, including those listed in or formally determined eligible for listing on the NRHP and California Historical Landmarks, numbered 770 and higher, are automatically included on the CRHR.

According to PRC Section 5024.1(c), a resource, either an individual property or a contributor to a historic district, may be listed in the CRHR if the State Historical Resources Commission determines that it meets one or more of the following criteria, which are modeled on NRHP criteria:

Criterion 1: It is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

Criterion 2: It is associated with the lives of persons important in our past;

Criterion 3: It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values;

Criterion 4: Has yielded, or may be likely to yield, information important in prehistory or history.

Properties that do not retain sufficient integrity for NRHP listing can still qualify for listing in the CRHR. Historical resources eligible for listing in the California Register must meet one of the criteria of significance described above and retain enough of their historic character or appearance to be recognizable as historical resources and to convey the reasons for their significance.

2.2.2 California Environmental Quality Act (CEQA)

CEQA requires a lead agency to analyze whether historic and/or archaeological resources may be adversely impacted by a proposed project. Under CEQA, a "project that may cause a substantial adverse change in the significance of a historic resource is a project that may have a significant effect on the environment" (PRC Section 21084.1). Answering this question is a two-part process: first, the determination must be made as to whether the proposed project involves cultural resources. Second, if cultural resources are present, the proposed project must be analyzed for a potential "substantial adverse change in the significance" of the resource.

According to CEQA Guidelines Section 15064.5, historic resources are:

1. A resource listed in, or formally determined eligible for listing in, the California Register of Historical Resources (PRC 5024.1, Title 14 CCR, Section 4850 et seq);

2. A resource included in a local register of historical resources, as defined in PRC Section 5020.1(k), or identified as significant in a historic resources survey meeting the requirements of PRC Section 5024.1(g);

3. Any building, structure, object, site, or district that the lead agency determines eligible for national, state, or local landmark listing; generally, a resource shall be considered by the lead agency to be historically significant (and therefore a historic resource under CEQA) if the resource meets the criteria for listing on the California Register (as defined in PRC Section 5024.1, Title 14 CCR, Section 4852).

Resources nominated to the CRHR must retain enough of their historic character or appearance to convey the reasons for their significance. Resources whose historic integrity (as defined in the previous section) does not meet NRHP criteria may still be eligible for listing in the CRHR.

According to CEQA, the fact that a resource is not listed in or determined eligible for listing in the California Register or is not included in a local register or survey shall not preclude the lead agency from determining that the resource may be an historical resource (PRC Section 5024.1). Pursuant to CEQA, a project with an effect that may cause a substantial adverse change in the significance of a historical resource may have a significant effect on the environment (CEQA Guidelines, Section 15064.5(b).

CEQA Guidelines specify that "substantial adverse change in the significance of an historical resource means physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of a historical resource would be materially impaired" (CEQA Guidelines, Section 15064.5). Material impairment occurs when a project alters in an adverse manner or demolishes "those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion" or eligibility for inclusion in the NRHR, CRHR, or local register. In addition, pursuant to CEQA Guidelines Section 15126.2, the "direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects."

2.2.3 California Certified Local Government Program

The City of Pasadena is designated "Certified Local Government" (CLG) by the State Office of Historic Preservation. The CLG program is administered by the National Park Service and the State Office of Historic Preservation. The goal of the CLG program is to encourage preservation through local partnerships. This national program encourages local governments to establish policies and procedures for the identification, registration, and preservation of historic properties.

Requirements for CLG status are described in the 2009 *Local Government Assistance Bulletin: Certified Local Government Program Application & Procedures*, published by the California Office of Historic Preservation, Department of Parks and Recreation. According to the *Certified Local Government Program Application & Procedures*, in order to obtain or retain CLG status, cities in the State of California must establish and maintain a preservation program that meets the following requirements:

1. Enforce appropriate state or local legislation for the designation and protection of historic properties:

    a. Designation refers to the identification and registration of both historic and prehistoric properties for purposes of protection using criteria established by the local government;

    b. Protection refers to the local review process under local law for proposed demolition of, changes to, or other action that may affect properties that have been designated pursuant to the local ordinance; and

    c. The CLG will prepare a comprehensive local historic preservation plan or preferably, a historic preservation element in the community's general plan. The plan or element will identify preservation missions, goals, and priorities and will establish preservation strategies, programs, and time schedules.

2. Establish an adequate and qualified historic preservation review commission by local law.

3. Maintain a system for the survey and inventory of historic properties:

    a. The CLG shall be responsible for organizing, developing, and administering an inventory of cultural resources within the entire spatial jurisdiction of the CLG;

    b. Because historical contexts and surveys are the foundation of preservation planning, CLGs must develop or have in place a system for identifying, evaluating, inventorying, and registering historical and cultural resources within their jurisdiction; upon certification, CLGs will forward to the SHPO copies of all pre-existing survey and inventory information;

    c. The commission shall develop procedures for conducting an inventory of culture resources. Survey activities shall be coordinated with and complementary to the state program to ensure that survey results produced by the CLG will be readily integrated into the statewide comprehensive historic preservation planning process;

    d. The CLG shall be responsible for overseeing the compiling, recording, and updating of inventory information on cultural resources within its jurisdiction. The information shall

be based on comprehensive surveys conducted in conformance with state survey standards and procedures;

e. As part of any ongoing survey effort, procedural requirements must allow for periodic update of survey results as buildings gain maturity and as new areas are incorporated or annexed by the CLG; and

f. The commission shall establish internal procedures to facilitate the use of survey results in the planning process by the CLG officials and departments. The commission shall submit survey results to the local government for adoption, then forward to OHP.

4. Provide for adequate public participation in the local historic preservation program.

5. Satisfactorily perform the responsibilities delegated to the CLG.

The CLG must have the legal authority to fulfill the minimum requirements specified in the application manual.

2.3 LOCAL

2.3.1 Pasadena General Plan

Adopted in 2015, Pasadena's General Plan Land Use Element establishes the development criteria and standards that help guide land use in the City. It describes the allowed densities, property types, configurations, and zoning for land uses throughout the City. Historic buildings, properties, districts, landscapes, and civic places are included in the General Plan Land Use Element. Goal 8, Historic Preservation, establishes the following policies to preserve and enhance Pasadena's cultural and historic resources:

Goal Eight. Historic Preservation. Preservation and enhancement of Pasadena's cultural and historic buildings, landscapes, streets, and districts as valued assets and important representations of its past and a source of community identity, and social, ecological, and economic vitality.

8.1: Identify and Protect Historic Resources. Identify and protect historic resources that represent significant examples of the City's history.

8.2: Historic Designation Support. Provide assistance and support for applicants applying for designation of a historic resource through a clear, thorough, and equitable process that identifies if monuments, individual or landmark districts, historic signs, or landmark trees are eligible for designation based on adopted evaluation criteria.

8.3: Preservation Efforts. Support preservation and restoration efforts through education, facilitation, and incentive programs.

8.4: Adaptive Reuse. Encourage sensitive adaptive reuse including continuing the historic use of historic resources to achieve their preservation, sensitive rehabilitation, and continued economic and environmental value.

8.5: Scale and Character of New Construction in a Designated Landmark and Historic Districts. Promote an architecturally sensitive approach to new construction in Landmark and Historic districts. Demonstrate the proposed project's contextual relationship with land uses and patterns, spatial organization, visual relationships, cultural and historic values, and relationships in height, massing, modulation, and materials.

8.6: Infrastructure and Street Design Compatibility. Encourage street design, public improvements, and utility infrastructure that preserves and is compatible with historic resources.

8.7: Preservation of Historic Landscapes. Identify, protect, and maintain cultural and natural resources associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values.

8.8: Evolving Preservation Practices. Continue to implement practices for historic preservation consistent with community values and conformance with the Secretary of the Interior's Standards for the Treatment of Historic Properties, California Historical Building Code, State laws, and best practices.

8.9: Maintenance. Support and encourage maintenance and upkeep of historic resources to avoid the need for major rehabilitation and to reduce the risk of demolition, loss through fire, deterioration by neglect, or impacts from natural disasters.

8.10: Enforcement. Ensure that City enforcement procedures and activities comply with local, State, and Federal historic preservation requirements and fosters the preservation of historic resources.

2.3.2 City of Pasadena Municipal Code

Sections 17.62.010 et seq. of the Pasadena Municipal Code define significance criteria for historic resources, as well as procedures to encourage, enhance, and promote historic preservation. These criteria are intended to promote the preservation and adaptive reuse of the City's historic resources, to enhance and preserve historically significant properties, and to stabilize and improve property values. These sections also serve to fulfill the City's responsibility as a CLG in the State of California (as described in Section 2.2.3). Any property in Pasadena that is found eligible for designation as a local landmark is considered to meet the definition of historical resource as defined by State CEQA Guidelines Section 15064.5. Pursuant to Section 17.62.040, a landmark meets one or more of the following criteria:

a) It is associated with events that have made a significant contribution to the broad patterns of the history of the City, region, or state.

b) It is associated with the lives of persons who are significant in the history of the City, region, or state.

c) It embodies the distinctive characteristics of a type, architectural style, period, or method of construction, or represents the work of an architect, designer, engineer, or builder whose work is of significance to the City or the region or possesses artistic values of significance to the City or to the region.

d) It has yielded, or may be likely to yield, information important locally in prehistory or history.

3.0 METHODS

3.1 RECORDS SEARCH

HELIX conducted a record search of the California Historical Resources Information System (CHRIS) from the South Central Coastal Information Center (SCCIC) on May 10, 2021. The records search covered a half-mile radius around the proposed project area and included the identification of previously recorded cultural resources (archaeological and historical resources), locations and citations for previous cultural resources studies, and a review of the State Office of Historic Preservation (OHP) Historic Resources Inventory. No previously documented historic resources within the APE were on file with the SCCIC. The properties of the Sunset Reservoir Complex are not included in the California Built Environment Resources Directory/State Historic Resources Inventory, nor are they included on a register or inventory of designated or eligible landmarks in the City of Pasadena. For a detailed summary of the records search results for the project, please refer to the separate Cultural Resources Report produced by HELIX for this project (Gittelhough and Robbins-Wade 2021:15-20).

3.2 PREVIOUS HISTORIC RESOURCE STUDIES AND EVALUATIONS

In 2017, a Historic Resource Assessment report was prepared for the Sunset Reservoir Complex by architectural historian Jenna Snow (Snow 2017). The intensive-level study included a site visit and archival research; archives and sources consulted included the *Los Angeles Times*, *Pasadena Star-News*, and *Pasadena Independent*, along with historic aerial photographs from the University of California Los Angeles Air Photo Archives, Huntington Digital Library, and archives of the Pasadena Water Department. Historic and as-built drawings and plans of the site were also reviewed. Secondary sources consulted included a variety of unpublished reports about Pasadena's water system, a 2007 Initial Study of the Sunset Reservoir, as well as seismic and geotechnical reports. Historic maps and Sanborn Fire Insurance Maps were also reviewed. Based on the site inspection and available sources, the evaluation concluded that the Sunset Reservoir Complex appears eligible for listing in the CRHR and as a local landmark (and therefore qualifies as a historical resource pursuant to CEQA), as the oldest extant reservoir in Pasadena, with an original construction date of circa 1888. The Sunset Reservoir Complex served as an important water storage facility for the burgeoning city at the end of the nineteenth and beginning of the twentieth centuries, facilitating its rapid, sustained growth well into the twentieth century.

3.3 FIELD SURVEY

The field survey was conducted of the project site on June 4, 2021, by HELIX Architectural Historian Annie McCausland and Archaeologist Kassie Sugimoto. Staff of the Department of Water and Power accompanied HELIX during the field survey to provide information on the facilities and changes over time. Field investigation consisted of examination and photography of the exterior of the buildings, structures, and features within the reservoir complex. Field notes included resource descriptions, existing conditions, alterations, character-defining features, and integrity. Primary and secondary contributors were identified. On September 9, 2021, a follow-up site visit was conducted by HELIX Senior Architectural Historian Debi Howell-Ardila, with staff of the Pasadena Department of Water and Power. The goal of this follow-up site visit was to inspect changes made to the facilitate over time in order to expand the integrity analysis and consideration of the period of significance of the facility.

The field survey focused on seven historic buildings, structures, and features. The Sunset Reservoir Complex was documented as a historic district per *National Register Bulletin: How to Apply the National Register Criteria for Evaluation* guidelines (NPS 1995).

3.4 ARCHIVAL RESEARCH

Research conducted by HELIX for this study included a variety of primary and secondary sources. Archives consulted for this study included the Pasadena Museum of History, Pasadena Heritage, the Pasadena Public Library, and City of Pasadena records, as well as online sources including the David Rumsey Map Collection, Ancestry.com, Newspapers.com, Online Archive of California, Pacific Coast Architecture Database, and Google Books. In addition, HELIX reviewed previous reports, including the 2017 report by Jenna Snow, as well as as-built drawings, property records, and historic photographs provided by PWP.

3.5 PROJECT PERSONNEL

HELIX Architectural Historian Annie McCausland, M.A., HELIX Senior Architectural Historian Teri Delcamp, M.A., and HELIX Senior Architectural Historian, Debi Howell-Ardila, M.H.P, served as principal investigators and authors of this study. HELIX Cultural Resources Group Manager Mary Robbins-Wade, RPA, provided QA/QC and strategic oversight. Ms. McCausland, Ms. Delcamp, and Ms. Howell-Ardila meet and exceed the Secretary of Interior's Professional Standards for architectural history and history. Resumes for key HELIX project personnel are presented in Appendix B.

4.0 HISTORIC SETTING AND CONTEXT

National Register Bulletin 24, *Guidelines for Local Surveys*, states that the historic context developed in support of historic resource surveys should analyze and describe the "broad pattern of historical development in a community or its region that may be represented by historic resources" (US Department of the Interior 1985: 14). Developing a historic context for survey areas is described in NPS guidelines as vital for providing the basis for a survey effort, helping researchers successfully identify all significant resources, and helping eliminate unintended biases. Through a review of the history and prehistory of the state and region under consideration, the historic context should define important patterns of development that may be reflected in the area's historic resources.

The National Register further defines context as "a body of information about our history according to the stages of development occurring at various times and places" (US Department of the Interior 1997: 7). Theme, place, and time are the basic elements that define a historic context.

Historic context is linked to the built environment through the concept of property type. A property type is "a grouping of individual properties based on a set of shared physical or associative characteristics. Physical characteristics may relate to structural forms, architectural styles, building materials, or site type. Associative characteristics may relate to the nature of associated events or activities, to associations with a specific individual or group of individuals" (US Department of the Interior 1985: 14). Historic contexts, therefore, become useful tools for gauging the relative importance and integrity of properties.

In order to provide a contextual framework for the assessment of the Sunset Reservoir Complex, this section provides the historic setting and context for the property, divided chronologically and according to themes of significance. Given the history of the Sunset Reservoir Complex, the context and theme that applies most closely include the following evaluative framework:

- Context: Public Institutional Development/Government Infrastructure
  Theme: Municipal Water and Power/Water Supply Infrastructure
  Property Type: Reservoir/Water Supply Complex

The following sections briefly summarize Pasadena's early history, followed by descriptions of the context/theme used in the evaluation of the Sunset Reservoir Complex. This focused historic context section draws on original research as well as information and excerpts from previous preservation planning studies completed for the City of Pasadena, including the following:

1. "Late 19th and Early 20th Century Development and Architecture in Pasadena" (Grimes and Vanaskie, 2010); this study provides a consistent evaluative framework for assessments of the late nineteenth and early twentieth-century properties in Pasadena

2. "Architectural/Historical Development of the City of Pasadena: Historic Context and Property Type Report" (City of Pasadena Urban Conservation Section, Planning Division, and California State Office of Historic Preservation, 1993); funded through a CLG grant, this early thematic historic context statement provides a comprehensive framework for evaluations, with a timeframe extending through the 1910s

Additional sources utilized in this section and report are included in Section 8 ("References").

4.1 EARLY SETTLEMENT AND DEVELOPMENT IN PASADENA

Pasadena's early years were shaped by its proximity to the Mission San Gabriel Arcángel, which was founded in September 1771 and became one of the wealthiest missions in California. Following Mexican independence from Spain in 1821, calls for the secularization of the mission system resulted in the 1834 proclamation, signed by Governor José Figueroa, to secularize California's missions and distribute their vast land holdings. As a result, the land that now encompasses most of Pasadena and large portions of South Pasadena, Altadena, and San Marino, was granted by the governor to Juan Mariné, the husband of Eulalia Pérez de Guillén, in compensation for his wife's long service at Mission San Gabriel. Mariné named his land, originally referred to as *El Rincón de San Pascual* (The Corner of San Pascual), Rancho San Pasqual. After Mariné was unable to construct an improvement on the land, as required by Mexican law to retain a land grant, Rancho San Pasqual was then granted in 1843 to Manuel Garfias.

In the U.S. period—after the 1848 conclusion of the U.S.-Mexican War and California statehood in 1850—owners of many such ranchos were obliged to prove the validity of their property titles following the 1851 creation of the U.S. Land Commission. Garfias's claim to Rancho Pasqual was confirmed by the U.S. Board of Land Commissioners in 1854. However, by 1858, Garfias's cattle ranch had gone into debt, and he ceded ownership of Rancho San Pasqual to Judge Benjamin D. Wilson, also commonly referred to as "Don Benito." Wilson, a trapper and trader from Tennessee who traveled to California in 1841 as part of the Workman-Rowland Party, became an important figure in the early settlement of Southern California. Wilson served as the first clerk of Los Angeles County and, in 1852, became Los Angeles's second elected mayor.

As noted in "Late 19th and Early 20th Century Development and Architecture in Pasadena," the year 1859 inaugurated the modern, post-Rancho era in Pasadena. In 1859, and through the following decade, Wilson and his partner, Dr. John S. Griffin, gradually subdivided and sold the sprawling lands of the former rancho for new settlers. During this era, roughly half the acreage of the former Rancho San Pasqual was divided and sold.

In early 1873, the area attracted the attention of a group of Midwesterners searching for a suitable location for a new settlement. Drawn to Southern California's climate and fertile soil, the group, which called itself the California Colony of Indiana, purchased 4,000 acres of Rancho San Pasqual from Griffin in 1873 with the intention of establishing citrus groves. By 1874, the group (by then renamed the "San Gabriel Orange Grove Association") subdivided a 1,500-acre tract, which stretched approximately one mile north of Colorado Boulevard to the north, to what is now Fremont Avenue (originally Fair Oaks Avenue) to the east, Monterey Road to the south, and the Arroyo Seco to the west.

In 1875, the San Gabriel Orange Grove Association stockholders voted to name their new town "Pasadena" (based on a Chippewa word), rejecting in the process choices such as "Indianola" and "Granada." During this time, a small business district had started to form around Fair Oaks Avenue and Colorado Boulevard (originally known as "The Corners"; now the focal point of Old Town Pasadena) (O'Connor 1993: 13). At the time, the original town center consisted of a general store, butcher shop, smithy, and a post office.

By 1876, approximately 40 residences were constructed on the original San Gabriel Orange Grove Association land. Apart from the original downtown, at Fair Oaks and Colorado, an institutional center was taking shape near the intersection of Orange Grove and California Boulevards, where several churches of different denominations were located. Even so, Pasadena remained a largely agriculture-based community and economy in its founding years. As of the 1880 census, for example, the City had a population of just over 380 residents; a vast majority of those residents identified as either farmers or orchardists.



Figure 5. San Gabriel Orange Grove Association members, circa 1890. Source: Pasadena Museum of History

Pasadena's boundaries continued to expand through the 1870s. In 1877, Benjamin Wilson subdivided a 2,500-acre swath of his land, which catalyzed new construction and settlement. This large rectangular parcel, which Wilson called the Lake Vineyard Land and Water Company, was generally bounded by

present-day Mentor Avenue (east), Raymond Hill in South Pasadena (south), Fair Oaks Avenue (west), and Villa Street (north).

With this new subdivision open and available for settlement and construction, the focal point of Pasadena shifted from Orange Grove and California to Fair Oaks Avenue and Colorado Boulevard, the present-day center of "Old Town" Historic Pasadena.

The gradual shift from an agricultural community to an expanding town accelerated in the 1880s. As has been well documented in the literature, the 1880s brought dramatic expansion to communities throughout Southern California. In 1886, a rate war between the Santa Fe and Southern Pacific Railroads brought a massive influx of tourists, new settlers, and land speculators to the region, causing real estate booms (and busts) throughout nascent communities, including Pasadena. Following a slowdown in the 1890s, this growth restarted and continued apace in the opening years of the twentieth century. In the 1900s, Pasadena grew over twofold; in 1904 and 1906, North Pasadena and East Pasadena were annexed to the City.

Against this backdrop, with the demand growing exponentially, and water representing the essential ingredient for this continued expansion, the Sunset Reservoir was established in northwest Pasadena.

4.2 PASADENA WATER DEPARTMENT

As has been well documented in the literature, water rights and access have represented the cornerstone for development and expansion throughout Southern California (and the state itself). The history of the region's water resources, from Los Angeles's Zanja Madre to William Mulholland's famous Los Angeles Aqueduct, still represent one of the most significant themes in the development history of Southern California's cities and communities.

Pasadena was no exception in this regard. With the growing population, and the reliance on agriculture and orchards, establishing a reliable and ample water supply was key in attracting new settlers and continuing to expand in the late nineteenth century.

As noted by Snow,

> The history of providing reliable water to the growing city of Pasadena began around 1874,[1] when Benjamin Eaton dug the first irrigation ditch for the [San Gabriel Orange Grove Association] by diverting water from Eaton Canyon and the Arroyo Seco. This ditch later became an enclosed pipeline.[2] Prior to 1912, Pasadena had three primary companies that supplied water to Pasadena: the Pasadena Land and Water Company, which grew out of the [San Gabriel Orange Grove Association]; the Lake Vineyard Association; and North Pasadena Land and Water Company.
>
> Numerous articles appearing in the *Los Angeles Times* and *Los Angeles Herald* discussed other reservoirs. An especially early article appearing in the *Los Angeles Herald* from 1875 hyped the

[1] According to Duncan A. Blackburn, Assistant Chief Engineer of Pasadena Water Department, writing in 1952, Benjamin Eaton provided his pipeline in 1887. (Duncan A. Blackburn, "Forty Years in Developing A Water System," unpublished paper presented on October 29, 1952, 5.)

[2] Timothy F Brick with Audrey Eftychiou, "Pasadena Water; The Essential Ingredient," City of Pasadena, Pasadena Water and Power, 2012, www.arroyoseco.org/documents/pwaterhistory.pdf.

> Indiana Colony by noting abundant availability of water held in reservoirs.[3] In 1888, the same year Sunset Reservoir opened, the Lake Vineyard Water Company constructed a large water main to Devil's Gate.[4] …The drought of 1898 made the growing city realize it required a dependable water system. However, it took fourteen years before the three, major land and water companies could be valued and purchased for a cost of $1,151,152.89.[5]

This key 1912 consolidation emerged out of political necessity. The previous year, Pasadena, like so many other emerging cities in the region, had narrowly defeated a local referendum calling for annexation to the City of Los Angeles. Joining the City of Los Angeles had been a condition placed on Pasadena by Los Angeles Mayor, George Alexander, in order to partake in the water provided by Mulholland's Los Angeles Aqueduct (Brick 2001).

On the day of the vote, on 1 April 1911, the lead article for the Pasadena Daily News summarized the choice before Pasadena voters that day: "Consolidation or No Owens Valley Water," with the daily editorial encouraging readers to "Vote Early and Vote for the Preservation of Pasadena" (Brick 2001). While the ultimate legitimacy of the annexation vote was nullified by the City Attorney, due to the structure of Pasadena's city charter, the election resulted in a decisive win for the anti-annexation candidate for mayor, William Thum. Pasadena retained its status as an independent, incorporated city, and Thum, as the new mayor, took steps to manage and expand Pasadena's municipal water supply.

In this context, the political pressure to consolidate water resources grew. In Thum's first full year as mayor, in 1912, Pasadena's three water companies were consolidated into one municipal utility, the Pasadena Water Department. Soon thereafter, the process had begun to establish a broader, regionwide system for water resources. As noted in Snow,

> By 1928, the Pasadena Water Department owed most watershed land in lower Arroyo Seco and Millard Canyons, as well as water rights in Eaton Canyon. In addition to the Arroyo Seco, much of Pasadena's water came from an aquifer called Raymond Basin, a 40-square mile groundwater basin below the San Gabriel Valley. …The Pasadena Water Department struggled in the beginning of the twentieth century to consistently provide sufficient water to the growing population. To overcome this obstacle, Pasadena was instrumental in establishing the Metropolitan Water District [described in more detail below]. …The first meeting of MWD took place at the Huntington Hotel in Pasadena on December 29, 1928. In 1941, Pasadena was able to access water from Colorado River Aqueduct and MWD Upper Feeder was placed in service to Sunset Reservoir on June 17 of that year.[6]
>
> The other solution to providing a reliable water source for the City of Pasadena was through construction of the Pine Canyon Dam, later renamed Samuel B. Morris Dam. Constructed of this dam took place between 1932-1934 in Azusa Canyon, although planning for it began in 1924. This dam was supplied by floodwater diverted from the San Gabriel River. …Water from Morris Dam was collected at Sunset Reservoir between 1937 and 1941, at which time, the dam was

[3] "Letter on the Indiana Colony," *Los Angeles Herald*, July 3, 1875, 3.

[4] "Pasadena: Improvements by the Water Company," *Los Angeles Times*, August 16, 1888, 6.

[5] Tim Brick, "The Fight for Municipal Water," unpublished lecture presented to the Pasadena Historical Society, March 3, 2001, 20.

[6] G&E Engineering Systems, Inc., 131-133.

deeded to MWD. […] In 1967, Pasadena Water Department consolidated with the Light and Power Department and became Water & Power Department (Snow 2017: 14-15).

4.3 METROPOLITAN WATER DISTRICT

Pasadena's Water Department is one of the founding members of the regional Metropolitan Water District (MWD), which provides approximately 40 percent of the total water supply for the Sunset Reservoir Complex. As noted in the 2017 evaluation,

> MWD was founded in 1928 with the main goal of bringing water from the Colorado River to the Los Angeles basin and its environs,[7] in order to meet increasing water demands for a growing population…. MWD began as a small, regional public entity that grew gradually during the 1930s and 40s, before annexing 'most of Southern California into its service territory' after World War II.[8] […] MWD began as a regional partnership between 13 Southern California cities.[9] In 1927, the California Legislature passed the Metropolitan Water District Act establishing MWD, which funded its operations through a voter-approved bond issue. Initially, MWD was charged with financing and building the Colorado River Aqueduct—a 242-mile 'engineering marvel that once was the longest and most expensive aqueduct in the world.'[10] The Aqueduct opened in 1941, initially serving a population of 2,100,000 and a service area of 608 square miles.[11] …During the 1930s, 'MWD played midwife to another engineering marvel—Hoover Dam (Lake Mead)—by purchasing a significant share of the project's hydropower.'[12]
>
> As a result of Southern California's rapid economic, housing, industrial, and population growth in the decades after World War II, MWD began a 'major system expansion' in 1952 that would help meet heavily increased water demand. While MWD completed construction of the Colorado River Aqueduct in 1941, the District deferred constructing other portions of the Aqueduct's distribution system until such additions were needed. Up until 1952, additional construction had been minor. But by 1957, MWD consisted of 3,019 square miles and 79 incorporated cities, serving a population of 6,543,000.[13] Frequent dry years prompted new cities to seek 'additional reliable water supplies.'[14] Moreover, in both urban and suburban areas, per capita use of water increased because of a 'rising standard of living and…new water-using equipment in most modern homes.' Likewise, MWD saw an increase of over fifty percent in 'municipal…and industrial uses of water in Southern California" during this same period, while 'local water supplies became less adequate and more severely over-pumped.'[15] At that point,

[7] Erie, *Beyond Chinatown*, p. 5.

[8] Erie, *Beyond Chinatown*, p. 5.

[9] The Metropolitan Water District of Southern California, Nineteenth Annual Report, 1957, p. vii. MWD originally consisted of nine cities in 1928, and adding four cities in 1931, for a total of 13 by the time the Colorado River Aqueduct opened in 1941. Erie, *Beyond Chinatown*, Table 1.2, p. 12.

[10] Erie, *Beyond Chinatown*, p. 7.

[11] Erie, *Beyond Chinatown*, p. 9. On population and square miles, see: The Metropolitan Water District of Southern California, Annual Report, 1957, p. vii. (Hereafter MWD Annual Report)

[12] Erie, *Beyond Chinatown*, p. 7.

[13] MWD Annual Report, 1957, p. 71.

[14] "The Metropolitan Water District of Southern California—An Overview." (MWD, June 6, 2015), p. 1.

[15] MWD Annual Report, 1957, p. 108.

> MWD inaugurated an accelerated construction plan "to provide increased water service to the enlarged and ever-growing district.'[16]
>
> In addition to the agency's regular operations during the 1960s, MWD would also come to play a central role in providing 'vital support' for the State Water Project.[17] The State Water Project (SWP) was the first phase of the California Water Plan, 'a long-range comprehensive program for the coordinated development and beneficial use of the water resources of the State.'[18]… In cooperation with 30 other public agencies, MWD helped make possible the construction of the 444-mile California Aqueduct, and would begin delivering water from Northern California to its member agencies in the 1970s.[19] (Snow 2017: 15-16)

For Southern California, the establishment of the MWD as well as the Colorado River Aqueduct represented significant breakthroughs, with each milestone widely celebrated in civic affairs and the local press (Figure 6 and Figure 7).



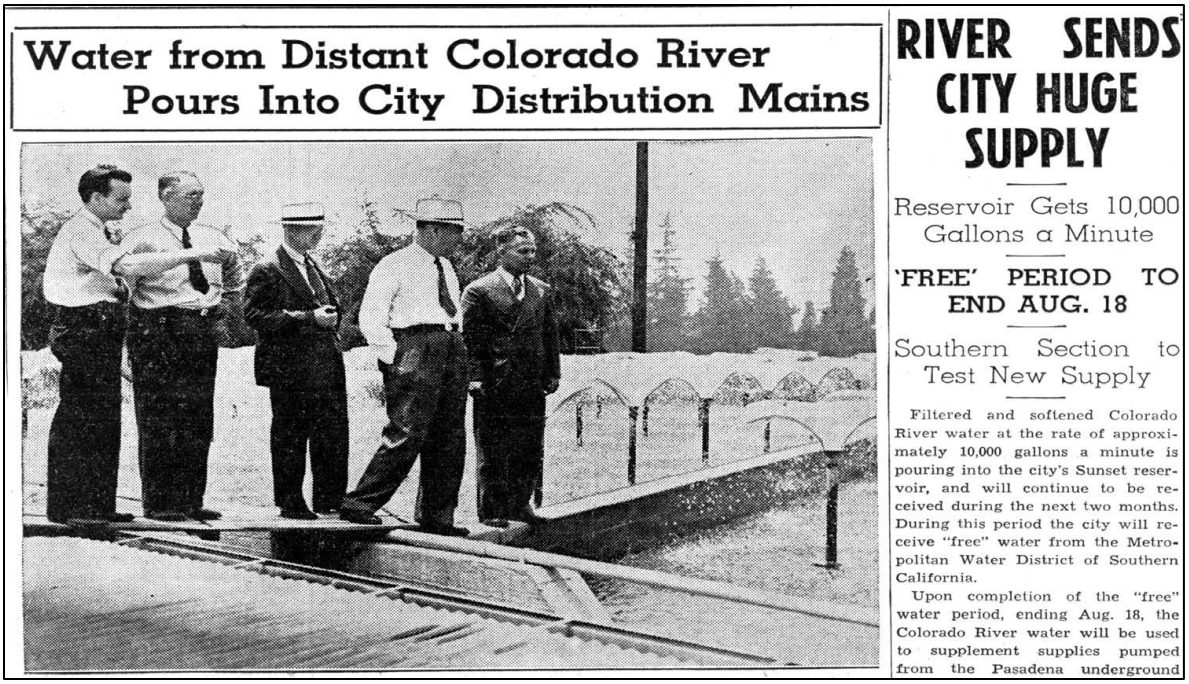
Figure 6. A section of the Colorado River Aqueduct pipeline set up by MWD as a publicity booth, circa 1930. Source: Los Angeles Water and Power Associates.

[16] MWD Annual Report, 1957, p. 71.

[17] Erie, *Beyond Chinatown*, p. 5.

[18] MWD Annual Report, 1969, p. 119.

[19] MWD Annual Report, 2015, p. xiv.



Water from Distant Colorado River Pours Into City Distribution Mains

RIVER SENDS CITY HUGE SUPPLY

Reservoir Gets 10,000 Gallons a Minute

'FREE' PERIOD TO END AUG. 18

Southern Section to Test New Supply

Filtered and softened Colorado River water at the rate of approximately 10,000 gallons a minute is pouring into the city's Sunset reservoir, and will continue to be received during the next two months. During this period the city will receive "free" water from the Metropolitan Water District of Southern California.

Upon completion of the "free" water period, ending Aug. 18, the Colorado River water will be used to supplement supplies pumped from the Pasadena underground

Figure 7. Arrival of Colorado River water in Sunset Reservoir, summer 1941.
Source: Pasadena Star-News, 18 June 1941.

4.4 SUNSET RESERVOIR COMPLEX

The earliest extant component of the Sunset Reservoir Complex is Reservoir No. 1, which was constructed in circa 1888 in northwest Pasadena. As shown in Figure 8, as of 1893, Reservoir No. 1 was one of three reservoirs extant in the growing City at the time. The other two reservoirs, owned by the Pasadena Land and Water Company (just south of the Sunset Complex) and the Lake Vineyard Reservoir (on Villa Street; now occupied by Villa Parke Community Center) were decommissioned/demolished in the early twentieth century.

The Sunset Reservoir Complex is located in a tract named after Thomas Banbury, the contractor who built Reservoir No. 1 (Figure 9). According to available archival sources, Banbury was a prolific, pioneering area contractor known as a "famous railroad grader, road maker and excavator" (*Los Angeles Herald* 1886). Banbury was regularly employed by the Pasadena Lake Vineyard Land and Water Company for excavation and road projects (Shoop 1958; *The Los Angeles Times* 1890; *The Los Angeles Times* 1892a, *The Los Angeles Times* 1892b; *The Los Angeles Herald* 1886).

Among his many projects, sources suggest that Banbury led efforts to construct the concrete flume from Devil's Gate to Reservoir No. 1, as well as other reservoirs in the City; he also graded Raymond Hill to make way for the famous Raymond Hotel in South Pasadena (*The Los Angeles Times* 1902; Shoop 1958). Banbury's uncle, Colonel Jabez Banbury, was the City of Pasadena's first "Zanjero"—i.e., the official responsible for regulating the flow and distribution of the water in open flumes, ditches, and canals (Shoop 1958).

The reservoir was originally lined with river stones and mortar, in a configuration resembling the historic stream-rock retaining wall along the southern and eastern border of the property (Carollo Engineers 2015:3). The reservoir was lined with concrete in circa 1900 by Banbury (Snow 2017; Shoop 1958); as of

2021, the reservoir continues to reflect this early change. In 1888, when Reservoir No. 1 initially opened, a 22-inch water main pipe was added to the system. Through it, water was diverted via a gravity-fed system from Devil's Gate on the Arroyo Seco to Reservoir No. 1 (Reid 1895:414; Hall 1888:503). (Later, in 1920, a dam was constructed at Devil's Gate.) Water allocated to the San Gabriel Orange Grove Association and the Pasadena Lake Vineyard Land and Water Company was diverted via a conduit/box extant at Reservoir No. 1 (Figure 10).

Reservoir No. 1 supported growing demand not only in the residential and commercial/industrial sectors, but also in the tourism sector for Pasadena and environs. In 1892, for example, a two-mile pipeline was constructed between Reservoir No. 1 and the Raymond Hotel in South Pasadena, to offer support for this destination hotel and its grounds (Reid 1985:420). The Raymond Hotel was the first major resort hotel of the San Gabriel Valley when it was constructed in 1886 (the Hotel Green and Castle Green followed in Pasadena in the 1890s).

Prior to construction of the Reservoir No. 1 addition, as shown in Figure 11 (now known as Reservoir No. 2), there was another reservoir owned and maintained by the Pasadena Lake Vineyard Land and Water Company called Reservoir No. 2. This Reservoir No. 2 was located south of the subject property on Villa Street (Reid 1895:420; The Los Angeles Times 1892). This earlier Reservoir No. 2 was the largest cemented reservoir in Southern California at the time of its construction (though it was subsequently demolished) (*The Los Angeles Times* 1892).



Figure 8. 1893 Map of Pasadena, California. Among 60 highlighted attractions (including churches, schools, and railway/transportation lines) are the City's three extant city reservoirs as of 1893. Among those three facilities, only Reservoir No. 1 of the Sunset Complex survives. Source: Observatories of the Carnegie Institution for Science Collection, Huntington Library, San Marino, California.



Figure 9. Devil's Gate, Pasadena, as of circa 1890. A dual track of piping runs through the center of the arroyo. Source: Huntington Digital Library, Pasadena, California.

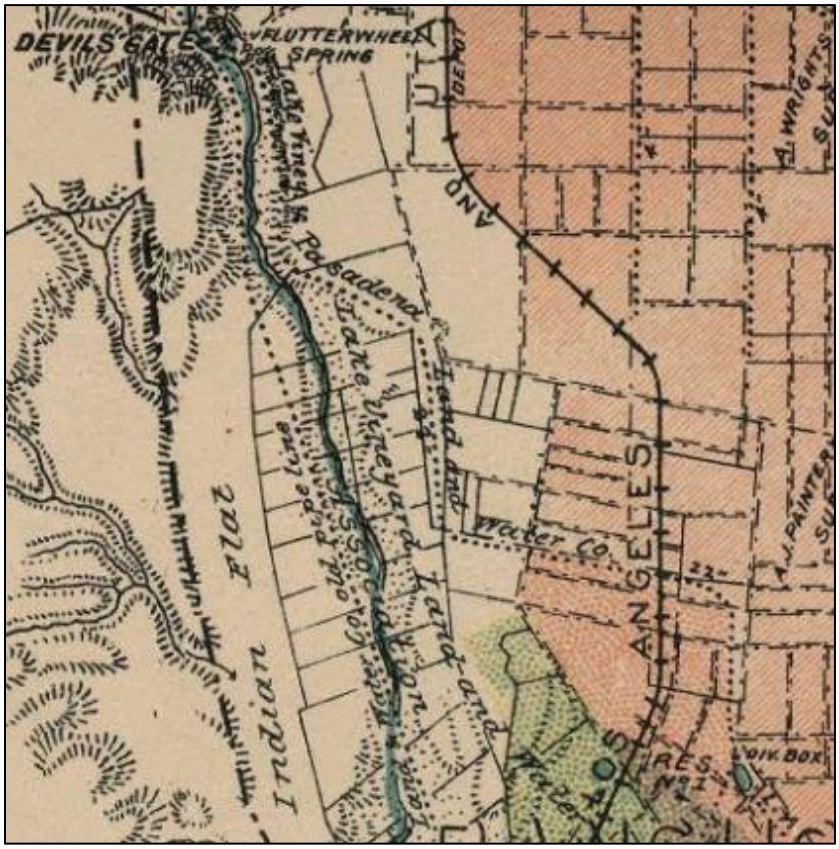


Figure 10. California State Engineering Department Irrigation Map, 1888. Source: David Rumsey Map Collection. Reservoir No. 1 appears in lower righthand corner.

In 1898, Reservoir No. 1 was capped with a wood roof at a cost of just over $2,140 (The Los Angeles Herald 1898). In circa 1900, Reservoir No. 1 was lined with concrete, and Reservoir No. 2 (referred to originally as an addition), was constructed (Figure 11) (Snow 2017:8). The 1910 Sanborn Fire Insurance Map illustrates a portion of the property, highlighting Reservoir No. 1, with its 3.2-million-gallon span, and Reservoir No. 2 (marked on the map as "Reservoir No. 1 Addition") with its 7-million-gallon capacity. Both reservoirs were capped at the time with wood board roof structures. Dense structural Redwood posts were used to support the new roofs. As shown on the 1910 Sanborn Fire Insurance map, the property was (and continues to be) located within a residential neighborhood.

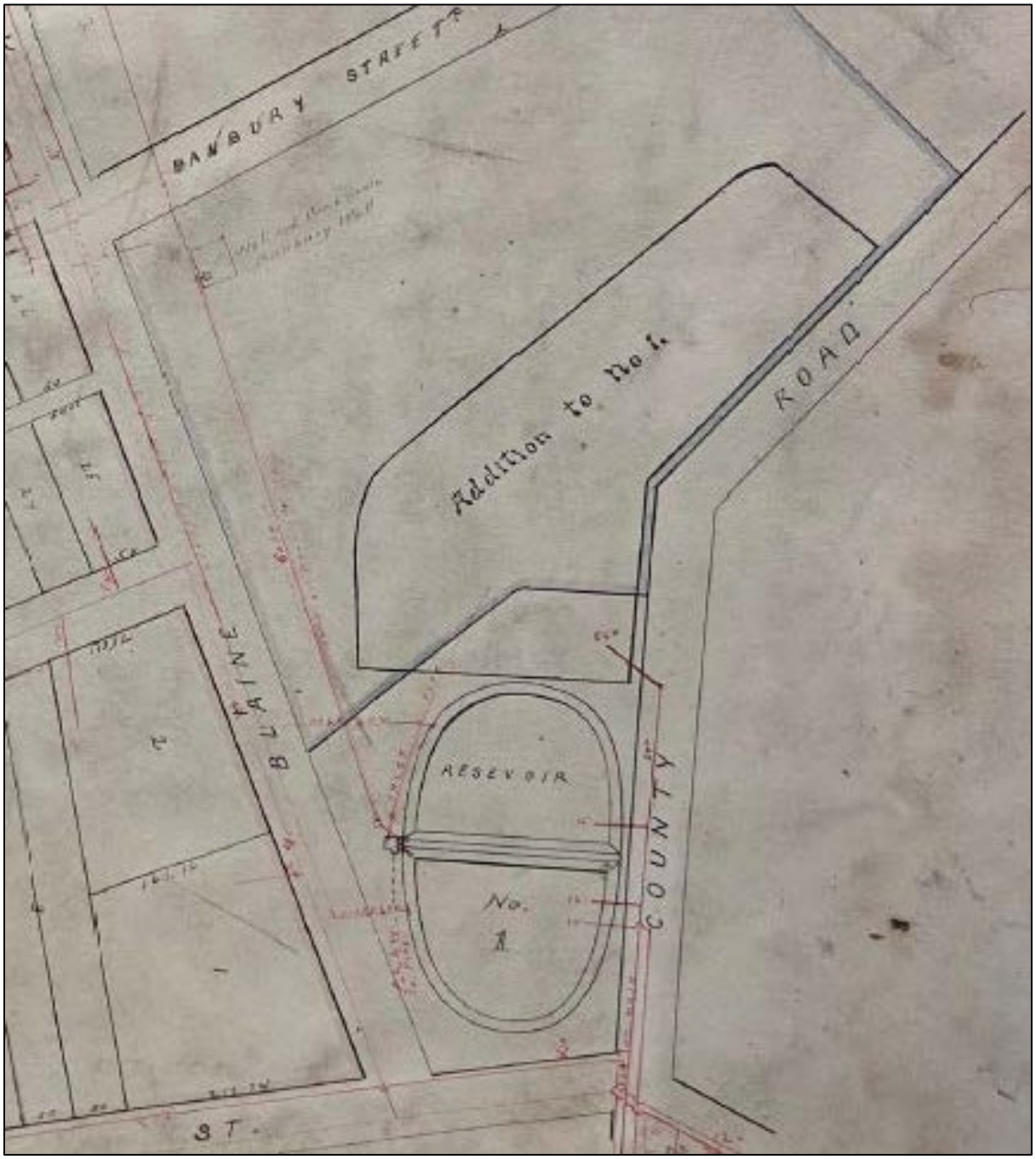


Figure 11. Portion of Pasadena Lake Vineyard Land and Water Map, circa 1889. Source: PWP

In 1920, a significant step forward for Pasadena's flood control and water conservation was taken, when Devil's Gate Dam was constructed. Construction of the dam was catalyzed by the devastating floods of 1914, which caused $10 million in damage throughout the Arroyo Seco basin (Los Angeles County Department of Public Works, n.d.). In response, the Los Angeles County Flood Control District was established in 1915. Five years later, Devil's Gate became the first dam constructed for the nascent Los Angeles County Flood Control District (Arroyo Seco Foundation, n.d.) (Figure 12 and Figure 13).

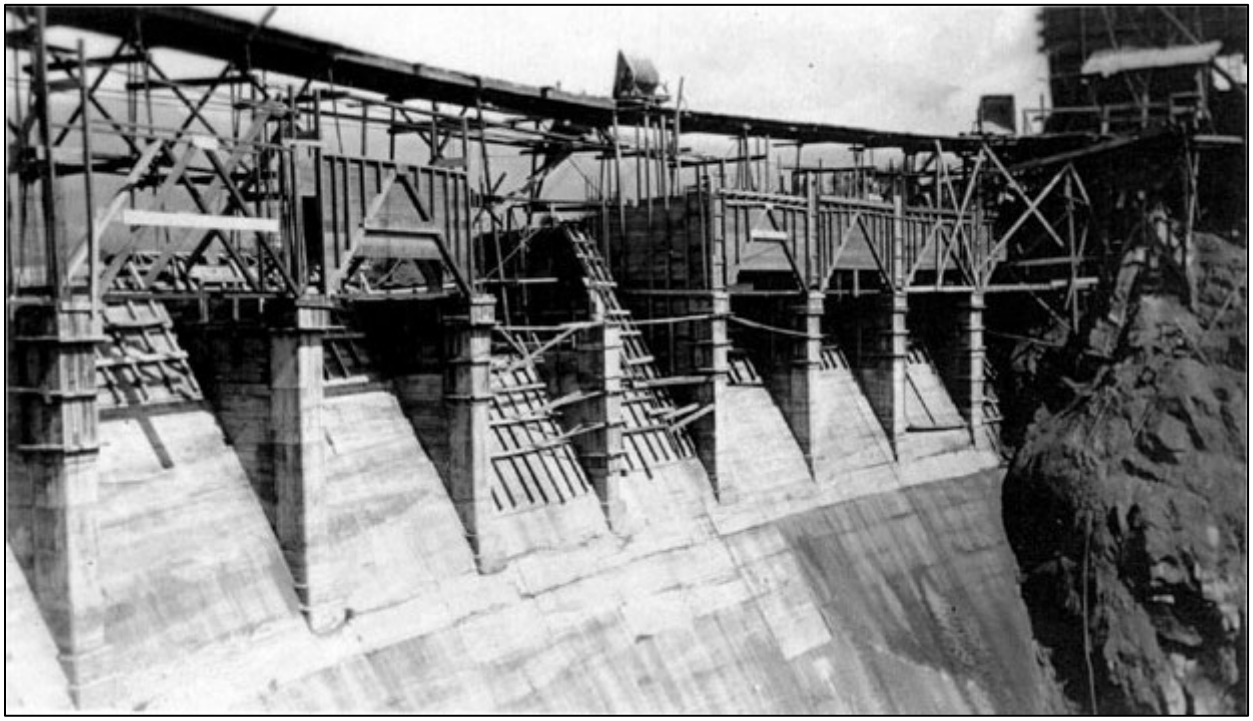


Figure 12. At the time of its 1920 construction, Devil's Gate dam became the first Los Angeles County Flood Control District dam. Source: Arroyo Seco Foundation, n.d.

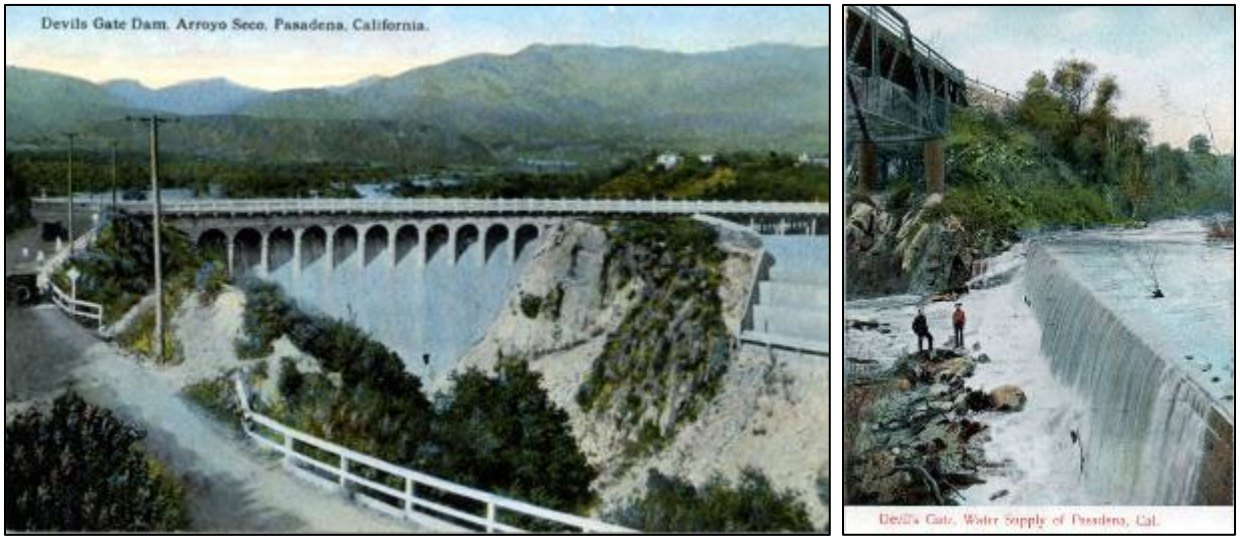


Figure 13. Historic postcards depicting the 1920 Devil's Gate dam, which fed into the Sunset Reservoir complex to the southeast. Source: Arroyo Seco Foundation, n.d.

Through the Roaring 1920s, down the hill from Devil's Gate, the Sunset Reservoir Complex continued to expand to serve a rapidly growing City and population. In 1923, the Sheldon Booster House (which is extant as of 2021) was constructed by the Pasadena Water Department (Pasadena Water Department 1923). In circa 1925, Well No. 20 (also still extant) was constructed. The Sheldon Booster House and Well No. 20 are illustrated in the 1928 aerial photograph provided in Figure 14.

In 1929, eight inches of cement plaster was added to the lining of Reservoir No. 1 (*Pasadena Star News* 1929a), and both Reservoirs No. 1 and No. 2 had new, galvanized corrugated iron roofs installed. These materials reflect the current design as of 2021.

In addition, in 1929, the original Redwood posts of Reservoir No. 1 were cut and lap-sliced together with new extended post segments using steel bolts and bearing plates (Pasadena Water Department 1929; Carollo Engineers 2015:3). These extensions of the Redwood posts, with the bolted, paired posts, remain intact and extant as of 2021.

Another extensive round of facility upgrades and expansion took place in 1934, during the Great Depression. These changes were made to accommodate new regulations and new water flow arriving from Morris Dam. To increase storage capacity of the reservoirs, a four-foot-tall concrete perimeter wall was added to both Reservoirs No. 1 and No. 2. This wall is intact and extant around both reservoirs.

In addition, portions of the reservoirs' lining were repaired with gunite concrete, with spot-treatments of asphalt used to cover joints and cracks (Carollo 2015; Snow 2017). Lastly, a new corrugated metal roof was installed on Reservoir No. 2.

Heart Structural Redwood was used (and is extant and intact) for the posts, and Douglas Fir (treated with creosote) was used (and is also extant and intact) for girders, joists, bracing studs, plates, bridging, and sills. Creosote-treated Douglas Fir, still extant and intact, was used for the roof superstructure to help combat wood rot due to dampness and to protect against termites (Pasadena Water Department 1934).

This phase of expansion in 1934 also brought construction of a new Chlorine Treatment Plant, Lime House, and an Aeration Plant with four distinct sections (Basins "A" through "D"). The Aerator Plant, which aerated water via an overhead spray system, is illustrated in a 1937 aerial photograph (Figure 15). Only a portion of Basin "A" is extant; the rest of these buildings and structures have since been demolished. Images shown in Figure 16 and Figure 17 illustrate Basin "A" in the 1950s, when it was still uncovered and functioning as an aeration basin. The concrete flume with weir and release gate shown in Figure 16 are extant.

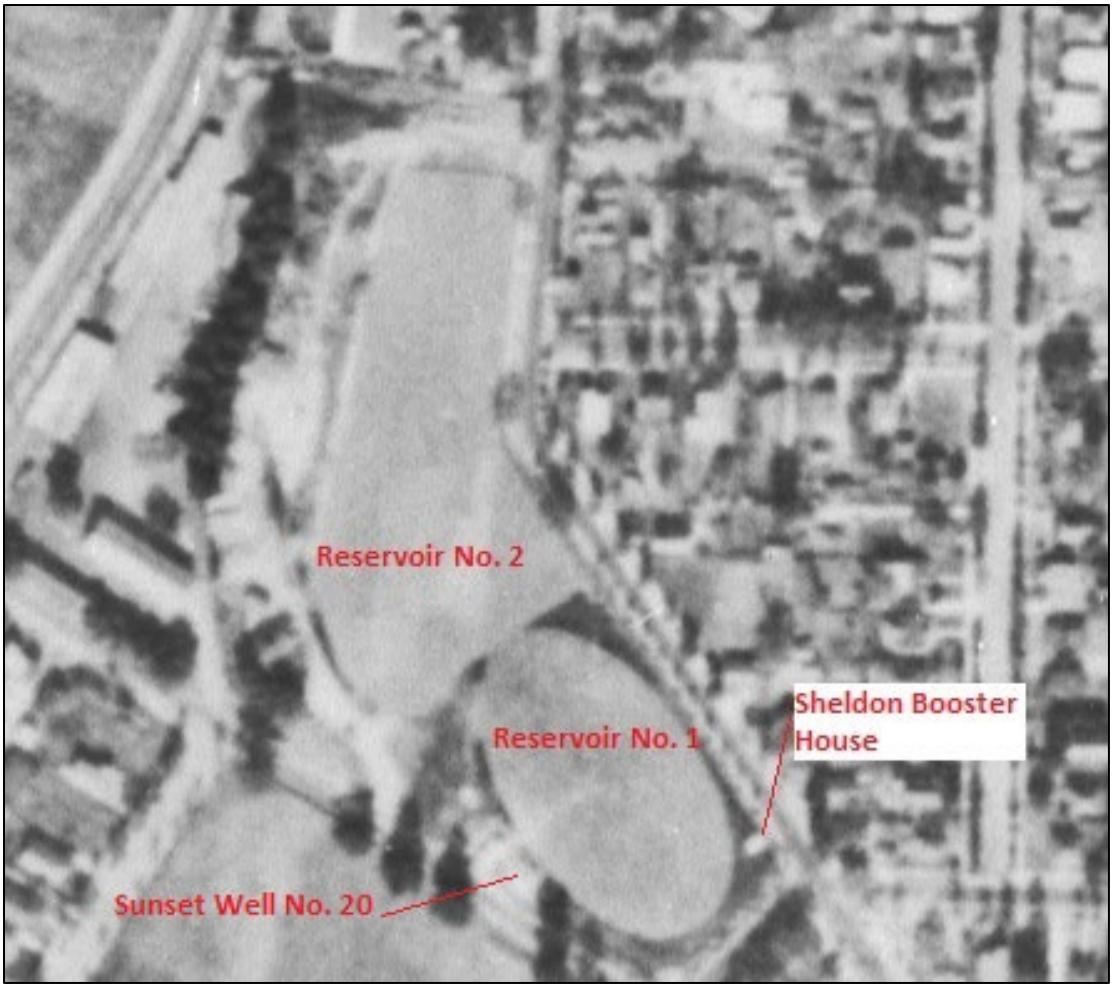


Figure 14. 1928 aerial photograph of the Sunset Reservoir Complex.
Source: University of California Santa Barbara Library

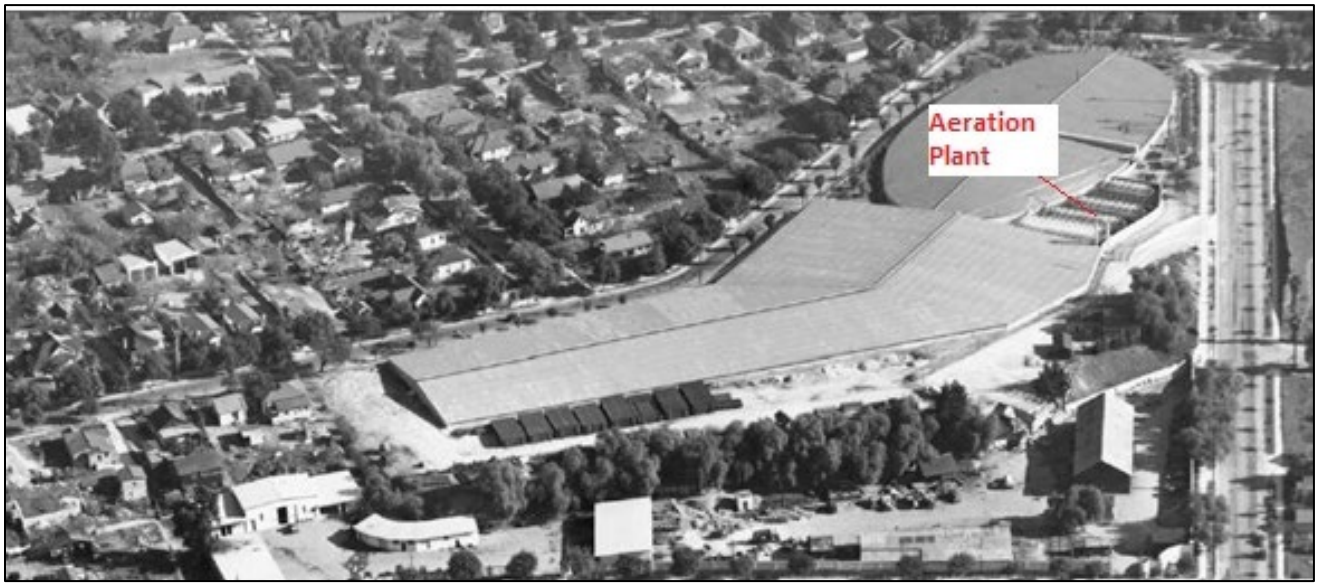


Figure 15. 1937 aerial photograph of the Sunset Reservoir Complex.
Source: Snow (2017)

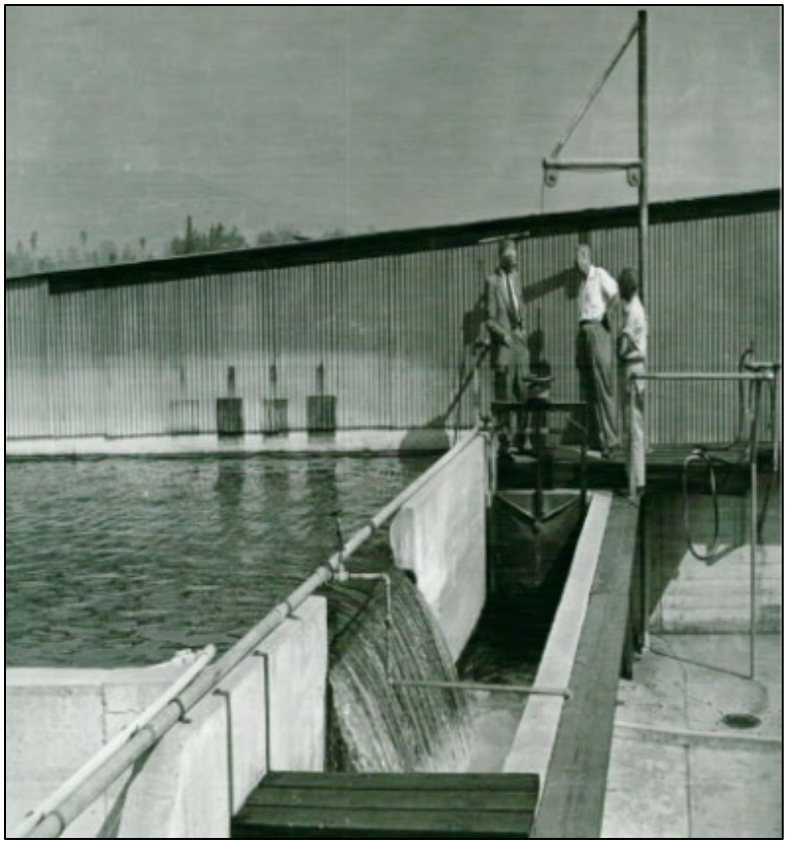


Figure 16. Basin "A" with concrete weir, flume, and sluice gate, circa 1950. This portion of Basin "A" is extant but covered with a wood-framed, corrugated metal roof. Source: PWP



Figure 17. Aeration Plant, 1950. Source: PWP

In 1941, water arrived at the Sunset Complex via the Colorado River Aqueduct (CRA), an important source that supplemented (and continues to supplement) the local water supply. To increase the pumping capacity of the system, the Glorieta Pumping House was constructed in 1947 to house three pumps as shown in Figure 18. Designed by local architect Breo Freeman, the building exhibits Streamline Moderne elements, with its flat roof, horizontal grooves, smooth stucco-clad walls, asymmetrical design composition on the façade (east elevation), as well as glass block windows that were later covered with metal mesh panels (Figure 19).



Figure 18. Interior of Glorieta Pumping House in 1950, looking northwest. Source: PWP

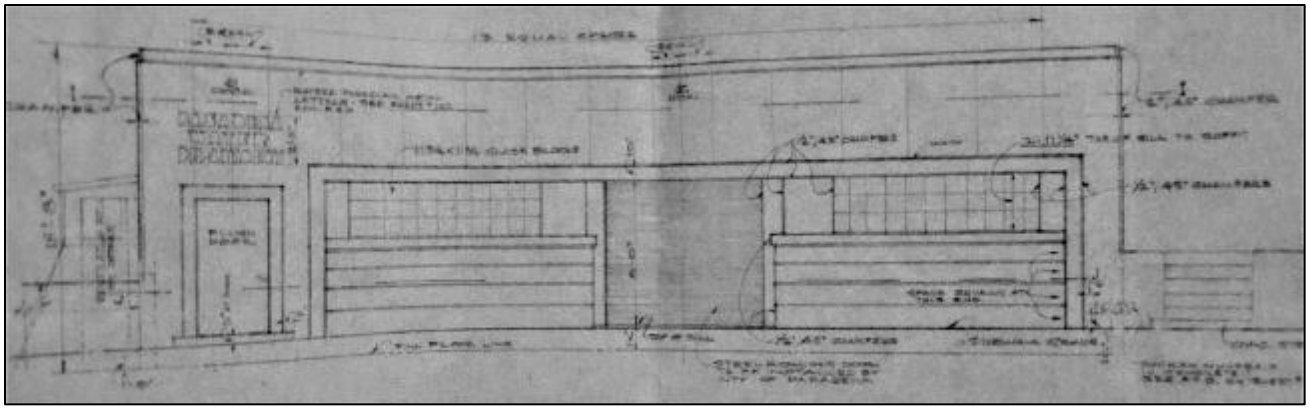


Figure 19. Portion of Glorieta Pumping House As-Built Drawings by Breo Freeman, 1947. Source: PWP

5.0 ARCHITECTURAL DESCRIPTION

This section provides architectural descriptions of all of-age components of the Sunset Reservoir Complex evaluated in this study. An overview of the facility is provided, followed by detailed descriptions of each of the seven evaluated buildings, structures, and features.

5.1 OVERVIEW OF SUNSET RESERVOIR COMPLEX

The Sunset Reservoir Complex is located in the western portion of the City of Pasadena, California. The facility occupies an irregularly shaped, sloped parcel bounded by West Hammond Street to the north, Sunset Avenue to the east, West Mountain Street to the south, and Glen Avenue and the 210 Freeway to the west. The parcel sits above grade, compared to surrounding streets. A tall brick wall and low concrete wall topped with a chain-link fence border the property along West Mountain Street. A low, stream-rock retaining wall also capped with a chain-link fence borders the southeast corner of the property; this wall encircles the property along Sunset Avenue, transitioning into a low concrete wall capped with a chain-link fence. Vehicular access to the property is provided through driveways located along West Mountain Street and Sunset Avenue.

The subject parcel also includes contemporary office buildings in the northwestern portion of the property, situated substantially below the grade of the rest of the property. (These buildings are not of-age and therefore were not included in this evaluation.) The Treatment Plant located at the south end of the property, between Well No. 20 to the south and Basin “A” to the north, is also a more recent addition to the facility. (Constructed between 2010 and 2011, the property was not evaluated in this study.)

The property is situated west of the Fair Oaks/Orange Grove neighborhood, which largely consists of residential properties. Brenner Park and another residential neighborhood are located south of the subject property. To the east of the subject property is the City of Pasadena Maintenance Yards, which include various, City-owned buildings and structures, dating from the early through late twentieth century.

Images shown in Figure 20 through Figure 25 provide a visual overview of the subject property from the public right-of-way.



Figure 20. Subject property, from West Mountain Street and Sunset Avenue, view northwest. Source: Snow, 2017



Figure 21. Subject property, from Sunset Avenue toward Reservoir No. 1, view northwest. Source: Snow, 2017



Figure 22. Subject property, Sunset Avenue toward Reservoir No. 1, west elevation of Glorieta Pump House at far right, view southwest. Source: Snow, 2017



Figure 23. Subject property, from West Mountain Street, driveway toward Reservoir No. 2, view north. Source: Snow, 2017



Figure 24. Subject property, from West Mountain Street toward Reservoir No. 1 (background) and southwest elevation of Well No. 20, view southeast. Source: Snow, 2017



Figure 25. Subject property, Reservoir No. 1 (left), Treatment Plant (right), view southeast. Source: Snow, 2017

5.2 RESERVOIR NO. 1

The oldest property of the complex, Reservoir No. 1 is oval in plan and measures 350 feet long by 200 feet high. The 57,300-square-foot basin sits deeply below grade on the south end of the reservoir parcel. The basin is hopper-bottom shaped and constructed of cobblestone and cement plaster sheathed in layers of concrete and gunite. A central berm capped with a cast-in-place curb traverses the longitudinal extent of the reservoir, dividing the south and north portions. A reinforced concrete wall and footing are extant around the above-grade perimeter of the reservoir. The pedestrian entrance to Reservoir No. 1 is located on the west elevation, with metal stairs and a wood deck leading to a corrugated metal door. The door leads to a timber catwalk above the reservoir basin, which extends east to the center of the reservoir. The walkway does not extend to the east side of the reservoir. On the interior, the roof superstructure consists of the original Oregon Pine (Douglas Fir) beams and members.

The roof rests on a grid of redwood posts with spliced redwood extension posts. Sheathed in corrugated iron sheets, the roof slopes from a high point in the center of the reservoir. A central air-vent extends along the roof crest on the longitudinal axis (north-south).

The following figures provide a visual overview of the materials and features of Reservoir No. 1.



Figure 26. Section of corrugated metal roof and enclosed walkway, looking northeast.



Figure 27. North end of Reservoir No. 1 sheathed corrugated metal roof and Reservoir No.2 in the background, looking northeast



Figure 28. Reservoir No. 1 walkway entry, looking southeast

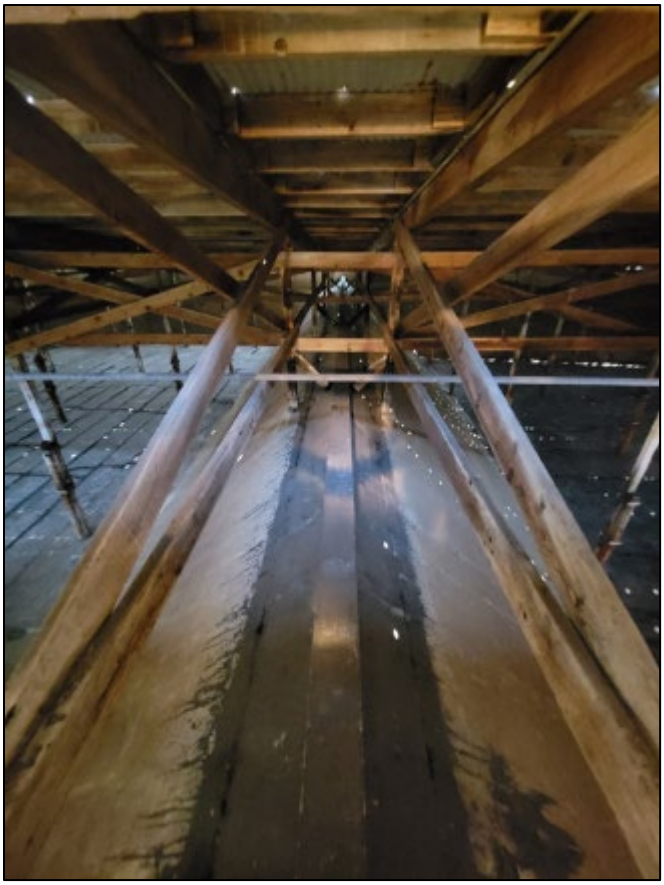


Figure 29. Central berm with cast-in-place curb at the top, separating north and south units, looking east



Figure 30. Interior of Reservoir No. 1 with redwood posts and spliced redwood extension posts



Figure 31. Corrugated metal roof on the southern portion of the reservoir, looking east

5.3 RESERVOIR NO. 2

L-shaped in plan, Reservoir No. 2 measures 525 feet long by 260 feet wide. The reservoir spans 97,000 square feet and sits below grade, north of Reservoir No. 1. Reservoir No. 2 is wider at the south end and narrower at the north end. The basin is sloped downward and lined with gunite. The basin also displays a concrete staircase leading to the bottom of the reservoir on the north end and a sloped concrete ramp. The perimeter of the basin consists of a 6-foot-tall, board-form concrete wall.

The reservoir interior is accessible on the north elevation via concrete stairs and a corrugated metal door. The south elevation exhibits a secondary entrance, accessed via metal stairs and a metal walkway extending from Basin "A" around the south elevation of Reservoir No. 2 to a corrugated metal door. Both entries lead to a timber catwalk spanning the longitudinal extent of the reservoir. The catwalk consists of Douglas Fir planks, and the roof superstructure displays creosote treated Douglas Fir. A grid of redwood posts supports the roof superstructure. An unused 30-inch pipeline, filled with a tree trunk, is extant on the west elevation of the basin. A flume opening is also extant on the south end of the reservoir, leading to the concrete flume spanning the western portion of Reservoir No. 1. At the south end of Reservoir No. 2, a concrete overflow weir is shared with Reservoir No. 1. The floor of the Reservoir No. 2 basin features a release gate on the south end, which leads to the local sewer system. Sheathed in corrugated metal, the roof displays a front-gable configuration with low pitched eaves. A central air-vent traverses the crest of the roof on the longitudinal axis (north-south).

The following figures provide a visual overview of the materials and features of Reservoir No. 2.



Figure 32. Exterior wall of Reservoir No. 2 (left) and Basin "A" (right), looking northeast



Figure 33. Reservoir No. 2 from the northwest corner, looking southeast



Figure 34. Reservoir No. 2 walkway entry on the north end, looking south



Figure 35. Interior of Reservoir No. 2 with concrete wall along the upper perimeter and concrete staircase on the north end, looking east



Figure 36. Gunite sloped driveway on the westside of Reservoir No.2

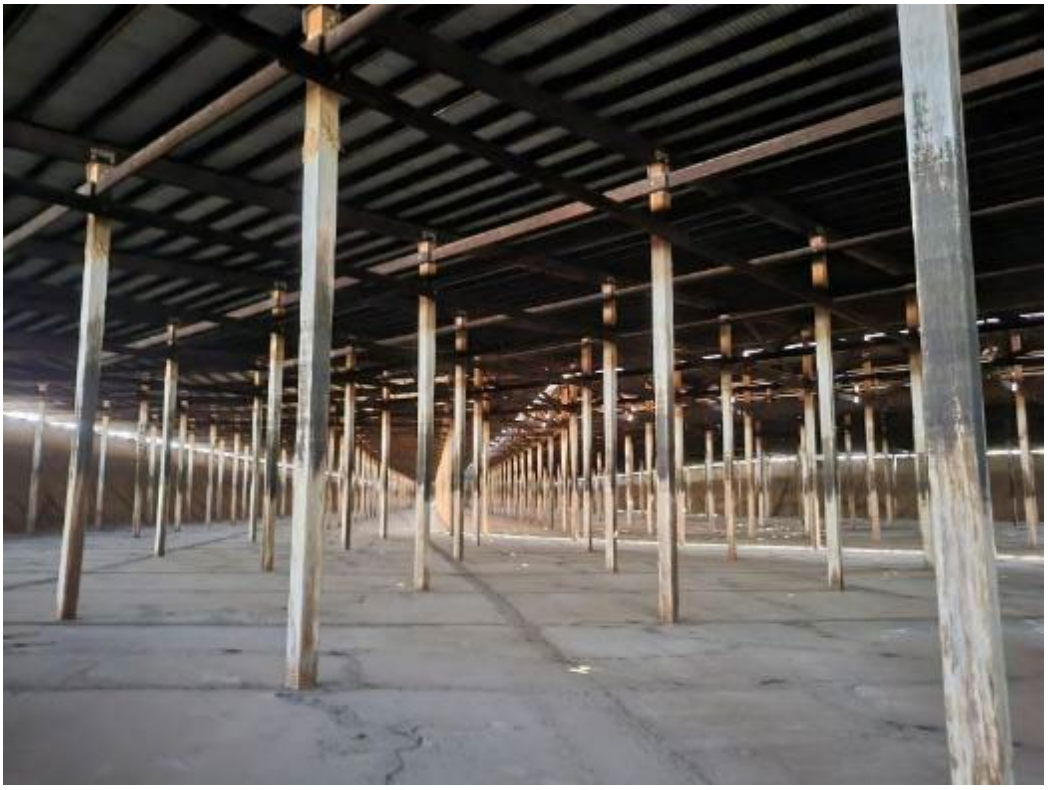


Figure 37. Redwood posts with creosote treated Douglas Fir roof superstructure, looking north



Figure 38. Flume entry on the south end of Reservoir No.2, looking north



Figure 39. Concrete overflow weir between Reservoir No. 1 and No. 2, looking southwest from the interior of Reservoir No. 2



Figure 40. Release gate to local sewer system on the bottom floor of Reservoir No.2 on the south end, looking northeast.

5.4 BASIN "A"

Separate from but adjacent to Reservoirs No. 1 and 2, Basin "A" is located to the west of the reservoirs. Basin "A" consists of a board-formed concrete basin with a metal pipe and concrete weir (flow control barrier); this basin empties into a flume spanning the westside of Reservoir No. 1. A sluice gate is extant on the north end of the flume, which controls the water released from Reservoir No. 2 to Reservoir No. 1. The basin and flume are covered with a timber-framed corrugated metal roof, similar to the roof structures on the reservoirs.

The following figures provide a visual overview of the materials and features of Basin "A."



Figure 41. Enclosed Basin "A" with pipe system, looking southwest



Figure 42. Basin "A" with weir and concrete flume, looking south



Figure 43. Sluice gate within the concrete flume, looking south.

5.5 WELL NO. 20

To the southwest of Reservoir No. 1, Well No. 20 houses a well pump for the reservoir complex. Square in plan and resting on a concrete foundation, Well No. 20 spans nearly 440 square feet. The exterior is clad in smooth stucco, and interior walls consist of board-formed concrete. Slightly below grade on the north elevation, the structure is located adjacent to Mountain Street and is visible from the public-right-of-way. A flat roof, punctuated with a wood-framed ventilation pop-up, caps the structure. A set of concrete stairs, along the west elevation, provide access from Mountain Street to the higher grade of the Sunset Reservoir Complex. The west elevation displays an arched air vent.

The primary (south) elevation displays a set of metal doors framed by a decorative accent of painted vertical bricks. A simple frieze molding wraps around the perimeter of the roof, with a small section missing at the center of the façade.

The following figures provide a visual overview of the materials and features of Well No. 20.



Figure 44. Primary façade (south elevation) of Well No. 20 with entry doors, looking northeast



Figure 45. North elevation and roof of Well No. 20 with ventilation pop-out, looking south



Figure 46. Air ventilation opening and screens on the roof of Well No. 20, looking north



Figure 47. Air vent on the west elevation, looking east



Figure 48. Interior of Well No. 20, looking north

5.6 GLORIETA PUMPING HOUSE

Located on the east portion of the property, the Glorieta Pumping House is rectangular in plan and spans over 1,360 square feet. Adjacent to Sunset Avenue and visible from the public right-of-way, this building consists of board-formed concrete, clad in stucco and resting on a concrete foundation. The building exhibits some Streamline Moderne-inspired design elements, including its asymmetrical design composition on the façade (east elevation), horizontal banding on either side of the centrally located metal roll-up garage door, and rectangular glass-block windows on the primary façade (east elevation). While obscured from the exterior by metal mesh panels, original glass-block windows are extant and visible on the interior.

Original signage reading “Pasadena Water Department” has also been removed from the façade, above the entrance. On a concrete retaining wall north of the building, original signage/engraving indicating the building’s construction date, 1947, is still visible and extant. The building interior is accessed via one door with simple unadorned surrounds on the southern portion of the façade. The interior consists of one large open room with three pumps and various machinery. The south elevation sits partially below grade and incorporates a rectangular “pop out” that provides ventilation to the interior. A roll-up garage door on the façade appears original.

The following figures provide a visual overview of the materials and features of Glorieta Pumping House.



Figure 49. Façade (east elevation), Glorieta Pumping House, west perspective. Note that original glass blocks have been covered and the "Pasadena Water Department" sign has been removed. Also note the "1947" engraved on the structure at the bottom right corner.



Figure 50. Air ventilation "pop out" on the south elevation, looking northwest



Figure 51. Interior, with original glass blocks on the east elevation

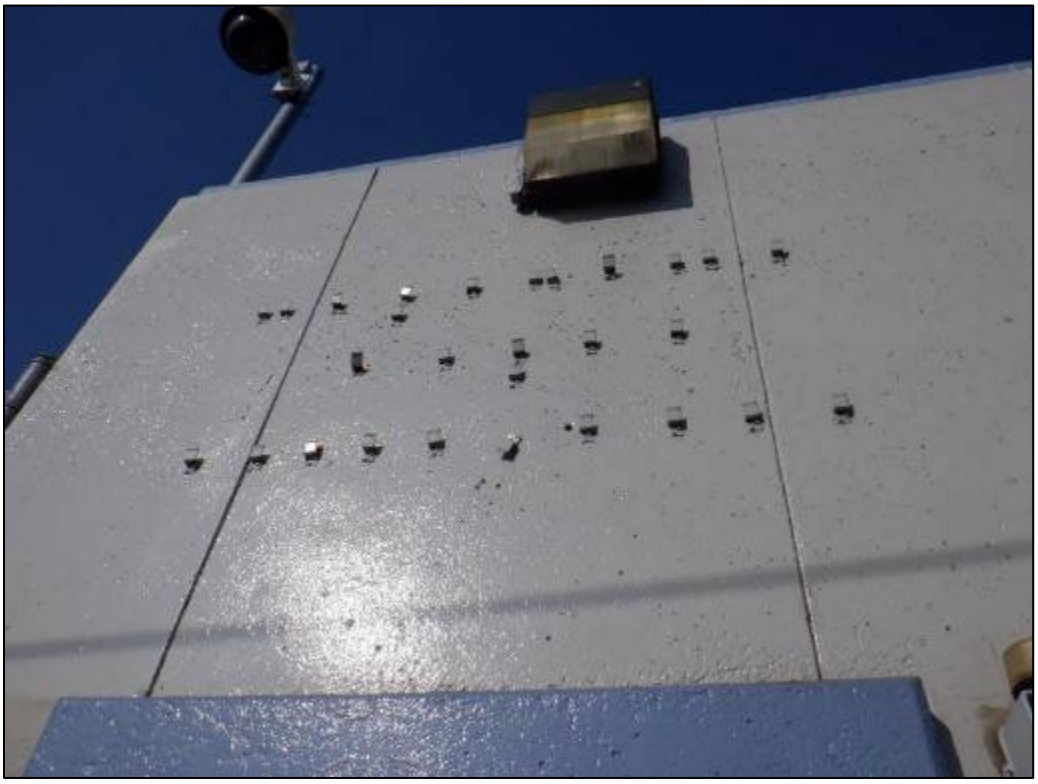


Figure 52. Remnants of entrance sign, which originally read "Pasadena Water Department," west perspective



Figure 53. "1947" construction date engraving on façade, west perspective



Figure 54. Interior detail, original air vents and fans on north elevation



Figure 55. Original roll-up door on the primary east facade, looking east from the interior



Figure 56. Detail of the roll up door pully system, looking northeast

5.7 SHELDON BOOSTER HOUSE

Utilitarian in design, the Sheldon Booster House is located east of Reservoir No. 1 along Sunset Avenue, at the southeast corner of the property. Square in plan, this structure is partially below grade, with the northeast elevation at grade with and visible from Sunset Avenue. This board-formed concrete structure is clad with smooth stucco and capped with a front gabled, low-pitched roof. A set of vertical wood-plank doors is located on the façade (east elevation). Fenestration consists of metal-framed casement windows on the north and south elevations.

The following figures provide a visual overview of the materials and features of the Sheldon Booster House.



Figure 57. East-facing facade with entry doors, west perspective. Doors appear nonoriginal, based on as-built drawings.



Figure 58. Interior, looking southwest



Figure 59. Interior, original casement windows, north elevation

5.8 STREAM-ROCK RETAINING WALL

Sunset Reservoir's stream-rock retaining wall defines the complex boundaries along its eastern and southern perimeters. The wall spans approximately 370 linear feet and is four-feet high. The wall is constructed of river stones, fastened with smooth mortar. A portion of the wall at the southernmost end was reinforced in 1974, with additional river rocks above the footing (PWP 1974). The original slope of the grade was also reduced during restoration efforts. In addition, the portions of the wall exceeding four feet along the southern span consist of new additions made in 1974. The wall includes drains spaced in intervals of 25 to 30 feet; six of these drains display the original terra cotta lining; nine have been upgraded to metal pipes.

The following figures provide a visual overview of the materials and features of the stream-rock retaining wall.



Figure 60. Portion of stream-rock retaining wall along the eastern perimeter, looking north



Figure 61. Portion of stream-rock retaining wall at the southern end along Mountain Street, looking west. A portion of this segment was repaired/replaced in-kind in the 1970s.

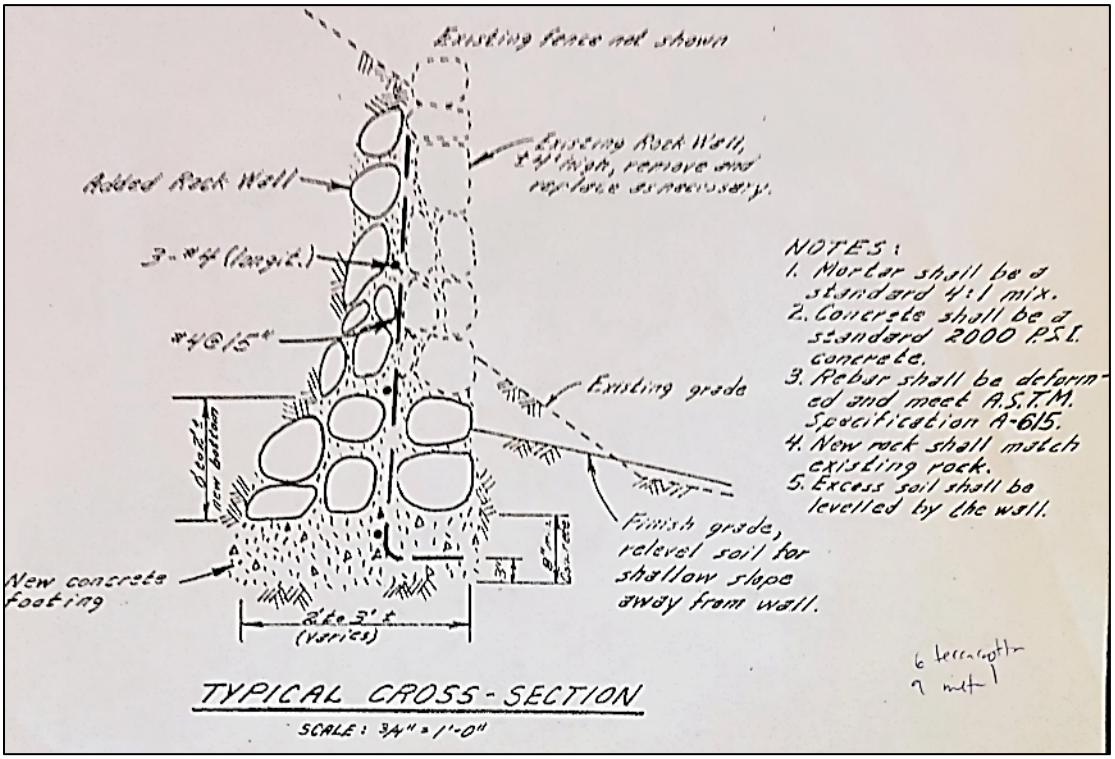


Figure 62. Portion of Stream-Rock Retaining Wall reinforcement, 1974. Courtesy of PWP



Figure 63. Metal drainage pipe within the masonry wall



Figure 64. Terra cotta drainage pipe within the masonry wall

6.0 EVALUATION

For purposes of this evaluation, the Sunset Reservoir Complex has been documented and evaluated as a historic district per NPS guidelines (NPS 1995). The significance of the complex is derived from the interrelationship of its resources and how they have functioned together over time. A district can include features that lack individual distinction provided that the resources all together convey the identified historical significance.

The following section describes eligibility criteria, integrity considerations, character-defining features, and primary and secondary contributors of the complex.

6.1 SIGNIFICANCE CRITERIA A/1/A

NRHP Criterion A: Is associated with events that have made a significant contribution to the broad patterns of our history

Criterion 1: It is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage

Local Criterion a: It is associated with events that have made a significant contribution to the broad patterns of the history of the City, region, or state

The Sunset Reservoir Complex is a rare and intact water reservoir and treatment system constructed during Pasadena's founding years, adapted and expanded over a century.

In circa 1888 and 1900, when Reservoirs No. 1 and No. 2 were constructed, Pasadena was gradually evolving from a small, agricultural community to an expanding city and tourist destination. During this period of growth, the development of water infrastructure was essential to meet expanding demand. In response to this challenge, syndicates including the Pasadena Lake Vineyard Land and Water Company and the Pasadena Land and Water Company invested in a new water conveyance system from Devil's Gate to Reservoir No. 1. Sunset Reservoir was the diversion point for this system and has continued to serve the City of Pasadena for over 130 years.

New water sources have filled this reservoir system, from circa 1888 until 2020, including water from local wells, Raymond Basin, the Arroyo Seco, Morris Dam, and the Colorado River Aqueduct. In this way, the Sunset Reservoir Complex has a strong, well-documented association with the late-nineteenth and early-twentieth century water history of the City.

As a result of this intensive-level evaluation, the Sunset Reservoir Complex **appears eligible as a historic district under NRHP Criterion A, CRHR Criterion 1, and as a City of Pasadena Landmark under Criterion a**. With the determination of eligibility under the NRHP, the historic district is a historic property under Section 106. As the oldest extant reservoir complex in Pasadena, the subject property represents an intact, early municipal water facility that facilitated the City's rapid growth and expansion from the late nineteenth through the twentieth centuries.

The period of significance is from 1888 to 1941, following the establishment of the Metropolitan Water District and the arrival of water to Pasadena from the Colorado River Aqueduct. The Sunset Reservoir Complex exemplifies the context of Public Institutional Development/Government Infrastructure and the theme of Municipal Water and Power/Water Supply Infrastructure.

The contributors to the Sunset Reservoir Complex Historic District are as follows:

1. Reservoir No. 1 (primary contributor)
2. Reservoir No. 2 (primary contributor)
3. Basin "A" (secondary contributor)
4. Well No. 20 (secondary contributor)
5. Sheldon Booster House (secondary contributor)
6. Historic stream-rock retaining wall (primary contributor)

Collectively, these six contributors form the Sunset Reservoir Complex Historic District. The period of significance for the historic district is circa 1888, the year Reservoir No. 1 and the stream-rock retaining wall were constructed on the property, to 1941, until water arrived in Pasadena via the Metropolitan Water District and the Colorado River Aqueduct. The Glorieta Pumping House is not a contributor to the district, since its 1947 construction date falls outside the period of significance. In addition, the Glorieta Pumping House does not appear individually eligible under the applicable criteria. The Pumping House has no significance on its own outside of its association with the Sunset Reservoir Complex and it has made no significant contribution to the broad patterns of the nation's, state's, or city's history and cultural heritage.

As a historic district eligible for the NRHP, CRHR, and as a local landmark, the Sunset Reservoir Complex Historic District **qualifies as a historic property pursuant to Section 106 and a historical resource pursuant to CEQA,** and the demolition and replacement of some of its contributing features, including primary contributors Reservoir No. 1 and Reservoir No. 2, **would be considered an adverse effect to a historic property, in accordance under Section 106 according to 36 CFR Part 800.5, and would be expected to cause a significant adverse impact and material impairment to the resource**, in accordance with CEQA Guidelines Section 15064.5(b). As a result of project implementation, the historic district would no longer convey the reasons for its significance (and no longer be eligible for national, state, or local listing).

6.2 SIGNIFICANCE CRITERIA B/2/B

NRHP Criterion B: Is associated with the lives of persons significant in our past

Criterion 2: It is associated with the lives of persons important in our past

Local Criterion b: It is associated with the lives of persons who are significant in the history of the City, region, or state

Research conducted for this study did not suggest that the Sunset Reservoir Complex, either in whole or in part, is significant for its association with individuals who made significant contributions at the local, state, or national level. Thomas Banbury was an active citizen in the City of Pasadena through his contracting work and municipal roles, but he does not appear to be a historically significant individual at the local level. While architect Breo Freeman designed the Glorieta Pumping House, the structure is not a contributor to the Sunset Reservoir Complex Historic District and is not individually significant as discussed in Section 6.3 below.

Therefore, the property **does not appear eligible for listing in the NRHP, CRHR, or as a local landmark under Criteria B/2/b**.

6.3 SIGNIFICANCE CRITERIA C/3/C

NRHP Criterion C: Embodies the distinctive characteristics of a type, period, or method of installation, or represents the work of a master, possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual distinction.

Criterion 3: It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

Local Criterion c: It embodies the distinctive characteristics of a type, architectural style, period, or method of construction, or represents the work of an architect, designer, engineer, or builder whose work is of significance to the City or the region or possesses artistic values of significance to the City or to the region.

The Sunset Reservoir Complex does not appear eligible under Criteria C/3/c. The Sunset Reservoir Complex, including its primary and secondary contributors, exhibits the function-driven design and construction typical of a water reservoir and treatment facility. The only structure associated with an architect is the Glorieta Pumping House designed by local architect Breo Freeman; however, the Pumping House is not a contributor to the district and is not individually significant as discussed below.

6.3.1 Streamline Moderne Architecture

The City of Pasadena's study of Cultural Resources of the Recent Past briefly mentions Streamline architecture in relation to earlier modern precedents as follows:

> The early impact of the International Style in the United States was primarily in the field of residential design. In contrast, it was the Art Deco or Moderne style that was the first European architectural development to have an impact on American commercial architecture. Art Deco was popularized by the Paris Exposition des Arts Decoratif in 1925 and featured exuberant forms and ornamentation. The exposition immediately influenced many American patrons and architects who desired a modern design that was not as austere as the Modernism developed by the Bauhaus school or Le Corbusier. The Streamline version of the style, which is seen in the 1930s and 1940s, emphasized curving forms, long horizontal lines, and less exaggerated detailing.[20]

Virginia McAlester refers to the Streamline Moderne architectural style as Art Moderne or Streamline Modernistic in her book *A Field Guile to American Houses*, and describes the style as comprised of

> Smooth wall surface, usually of stucco; flat roof, usually with small ledge (coping) at roof line; horizontal grooves or lines in walls and horizontal balustrade elements give a horizontal emphasis; façade usually asymmetrical. . . One or more of the corners of the building may be

[20] "Cultural Resources of the Recent Past, City of Pasadena" National Register of Historic Places Multiple Property Documentation Form, Section E, Page 4.

> curved; windows frequently are continuous around corners; glass blocks are often used in windows, or as entire sections of wall; small round windows are common.[21]

McAlester goes on to describe how the earlier Art Deco evolved to a simpler style when

> Shortly after 1930 another, more diffuse influence affected the Modernistic style – the beginning of streamlined industrial design for ships, airplanes and automobiles. The smooth surfaces, curved corners, and horizontal emphasis of the Art Moderne style all give the feeling that airstreams could move smoothly over them; thus, they were streamlined.[22]

6.3.2 Breo Freeman, Architect (1892-1975)

Biography

As noted above, the Glorieta Pumping House was designed by local architect Breo Freeman. According to the biography in the collection notes for the Breo Freeman World War I Photograph Collection

> Breo Freeman was born in Lousiana [sic] on September 10, 1892. He studied architecture at the Armour Institute in Chicago, and in 1914 moved to Pasadena where he worked for Harrison Albright. Under Albright, Freeman worked on the music space for the 1915 Panama-California Exposition in Balboa Park and on the Spreckels Theatre in San Diego. In 1917, he enlisted with the United States Navy, and was stationed in London where he oversaw repairs to navy vessels. After the war, Freeman returned to Pasadena to resume work as an architect. His most prominent designs include the Los Angeles County Court Building, the Washington Theater [renovation] in Pasadena, and the R.K. Collins House. He also served as the first president of the Pasadena Chapter of the American Institute of Architects [AIA]. Freeman passed away in 1975. He had a wife and two sons.[23]

Breo Freeman was married in 1926 to Dorothy Dobbins, daughter of Horace Dobbins who was a civic leader and had been chair of the board when Pasadena's city charter was formed (Daily News 1926; Independent Star-News 1961b). Freeman established his architectural firm in Pasadena in 1927. He was also active in civic and professional organizations. In addition to serving as president of the Pasadena AIA, he was a director of the Pasadena Federal Savings and Loan Association for more than 17 years and served on the Pasadena Citizen's Council for Planning. Freeman was also a member of the University and Valley Hunt Clubs, a director of the Overland Club and a member of the Optimist Club (Pasadena Independent 1951b; Pasadena Independent 1951c; Washburn 1963). Dorothy Freeman was a graduate of Stanford University and a member of the alumnae Stanford Women's Club of Pasadena. She was also a member of the Valley Hunt Club, the Women's City Club, and the Women's Architectural League of California, which was affiliated with the Los Angeles chapter of the AIA and whose membership consisted of the spouses of area architects (Daily News-Post 1953; Independent Star-News 1961a).

Architect Harrison Albright was an early mentor for Freeman. Albright was renowned for being an early proponent of reinforced concrete construction. He designed Los Angeles' first reinforced concrete building in 1905 - the Annex to the Homer Laughlin Building on Broadway in downtown Los Angeles. By the time Freeman was working for Albright, Albright had already established himself with prominent

[21] Virginia McAlester, *A Field Guide to American Houses,* 581.
[22] Ibid, 582.
[23] Online Archive of California, "Breo Freeman World War I Photograph Collection", Collection Guide.

clients including San Diego's John D. Spreckels and Henry Timken, and Los Angeles' Homer Laughlin. Albright's California portfolio by then included many prominent buildings in Los Angeles, San Diego, and Coronado, California. Many of Albright's significant buildings were designed before Freeman's time, but Freeman would have been working for Albright in 1916 when Albright was commissioned to design the original Coronado Bank mixed-use building on Orange Avenue at Loma Avenue in Coronado. Albright's buildings tended toward the Neoclassical and Italian Renaissance architectural styles, styles that not only conveyed classical beauty but also more easily accommodated the reinforced concrete construction that he favored (PCAD 2023).

Freeman's Overall Body of Work

Working for Albright no doubt influenced Freeman's later work, although the much younger Freeman's portfolio evolved throughout the rest of his career. The three buildings referenced in the brief biography of Freeman that were designed after World War (WW) I are all located in Pasadena or San Marino, California. Based on archival research, other projects of Freeman's in the Pasadena area included (some but not all of which appear to be extant based on a cursory review of Google Maps):

- Crown City Auto modifications (1936; contributor to NRHP Old Pasadena Historic District)
- Pasadena Boys Club (1945)
- McKinley School remodel (1945)
- East Pasadena Post Office (1947)
- First Federal Savings and Loan renovation (1951; Freeman was also one of the bank's directors then and after its name had changed to Pasadena Federal Savings)
- Houston Fire and Casualty Insurance renovation (1952)
- Pasadena Dispensary Waiting Room Building (1954)
- Thoburn Hall at Robincroft Rest Home (1957)
- Citizen's Commercial Trust & Savings Bank (1963)
- 1,000-space County-City Parking Structure (with Joseph Thomas; 1967)
- New County Courts Building (with Neptune & Thomas; 1970)

The City of Pasadena retained Freeman to design the Press Box at the Rose Bowl (1960), for which he was honored in 1963 with one of only nine awards of excellence in the nation conferred by the American Institute of Steel Construction. The award was for Freeman's use of structural steel in the design of the press box. The city also hired Freeman to design new dressing rooms and a redesign of hospital facilities at the Rose Bowl in 1961, Glorieta Pumping House at the Sunset Reservoir Complex (1947), and the Lake-Villa Fire Station (1949).

However, Freeman's work extended well beyond the Pasadena area based on archival research. Freeman was also responsible for designing:

- Neighborhood House in Calexico (1949)
- Luther Burbank School expansion in Altadena (1951)

- San Fernando Civic Center (1949 and 1954)
- San Fernando Courthouse (1951)
- New office, crematorium, and memorial garden at Live Oak Cemetery in Monrovia (1951 and 1959)
- East Whittier Methodist Church (1952)
- Antelope Valley Administrative Center (1956-1960)
- El Toro Marine Air Station headquarters, administration buildings, hangars and warehouses (with Robert Ainsworth and George Duncan; 1957)
- County Building Department in Altadena (1957)
- Burbank Fire Station (1958) [24]

In addition to the lists of major projects above, Freeman also designed smaller residential commissions including the W.J. Schmidt home in San Marino (1930), Bringham House in Flintridge (1936), Sterling House remodel in South Pasadena (1936), large addition to the Honeyman Ranch home in San Juan Capistrano (1950), and the Holmes House in La Canada (1960).



Figure 65. 1953 and 1970 Los Angeles County Court buildings designed by Freeman

The most prominent historic building designed by Freeman in Pasadena was the Los Angeles County Courts Building referenced in the biography paragraph above. The building is a contributor to the National Register-listed Pasadena Civic Center Historic District. The National Register nomination describes the Court as a "very rare example of a post WWII public building in the Mediterranean style...[that] conforms well to the architecture of the Civic Center. It has warm plaster walls and a hipped roof of red tile…"[25] Freeman was selected to design the new court building prior to passage of a

[24] Lists of Freeman's commissions based on articles at Newspapers.com and California Digital Newspaper Collection (http://cdnc.ucr.edu), as well as the City of Pasadena Historical Resources Database (http://pasadena.cfwebtools.com/search.cfm). See Section 8, References for more details.

[25] City of Pasadena, "Pasadena Civic Center District National Register Nomination," Item 7, 9.

1950 ballot measure that appeared to assure the project would move forward. However, controversy over the financing of the court's construction delayed the project. Built in 1952/1953 and dedicated in 1954, its architectural style is more streamlined than earlier Mediterranean style precedents of the 1920s and 1930s, but it complements the earlier buildings in the civic center. Freeman was also one of the architects (with Neptune & Thomas) for the adjacent mid-century style new Los Angeles County Court Building completed in 1970 (Figure 65).

Other designs of Freeman's were avant-garde for their time, including the renovation of the Washington Theatre in Pasadena referenced in the biography paragraph above. The theater was part of a mixed-use building that included stores, offices, apartments, and the theater, designed by architects Clarence Lee Hay and Henry M. Patterson in 1923. The 1937 renovation of the theater consisted of "black structural glass, vitrolite, as a facing material for the walls of the lobby and exterior storefronts; he completed this work for the North American Building and Loan Association, who then owned the property; the glass was later removed."[26]

Glorieta Pumping House Design in Context

Breo Freeman's overall body of work is primarily characterized by significant buildings designed for city, county and federal governmental agencies, non-profit institutions, and commercial entities in Southern California. It is beyond the scope of this report to determine, but Freeman's design of these buildings may potentially be of significance to the City of Pasadena or the region. However, within the context of these large-scale commissions, the smaller commissions for individual homes and home remodels, and projects like the Glorieta Pumping House, are not representative of Freeman's work because they do not add to our general understanding of his design approach or the character of his overall work portfolio.

Furthermore, the Glorieta Pumping House only exhibits influences, and is not exemplary, of the Streamline Moderne architectural style and it does not possess any high artistic value that would be significant to the city or region. The building only exhibits minor Streamline design elements. A sense of horizontal banding is evoked by the inscribed score lines below the windows; yet they are not continuous because they are framed within a chamfered molding and interrupted by the roll-up door. The glass block windows that are typical of Streamline Moderne buildings are present, but they are obscured from exterior view by non-compatible metal panels. The building does not have rounded corners with windows wrapping them; there is a chamfered detail at the roof parapet rather than a ledge (coping); and there are no small round windows. As designed and in its present condition, the building is not a good example of the Streamline Moderne architectural style because it lacks a strong horizontal and streamlined emphasis and the main design element (glass block) has been covered. Therefore, the Glorieta Pumping House does not characterize Streamline Moderne as a style, is not considered to be representative of the work of a significant architect, and does not possess high artistic values of significance to the City or the region.

6.3.3 Significance Conclusion

Based on the above analysis, the Sunset Reservoir Complex and individual components do not reflect outstanding or distinctive design, the work of a master, or a distinctive method of construction or engineering. The Complex individual components and the collective district do not possess high artistic values. Therefore, **the Sunset Reservoir Complex appears ineligible under Criteria C/3/c.**

[26] *Pasadena Star-News*, "Washington Theatre Renovation, Pasadena," March 14, 2005.

6.3.4 Historic Integrity Analysis

As noted above, "integrity" is the ability of a historical resource to convey the reasons for its significance (through the retention of character-defining features, materials, spatial relationships, and other components). Historic integrity is weighed through a consideration of seven aspects of integrity: location, design, setting, materials, workmanship, feeling, and association. This section provides an analysis of the historic integrity of the Sunset Reservoir Complex Historic District. As noted previously, to retain integrity, a resource generally must possess several, if not all, of the seven qualities defined in National Register Bulletin 15.

Location: **The place where the historic property was constructed or the place where the historic event occurred.**

The Sunset Reservoir Complex Historic District retains integrity of location. All contributors retain their original footprints and locations within the site.

Design: **The combination of elements that create the form, plan, space, structure, and style of a property.**

As a large-scale water infrastructure facility in continuous use for over a century, the Sunset Reservoir Complex Historic District retains integrity of design. Various maintenance and improvement projects have occurred within the complex over time, such as the addition of four-foot perimeter walls around the reservoirs in 1934 to increase storage capacity. The contributing structures within the Sunset Reservoir Complex retain most of their original design elements including their massing, construction systems, spatial relationships, materials, utilitarian style, and technical function.

Setting: **The physical environment of a historic property.**

The setting of the Sunset Reservoir Complex has changed relatively little since its construction and expansion through the twentieth century. The district is adjacent to the City of Pasadena Maintenance Yards, which includes City owned and operated buildings dating from the early twentieth century until the late twentieth century. The district is also adjacent to the Fair Oaks/Orange Grove neighborhood, which has been extant since the early twentieth century. Sunset Reservoir retains integrity of setting.

Materials: **The physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property.**

The Sunset Reservoir Complex Historic District retains integrity of materials. Most of the materials extant are original or were added during the district's period of significance. Prevalent materials include corrugated iron; reinforced concrete; board-formed concrete; stucco walls; Douglas Fir and Redwood structural members.

Workmanship: The physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.

The Sunset Reservoir Complex retains integrity of workmanship. Character-defining features for the principal contributors to the historic district—Reservoirs No. 1 and 2—include the expansive scale, depth, and footprint of the reservoirs, along with their original timber-frame roof structure and supports, made from Redwood and Douglas Fir posts and beams. Integrity of workmanship is reflected in the sophisticated, intact carpentry work of the timber-frame roof structures and supports as well as the intact arroyo stone retaining wall fronting the property.

Feeling: A property's expression of the aesthetic or historic sense of a particular period of time.

The Sunset Reservoir Complex Historic District retains integrity of feeling as a functioning reservoir system, with a period of significance ranging from the late nineteenth century through 1941. The historical use of the reservoir complex has been maintained for over 130 years, and that long history, including the layers of water use history, is conveyed by the Historic District.

Association: The direct link between an important historic event or person and a historic property.

The Sunset Reservoir Complex Historic District retains integrity of association as a functioning reservoir system within the City of Pasadena, with a period of significance ranging from the late nineteenth century through 1941. The historical use of the reservoir complex has been maintained for over 130 years, and that long history, including the layers of water use history, is conveyed by the Historic District.

Summary of Integrity Analysis

The Sunset Reservoir Complex Historic District retains integrity to convey its significance under Criteria A/1/a, and appears eligible for listing in the NRHP, the CRHR, and as a local landmark district.

The Sunset Reservoir Complex includes six contributors: Reservoir No. 1; Reservoir No. 2; Basin "A"; Well No. 20; Sheldon Booster House, and the stream-rock retaining wall. Because its 1947 date of construction places it outside the period of significance, the Glorieta Pumping House is not considered a contributor to the historic district. Furthermore, as discussed in the previous section, the Pumping House is not individually significant under these criteria.

Table 1, *Sunset Reservoir Complex Historic District,* provides an overview and summary of each of the contributing primary and secondary resources within the Sunset Reservoir Complex Historic District.

Table 1
PRIMARY AND SECONDARY CONTRIBUTOR LIST, SUNSET RESERVOIR COMPLEX HISTORIC DISTRICT

Resource Name	Resource Type	Engineer and/or Architect (if known)	Built Date	NRHP/CRHR/City Landmark Eligibility Criteria	Primary or Secondary Contributor
Reservoir No. 1	Reservoir	Thomas Banbury	Circa 1888	Eligible as a contributor to the Sunset Reservoir Complex Historic District under Criteria A/1/a	Primary

Resource Name	Resource Type	Engineer and/or Architect (if known)	Built Date	NRHP/CRHR/City Landmark Eligibility Criteria	Primary or Secondary Contributor
Reservoir No. 2	Reservoir	Unknown	Circa 1900	Eligible as a contributor to the Sunset Reservoir Complex Historic District, Criteria A/1/a	Primary
Basin "A"	Aerator tank, weir, and flume	Pasadena Water Department	1934	Eligible as a contributor to the Sunset Reservoir Complex Historic District, Criteria A/1/a	Secondary
Well No. 20	Well	Pasadena Water Department	Circa 1925	Eligible as a contributor to the Sunset Reservoir Complex Historic District, Criteria A/1/a	Secondary
Sheldon Booster House	Booster House	Pasadena Water Department	1923	Eligible as a contributor to the Sunset Reservoir Complex Historic District, Criteria A/1/a	Secondary
Stream-Rock Retaining Wall	Wall	Unknown	Circa 1888	Eligible as a contributor to the Sunset Reservoir Complex Historic District, Criteria A/1/a	Primary

6.3.5 Character-Defining Features

6.3.5.1 Sunset Reservoir Historic District

The following list identifies the character-defining features of the Sunset Reservoir Historic District:

- Massing, location, and spacing of the six contributing resources
- Location at the corner of Mountain Street and Sunset Boulevard
- City maintenance yard and residential setting within the western part of the City of Pasadena

6.3.5.2 Reservoir No. 1 (primary contributor)

The following list identifies the character-defining features of Reservoir No. 1:

- Corrugated metal roof
- Redwood posts
- Oregon Pine (Douglas Fir) roof superstructure
- Wood timber walkway
- Oval shape basin and footprint
- Central berm with cast-in-place curb, separating north and south sections
- Shared overflow wall with Reservoir No. 2
- Air vent along the crest of the roof

6.3.5.3 Reservoir No. 2 (primary contributor)

The following list identifies the character-defining features of Reservoir No. 2:

- Corrugated metal roof
- Redwood posts
- Treated Douglas Fir roof superstructure
- Wood timber walkway
- L-shaped basin and footprint
- Shared overflow wall with Reservoir No. 1
- Air vent along the crest of the roof
- Abandoned Devil's Gate pipe plugged with redwood

6.3.5.4 Basin "A" (secondary contributor)

The following list identifies the character-defining features of Basin "A":

- Concrete basin
- Concrete weir
- Metal sluice gate
- Concrete flume

6.3.5.5 Well No. 20 (secondary contributor)

The following list identifies the character-defining features of Well No. 20:

- Flat roof
- Square footprint
- Utilitarian design
- Air vent on the west elevation

6.3.5.6 Sheldon Booster House (secondary contributor)

The following list identifies the character-defining features of the Sheldon Booster House:

- Stucco exterior
- Utilitarian design
- Double casement windows

6.3.5.7 Stream-Rock Retaining Wall (primary contributor)

The following list identifies the character-defining features of the Stream-Rock Retaining Wall:

- River stone and mortar construction materials
- Footprint along a portion of the eastern and southern perimeter of the property along the public-right-of-way
- Metal and terra cotta drainpipes

7.0 CONCLUSION AND MITIGATION MEASURES

As noted previously, the proposed project would demolish/replace several contributing elements of the historic district, including the primary contributors Reservoir No. 1 (circa 1888) and Reservoir No. 2 (circa 1900). A new groundwater treatment facility would also be constructed. Both reservoirs would be removed and replaced with new prestressed concrete reservoirs. As Basin "A" (where water has been previously blended) is to be demolished, an inlet clearwell will be installed upstream of the reservoirs. Additionally, a new groundwater treatment plant will be developed. Replacement and construction of associated piping, inlet and outlet, valves, and hardscaping will also occur across the project area. The project also proposes a landscaped "park-like" area at the southernmost tip of the property at the intersection of Mountain Street and Sunset Avenue. An interpretive program, including signage, will be installed, which will interpret the history of the property for the public in an area that has public access.

As a historic district eligible for the NRHP, CRHR, and as a local landmark, the Sunset Reservoir Complex Historic District **qualifies as a historic property under Section 106 and a historical resource pursuant to CEQA**. The demolition and replacement of the two key elements of the historic district, Reservoir No. 1 and Reservoir No. 2, along with several other contributing elements, **would be expected to cause an adverse effect pursuant to Section 106 and cause a significant adverse impact and material impairment to the resource** as defined by CEQA Guidelines Section 15064.5(b). As a result of the project undertaking, the historic district would no longer convey the reasons for its significance (and no longer be eligible for national, state, or local listing).

7.1 MITIGATION MEASURES

CUL-1 Documentation Program. A documentation program shall be undertaken prior to commencement of the project to document the Sunset Reservoir to the standards of the Historic American Engineering Record (HAER).

The documentation program would include all of the following components:

1. Produce large format black-and-white, film photographs, with the original negatives having a minimum size of 4 inches by 5 inches, of Reservoir No. 1, Reservoir No. 2, and the stream-rock retaining wall, to include aerial and context views of the site, views of significant elements and interior spaces, and detail views of specific character-defining features. Include a photo index and photo key-maps. A draft laser copy (or digital PDF) of the finished survey formatted to the photo index is required for City review prior to final archival printing.

2. Reproduce original drawings (plans, drawings, blueprints, and other structural data) full scale on vellum that meets Federal Vellum Specification UU-P-561H, Type IV and prepared to HAER drawing guidelines per Recording Historic Structures & Sites for the Historic American Engineering Record (revised 2020). If original drawings are not available, then an architect or engineer meeting the Secretary of the Interior's Professional Qualification Standards shall produce full-size measured drawings of the resource's plan, elevations, sections, and details to the same HAER standards.

3. Assemble historical background information, and the produced drawings, large format and historic photographs relevant to the Sunset Reservoir and its setting, into a format meeting HAER history guidelines per the Historic American Engineering Record Guidelines for Historical Reports (2008, updated December 2017) (contact info updated December 2021).

4. Donate one copy of the final historic report, drawings, photographs, and negatives to the HABS/HAER/HALS division of the National Park Service for transmittal to the Library of Congress. Duplicate archival laser-copies, or other media as directed by the recipient, of the report, drawings and photographs shall be kept on file with the City of Pasadena and filed with local historical societies and local libraries.

CUL-2 **Interpretive Program.** An interpretive program shall be installed prior to the notice of completion on or adjacent to the project site to provide a visual historical record for the general public. The interpretive program shall be designed, fabricated, and installed to visually interpret the history of the property including signage with descriptive narrative and reproductions of historic and recent images in an area that is publicly accessible. The interpretive program should be installed in the landscaped "park-like" area to be located adjacent to the southernmost project boundary at the intersection of Mountain Street and Sunset Avenue, or a suitable alternative location as determined by the City of Pasadena.

7.2 LEVEL OF SIGNIFICANCE AFTER MITIGATION

The proposed Project would result in a significant adverse impact and material impairment to cultural resources under CEQA. Although some of the district's character-defining features will remain, primary significant character-defining features of the Sunset Reservoir historic district will be demolished as part of the project. The new project design will also completely alter the feeling of the reservoir site through the installation of two new individually capped reservoirs, uncovered parking areas and perimeter landscaping, etc. The proposed mitigation measures CUL-1 and CUL-2 will document the Sunset Reservoir for future research and help relate the site's history to the public through an interpretive program, but these mitigation measures are not sufficient to reduce impacts on cultural resources to a less than significant level. Therefore, impacts related to cultural resources would be significant with project implementation under CEQA.

7.3 SECTION 106 CONSULTATION

As stated previously, this report has been prepared to comply with Section 106 of the NHPA, as amended, in support of a potential funding application to a federal agency. The project is considered an undertaking under Section 106 if a federal agency is involved in funding, assistance, permitting or licensing. The federal agency under Section 106 is the Environmental Protection Agency. This evaluation

has found that, pursuant to Section 106, the undertaking would be expected to cause adverse effects that diminish the characteristics qualifying the historic district for inclusion in the NRHP. In the event that federal funding is sought for the undertaking, then federal agency consultation with the State Historic Preservation Officer, the City of Pasadena, and other interested consulting parties will need to occur. Consultation would focus on those effects that would alter the characteristics that qualify the property for inclusion in the NRHP, and explore whether adverse effects could be further avoided, minimized or mitigated. As a part of the consultation process, additional mitigation measures may be developed to achieve resolution of the adverse effects. If measures to resolve the adverse effects cannot be agreed upon during consultation, the federal agency would need to obtain and consider formal advisory comments from the ACHP prior to making a final decision on the funding application.

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Appendix A

Department of Parks and Recreation
Series 523 Forms

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #_____
HRI #_____
Trinomial_____
NRHP Status Code 3D
Other Listings_____
Review Code_____ Reviewer_____ Date_____

 Resource name(s) or number (assigned by recorder) *Sunset Reservoir Complex Historic District*

P1. Other Identifier: *N/A*
***P2. Location:** □Not for Publication ■Unrestricted
***b. USGS 7.5' Quad:** *Pasadena*
*c. **Address:** *201 West Mountain Street*
*e. **Other Locational Data:** *APN 5728-021-916*

***a. County:** *Los Angeles County*
Date: *1995*
City: *Pasadena* **Zip:** *91103*

***P3a. Description:**

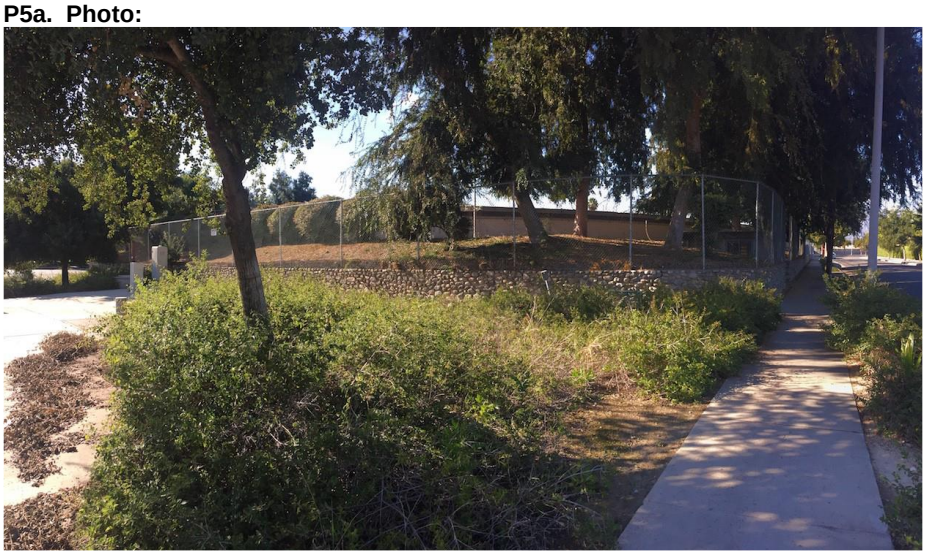
Located in west Pasadena, the Sunset Reservoir Complex has operated as a municipal reservoir on this site in West Pasadena beginning in circa 1888, in the early years of the City, through 2021. The Sunset Reservoir Complex Historic District consists of six buildings, structures, and features: Reservoir No. 1 and a Stream-Rock Retaining Wall (both added in circa 1888); Reservoir No. 2 (Circa 1900); "A" Basin (an aerator tank, weir and flume; 1934); Well No. 20 (Circa 1925); and the Sheldon Booster House (1923).

The complex occupies an irregularly shaped parcel bounded by West Hammond Street (north), Sunset Avenue (east), West Mountain Street (south), and Glen Avenue and the 210 Freeway (west). The property sits above the grade of surrounding streets. A tall brick wall and a low concrete wall with chain link fence above border the property along West Mountain Street. A low, stream-rock retaining wall capped with a chain link fence borders the southeast corner of the property; this wall wraps the property's border along Sunset Avenue, transitioning into a low concrete wall with chain link fence above. The property is situated west of the Fair Oaks/Orange Grove neighborhood, which largely consists of residential properties. Brenner Park and another residential neighborhood is located south of the subject property. To the east is the City of Pasadena Maintenance Yards, which include various facilities owned and operated by the City, dating from the early twentieth century until the late twentieth century.

Each of the six components of the complex are described and illustrated below. (*See Continuation Sheet page 4*)

***P3b. Resource Attributes:** HP22. Reservoir; HP9. Public Utility Building; HP11: Engineering Structure; HP46. Wall
***P4. Resources Present:** □Building □Structure □Object □Site ■District □Other

P5a. Photo:



P5b. Photo: Street view, 2017

***P6. Date Constructed/Age and Sources:** 1888-1947 ■ historic

***P7. Owner and Address:**
Pasadena Water and Power
150 S Los Robles Ave #300
Pasadena, CA 91101

***P8. Recorded by:**
Debi Howell-Ardila & Annie McCausland
HELIX Environmental Planning, Inc.
7578 El Cajon Blvd, La Mesa, CA 91942

***P9. Date Recorded:**
June 30, 2021

***P10. Survey Type:** *Intensive-Level Evaluation*

***P11. Report Citation:** (Cite survey report and other sources, or enter "none"):

McCausland, Annie and Debi Howell-Ardila. 2021. *Historic Resources Evaluation Report for the Sunset Reservoir Complex Project*. HELIX Environmental Planning, Inc. Project No. 00407.00036.001. Report on file at the South Central Coastal Information Center, Fullerton State University.

***Attachments:** ☐None ■Location Map ■Sketch Map ■Continuation Sheet ■Building, Structure, and Object Record
☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record
☐Artifact Record ☐Photograph Record ☐ Other (list)

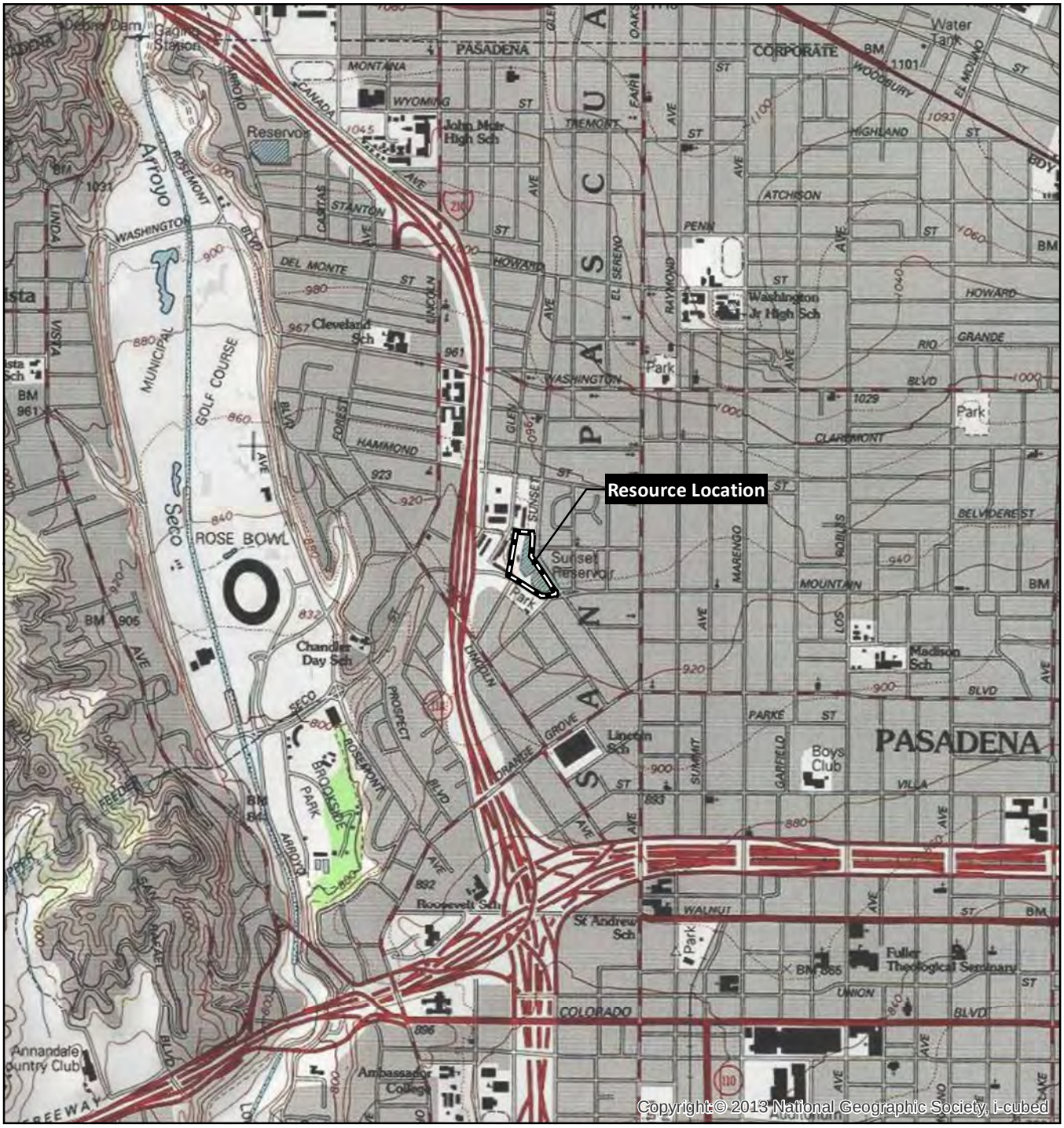
State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary #:
HRI #
Trinomial:

***Resource Name or #:** Sunset Reservoir Complex Historic District

***Map Name:** PASADENA ***Scale:** 1:24,000 ***Date:** 1995



B1. Historic Name: Sunset Reservoir
B2. Common Name: Sunset Reservoir Complex
B3. Original Use: Water reservoir
B4. Present Use: Water reservoir
***B5. Architectural Style:** Utilitarian

***B6. Construction History:**

The six contributing buildings, structures, and features of the Sunset Reservoir Complex Historic District were constructed in phases over time as the reservoir and treatment facility were adapted to meet the needs of a rapidly growing city. Reservoirs No. 1 and 2 have been in continuous use for over a century, from circa 1888 through 2021. The earliest documented portions of the reservoir are Reservoir No. 1 and a Stream-Rock Retaining Wall that defines and encircles the property at the public right-of-way (both added in circa 1888). Subsequent facility expansions included the construction of Reservoir No. 2 (circa 1900); "A" Basin (an aerator tank, weir and flume; 1934); Well No. 20 (Circa 1925); and the Sheldon Booster House (1923). Given that the complex has been in extended continuous use, numerous maintenance and facilities upgrades and modernization efforts have been completed.

***B7. Moved?** ☒**No** □**Yes** ☐ **Unknown** **Date:** **Original Location:**
***B8. Related Features:** Stream-rock retaining wall
B9a. Architect: Unknown
b. Builder: Reservoir No. 1: Thomas Banbury
All other structures: Pasadena Water Department
***B10. Significance: Theme:** Municipal Water and Power/Water Supply Infrastructure **Area:** City of Pasadena
Period of Significance: 1888-1941 **Property Type:** Water Storage and Distribution **Applicable Criteria:** A/1/a

As a result of this intensive-level evaluation, the Sunset Reservoir Complex **appears eligible as a historic district under NRHP Criterion A, CRHR Criterion 1, and as a City of Pasadena Landmark under Criterion a**. As the oldest extant reservoir in Pasadena, the Sunset Reservoir Complex represents an intact, early municipal water facility that facilitated the City's rapid growth and expansion from the late nineteenth through the twentieth centuries. The facility remained in continuous use for over a century, from circa 1888 through 2021, with its period of significance ending in 1941 when water arrived to the facility via the landmark project, the Colorado River Aqueduct, operated by the Metropolitan Water District. The Sunset Reservoir Complex has a strong, well-documented association with the early water history of the City of Pasadena, beginning with the construction of Reservoirs No. 1 and 2 in circa 1888 and 1900, respectively. Highly intact and one of a kind in Pasadena, the Sunset Reservoir Complex exemplifies this early era in the development of water-related infrastructure in the City of Pasadena.

(See Continuation Sheet p. 8)

B11. Additional Resource Attributes:

***B12. References:**
(See Continuation Sheets pp. 9-11)

B13. Remarks:

***B14. Evaluator:**
Debi Howell-Ardila, MHP, and Annie McCausland, MS
HELIX Environmental Planning, Inc.

***Date of Evaluation:** October 10, 2021

(This space reserved for official comments.)

Sketch Map



***P3a. Description (continued):**

1. Reservoir No. 1

The oldest property of the complex, Reservoir No. 1 is oval in plan and measures 350 feet long by 200 feet high. The 57,300-square-foot basin sits below grade on the south end of the reservoir parcel. The basin is hopper-bottom shaped and is constructed of cobblestone and cement plaster sheathed in layers of concrete and gunite lining. A central berm capped with a cast-in-place curb traverses the longitudinal extent of the reservoir, dividing the south and north portions. A reinforced concrete wall and footing are extant around the above-grade perimeter of the reservoir. The pedestrian entrance to Reservoir No. 1 is located on the west elevation, with metal stairs and a wood deck leading to a corrugated metal door. The door leads to a timber catwalk above the reservoir basin, which extends east to the center of the reservoir. The walkway does not extend to the east side of the reservoir. On the interior, the roof superstructure consists of Oregon Pine (Douglas Fir). The roof rests on a grid of redwood posts with spliced redwood extension posts. Sheathed in corrugated iron sheets, the roof slopes from a high point in the center of the reservoir. A central air-vent extends along the roof crest on the longitudinal axis (north-south).

Reservoir No. 1, Roof configuration and materials (top left); exterior walkway and entrance (top right); interior, central berm with cast-in-place curb (bottom left) and redwood post supports (bottom right)







***P3a. Description (continued):**

2. Reservoir No. 2

L-shaped in plan, Reservoir No. 2 measures 525 feet long by 260 feet wide. The reservoir spans 97,000 square feet and sits below grade, north of Reservoir No. 1. Reservoir No. 2 is wider at the south end and narrower at the north end but overall, it is taller than Reservoir No. 1. The basin is sloped downward and lined with gunite. The basin also displays a concrete staircase leading to the bottom of the reservoir on the north end and a sloped concrete ramp. The perimeter of the basin consists of a 6-foot-tall board-form concrete wall.

The reservoir interior is accessible on the north elevation via concrete stairs and a corrugated metal door. The south elevation exhibits a secondary entrance, accessed via metal stairs and a metal walkway extending from "A" Basin around the south elevation of Reservoir No. 2 to a corrugated metal door. Both entries lead to a timber catwalk spanning the longitudinal extent of the reservoir. The catwalk consists of Douglas Fir planks, and the roof superstructure displays creosote treated Douglas Fir. A grid of redwood posts supports the roof superstructure. An unused 30-inch pipeline, filled with a tree trunk, is extant on the west elevation of the basin. A flume opening is also extant on the south end of the reservoir, leading to the concrete flume spanning the western portion of Reservoir No. 1. At the south end of Reservoir No. 2, a concrete overflow weir is shared with Reservoir No. 1. The floor of the Reservoir No. 2 basin features a release gate on the south end, which leads to the local sewer system.

Sheathed in corrugated metal, the roof displays a front-gable configuration with low pitched eaves. A central air-vent traverses the crest of the roof on the longitudinal axis (north-south).

Reservoir No. 2, Exterior overview (top left); exterior and roofline from the northwest corner, looking southeast (top right); walkway entry on the north, looking south (bottom left); interior, with concrete wall and staircase (bottom right)






***P3a. Description (continued):**

3. "A" Basin

Separate from but adjacent to Reservoirs No. 1 and 2, the "A" basin is a separate structure from the two reservoirs and is located on the west side of the reservoirs. The "A" basin consists of a board-formed concrete basin with a metal pipe and concrete weir (flow control barrier); this basin empties into a flume spanning the westside of Reservoir No. 1. A sluice gate is extant on the north end of the flume, which controls the water released from Reservoir No. 2 to Reservoir No. 1. The basin and flume are covered with a timber-framed corrugated metal roof, similar to the roof structures on the reservoirs.

"A" Basin, overview of pipe system (left); A" Basin with weir and concrete flume, looking south (right)




4. Well No. 20

To the southwest of Reservoir No. 1, Well No. 20 houses a well pump for the reservoir complex. Square in plan and resting on a concrete foundation, Well No. 20 spans nearly 440 square feet. The exterior is clad in smooth stucco, and interior walls consist of board-formed concrete. Slightly below grade on the north elevation, the structure is located adjacent to Mountain Street and is visible from the public-right-of-way. A flat roof, punctuated with a wood-framed ventilation pop-up, caps the structure. A set of concrete stairs, along the west elevation, provide access from Mountain Street to the higher grade of the Sunset Reservoir Complex. The west elevation displays an arched air vent. The primary (south) elevation displays a set of metal doors framed by a decorative accent of painted vertical bricks. A simple frieze molding wraps around the perimeter of the roof, with a small section missing at the center of the façade.

Well No. 20, façade (south elevation) (left); roof with ventilation pop-out (right)




***P3a. Description (continued):**

5. Sheldon Booster House

Utilitarian in design, the Sheldon Booster House is located east of Reservoir No. 1 along Sunset Avenue, at the southeast corner of the property. Square in plan, this structure is partially below grade, with the northeast elevation at grade with and visible from Sunset Avenue. This board-formed concrete structure is clad with smooth stucco and capped with a front gabled, low-pitched roof. A set of vertical wood-plank doors is located on the façade (east elevation). Fenestration consists of metal-framed casement windows on the north and south elevations.

Sheldon Booster House, East-facing facade with entry doors, west perspective (left); Interior, original casement windows, north elevation (right)





***P3a. Description (continued):**

6. Stream-Rock Retaining Wall

Sunset Reservoir's stream-rock retaining wall defines the complex boundaries along its eastern and southern perimeters. The wall spans approximately 370 linear feet and is four-feet high. The wall is constructed of river stones from the Arroyo Seco, fastened with smooth mortar. A portion of the wall at the southernmost end was reinforced in 1974, with additional river rocks above the footing (PWP 1974). The original slope of the grade was also reduced during restoration efforts. In addition, the portions of the wall exceeding four feet along the southern span consist of new additions made in 1974. The wall includes drains spaced in intervals of 25 to 30 feet; six of these drains display the original terra cotta lining; nine have been upgraded to metal pipes.

Stream-rock retaining wall, portion along eastern perimeter (left) and wall at the southern property boundary along Mountain Street, looking west. A portion of this segment was reconstructed in the 1970s.





***B10. Significance (continued):**

Pasadena transitioned from a largely agricultural town to a developing City in the 1880s. It was a period of exponential growth requiring the development of new water infrastructure to meet unprecedented demands. Several syndicates in Pasadena had to work together to address the critical water issues of sustainable sources and allocation of this resource. The Pasadena LVLWC and the Pasadena Land and Water Company invested in developing a new water conveyance system from Devil's Gate to Reservoir No. 1, which was owned by the Pasadena LVLWC. Sunset Reservoir was the diversion point for this complex system and has continued to serve the City of Pasadena for over 130 years. New water sources have filled this reservoir system, from circa 1888 until 2020, including water from local wells, Raymond Basin, the Arroyo Seco, Morris Dam, the CRA, and the California Aqueduct.

The Sunset Reservoir Complex is a rare and intact exemplification of a pioneering water reservoir constructed during Pasadena's founding years, adapted and expanded over a century. It appears significant at the local level under NRHP/CRHR Criterion A/1 and the City of Pasadena Register Criterion a. The applicable context for eligibility is Public Institutional Development/Government Infrastructure, and the applicable theme is Municipal Water and Power/Water Supply Infrastructure. The property type is a Reservoir/Water Supply Complex.

The period of significance is 1888, when Reservoir No. 1 and the stream-rock retaining wall were constructed, to 1941, marking the arrival of water via the Colorado River Aqueduct and the Metropolitan Water District of Southern California, an infrastructure project that transformed water access throughout Southern California.

For purposes of this evaluation, Reservoir No. 1, Reservoir No. 2, and the stream-rock retaining wall are primary contributors to the district. The remaining support buildings and structures are considered secondary contributors to the district.

***B12. References (continued):**

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1993 "Architectural/Historical Development of the City of Pasadena: Historic Context/Property Type Report." Prepared by City of Pasadena, Urban Conservation Section, Planning Division and Pamela O'Connor. On file with HELIX Environmental Planning, Inc., Pasadena, CA.

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1929a "Forty Years Old, New Roof Needed; Sunset Reservoir Also to Receive Cleaning." *Pasadena Star-News*. February 6, 1929. Pasadena, CA.

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1941 "Water from Distant Colorado River Pours into City Distribution Mains." *Pasadena Star-News*. June 18, 1941. Pasadena, CA.

Pasadena Water Department

1923 Plans for Sheldon Booster House at Sunset Res. August 1923. On file with PWP.

1929 Sunset Reservoir Roof Plans: Plan of Posts. March 15, 1929. On file with PWP.

1934 Details of Construction of Sunset Reservoir No. 2. November 13, 1934. On file with PWP.

Pasadena Water and Power (PWP)

1974 Sunset Reservoir Rock Wall Replacement. October 1974. On file with PWP.

The Los Angeles Herald

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1898 "Pasadena" *The Los Angeles Herald*. January 2, 1898. Los Angeles, CA.

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Appendix B

Resumes of Key Personnel

Debi Howell-Ardila, MHP

Senior Architectural Historian

HELIX Environmental Planning

Summary of Qualifications

Ms. Howell-Ardila is an award-winning architectural historian and historic preservation professional with 15 years of experience in environmental compliance, historic resource assessments, survey, and documentation. She has extensive experience in researching and writing about architectural history, as well as applying the regulatory framework of its diverse cities to the built environment.

Ms. Howell-Ardila's project experience has included oversight and completion of a variety of project types, including Secretary of the Interior's Standards project review, preparation of environmental compliance studies, federal and local landmark nominations, Mills Act applications, and Historic American Buildings Survey documentation. She has conducted site investigations and led historic resource surveys and evaluations throughout California, with an emphasis on Southern California. Her experience includes preparation of environmental compliance studies and documentation in support of the California Environmental Quality Act (CEQA) and contributions to studies in support of the National Environmental Policy Act (NEPA) and the National Historic Preservation Act (NHPA). Ms. Howell-Ardila meets and exceeds requirements in the Secretary of the Interior's Professional Qualification Standards in Architectural History and History.

Selected Project Experience

Contract Planning Project Review for South Pasadena (2020 - 2021). Preservation Planner and Project Manager for project review, permit processing, and preservation planning support to the City of South Pasadena Planning and Building Department. Duties included preparing historic resource evaluations, assessing projects for compliance with the City's Municipal Code, design guidelines, and the Secretary of the Interior's Standards, and preparing and presenting staff reports to the Cultural Heritage Commission. Work performed for the City of South Pasadena Planning and Building Department.

John Hinkel Park Historic Resources Evaluation and Amphitheater Improvements Project (2018). Principal Author/Investigator and Project Manager for a historic resources evaluation of John Hinkel Park in the City of Berkeley, in support of park upgrades and improvement projects. The evaluation informed preservation project review of proposed upgrades to the park facilities, as well as new construction, to ensure compliance with the Secretary of the Interior's Standards for the Treatment of Historic Properties. Recommendations were made to the City of Berkeley and project architect in order to facilitate compliance with the Secretary's Standards, to avoid adverse impacts to historic resources, and to streamline environmental compliance review. Work performed for the City of Berkeley.

Education

Masters of Historic Preservation, University of Southern California, Los Angeles

Bachelor of Arts, German and Architectural History, University of California, Berkeley

Registrations/ Certifications

Meets/exceeds Secretary of the Interior's Professional Qualification Standards in Architectural History and History

Awards

California Preservation Foundation, Preservation Design Award (Riverside Latino Historic Context Statement, 2019; City of San Gabriel Historic Preservation Ordinance Update, 2018; and LAUSD Historic Context Statement, 2014)

Los Angeles Conservancy, Preservation Award (City of San Gabriel Historic Preservation Ordinance Update, 2018; and LAUSD Historic Context Statement, 2015)

Riverside Latino Historic Context Statement (2018). Principal Author/Investigator and Project Manager for preparation of a Latino Historic Context Statement, which explored over a century of history and culture of Riverside's Latino community. The Historic Context Statement provided a comprehensive framework for assessing properties associated with the Latino community. This effort was recognized with an award from the California Preservation Foundation in 2019. Work performed for the City of Riverside and the California Office of Historic Preservation (OHP).

University of California, Riverside Campus-wide Historic Resources Survey Report (2019 - 2021). Author and Project Manager for a campus-wide historic resources survey of the University of California, Riverside. The resulting Historic Resources Survey Report, along with a focused historic context statement and ArcGIS maps, offered the University an accurate, comparative baseline of historic resources and University assets, in support of master planning and upgrades projects. Work performed for the University of California, Riverside.

California State University, Fullerton Master Plan EIR Historic Resources Survey Report (2019 - 2020). Principal Author and Project Manager for a campus-wide historic resources survey of California State University, Fullerton (CSUF). The resulting Historic Resources Survey Report, along with a focused historic context statement and ArcGIS maps, offered the University an accurate, comparative baseline of historic resources and University assets, in support of master planning and upgrades projects. In addition, the survey results provided a sound basis for an analysis of historic resource impacts, alternatives, and mitigation measures for the CSUF Master Plan EIR. Work performed for the California State University, Fullerton.

Long Beach Grant Neighborhood Historic Context Statement and Survey (2018 - 2019). Principal Author/Investigator and Project Manager for preparation of a historic context statement and conducting a survey of Long Beach's Grant Neighborhood. As a result of the project, Grant Neighborhood's first historic district was identified and designated by City Council in 2018. Work performed for the City of Long Beach.

Anacapa Courts/Top Hat Rehabilitation Project Secretary of the Interior's Standards Project Review (2017). Principal Author and Investigator for Secretary of the Interior's Standards project review for the Anacapa Courts/Top Hat Rehabilitation Project in the City of Ventura. Project plans, including architectural drawings, site plans, and elevations, were analyzed for compliance with the Secretary of the Interior's Standards. Recommendations were made for project modifications and refinements aimed at facilitating compliance with the standards. Work performed for the City of San Buenaventura.

250 Mills Road Rehabilitation Project Secretary of the Interior's Standards Project Review (2017). Principal Author and Investigator for Secretary of the Interior's Standards project review for the 250 Mills Road Rehabilitation Project in the City of Ventura. Project plans, including architectural drawings, site plans, and elevations, were analyzed for compliance with the Secretary of the Interior's Standards. Recommendations were made for project modifications and refinements aimed at facilitating compliance with the standards. Work performed for the City of San Buenaventura.

Annie McCausland

Architectural Historian

HELIX Environmental Planning

Summary of Qualifications

Ms. McCausland meets the Secretary of the Interior's Professional Qualification Standards for Architectural History and History. Her expertise includes the Secretary of the Interior's Standards for the Treatment of Historic Properties, archival research, historic contexts, significance evaluations, and historic district documentation. She has completed numerous studies for residential, agricultural, military, rural, commercial, and industrial properties across California. She has prepared numerous technical reports including Historical Resources Evaluation Reports (HRER), Historic Property Survey Reports (HPSR), Historic Building Assessment Reports, Rehabilitation Reports, and Cultural Resources Phase I and II Reports, to satisfy compliance requirements under National Historic Preservation Act (NHPA) Section 106, California Environmental Quality Act (CEQA), and local government preservation ordinances. Ms. McCausland has worked extensively under the California Department of Transportation (Caltrans) Districts 5 and 8, as well as the U.S. Army Corps of Engineers (USACE), Bureau of Land Management (BLM), and the Bureau of Reclamation (BOR), as well as many local governments.

Selected Project Experience

One Alexandria Square Environmental Consulting (2020). Architectural Historian preparing a historic built-environment resources memo report for a proposed mixed-use development in the University City community of the City of San Diego. Work was conducted for Alexandria Real Estate Equities, with the City of San Diego as the lead agency.

Dam Maintenance Program (2019 - ongoing). Architectural Historian for Dam Maintenance Program at 13 dams across San Diego County. Led effort to survey, document, research, and evaluate historical resources within the 13 project areas, including a previously documented City of San Diego Water System discontiguous historic district. Lead Author for the Historical Resources Assessment Report and Co-author for the Cultural Resources Assessment Report. Historic contexts, evaluations, and DPR 523 forms were prepared utilizing archival sources. Work performed for the City of San Diego Public Utilities Department.

Sycamore Drive Bridge Project (2020 - 2021). Architectural Historian for a bridge project located on the boundary of the City of San Marcos and unincorporated community of Twin Oaks within unincorporated San Diego County. The proposed project consists of replacing the existing timber box culvert bridge over San Marcos Creek with a new bridge designed to meet current standards and convey the 100-year storm event and may involve realignment of Sycamore Drive in the vicinity of the bridge to improve the substandard curve at the bridge's southern approach. Conducted survey for historic built-environment resources within the APE.

Education

Master of Arts, Public History, California State University, Sacramento, California, 2015

Bachelor of Arts, History, Chapman University, Orange, California, 2010

Registrations/ Certifications

Huntington Library San Marino, Registered Reader,

Professional Affiliations

California Council for the Promotion of History

American Association for State and Local History

National Council on Public History

California Preservation Foundation

Los Angeles Conservancy

Society of Architectural Historians

Buckman Springs Road Bridge Widening Technical Studies (2020 - ongoing). Architectural Historian for the rehabilitation and widening of the existing Cottonwood Creek Bridge crossing of Buckman Springs Road over Cottonwood Creek, located in eastern San Diego County. The project proponent was the County of San Diego Department of Public Works, with local assistance funding from the FHWA. Responsibilities included review records search material; field survey; and preparation of an Historical Resources Evaluation Report (HRER), Historic Property Survey Report (HPSR), consistent with Caltrans format and content requirements. Duties also included the direction and oversight of the completion of a draft Finding of No Adverse Effect and Secretary of Interior's Standards Action Plan for the Cottonwood Creek Bridge, a contributing feature of Buckman Springs Road. Work performed under the County of San Diego Department of Public Works as-needed environmental services contract and completed for Caltrans review and oversight for the completion of the environmental review process.

Sycuan/Sloane Canyon Trail IS/MND (2019 - 2020). Architectural Historian for environmental documentation addressing an approximately five-mile-long proposed trail, in the unincorporated Crest-Dehesa community of eastern San Diego County, which crosses lands owned by the County, San Diego National Wildlife Refuge, Sycuan Band of the Kumeyaay Nation, and lands owned by the Kumeyaay Diegueño Land Conservancy, and includes bridge crossings of Harbison Canyon Creek and the Sweetwater River. Reviewed records search results, conducted archival research, and produced a project area historic context to be included in the study. Work performed for the County of San Diego Department of Parks and Recreation under an as-needed environmental services contract.

Downtown Riverside Metrolink Station Track & Platform Project (2019). Architectural Historian conducting historic and archaeological record search for this project to construct an additional platform, extended bridge and elevator, and associated tracks on the south side of the station, which will allow for two trains to service the station off the BNSF Railway (BNSF) mainline. Work performed as a subconsultant to HNTB, with Riverside County Transportation Commission and Federal Transit Authority as the lead agencies for CEQA and NEPA, respectively.

Padre Dam Municipal Water District East County Advanced Water Purification Program Year 3 (2019 - ongoing). Architectural Historian preparing appropriate State of California Department of Parks and Recreation (DPR) 523 forms for three historic resources: Ray Stoyer Wastewater Treatment Facility, Chet Harritt Dam, and Monte Tunnel (San Diego Flume). Evaluated the individual significance and eligibility of the resources for listing in the NRHP/CRHR. Responsibilities also include the preparation of the El Monte Tunnel Rehabilitation Plan, which provided preliminary rehabilitation guidelines for the Monte Tunnel which is eligible for the NRHP and the CRHR as a remaining extant feature of the San Diego Flume. The DPR forms and rehabilitation plan were prepared to supplement the Environmental Package component of the Financial Assistance Application for the State Water Resources Control Board (SWRCB) Clean/Drinking Water State Revolving Fund.

Pure Water San Diego Conveyance Project (2019 - ongoing). Architectural Historian providing support for environmental compliance under the Construction Management contract for Phase 1 (also referred to as the North City Project) of the San Diego Pure Water Program. Responsibilities include preparation of a Cultural Resources Monitoring and Treatment Plan and a Site Protection and Stabilization Plan for a stone wall associated with a 1930s residence and providing environmental compliance monitoring

oversight and reporting during construction. Work performed as subconsultant, with the City of San Diego as lead agency.

San Diego High School Whole Site Modernization and Long-Range Facilities Master Plan EIR (2020 - 2021). Architectural Historian to evaluate potential impacts to historic resources associated with near- and long-term project components as part of campus master plan at San Diego High School in downtown San Diego. A total of 10 historic built environment resources were identified for further evaluation as part of environmental review. Specific tasks consisted of directing a cultural resources historic evaluation with the support of a subconsultant. The historic evaluation is comprised of archival research, a historic built-environment survey (including photo documentation, architectural descriptions, character-defining feature identification and integrity notes), and completion of forms from the Department of Parks and Recreation. The results of the historic evaluation will be presented in a CEQA Cultural Resources Technical Report and summarized in the forthcoming EIR. Work performed for San Diego Unified School District.

San Diego High School Whole Site Modernization Cultural Resources Evaluation and Technical Report (2020 - 2021). Architectural Historian to evaluate potential impacts to historic resources associated with near- and long-term project components as part of campus master plan at San Diego High School in downtown San Diego. A total of 10 historic built environment resources were identified for further evaluation as part of environmental review. Specific tasks consisted of directing a cultural resources historic evaluation with the support of a subconsultant. The historic evaluation is comprised of archival research, a historic built-environment survey (including photo documentation, architectural descriptions, character-defining feature identification and integrity notes), and completion of forms from the Department of Parks and Recreation. The results of the historic evaluation will be presented in a CEQA Cultural Resources Technical Report and summarized in the forthcoming EIR. Work performed for San Diego Unified School District.

Learn and Play Montessori School Project (2021 - ongoing). Architectural Historian performing a built-environment survey, archival research, and preparing DPR 523 forms, historic contexts, significance and eligibility evaluations, and report for a historic Minimal Traditional house in Union City, Alameda County. The house will be evaluated for eligibility for listing in the CRHR and as a local City Landmark. Work performed for Union City with Union City as the lead agency.

Escondido Centre City Pkwy Condominium (2020 - 2021). Architectural Historian performing a built-environment survey, archival research, and preparing DPR 523 forms, historic contexts, significance evaluations, and report including several historic resources within five properties in the City of Escondido. The resources were evaluated for eligibility for listing in the CRHR and as a local City Landmark. Work performed for Warmington Residential, with City of Escondido as the lead agency.

Aramis Solar Energy Generation and Storage Project EIR (2020). Architectural Historian performing built-environment survey, archival research, and preparing DPR 523 forms, historic contexts, and significance and eligibility evaluation for an active historic ranch in east Alameda County. The ranch features a post and beam barn and shed and is owned and managed by the same family since circa 1869. The resource was recommended eligible for listing in the NRHP, CRHR and the Alameda County

Register of Historic Resources. Ms. McCausland also identified the potential for a larger historic landscape and/or historic district in this portion of eastern Alameda County. Work performed for Intersect Power, with the County of Alameda as the CEQA lead agency.

7-Eleven at 43 Middle Rincon Road (2020 - ongoing). Architectural Historian performing built-environment survey, archival research, and preparing historic contexts, DPR 523 forms, and significance and eligibility evaluations for listing the CRHR and as a local City of Santa Rosa Landmark. Work performed for TAIT & Associates, with City of Santa Rosa as the lead agency.

Previous Project Experience

196 San Miguel and 379 Second Street Historic Evaluation Report (2019). Architectural Historian preparing a Historic Evaluation Report including built-environment survey, site record, historic contexts, and significance evaluation for a 1940s vernacular beach cottage located in the community of Avila Beach, San Luis Obispo County. The study found the cottage eligible for the National Register of Historic Place (NRHP) and California Register of Historical Resources (CRHR) at the local level. Work performed for private developer, Sullivan & Associates, with San Luis Obispo County as lead agency.

Sonoma Valley Historical Society (2016 - 2017).Archivist and Collections Registrar with the Sonoma Valley Historical Society managing both the Marcy House Archives and Research Center, and the Society's analog and digital collections. Advised the Society's Board of Directors and served as chair of both the Acquisitions and Archives Committees. The management of the Archives and Research Center encompassed the creation and implementation of standing collection and research policies and procedures, oversight of collection organization, storage, and accessibility between six facilities, the management of all collection-related contracts and agreements, as well as the coordination and oversight of all intern training and scheduling, volunteer training, grant proposals, and outreach events. The management of the analog and digital collections encompassed the creation and oversight of Society-wide database systems. Acquired the California Revealed Grant through the California State Library, which allowed the digitization of the last remaining copies of the *Sonoma Valley Expositor* newspaper.

De la Vina Street Bridge Replacement (2018 - 2019). Architectural Historian preparing the Caltrans HRER, HPSR, and City Memo for a bridge replacement project in the City of Santa Barbara. Nine properties were included in the study and one property was found eligible as a local historic landmark. Presented findings to the City of Santa Barbara Historic Landmarks Commission, who approved the local designation. Work performed for Bengal Engineering, Inc. with the City of Santa Barbara as the lead agency in consultation with Caltrans District 5.

Chuckwalla Valley Road Bridge Replacements (2019). Architectural Historian preparing the Caltrans HRER for the replacement of four historic bridges on NRHP/California Register of Historic Places (CRHR) eligible Chuckwalla Valley Road, near Desert Center in Riverside County. The bridges were found eligible for listing as character defining features of Chuckwalla Valley Road (Highway 60/70). Work performed for Riverside County in consultation with Caltrans District 8.

East Mountain Drive Water Crossing Replacement (2018 - 2019). Architectural Historian preparing the Caltrans HRER for a water crossing replacement project in the community of Montecito. The study recommended a property eligible for the NRHP and the CRHR. Work performed for the design engineer in consultation with the County of Santa Barbara and Caltrans District 5.

Montecito Creek Bridge Emergency Replacement (2018). Architectural Historian preparing the Caltrans HRER for emergency replacement of a NRHP/CRHR eligible bridge in the community of Montecito. The bridge no longer retained integrity after the 2018 mudslide event and was found not eligible for listing in the NRHP/CRHR prior to its emergency demolition. Work performed for Santa Barbara County in consultation with Caltrans District 5.

Railroad Avenue Bridge (2019).Architectural Historian preparing the Caltrans HRER for the replacement of two historic bridges on Railroad Avenue located in Riverside County. The bridges were recommended not eligible for listing in any register. A segment of the Pacific Crest Trail was documented and found eligible for listing in the NRHP and the CRHR. Work performed for Riverside County in consultation with Caltrans District 8.

Historic Building Assessment at 250 South Tustin Street (2018). Architectural Historian preparing a Historic Building Assessment for an early twentieth century craftsman house in the City of Orange. Work performed for private developer, Klassic Engineering and Construction, Inc., with the City of Orange as lead agency.

Avila Beach Schoolhouse Conversion (2018 - 2019). Architectural Historian consulting with contractor on the rehabilitation of a schoolhouse in San Luis Obispo County, into a bed and breakfast, adhering to the Secretary of the Interior's Standards for the Treatment of Historic Properties. Work performed for private developer, Hodge Company, with County of San Luis Obispo as the lead agency.

Brea Dam Electrical Modernization (2018 - 2019). Architectural Historian consulting with contractors on the electrical and utility rehabilitation of the NRHP and CRHR eligible Brea Dam, a USACE property in the City of Fullerton. Prepared a Historic Property Rehabilitation Report and monitored removal and positioning of historic features. Work performed for Power Pro Plus, Inc. in consultation with USACE Los Angeles District as lead agency.

Port of Long Beach Master Plan Update (2018 - 2019). Architectural Historian producing the cultural resource chapter of a Programmatic Environmental Impact Report (EIR) for the Port of Long Beach, as well as a technical survey and evaluation report. Conducted intensive and windshield surveys for historic built environment resources within the entire Port of Long Beach. Work performed as a subconsultant in consultation with the Port of Long Beach.

1121 Montalban Street (2019). Architectural Historian preparing the Historic Building Assessment for a private developer in the City of San Luis Obispo. The assessment included two properties and a 1920s Spanish Colonial Revival house. The study found the properties and dwelling not eligible for listing in the CRHR or the city register. Work performed for CoVelop, Inc., with the City of San Luis Obispo as the lead agency.

Tranquillity Irrigation District Southeast Service Area Water Conservation and Conveyance Improvement (2018). Architectural Historian implementing the built environment study for a Cultural Resource Inventory and Evaluation in Fresno County. Work performed for Provost & Pritchard Consulting Group, with U.S. Bureau of Reclamation as the lead agency.

Gordon Acres Water Company Water System Improvements (2018). Architectural Historian implementing the built environment survey and preparation of architectural resources investigation report for water system improvements in the town of Lucerne Valley. Work performed for NV5, with California State Water Resources Control Board as the lead agency.

Bloomington Commerce Center (2018). Architectural Historian implementing the built environment survey and preparation of cultural resources assessment report for a 56.6-acre commercial site in the community of Bloomington, San Bernardino County. Work performed for Howard Industrial Partners,with San Bernardino County as the lead agency.

Prologis Trailer Parking Expansion (2018). Architectural Historian implementing the built environment survey and preparation of cultural resources assessment report for expansion of a trailer parking area near the City of Redlands, San Bernardino County. Work performed for Albert A. Webb Associates, with San Bernardino County as the lead agency.

Interstate 215 and University Parkway Interchange Improvements (2018). Architectural Historian preparing the Caltrans HRER for improvements to the I-215 interchange in the City of San Bernardino. Work performed for HDR in consultation with the City of San Bernardino and Caltrans District 8.

Interstate 10/Monroe Street Interchange Improvements (2018). Architectural Historian preparing the Caltrans HRER for interchange improvements in the City if Indio. Work performed for Michael Baker in consultation with the City of Indio and Caltrans District 8.

Biola Community Services District Recycled Water Improvements Feasibility Study (2018). Architectural Historian implementing the built environment survey and preparation of architectural resources investigation report for recycled water improvements in Fresno County. Work performed for Crawford & Bowen Planning, Inc., with U,S, Bureau of Reclamation as the lead agency.

Athos Renewable Energy Project (2018 - 2019). Architectural Historian implementing the built environment survey and preparation of historic contexts and resource evaluations for a 2,848-acre solar facility, a 6-mile-long transmission line corridor, and a surrounding 5-mile-wide buffer in Riverside County. Resources documented are associated with Desert Training Center, a designated multi-property historic district. Work performed for IP Athos, LLC and Aspen Environmental Group, with BLM as the lead agency.

Blythe Airport Fence Project (2018). Architectural Historian implementing the built environment survey and preparation of Phase-I Cultural Report for an improvement project within the Blythe Army Air Base Historic District. Contributing features to the historic district were newly identified and documented including runways. The overall significance evaluation of the Blythe Army Air Base Historic District was also updated as a historic district contributing to the Desert Training Center/California-Arizona Maneuver Area Multiple Property Historic District. Work performed as a subconsultant for Mead & Hunt, with the Federal Aviation Administration (FAA) as the lead agency.

University of California Riverside Plant Growth Facility (2018). Architectural Historian implementing the built environment survey and preparation of a Historic Building Assessment report for a campus facility expansion project in the City of Riverside. Work performed for Albert A. Webb Associates,with University of California Riverside as the lead agency.

Victorville Water District Distribution System Phase I Cultural Resource Assessment (2017). Architectural Historian preparing site records, significance evaluations, and historic contexts for a water distribution system project in the City of Victorville. Work performed for Meridian Consultants, LLC., with City of Victorville as the lead agency.

Cultural Resource Study: 196 San Miguel and 379 Second Street Avila Beach, San Luis Obispo County, California (2019). Architectural Historian preparing a built-environment survey, site record, historic contexts, and significance evaluation for a 1940s vernacular beach cottage located in the community of Avila Beach. The study found the cottage eligible for the NRHP and CRHR at the local level. Work performed for private developer, Sullivan & Associates, with San Luis Obispo County as the lead agency.

Alabama and Palmetto Project Phase 1 Cultural Resources Assessment (2019). Architectural Historian preparing a built-environment survey, site records, historic contexts, and significance evaluations for a development project in San Bernardino County. Work completed for Albert A. Webb Associates with County of San Bernardino as lead agency.

Sierra Avenue Widening Project Cultural Resources Assessment Revision (2018). Architectural Historian preparing a built-environment survey, site record, historic context, and significance evaluation for a street widening project in the City of Fontana. Work completed for HDR, with the City of Fontana as lead agency.

City of Orange Cove Water Treatment Improvement Project Historic Property Identification Report (2019). Architectural Historian preparing a Historic Property Identification Report in the City of Orange Cove in Fresno and Tulare counties. Work performed for Crawford & Bowen Planning Inc. with the City of Orange Cove as lead agency.

LA Waterwheel Project Cultural Resources Assessment Report (2019). Architectural Historian preparing a built-environment survey, site record, historic context, and significance evaluation for a portion of the Los Angeles River Channel in the City of Los Angeles. Work performed for Ruth Villalobos & Associates, Inc. with the City of Los Angeles as lead agency.

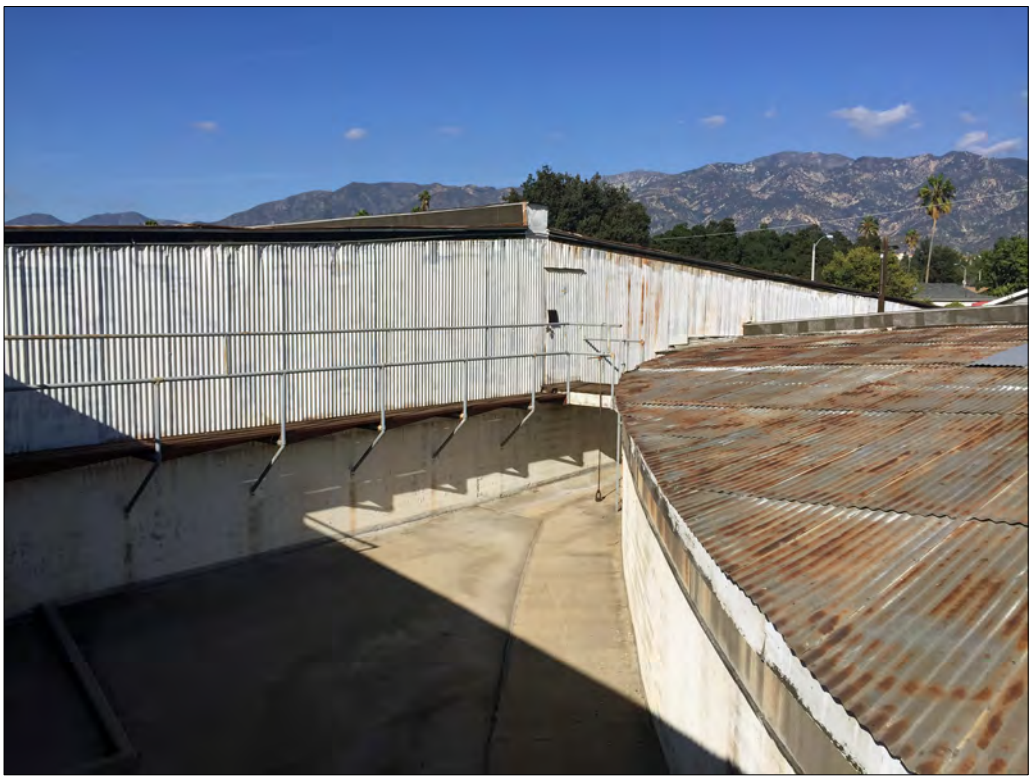
Southern California Logistics Airport Cultural Resources Assessment Report (2019). Architectural Historian preparing a site record update for George Airforce Base in the City of Victorville, California. Work performed for Michael Baker and Associates with the City of Victorville as lead agency.

Fort Visalia Historic Review (2018). Architectural Historian assisting with research and preparing historic contexts for the Fort Visalia site investigation. Work performed for the City of Visalia who is working to preserve the city's early history as the location of a fort in the mid-19th century.

Appendix C

"Historic Resource Assessment, Pasadena Water and Power, Sunset Reservoir, 201 West Mountain Street, Pasadena, CA," 2017, Jenna Snow, Historic Preservation Consulting

Historic Resource Assessment
Pasadena Water and Power
Sunset Reservoir
201 West Mountain Street
Pasadena, CA



Final
December 2017

Jenna Snow, Historic Preservation Consulting 323/317-3297 jenna@preservingbuildings.com

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Attachment A: Maps
Attachment B: Historic Maps
Attachment C: Contemporary Photographs
Attachment D: Historic Photographs
Attachment E: List of Reservoirs in Pasadena

I. INTRODUCTION AND EXECUTIVE SUMMARY

This report provides an historic resource assessment of Sunset Reservoir (Assessor Parcel Numbers 5728-021-916) in Pasadena, California ("subject property" or "property"). The subject property is located close to the Orange Grove/Fair Oaks neighborhood of Pasadena and is bounded by West Mountain Street to the south, Sunset Avenue to the east, West Hammond Street to the north, and the private Glen Avenue to the west. The subject property consists of two reservoirs, identified as Sunset 1 and Sunset 2, as well as five other structures. The property has not been previously surveyed, although it was the subject of an Initial Study in 2007.[1] While the Initial Study did not identify the subject property as an historical resource, it does not reference any technical report and there does not appear to have been any in-depth evaluation of the property at that time. This historic resource assessment evaluates the subject property for eligibility for listing in the National Register of Historic Places (National Register), California Register of Historical Resources (California Register), and as a local Pasadena Landmark. This report concludes that the property appears eligible for listing in the California Register as well as a local Pasadena Landmark. As the oldest extant reservoir in Pasadena constructed circa 1888, Sunset Reservoir served as a reliable water storage facility for the burgeoning city at the end of the nineteenth and first half of the twentieth centuries, and allowed for its continued and sustained growth.

II. QUALIFICATIONS

This report was prepared by Jenna Snow and Kathryn McGee. Both Ms. Snow and Ms. McGee meet the Secretary of the Interior's Professional Qualifications Standards in Architectural History

Jenna Snow

In January 2015, Jenna Snow launched an independent historic preservation consulting practice with offices in Los Angeles. With over fifteen years of professional experience, Ms. Snow has a strong and broad understanding of best historic preservation practice, including federal, state, and local regulations. She has worked on a wide range of projects on both the east and west coasts, as well as internationally. Ms. Snow holds a M.S. in Historic Preservation from Columbia University and a B.A. in Fine Arts focusing on architectural history from Brandeis University. She meets the Secretary of the Interior's Professional Qualifications Standards in Architectural History. Throughout her career, Ms. Snow has authored, co-authored, and/or served as project manager for nearly 100 historic preservation projects, including a wide variety of historic resource assessments, National Register nominations, and historic resources surveys. She regularly contributes to environmental impact reports, historic preservation certification applications, Section 106 reviews and other work associated with historic building rehabilitation and preservation planning. Ms. Snow has prepared multiple National Register nominations, including the Twohy Building in San José, CA; the Beverly Hills Women's Club in Beverly Hills, CA; the Sam and Alfreda Maloof Compound in Rancho Cucamonga, CA; the Boyle Hotel/Cummings Block in Los Angeles, CA; the West Los Angeles Veterans Affairs Historic District in Los Angeles, CA, and Temple Ohave Israel in Brownsville, PA. She has completed historic resources surveys, including coauthoring historic context statements in Hollywood, Whittier, CA, and South Los Angeles. Prior to her consulting work, Ms. Snow worked for the New York City Department of Design and Construction in New York, NY, the Freedom Trail Foundation in Boston, MA, and the Neighborhood Preservation Center in New York, NY.

Kathryn McGee

Ms. McGee is an architectural historian and historic preservation planner based in Los Angeles. She has over nine years of experience in the field of historic preservation consulting and launched an

[1] City of Pasadena, Planning Division, "Initial Study; Sunset Reservoir Ion Exchange Project," February 2007. As of the date of this report, this project has not been realized.

independent practice in 2015. Her educational background includes a Bachelor of Arts degree in architectural history from the University of California, Santa Barbara and a Master of Urban and Regional Planning degree from the University of California, Irvine. She has also completed the Summer Program in Historic Preservation at the University of Southern California and is a LEED Accredited Professional with specialty in Neighborhood Development. Her consulting work entails writing reports for purposes of environmental and local project review; preparation of historic resource assessments and surveys; preparation of technical reports for General Plan Updates; evaluation of properties seeking or complying with Mills Act Contracts; and consultation on adaptive reuse and federal Investment Tax Credit projects.

III. METHODOLOGY

Jenna Snow and Kathryn McGee visited the site November 9, 2017. Research was conducted throughout November 2017 and included the following primary resources: historic newspaper articles from the *Los Angeles Times* and newspapers.com; clippings from the *Pasadena Star-News* and *Pasadena Independent*; historic aerial photographs from University of California Los Angeles Air Photo Archives; Huntington Digital Library, and archives of the Pasadena Water Department, including historic and as-built drawings. Secondary sources provided by the Pasadena Water Department include the following unpublished reports:

- Duncan A. Blackburn, "Forty Years in Developing A Water System," unpublished paper presented on October 29, 1952.
- Tim Brick, "The Fight for Municipal Water," unpublished lecture presented to the Pasadena Historical Society, March 3, 2001.
- Timothy F. Brick with Audrey Eftychiou, "Pasadena Water; The Essential Ingredient," City of Pasadena, Pasadena Water and Power, 2012, www.arroyoseco.org/documents/pwaterhistory.pdf.
- G&E Engineering Systems, Inc., report entitled "Seismic Vulnerability Assessment, City of Pasadena Water System," prepared for City of Pasadena, December 10, 2006.

IV. REGULATORY SETTING

Federal

National Register of Historic Places

The National Register of Historic Places is "an authoritative guide to be used by federal, state, and local governments, private groups, and citizens to identify the nation's cultural resources and indicate what properties should be considered for protection from destruction or impairment."[2] Administered by the National Park Service, the National Register is the nation's official list of historic and cultural resources worthy of preservation. Properties listed in the National Register include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archaeology, engineering, and culture. Resources are eligible for the National Register if they meet one or more of the following criteria for significance:

A) are associated with events that have made a significant contribution to the broad patterns of our history; or
B) are associated with the lives of significant persons in our past; or
C) embody 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; or
D) have yielded or may be likely to yield, information important in history or prehistory.[3]

Once a resource has been determined to satisfy one of the above criteria, then it must be assessed for "integrity."[4] Integrity refers to the ability of a property to convey its significance. Evaluation of integrity is based on "an understanding of a property's physical features and how they relate to its significance." The National Register recognizes seven aspects or qualities of integrity: location, design, setting, materials, workmanship, feeling, and association. To retain integrity, a property must possess several, and usually most, of these aspects.

Relationship to Project

The subject property is not listed in the National Register. While the property was considered under criterion A as the oldest reservoir in Pasadena, the property may not retain sufficient integrity for National Register eligibility due to alterations made in the 1920s and 1930s.

State

California Register

Based substantially on the National Register, the California Register is "an authoritative guide… used by state and local agencies, private groups, and citizens to identify the state's historical resources and to indicate what properties are to be protected."[5] For a property to be listed in to be eligible for listing in the California Register, it must be found by the State Historical Resources Commission to be significant under at least one of the following four criteria:

1) is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage; or

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[2] National Register Bulletin #16A: *How to Complete the National Register Registration Form* (National Park Service, 1997).

[3] National Register Bulletin #15, *How to Apply the National Register Criteria for Evaluation* (National Park Service, 1990, revised 2002).

[4] National Register Bulletin #15, *How to Apply the National Register Criteria for Evaluation* (National Park Service, 1990, revised 2002).

[5] California Public Resources Code §5024.1(a), http://codes.lp.findlaw.com/cacode/PRC/1/d5/1/2/s5024.1.

2) is associated with the lives of persons important in our past; or
3) embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual or possesses high artistic values; or
4) has yielded, or may be likely to yield, information important in prehistory or history.

Also included in the California Register are properties which have been formally determined eligible for listing in, or are listed in the National Register; are registered State Historical Landmark Number 770, and all consecutively numbered landmarks above Number 770; and Points of Historical Interest, which have been reviewed and recommended to the State Historical Resources Commission for listing.

The primary difference between eligibility for listing in the National and California registers is integrity. Properties eligible for listing in the National Register generally have more integrity than those only eligible for listing in the California Register. There is, however, no difference regarding significance.

Relationship to Project
The subject property is not listed in the California Register. However, the subject property appears significant under criterion 1 at the local level of significance as the oldest extant reservoir in Pasadena that allowed for the city's growth at the end of the nineteenth and through the first half of the twentieth century. While the property may not retain sufficient integrity for listing in the National Register, it appears to retain sufficient integrity for California Register eligibility.

California Environmental Quality Act (CEQA)
The purpose of CEQA is to evaluate whether a proposed project may have an adverse effect on the environment and, if so, if that effect can be reduced or eliminated by pursuing an alternative course of action or through mitigation. *Guidelines for California Quality Act* (CEQA Guidelines) are the regulations that govern the implementation of CEQA. CEQA Guidelines are codified in the California Code of Regulations (CCR), Title 14, Chapter 3, § 15000 et seq. and are binding on state and local public agencies. The basic goal of CEQA is to develop and maintain a high-quality environment now and in the future.

CEQA defines a historical resource as:

> a resource listed in, or determined eligible for listing in, the California Register of Historical Resources. Historical resources included in a local register of historical resources..., or deemed significant pursuant to criteria set forth in subdivision (g) of Section5024.1, are presumed to be historically or culturally significant for purposes of this section, unless the preponderance of the evidence demonstrates that the resource is not historically or culturally significant (California Public Resources Code, PRC §21084.1).

Relationship to Project
As the subject property appears eligible for listing in the California Register, it is a historical resource for purposes of CEQA.

Local

The Pasadena Cultural Heritage Ordinance allows for designation of Landmarks that meet one or more of the following criteria:

a. It is associated with events that have made a significant contribution to the broad patterns of the history of the City, region, or State.
b. It is associated with the lives of persons who are significant in the history of the City, region, or State.
c. It embodies the distinctive characteristics of a type, architectural style, period, or method of construction, or represents the work of an architect, designer, engineer, or builder whose work is of significance to the City or, to the region or possesses artistic values of significance to the City or to the region.
d. It has yielded, or may be likely to yield, information important locally in prehistory or history.

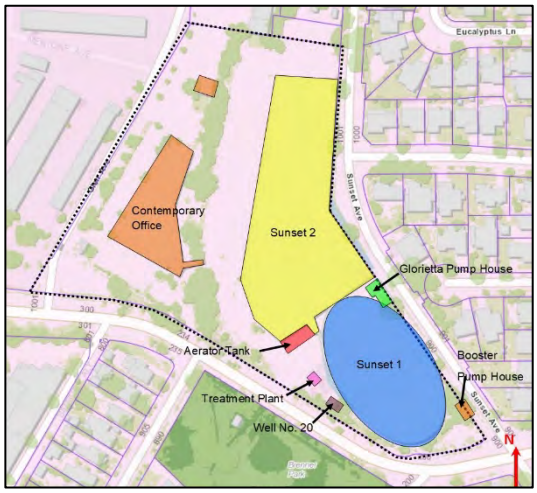
Relationship to Project

The subject property is not locally designated. However, as the oldest extant reservoir in Pasadena, it appears eligible under criterion a as the oldest reservoir in Pasadena that allowed for the city's growth at the end of the nineteenth and through the first half of the twentieth century.

V. PROPERTY DESCRIPTION AND HISTORY

Physical Description

Site (Maps 1-4, Figures 1-5)



Site plan identifying subject property and associated structures.

The subject property is located in the western portion of the City of Pasadena, California, bounded by West Hammond Street to the north, Sunset Avenue to the east, West Mountain Street to the south, and Glen Avenue and the 210 Freeway to the west. The property is situated right outside to the west of the Fair Oaks/Orange Grove neighborhood to the east. The Arroyo Seco is located immediately west of the 210 Freeway. The surrounding neighborhood largely consists of residential properties, although the subject property is one of three properties owned by the City of Pasadena clustered together in this area that contain buildings, reservoirs, and other infrastructure for the City's Water and Power Department and related city uses.

The subject property sits above the grade of surrounding streets, with the site sloping down from north to south. A tall brick wall and a low concrete wall with chain link fence above border the property along West Mountain Street. A low wall constructed of river rock with a chain link fence above borders the southeast corner of the property; this wall wraps the property's border along Sunset Avenue, transitioning into a low concrete wall with chain link fence above. Driveways located along West Mountain Street and Sunset Avenue provide access to the property. The parcel is irregularly shaped and contains the following seven structures: Sunset 1 (reservoir); Sunset 2 (reservoir); Aerator Tank; Well No. 20; Treatment Plant; Glorietta Pump House; and Booster Pump House. Surface parking wraps these structures to the north and west. The parcel also contains contemporary office buildings located to the northwest, situated substantially below the grade of the rest of the parcel. As the office buildings are contemporary and physically separated from the above-listed structures by drop in grade and a retaining wall, they are not further considered in this assessment report, though photos are included in the attachment (see Figures 33, 34, and 36).

Sunset 1 (Figures 5-7, 9-17)

Sunset 1 is located in the south portion of the parcel. The reservoir is oval-shaped and the basin sits below-grade. Above grade, the reservoir is wrapped by an approximately 6-foot tall board-form concrete wall with venting at the top. Sunset 1 is covered by a corrugated metal roof. The roof slopes gradually upward toward the center of the reservoir. A long rectangular vent pops up at the top of the gable, appearing as a monitor, or extended pop-up roof, and extends the entire length of the roof. Access to the interior is provided through a door in the southwest part of the reservoir. The door is located at one end of an enclosed, rectangular passageway that extends above the top of the roof. An exterior, metal staircase provides access to the enclosed passageway. At the interior, the door leads onto a wood catwalk extending over the water-filled basin. The basin is divided into north and south halves by a concrete wall stretching from the southwest to northeast sides. Interior walls around the perimeter of the basin and along the central dividing wall are finished in gunite and slope upward from bottom to top. The roof is supported on a grid of wood posts joined by trusses arranged horizontally with "X" bracing between posts.

Sunset 2 (Figures 17-19, 21-28)

Sunset 2 is located in the north part of the parcel and interconnected with the north tip of Sunset 1. The reservoir is irregular in plan, wider at the south end and narrower at the north end, forming a boomerang-like shape that opens up to the east. The reservoir has a metal, front gable roof with a low pitch. Sunset 2 is taller than Sunset 1, with its above-grade structure consisting of an approximately 6-foot tall board-form concrete exterior wall. At north and south elevations, the concrete wall is topped by corrugated metal siding. A long rectangular monitor vent is placed at the top of the gable and extends the entire length of the roof. Access to the interior is provided at north and south elevations. At the south elevation, an exterior, raised metal walkway continues from the Aerator Tank (see below), and runs along the south elevation of Sunset 2, providing access through a raised door at the center of the elevation. At the interior, the door leads onto a wood catwalk extending over the entire length of the water-filled basin. Interior walls around the perimeter of the basin are finished in gunite and slope upward from bottom to top. The roof is supported on a grid of wood posts joined by trusses arranged horizontally with in "X" bracing between posts.

Aerator Tank (Figures19-20)

The Aerator Tank is a separate structure located between Sunset 1 and Sunset 2, just west of the connection between the two reservoirs. The Aerator Tank sits above grade and is rectangular in plan, encircled by a low concrete wall with a wood frame wall above. The structure is clad in corrugated metal siding with a flat metal roof. It is accessed by an exterior raised metal walkway running along the east elevation. A single door is located in the north part of the east elevation. Aside from a shallow landing, there are no accessible walkways inside the space. The interior consists of two rectangular basins arranged side-by-side. The basin on the north side sits higher than the basin on the south side, and is bordered by a low concrete wall. In the north basin, an underwater pipe brings water into the basin, and an opening in the south wall of the basin allows water to flow down into the lower, south, basin, where it is transferred to the reservoirs.

Sunset Well No. 20 (Figures 5 and 8)

Sunset Well No. 20 is enclosed within a small, rectangular structure, located southwest of Sunset 1 Reservoir. The structure is partially sunken below grade, with its primary façade at grade with West Mountain Street. The structure is utilitarian, without any architectural style. It has a rectangular plan and a flat roof and is finished in smooth stucco. A concrete staircase runs along the northwest elevation, providing access from the subject property to the primary, southwest, elevation entrance. This entrance has a pair of doors bordered by a narrow column of bricks on either side. The northwest elevation is a blank wall, containing only a rectangular vent that is curved at the top. The northeast elevation is also a blank wall and contains a rectangular opening for a window or vent, though the lower half of the wall is not visible, sunken below the level of the subject property. Similarly, the southeast elevation is sunken below the level of the subject property. The interior was not accessible at time of site visit.

Treatment Plant (Figure 6)

The Treatment Plant is located northwest of Sunset Well No. 20 and west of Sunset 1. It is a utilitarian structure consisting of a metal canopy sitting on a high concrete block foundation. A concrete block wall separates the area under the canopy into two halves where tanks are located for use in the water treatment process.

Glorietta Pump House (Figures 29-31)

The Glorietta Pump House is located east of the north end of Sunset 1 and partially sunken below the grade of the rest of the property, with its primary northeast façade at grade with Sunset Avenue. The building is a utilitarian, concrete structure, clad in smooth stucco. It has elements of Streamline Moderne style through horizontal banding on either side of the centrally located metal roll-up garage door along the northeast facade. A simple pedestrian door is situated at the southeast side of the façade. The horizontal banding flanking the truck door is topped by bands of round, pierced concrete screens. The parapet wall is clad in stucco with vertical scoring at regular intervals. Access from the subject property to Sunset Avenue is provided through an exterior concrete stair running along the northwest elevation. The northwest elevation sits partially below grade and incorporates two rectangular vents. The southeast elevation sits partially below grade and incorporates a rectangular "pop out" that provides ventilation to the interior. The southwest elevation was not visible at time of site visit. The interior consists of one open room used for housing mechanical equipment. Walls consist of unfinished board-form concrete. Bands of glass block windows set within fixed metal sash are evident from the interior. At the ceiling, metal beams run just below the roof. There are three large rectangular floor grates with pumping equipment integrated into each grate. The southeast wall contains square-shaped openings for ventilation.

Booster Pump House (Figure 32)

The Booster Pump House is located east of the south end of Sunset 1, at the southeast corner of the property, sunken partially below the grade of the rest of the property, with its primary northeast façade at grade with Sunset Avenue. The structure is utilitarian, without any architectural style, and features blank stucco walls on all visible elevations. There is no architectural detailing or ornamentation. Rectangular in plan, it has a front gable roof with very low pitch. The primary, northeast, elevation includes a pair of doors. The lower halves of the northwest and southeast elevations are sunken below grade, with one rectangular vent opening visible on each elevation. The southwest elevation is not visible. The interior was not accessible at time of site visit.

Alterations

Few primary sources detailing the history of alterations were available. The following description of alterations is based on a report prepared by G&E Engineering Systems, Inc. in 2006 for the City of Pasadena entitled "Seismic Vulnerability Assessment, City of Pasadena Water System,"[6] as well as historic Sanborn Fire Insurance maps (Sanborn maps) and historic aerial photographs.

Sunset 1 was constructed in 1888 and, in the early 1890s, portions were relined in concrete.[7] While it is not certain what the original lining material was, there is a reference that Sunset 1 was lined with "cobble stones."[8] A roof was installed in 1899. Sunset 2 was constructed around 1900. It appears that by 1910, both reservoirs had wood roofs. The 1910 Sanborn map has partial coverage of the subject property and shows the northeast outline of the two reservoirs, noting both have "board roof over." In 1929, the lining of Sunset 1 was altered to add 8-inches of cement plaster. In addition, one-inch thick reinforced gunite lining was added to walls and a new, corrugated iron roof was installed. A contemporaneous article headline declared, "Forty Years Old, New Roof Needed;

[6] G&E Engineering Systems, Inc., "Seismic Vulnerability Assessment, City of Pasadena Water System," prepared for City of Pasadena, December 10, 2006, 131-133.

[7] Samuel H. Banbury, "Research: Thomas Banbury," undated, unpublished document.

[8] G&E Engineering Systems, Inc., "Seismic Vulnerability Assessment, City of Pasadena Water System," prepared for City of Pasadena, December 10, 2006, 131.

Sunset Reservoir Also to Receive Cleaning."[9]

The 1931 Sanborn map includes Sunset Well No. 20 and the Booster Pump House. Based on historical records of the Water Department, Sunset Well No. 20 was constructed circa 1925. An exact date of construction of the Booster Pump House is not known. The 1931 Sanborn map also shows the remainder of the subject property to the west of the reservoirs as occupied by the Pasadena Street Department with a variety of buildings that are no longer extant.

More significant alterations were undertaken in 1934 with the addition of a 4-foot high concrete wall around Sunset 1, increasing the capacity from 3,375,000 gallons to 5,583,000 gallons. A portion of the lining was also repaired with reinforced gunite concrete. At the same time, the wall of Sunset 2 was repaired with one to 1.5-inch reinforced gunite concrete; a new, four-foot high concrete wall was added; bottom joints and cracks were covered with asphalt; and a new corrugated metal roof was installed, supported by creosoted timber frame with redwood posts. Work on Sunset 2 increased capacity from 3,104,900 to 9,854,000 gallons.[10] Total capacity of both Sunset 1 and Sunset 2 is currently 15,438,000 gallons. Also in 1934, the site was graded; new retaining walls were constructed; a new aerator was constructed to oxygenate water; and a new 12-inch discharge pipe was added from Sunset Well No. 20 over the top of the reservoir wall. The aerator is no longer extant.

The 1950 Sanborn map includes Glorietta Pump House. It is likely the structure was constructed in 1947, as noted on the cornerstone. The only other alteration noted in the G&E Engineering Systems report was repainting of the roof of Sunset 1 in 1974.

Historic aerial photographs support that there have not been significant changes to the site since construction of Gloriette Pump House in the late 1940s; replacement of the aerator tank between 1961 and 1966; and construction of the treatment plant, which appears to be of fairly recent construction.

History

Sunset 1 was built circa 1888 by Thomas Banbury, who also constructed an open concrete ditch from Devil's Gate, the source of water in the Arroyo Seco. Located north of the subject property at the base of the mountains, there were several springs at Devil's Gate, most notably Thibbets, Ivy and Flutterwheel springs. Water ran through the ditch to Sunset 1 for first time on November 9, 1888.[11]

Thomas Banbury, "one of Pasdaena's pioneers"[12] was "known all over Los Angeles County, not to mention two or three neighboring counties."[13] Originally from England, he is first included in the 1880 Census, listed with an occupation of farmer.[14] In addition to his work as a farmer, Thomas

[9] "Forty Years Old, New Roof Needed; Sunset Reservoir Also to Receive Cleaning," *Pasadena Star News*, February 6, 1929, 14.

[10] It is interesting to note that the capacity of the reservoirs does not correspond between Sanborn maps and G&E Engineering Systems. The 1950 Sanborn map notes capacity of Sunset 1 Reservoir as 3,375,000, which does not reflect the increase in capacity indicated by G&E Engineering Systems. The 1931 Sanborn map notes capacity of Sunset 2 Reservoir as 6,750,000 gallons, which is greater than the capacity identified by G&E Engineering Systems for that time period.

[11] Samuel H. Banbury, "Research: Thomas Banbury," undated document.

[12] "Los Angeles County: Cities and Suburban Places," *Los Angeles Times*, March 19, 1902, A7.

[13] "The Candidates; 'Good Men and True' is the Demand of the People," *Los Angeles Times*, March 27, 1890, 7.

[14] 1880 United States Federal Census, Pasadena, Los Angeles, California, Enumeration District: 034, Page: 398A.

Banbury owned property in Pasadena, La Canada, Lamanda Park, and San Bernardino County.[15] He also served a term as Justice of the Peace and was a deputy under the Sheriff Gard in Pasadena.[16]

When first constructed, Sunset Reservoir held water for two of the three main land and water companies in Pasadena. An article from 1892 notes:

> Pasadena is blessed with an abundant and never-failing water supply. There are two water companies, the Pasadena Land and Water Company, supplying the west side, and the Pasadena Lake Vineyard Land and Water Company, the east side of town. The chief source of supply is at Devil's Gate, where there is a constant flow of 2225 miner's inches. This is piped to the Mountain street reservoir, where the supply for each of the two companies is distributed in proper proportions.[17]

Sunset Reservoir was not the only reservoir constructed prior to 1900 in Pasadena. However, none of the other, pre-1900 reservoirs are extant. Currently, there are 17 reservoirs in Pasadena, all constructed after circa 1910 (see Attachment E: List of Reservoirs in Pasadena).

[15] "Los Angeles County: Cities and Suburban Places," *Los Angeles Times*, March 19, 1902, A7.

[16] "The Candidates; 'Good Men and True' is the Demand of the People," *Los Angeles Times*, March 27, 1890, 7.

[17] "Pasadena: The Wonderful City that was a Sheep Pasture in 1874," *Los Angeles Times,* March 27, 1892, 1.

VI. HISTORIC CONTEXT

The subject property is evaluated for significance within the following historic contexts: Late 19th and Early 20th Century Development in Pasadena and the Pasadena Water Department.

Late 19th and Early 20th Century Development in Pasadena

The following historic context of the early settlement of Pasadena is excerpted from the National Register of Historic Places Multiple Property Documentation Form for "Late 19th and Early 20th Century Development and Architecture in Pasadena:"[18]

> The forces that shaped the early settlement of Pasadena were both physical and manmade. Pasadena's setting at the foot of the San Gabriel Mountains and on the edge of the deeply cut canyon called the Arroyo Seco provided physical barriers to development, but also remarkable natural beauty. These physical features partly dictated the boundaries of the three ranchos from the Mexican period that became present day Pasadena: Ranchos San Pasqual, Santa Anita, and San Raphael. The differences in the subsequent subdivision of these ranchos during the American period help explain the development of Pasadena during the late 19th and early 20th centuries. Beginning in the 1870s, portions of Rancho San Pasqual changed hands several times; each time it was subdivided into smaller tracts and sold to newcomers. In contrast, thousands of acres of Rancho Santa Anita and Rancho San Rafael were held by individuals and families through the 1880s, if not later, postponing their development by decades.
>
> The area that was to become Pasadena was originally part of the San Gabriel Mission, which was established by the Spanish missionaries in 1771. In addition to present day Pasadena, the mission had control over areas that are now South Pasadena, San Marino, and San Gabriel. With the secularization of the missions by the government of Mexico in 1833, parcels were granted to individuals who had served the government, usually soldiers. Thus, the San Gabriel Mission land became Rancho San Pasqual. After a series of grants and claims, Manuel Garfias, a lieutenant in the Mexican Army, was granted title to Rancho San Pasqual in 1843.
>
> Rancho Santa Anita, east of Rancho San Pasqual, was settled by Scotsman Hugo Reid. In 1858, investors acquired the land and divided the property. The eastern portion (now Arcadia) was sold to William Wolfskill, and the western portion was sold to Leonard Rose, a German immigrant…
>
> Rancho San Rafael was located west of Rancho San Pasqual with the Arroyo Seco providing a natural boundary on the east side. Jose Maria Verdugo acquired the land in 1784 and used it for grazing cattle. It was retained by his heirs until 1871 when the courts portioned and sold it to speculators. Prudent Beaudry, Mayor of Los Angeles from 1874 to 1876, acquired the area south of Colorado Boulevard, and Benjamin Dreyfus, a German immigrant, acquired that to the north. In 1883, Alexander Campbell-Johnston and his wife purchased over 2,000 acres from Beaudry, and named it the San Rafael Ranch. A winery was built on the ranch, which is still extant but remodeled. The Campbell-Johnston's sons continued to operate the ranch until about 1920. Professor John D. Yocum also purchased a portion of Rancho San

[18] Teresa Grimes and Laura Vanaskie, Galvin Preservation Associates, *National Register of Historic Places Multiple Property Documentation Form.* "Late 19th and Early 20th Century Development and Architecture in Pasadena," undated.

Rafael in 1883. He and his wife Hannah came to Pasadena from Iowa in 1882 and purchased four acres on Monk Hill. In a series of transactions, he became the primary owner of what is now known as the Linda Vista area. The Yocums built a two-story house north of present day Lida Street. Three years later, they moved to a new house they built near Devil's Gate, while their son and daughter-in law remained in the original house. They drove tunnels into the hillsides to obtain water and planted 12,000 peach and apricot trees around the houses. Although the Yocums also developed some of their property as home sites, only a few were sold because of lack of transportation across the Arroyo Seco.

Pasadena's modern history begins in 1859 with the acquisition of Rancho San Pasqual by Dr. John S. Griffin and Judge Benjamin D. Wilson. They subsequently subdivided and sold the land to settlers during the 1860s and 1870s…

In 1873, "The California Colony of Indiana," was formed in Indianapolis, Indiana by a group composed primarily of farmers; the colony was organized and headed by Dr. Thomas Elliott. The farmers were seeking an area that was suitable for growing warm climate crops such as citrus and grapes. Elliott along with his brother-in-law, Daniel Berry, marketed the new venture, which promised tracts in California that could be purchased for three dollars per acre and were "well timbered, well watered and adapted to the culture of citrus fruits." Berry negotiated to buy a portion of Rancho Anita from Harris Newmark, who had purchased it from William Wolfskill. However, the deal was thwarted by the Panic of 1873, which caused some of the original investors to withdraw their shares.

Berry remained in California to represent Dr. Elliot, and with the help of new investors formed the San Gabriel Orange Grove Association (SGOGA). He immediately began to negotiate with Wilson and Griffin to buy a portion of Rancho San Pasqual. Wilson and Griffin came to an agreement regarding their joint ownership. Wilson desired to develop his own lands and took 1,600 acres east of present day Fair Oaks Avenue, while Griffin took 3, 962 acres west of that line. On November 11, 1873, the SGOGA became incorporated and by January of the following year, Berry purchased Griffin's land for $25,000. The land was roughly bounded by Villa Street to the north, Fair Oaks Avenue to the east, the Arroyo Seco to the west, with the southern end extending into what is now South Pasadena. Every SGOGA shareholder was entitled to seven and a half acres of the subdivided lands and a 1/200 interest in the unplatted remainder. The subdivided portion consisted of 1,500 acres laid out in 15 and 30-acre farm tracts.

Within a few of weeks of incorporation, 27 tracts were sold. Albert O. Bristol constructed one of the first houses in the area. It was this subdivision that largely established Fair Oaks Avenue and Orange Grove Avenue (now Boulevard) as the main north-south streets, and Colorado Street (now Boulevard) and California Street (now Boulevard) as the main east-west corridors. On April 22, 1875, the settlement was named "Pasadena," although it was also referred to as the "Indiana Colony." By the following year, approximately 40 residences were constructed on the original SGOGA land. The original center of Pasadena was the intersection of Orange Grove and California Boulevards where several churches of different denominations were located, as well as a small number of stores.

Just before his death in 1877, Benjamin Wilson subdivided the remainder of his land along with a portion of Craig's Grogan Tract, which amounted to 2,500 acres and named it the Lake Vineyard Land and Water Company (LVLWC). The approximate boundaries of this generally rectangular subdivision were Villa Street on the north, Raymond Hill on the south, Mentor Avenue on the east, and Fair Oaks Avenue on the west. The SGOGA tract along with the adjacent LVLWC tract make up what is now the core of Pasadena. The subdivision of the LVLWC shifted the geographic focus of the growing town to the intersection of Fair Oaks Avenue and Colorado Boulevard. In 1876, a general store and post office were established at this new location, along with the town school.

Among the 383 residents in the 1880 Census, the vast majority are identified as farmers or orchardists…In the 1881-82 Directory, men and women alike are listed with the number of acres of land they owned. Most of the citizens owned a relatively small number of acres, ranging from 5 to 25. A few owned over 100 acres of land. Those who owned even more are identified as orchardists, such as William Allen…

The 1880s marked Pasadena's shift from a small agricultural community to an expanding town. Within this decade, the city incorporated, and many institutions such as churches and schools were founded. Several small inns and boarding houses were constructed to accommodate tourists who were attracted to the area by the wineries, horse ranches, and natural beauty. But it was the real estate boom of the late 1880s that forever changed Pasadena. The boom was triggered by improved rail connections that made it possible to ship oranges long distances without spoiling. Likewise, railroads allowed tourists and settlers to travel west quickly and cheaply. Boosters were soon touting the region as the most idyllic place in Southern California.

The coming of the railroad to Pasadena, as in many communities, was the catalyst for a different scale and type of development. Rail connections provided a boost to the local agricultural economy and to the fledgling tourism industry…The ensuing land boom, which lasted until 1887, transformed Pasadena into a resort town with the construction of several hotels near the town's commercial core…

Coinciding with the boom in the commercial district was the boom in residential buildings, many of which were constructed by those who prospered in the buying and selling of real estate…

During the boom, 433 plat, replat, and addition maps were filed in Pasadena. The city's land prices, which had increased slowly before 1886, skyrocketed. By the end of 1886, land was selling for $1,000 per acre. Before the end of 1887, 1,500 acres had been subdivided, and the population had increased to more than 6,000, and over 400 new buildings had been constructed. A local journalist observed that property changed owners so quickly that no one stayed long enough to cultivate the orange groves. "The result was that Pasadena orchards do not present so fine an appearance as two years ago." Late in 1887 construction slowed, prices declined, and interest rates rose… Also during the boom, many permanent improvements were made that provided the foundation for the rapid growth of the city in the 1890s…

> Shortly after the turn of the century, the city more than doubled in size. North Pasadena and East Pasadena were annexed to the City in 1904 and 1906, respectively. These annexations expanded the city limits to the northern boundary at Woodbury Road and an eastern boundary at Santa Anita Avenue (later changed to Rose Avenue and then later to San Gabriel Boulevard).

Pasadena Water Department

The history of providing reliable water to the growing city of Pasadena began around 1874,[19] when Benjamin Eaton dug the first irrigation ditch for the San Gabriel Orange Grove Association by diverting water from Eaton Canyon and the Arroyo Seco. This ditch later became an enclosed pipeline.[20] Prior to 1912, Pasadena had three primary companies that supplied water to Pasadena: the Pasadena Land and Water Company, which grew out of the San Gabriel Orange Grove Association; the Lake Vineyard Association; and North Pasadena Land and Water Company. All three companies obtained their water from the Arroyo Seco, although ostensibly from different springs.[21]

Numerous articles appearing in the *Los Angeles Times* and *Los Angeles Herald* discussed other reservoirs. An especially early article appearing in the *Los Angeles Herald* from 1875 hyped the Indiana Colony by noting abundant availability of water held in reservoirs.[22] In 1888, the same year Sunset Reservoir opened, the Lake Vineyard Water Company constructed a large water main to Devil's Gate.[23] That year, the North Pasadena Land and Water Company constructed a new covered reservoir and bought Brown's Canyon.[24] It is not known where that reservoir was located.

The drought of 1898 made the growing city realize it required a dependable water system. However, it took fourteen years before the three, major land and water companies could be valued and purchased for a cost of $1,151,152.89.[25] The three companies were consolidated into one municipal utility, the Pasadena Water Department, which was established on November 1, 1912. The Pasadena Water Department eventually took over 10 local water companies.[26] Samuel B. Morris was the first Chief Engineer and General Manager of the Pasadena Water Department and he held that job for 22 years. In 1912, the Pasadena Water Department had 20,000 customers and 8,300 meters. By 1951, the population had grown exponentially with 130,000 customers and 38,000 meters. Gross revenues of the Pasadena Water Department reflected that growth with totals of $118,420 in 1914 and $2,136,000 in 1952.[27]

By 1928, the Pasadena Water Department owed most watershed land in lower Arroyo Seco and Millard Canyons, as well as water rights in Eaton Canyon. In addition to the Arroyo Seco, much of

[19] According to Duncan A. Blackburn, Assistant Chief Engineer of Pasadena Water Department, writing in 1952, Benjamin Eaton provided his pipeline in 1887. (Duncan A. Blackburn, "Forty Years in Developing A Water System," unpublished paper presented on October 29, 1952, 5.)

[20] Timothy F Brick with Audrey Eftychiou, "Pasadena Water; The Essential Ingredient," City of Pasadena, Pasadena Water and Power, 2012, www.arroyoseco.org/documents/pwaterhistory.pdf.

[21] See "Pasadena Water: Some Historical Points on our Water Supply," *Los Angeles Times*, March 4,1890, 7.

[22] "Letter on the Indiana Colony," *Los Angeles Herald*, July 3, 1875, 3.

[23] "Pasadena: Improvements by the Water Company," *Los Angeles Times*, August 16, 1888, 6.

[24] "Pasadena: Land, Water and Building Notes," *Los Angeles Times*, June 1, 1888, 2.

[25] Tim Brick, "The Fight for Municipal Water," unpublished lecture presented to the Pasadena Historical Society, March 3, 2001, 20.

[26] Blackburn, 9.

[27] Brick and Eftychiou.

Pasadena's water came from an aquifer called Raymond Basin, a 40-square mile groundwater basin below the San Gabriel Valley. By 1920s, Raymond Basin was falling 10-feet a year. As a result of a series of lawsuits and negotiations, supply from Raymond Basin was limited in 1943.[28]

The Pasadena Water Department struggled in the beginning of the twentieth century to consistently provide sufficient water to the growing population. To overcome this obstacle, Pasadena was instrumental in establishing the Metropolitan Water District (MWD, see below). Hiram Wadsworth, Chairman (Mayor) of the Board of City Directors in Pasadena, later the city council, chaired the Colorado River Aqueduct Association, which became MWD. The first meeting of MWD took place at the Huntington Hotel in Pasadena on December 29, 1928. In 1941, Pasadena was able to access water from Colorado River Aqueduct and MWD Upper Feeder was placed in service to Sunset Reservoir on June 17of that year.[29]

The other solution to providing a reliable water source for the City of Pasadena was through construction of the Pine Canyon Dam, later renamed Samuel B. Morris Dam. Constructed of this dam took place between 1932-1934 in Azusa Canyon, although planning for it began in 1924. This dam was supplied by floodwater diverted from the San Gabriel River. The dam had dimensions of 325-feet tall by 756-feet wide and[30] the reservoir had a storage capacity of 39,350 acre-feet. A 36-inch diameter steel pipeline transported water 29 miles to Pasadena. Water from Morris Dam was collected at Sunset Reservoir between 1937 and 1941, at which time, the dam was deeded to MWD. However, a 36-inch pipe is still used to transport water between Sunset and Jones reservoirs.[31]

In 1967, Pasadena Water Department consolidated with the Light and Power Department and became Pasadena Water & Power Department.

Metropolitan Water District

Pasadena Water Department is one of the founding members of the Metropolitan Water District (MWD) and approximately 40% of the water at Sunset Reservoir is provided through MWD. MWD was founded in 1928 with the main goal of bringing water from the Colorado River to the Los Angeles basin and its environs,[32] in order to meet increasing water demands for a growing population.

MWD "arguably the nation's and even the world's biggest and most important public water agency of its kind,"[33] responsible for supplying water to "85 percent of the population of six Southland counties: Los Angeles, Orange, Ventura, Riverside, San Bernardino, and San Diego."[34] During its 88-year history, MWD's policy choices and strategies have ultimately aimed to secure "a reliable and safe water supply – in an environmentally and economically responsible manner – for one of the world's great regional economies."[35]

MWD began as a small, regional public entity that grew gradually during the 1930s and 40s, before

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[28] Blackburn, 13.

[29] G&E Engineering Systems, Inc., 131-133.

[30] Brick and Eftychiou.

[31] G&E Engineering Systems, Inc., 131-133.

[32] Erie, *Beyond Chinatown*, p. 5.

[33] Steven P. Erie, *Beyond Chinatown: The Metropolitan Water District, Growth, and the Environment in Southern California*, (Stanford: Stanford University Press, 2006), p. 5. The MWD essentially supplies wholesale water supplies to members.

[34] Erie, *Beyond Chinatown*, p. 10.

[35] Erie, *Beyond Chinatown*, p. 5.

annexing "most of Southern California into its service territory" after World War II.[36] Southern California's exponential population growth and increasing demand for water led to the rapid expansion of MWD projects and personnel. Historian Steven Erie credits MWD's water projects and infrastructure as a major force in "Southern California's astonishing 20th-century development."[37] MWD currently consists of 26 member agencies serving a population of 19 million.[38]

Like many other early public agencies, MWD began as a regional partnership between 13 Southern California cities.[39] In 1927, the California Legislature passed the Metropolitan Water District Act establishing MWD, which funded its operations through a voter-approved bond issue.[40] Initially, MWD was charged with financing and building the Colorado River Aqueduct – a 242-mile "engineering marvel that once was the longest and most expensive aqueduct in the world."[41] The Aqueduct opened in 1941, initially serving a population of 2,100,000 and a service area of 608 square miles.[42] MWD's early years were characterized by cooperation among member cities, and later, water districts. During the 1930s, "MWD played midwife to another engineering marvel – Hoover Dam (Lake Mead) – by purchasing a significant share of the project's hydropower."[43] Throughout the 1930s and 1940s, the "Colorado River Aqueduct facilities…[were] under construction almost continuously," in order to accommodate the water needs of new members and a growing population.[44]

As a result of Southern California's rapid economic, housing, industrial, and population growth in the decades after World War II, MWD began a "major system expansion" in 1952 that would help meet heavily increased water demand. While MWD completed construction of the Colorado River Aqueduct in 1941, the District deferred constructing other portions of the Aqueduct's distribution system until such additions were needed. Up until 1952, additional construction had been minor. But by 1957, MWD consisted of 3,019 square miles and 79 incorporated cities, serving a population of 6,543,000.[45] Frequent dry years prompted new cities to seek "additional reliable water supplies."[46] Moreover, in both urban and suburban areas, "per capita use of water" increased because of a "rising standard of living and…new water-using equipment in most modern homes." Likewise, MWD saw an increase of over fifty percent in "municipal…and industrial uses of water in Southern California" during this same period, while "local water supplies became less adequate and more severely over-pumped."[47] At that point, MWD inaugurated an accelerated construction plan "to provide increased water service to the enlarged and ever-growing district."[48]

In addition to the agency's regular operations during the 1960s, MWD would also come to play a

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[36] Erie, *Beyond Chinatown*, p. 5.

[37] Erie, *Beyond Chinatown*, p. 7.

[38] "The District at a Glance." (MWD, 2014). Member agencies consist of 11 municipal water districts, 14 cities, and one county water authority.

[39] The Metropolitan Water District of Southern California, Nineteenth Annual Report, 1957, p. vii. MWD originally consisted of nine cities in 1928, and adding four cities in 1931, for a total of 13 by the time the Colorado River Aqueduct opened in 1941. Erie, *Beyond Chinatown*, Table 1.2, p. 12.

[40] "The Metropolitan Water District of Southern California—An Overview." (MWD, June 6, 2015), p. 1.; "The District at a Glance." (MWD, 2014).

[41] Erie, *Beyond Chinatown*, p. 7.

[42] Erie, *Beyond Chinatown*, p. 9. On population and square miles, see: The Metropolitan Water District of Southern California, Annual Report, 1957, p. vii. (Hereafter MWD Annual Report)

[43] Erie, *Beyond Chinatown*, p. 7.

[44] MWD Annual Report, 1957, p. 71.

[45] MWD Annual Report, 1957, p. 71.

[46] "The Metropolitan Water District of Southern California—An Overview." (MWD, June 6, 2015), p. 1.

[47] MWD Annual Report, 1957, p. 108.

[48] MWD Annual Report, 1957, p. 71.

central role in providing "vital support" for the State Water Project.[49] The State Water Project (SWP) was the first phase of the California Water Plan,[50] "a long-range comprehensive program for the coordinated development and beneficial use of the water resources of the State."[51] Like MWD's other 1950s and 60s construction programs, the SWP sought to solve the water needs of a "burgeoning Southland population,"[52] through an "orderly and coordinated development and utilization of the State's water resources."[53] In cooperation with 30 other public agencies, MWD helped make possible the construction of the 444-mile California Aqueduct, and would begin delivering water from Northern California to its member agencies in the 1970s.[54]

[49] Erie, *Beyond Chinatown*, p. 5.

[50] MWD Annual Report, 1963, p. xxviii. The MWD signed a contract with the State of California in 1960 to deliver water from Northern California to the District via the California Aqueduct. See: MWD Annual Report, 1962, p. xxvii.

[51] MWD Annual Report, 1969, p. 119.

[52] Erie, *Beyond Chinatown*, p. 7.

[53] MWD Annual Report, 1959, p. 116; the State Water Project was authorized and guided by the California Water Plan, A.B. 1063, authorized by the California Legislature in 1957. See: Erie, *Beyond Chinatown*, p. 241.

[54] MWD Annual Report, 2015, p. xiv.

VII. HISTORIC RESOURCE ASSESSMENT

Because eligibility criteria for National and California Registers and local Pasadena Landmarks align, the following evaluation considers the subject properties under each of the criterion at federal and state and local levels under a single heading.

Criterion A/1/a: Is associated with events that have made a significant contribution to the broad patterns of our history and cultural heritage.
Sunset Reservoir is significant as the oldest reservoir still extant in Pasadena. Constructed circa 1888, the reservoir supplied water to two of three the major land and water companies in Pasadena. Without a reliable supply of water, Pasadena would not have been able to support the growing population during the late nineteenth century and first half of the twentieth centuries. Sunset Reservoir continued to be integral to Pasadena's water supply infrastructure, first for collecting water from Morris Dam, and later from the Colorado River Aqueduct. The period of significance for the subject property is 1888, when the reservoir was constructed, through 1941, when MWD's water from the Colorado River Aqueduct began to supplement Pasadena's supply. Structures related to the period of significance include Sunset 1 and 2 reservoirs, Well No. 20, and the Booster Pump House.

With alterations in 1929 and 1934, notably relining the reservoirs, new roofs, and addition of side walls to increase capacity, it is possible the subject property does not retain sufficient integrity for listing in the National Register. However, the subject property appears to retain sufficient integrity to be eligible for listing in the California Register as well as a local Pasadena Landmark, which do not have as high a threshold of integrity.

Criterion B/2/b: Is associated with the lives of persons important in our past.
The subject property cannot be associated with anyone important in our past. While construction of Sunset Reservoir has been credited to Thomas Banbury, an important member of Pasadena's early community, the property does not appear to be a site closely associated with his important work. In addition, although there are many individuals associated with the Pasadena Water Department, including Samuel Morris, none appear to have had any association with the subject property. Therefore, the subject property is not eligible under criterion B/2/b.

Criterion C/3/c: Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual or possesses high artistic values.
The subject property does not embody distinctive characteristics of a type, period, region, or method of construction. Both Sunset 1 and 2 are typical construction of their period, both covered reservoirs with linings finished in gunite. Neither reservoir is architecturally distinctive or represents any kind of engineering innovation. Furthermore, the two other structures connected with the period of significance, Well No. 20 and the Booster Pump House, are utilitarian structures without any architectural style or character. The subject property does not represent the work of an important creative individual, nor does it possess any artistic value. Therefore, the subject property is not eligible under criterion C/3/c.

Criterion D/4/d: Has yielded, or may be likely to yield, information important in prehistory or history.
The subject property cannot be reasonably expected to yield information important in prehistory or history. While Sunset 1 reservoir was constructed prior to 1900, it appears to have been a common construction type and it is unlikely that the original stone lining, if still extant, would provide any important information on construction techniques of the reservoir. Therefore, the subject property is not eligible under Criterion D/4/d.

VIII. CONCLUSION

Sunset Reservoir was evaluated for historic and architectural significance. Its history and alterations were researched and evaluated. The subject property was considered under the contexts of Late 19th and Early 20th Century Development in Pasadena and the Pasadena Water Department. The subject property appears eligible for listing in the California Register as well as a local Pasadena Landmark as the oldest extant reservoir in Pasadena constructed circa 1888. Sunset Reservoir served as a reliable water storage facility for the burgeoning city at the end of the nineteenth and beginning of the twentieth centuries and allowed for its continued and sustained growth. As the subject property appears eligible for listing in the California Register and as a Pasadena Landmark, it is therefore an historical resource under CEQA.

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Brick, Timothy F and Audrey Eftychiou. "Pasadena Water; The Essential Ingredient." City of Pasadena, Pasadena Water and Power, 2012, www.arroyoseco.org/documents/pwaterhistory.pdf.

Attachment A: Maps

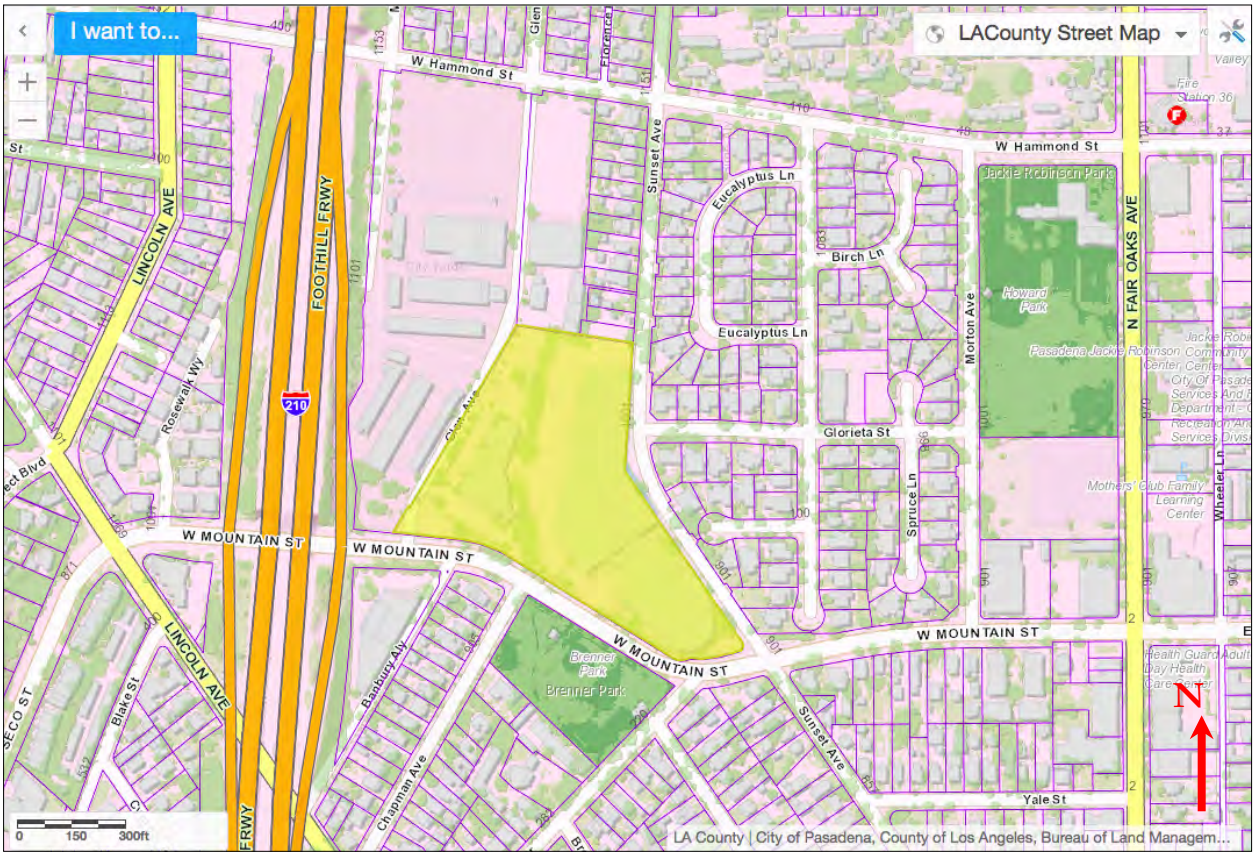


Map 1: Location map, subject property circled (Source: Google maps, 2017)



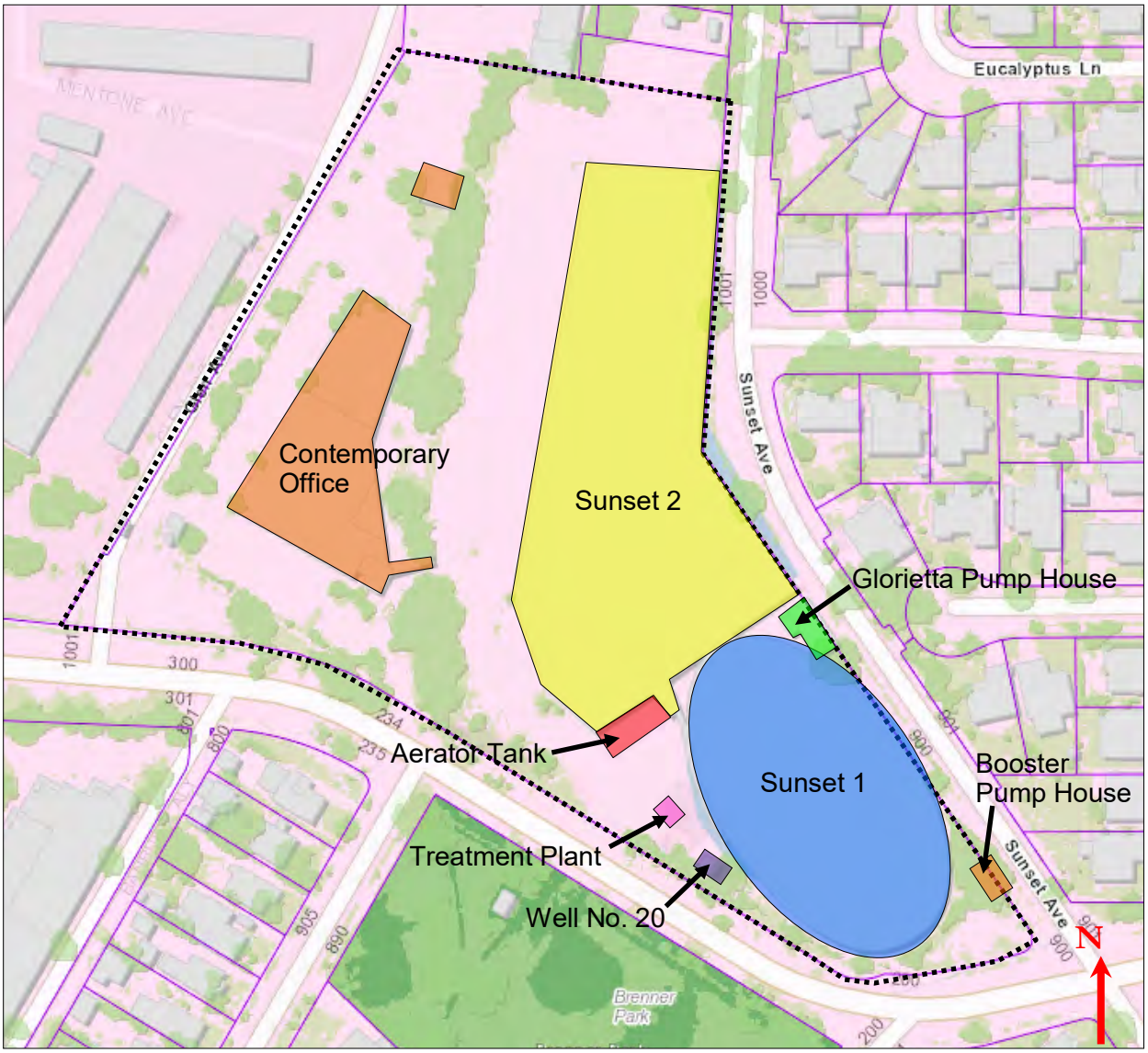
Map 2: Detail of location map, subject property circled (Source: Google maps, 2017)

Attachment A: Maps



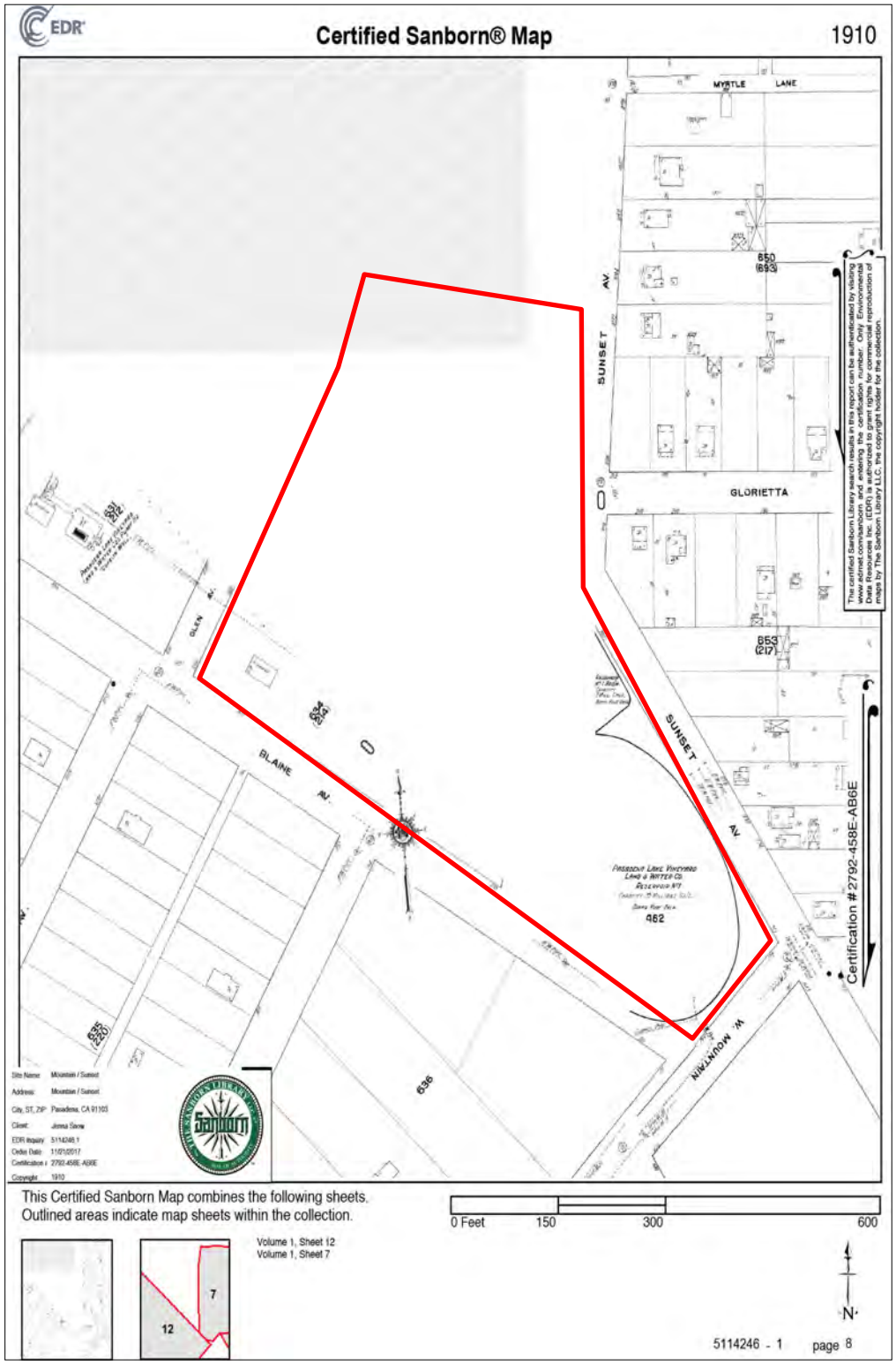
Map 3: Location map, subject property highlighted yellow (Source: Los Angeles County Assessor, 2017)

Attachment A: Maps



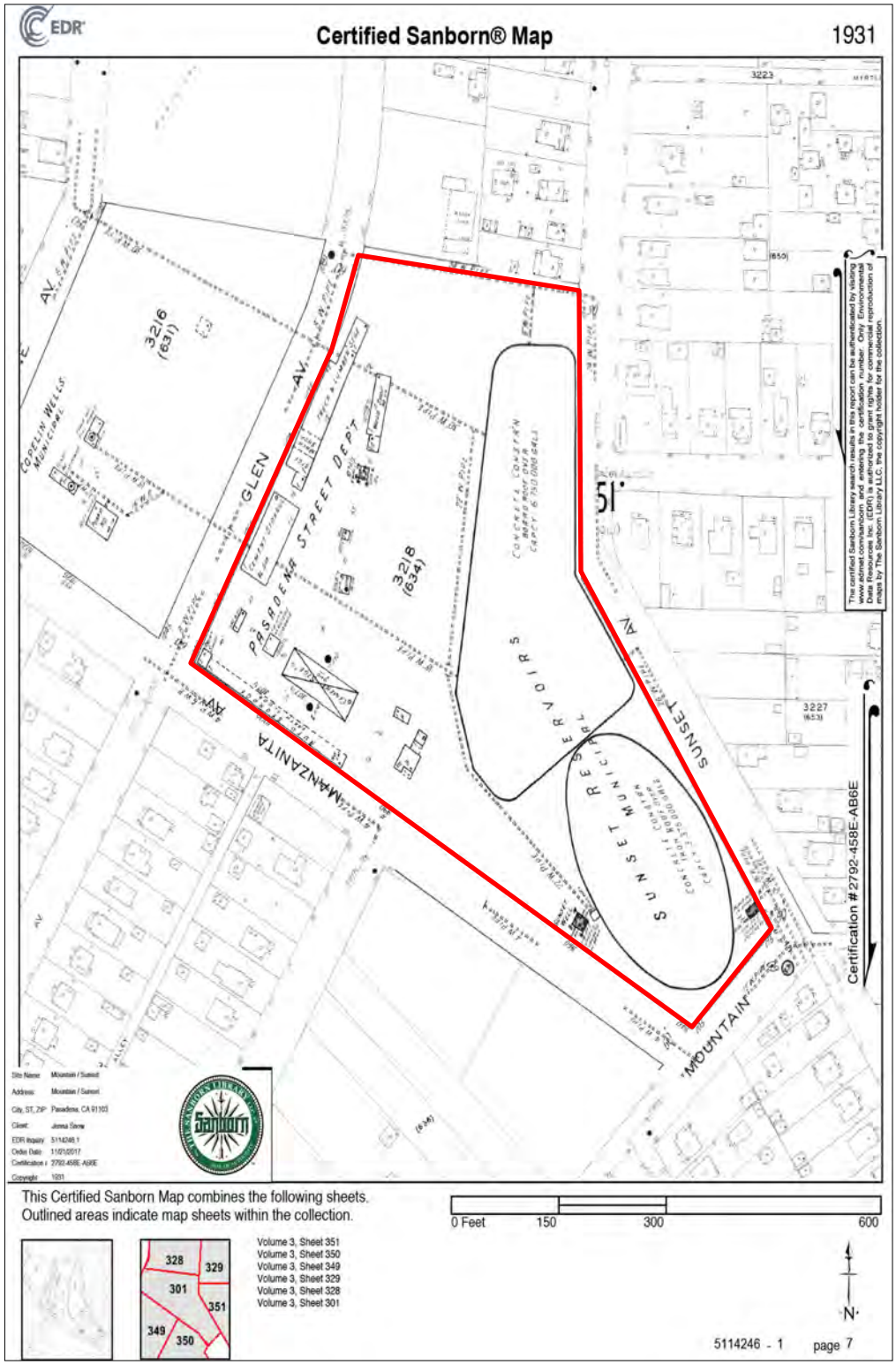
Map 4: Site plan, subject property outlined in dashed line, with existing structures indicated (Source of base map: Los Angeles County Assessor, 2017)

Attachment B: Historic Maps



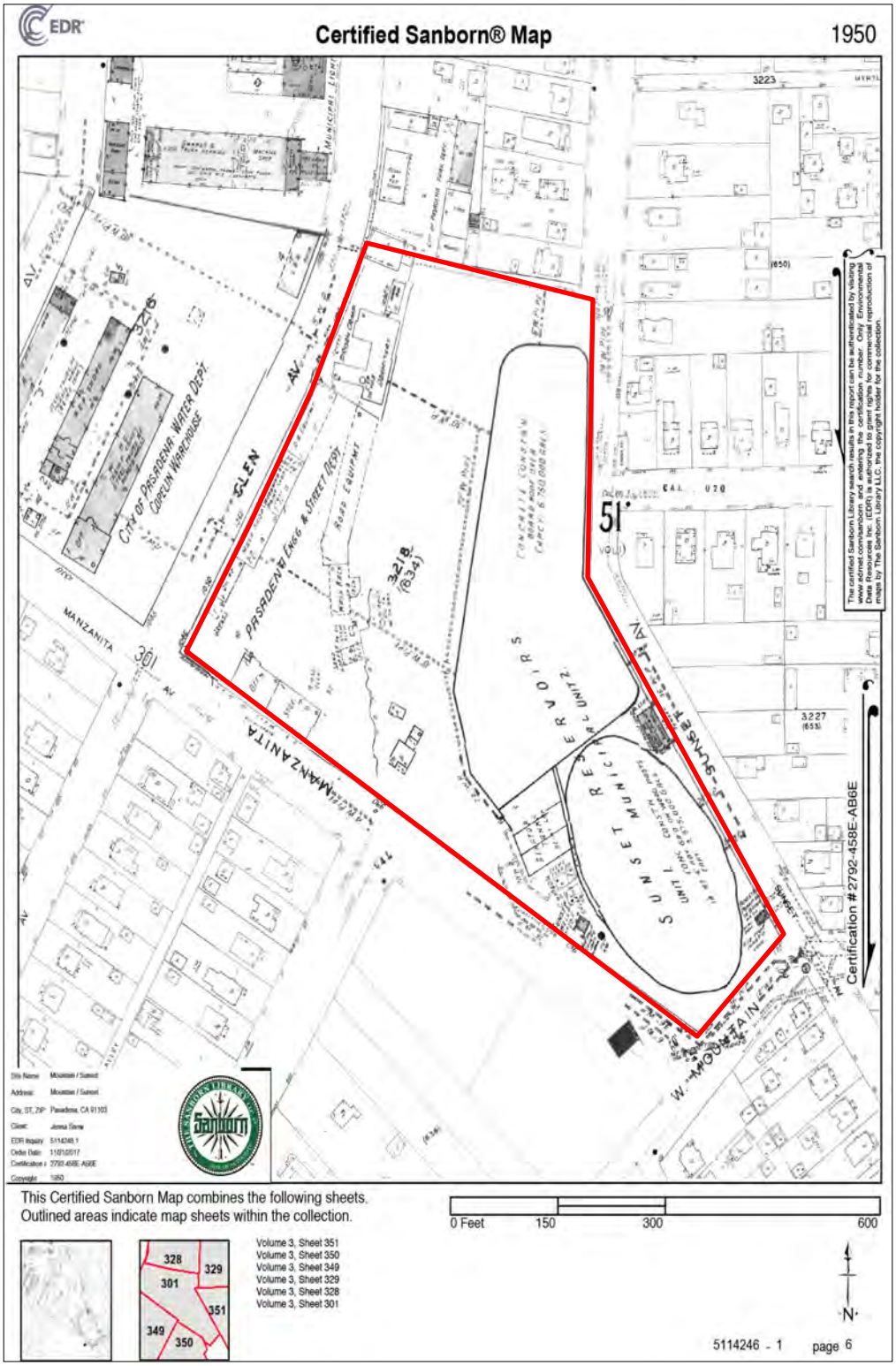
Map 5: Sanborn Fire Insurance map, subject property outlined in red, note: coverage of parcel is incomplete (1910, Environmental Data Resources, Inc.)

Attachment B: Historic Maps



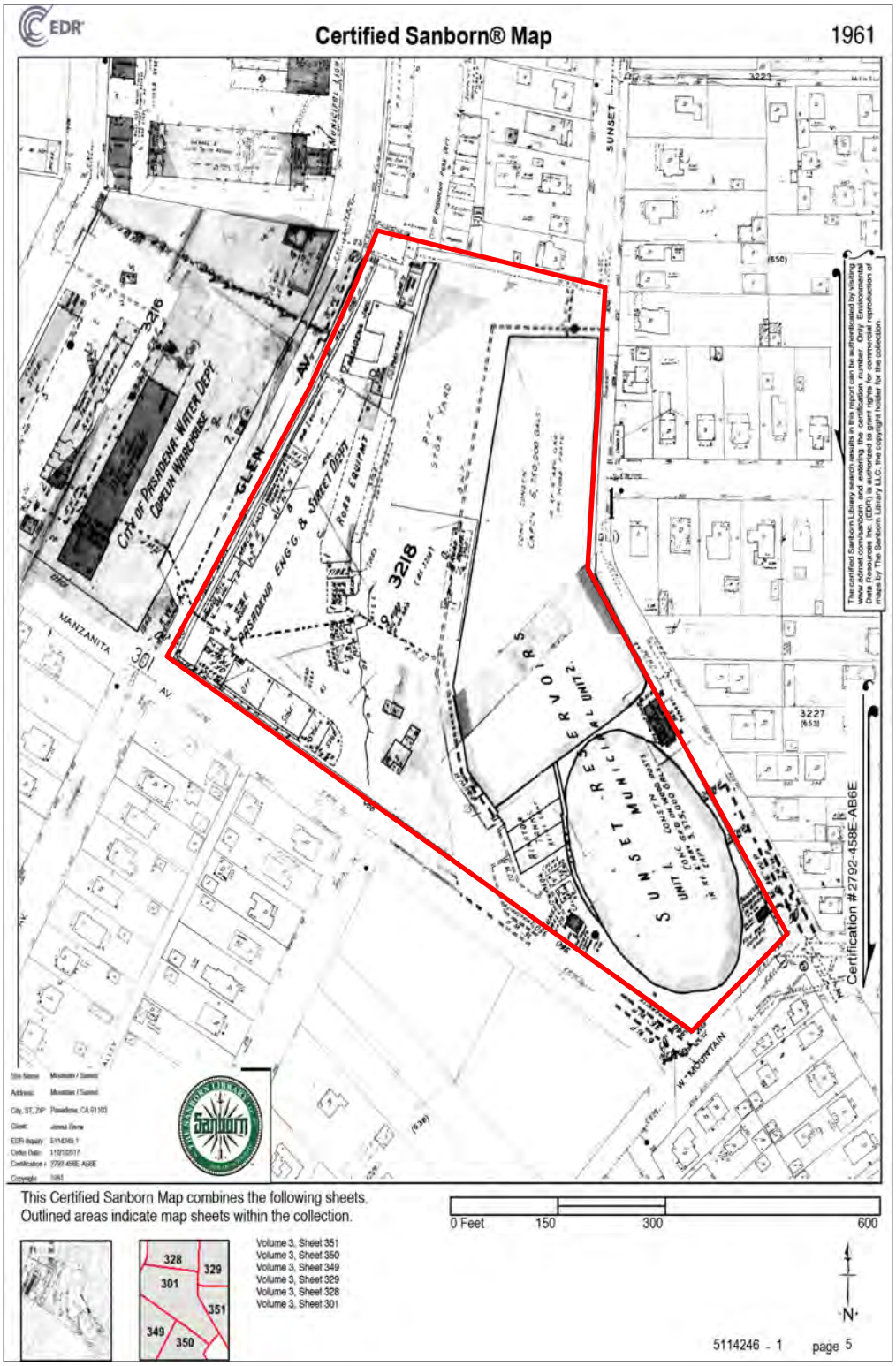
Map 6 Sanborn Fire Insurance map, subject property outlined in red (1931, Environmental Data Resources, Inc.)

Attachment B: Historic Maps



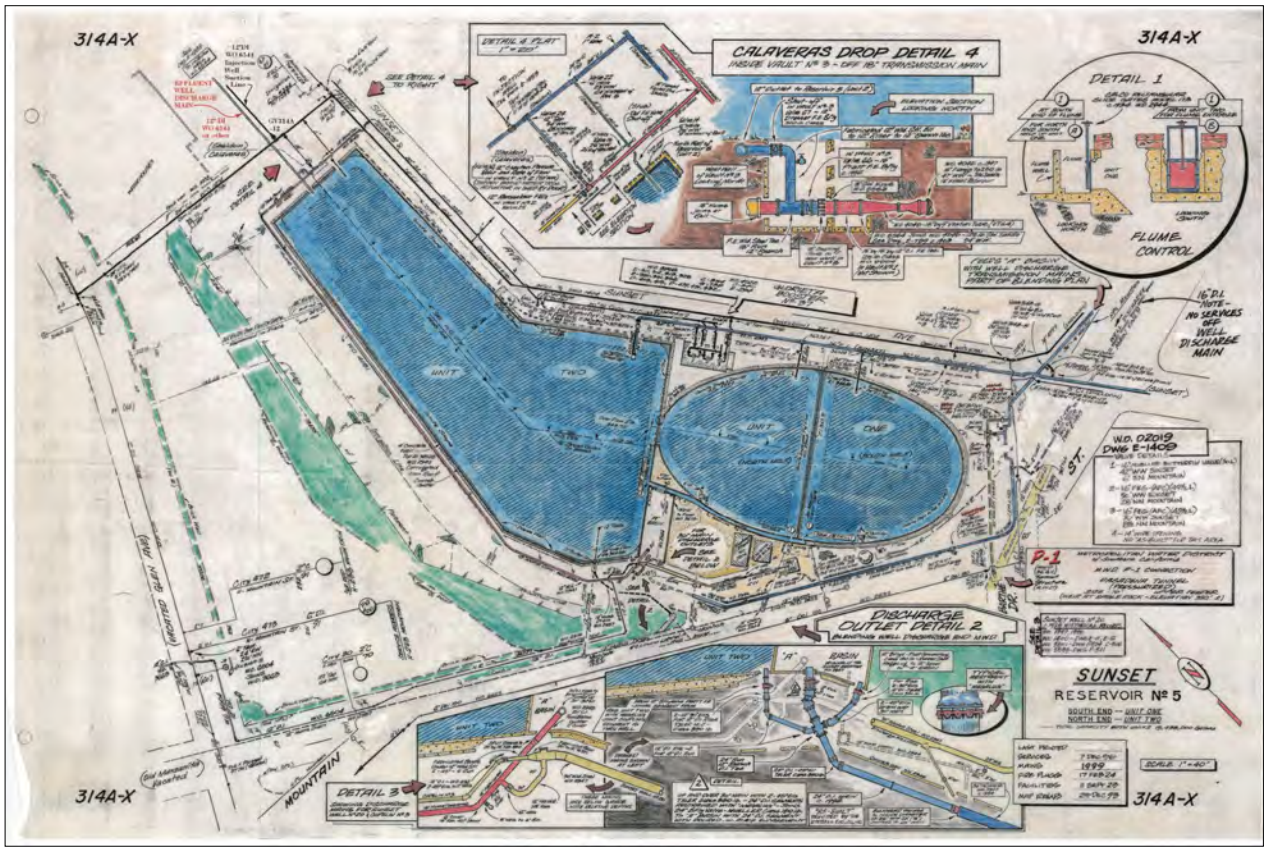
Map 7: Sanborn Fire Insurance map, detail of previous map, subject property outlined in red (1950, Environmental Data Resources, Inc.)

Attachment B: Historic Maps



Map 8: Sanborn Fire Insurance map, subject property outlined in red (1961, Environmental Data Resources, Inc.)

Attachment B: Historic Maps



Map 9: Subject property, site plan (1999)

Attachment C: Contemporary Photographs



Figure 1: Subject property, from West Mountain Street and Sunset Avenue, view northwest (Snow, 2017)

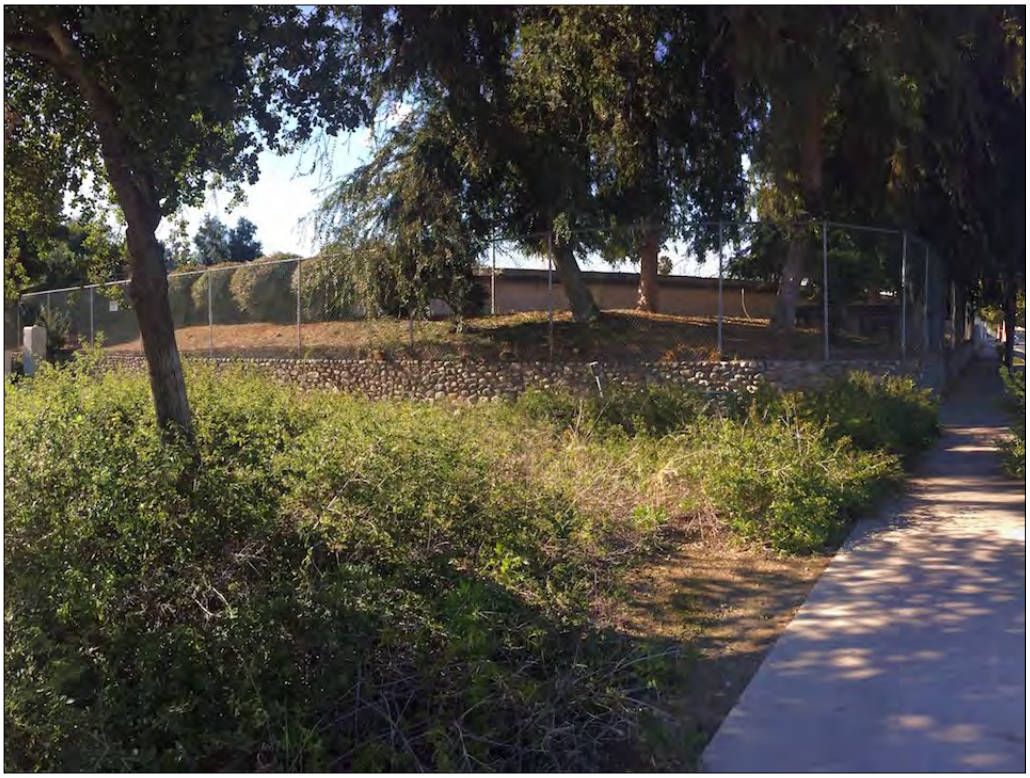


Figure 2: Subject property, from Sunset Avenue toward Sunset 1, view northwest (Snow, 2017)

Attachment C: Contemporary Photographs



Figure 3: Subject property, Sunset Avenue toward Sunset 1, west elevation of Glorietta Pump House at far right, view southwest (Snow, 2017)



Figure 4: Subject property, from West Mountain Street, driveway toward Sunset 2, view north (Snow, 2017)

Attachment C: Contemporary Photographs



Figure 5: Subject property, from West Mountain Street toward Sunset 1 (background) and southwest elevation of Sunset Well No. 20, view southeast (Snow, 2017)



Figure 6: Subject property, Sunset 1 (left), Treatment Plant (right), view south-east (Snow, 2017)

Attachment C: Contemporary Photographs



Figure 7: Subject property, Sunset 1 (left) and Sunset Well (right), view south (Snow, 2017)



Figure 8: Subject property, Sunset Well No. 20, view northwest (Snow, 2017)

Attachment C: Contemporary Photographs



Figure 9: Subject property, Sunset 1, view southeast (Snow, 2017)



Figure 10: Subject property, Sunset 1, view southeast (Snow, 2017)

Attachment C: Contemporary Photographs



Figure 11: Subject property, from Sunset 1 (foreground) toward Unit 2 (background), view northwest (Snow, 2017)



Figure 12: Subject property, Sunset 1 , door to walkway over reservoir, view north (Snow, 2017)

Attachment C: Contemporary Photographs



Figure 13: Subject property, Sunset 1, interior, raised walkway dividing north half and south half of reservoir, view northeast (Snow, 2017)



Figure 14: Subject property, Sunset 1, interior, raised walkway (left) and north half of reservoir (right), view southwest (Snow, 2017)

Attachment C: Contemporary Photographs



Figure 15: Subject property, Sunset 1, interior, from raised walkway toward north half of reservoir, view southeast (Snow, 2017)



Figure 16: Subject property, Sunset 1, interior, from raised walkway toward south half of reservoir, view northwest (Snow, 2017)

Attachment C: Contemporary Photographs



Figure 17: Subject property, Sunset 1 (right) and southeast wall of Sunset 2 (left), view northeast (Snow, 2017)



Figure 18: Subject property, Sunset 2, southeast elevation (right) and southwest elevation (left), view north (Snow, 2017)

Attachment C: Contemporary Photographs



Figure 19: Subject property, Sunset 1 (left), Aerator Tank (center), and Sunset 2 (right), view southwest (Snow, 2017)



Figure 20: Subject property, Aerator Tank, interior, view southwest (Snow, 2017)

Attachment C: Contemporary Photographs



Figure 21: Subject property, Sunset 2, west elevation, view east (Snow, 2017)



Figure 22: Subject property, Sunset 2, west elevation (center and right) and north elevation (left), view southeast (Snow, 2017)

Attachment C: Contemporary Photographs



Figure 23: Subject property, Sunset 2, north elevation, view south (Snow, 2017)



Figure 24: Sunset 2, interior, view north (Snow, 2017)

Attachment C: Contemporary Photographs



Figure 25: Sunset 2, interior, view south (Snow, 2017)

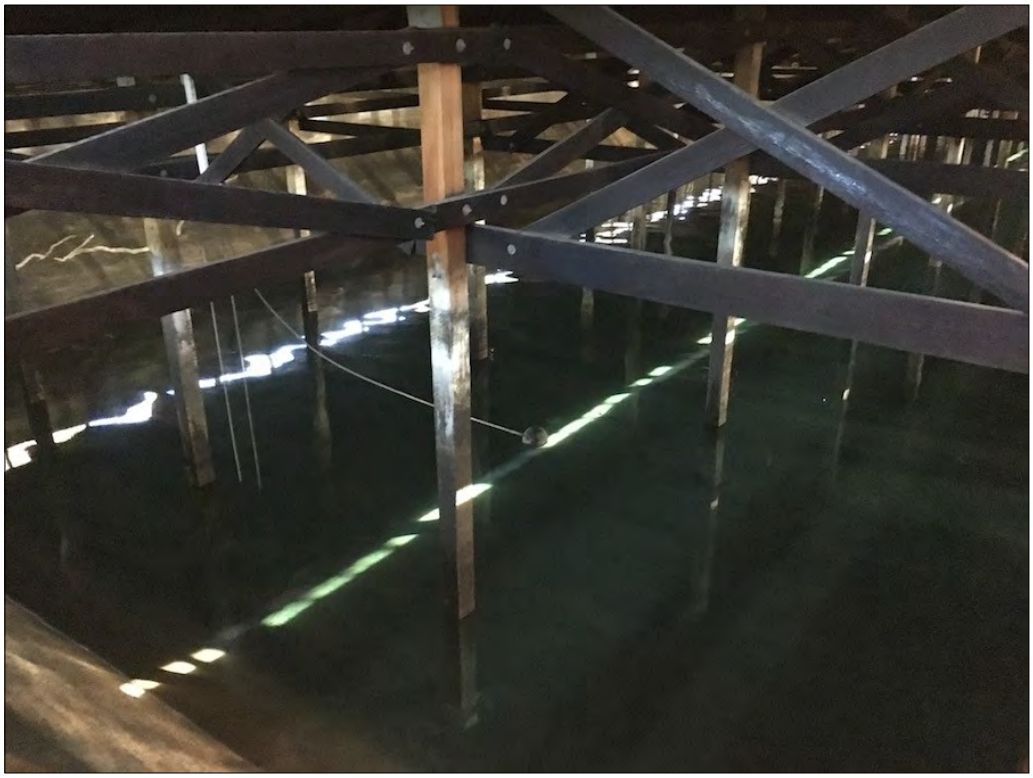


Figure 26: Sunset 2, interior, view northwest (Snow, 2017)

Attachment C: Contemporary Photographs



Figure 27: Sunset 2, interior, view west (Snow, 2017)



Figure 28: Sunset 2, interior, door to north elevation, view north (Snow, 2017)

Attachment C: Contemporary Photographs



Figure 29: Glorietta Pump House, northeast facade, view southwest (Snow, 2017)



Figure 30: Glorietta Pump House, northeast facade , view south (Snow, 2017)

Attachment C: Contemporary Photographs

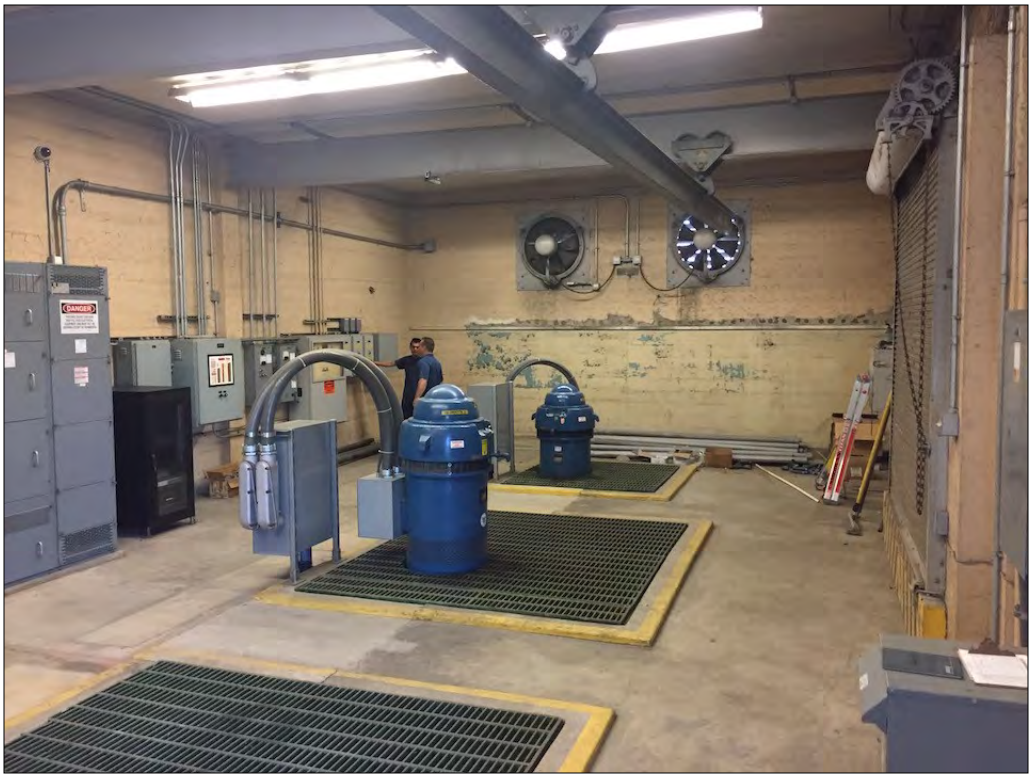


Figure 31: Glorietta Pump House, interior, view northwest (Snow, 2017)



Figure 32: Booster Pump House, northeast elevation (left) and northwest elevation (right), view southwest (Snow, 2017)

Attachment C: Contemporary Photographs



Figure 33: Contemporary office buildings and parking lot located northwest of subject property, view southwest (Snow, 2017)



Figure 34: Contemporary office buildings and parking lot located northwest of subject property, view southwest (Snow, 2017)

Attachment C: Contemporary Photographs



Figure 35: Brick wall located along Glen Avenue, view northwest (Snow, 2017)

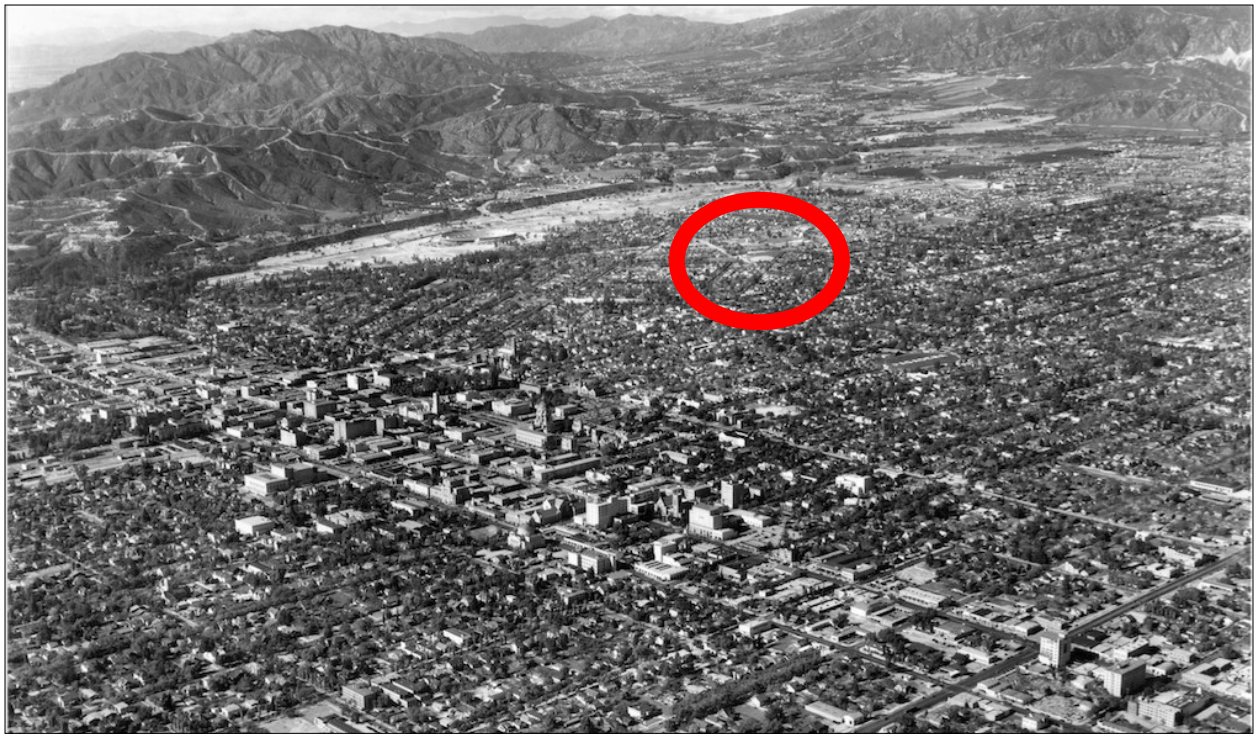


Figure 36: Contemporary office buildings and parking lot located northwest of subject property, view northwest (Snow, 2017)



Figure 37: Area northwest of subject property, showing retaining wall below and west of Sunset 2 (right) and east elevation of contemporary office building (left) (Snow, 2017)

Attachment D: Historic Photographs



Historic Photo 1: Historic aerial, view northwest, subject property circled in red (1932, UCLA Department of Geography, Benjamin and Gladys Thomas Air Photo Archives, Fairchild Aerial Surveys Collection)



Historic Photo 2: Crop of previous, historic aerial, view northwest, subject property circled in red (1932, UCLA Department of Geography, Benjamin and Gladys Thomas Air Photo Archives, Fairchild Aerial Surveys Collection)

Attachment D: Historic Photographs

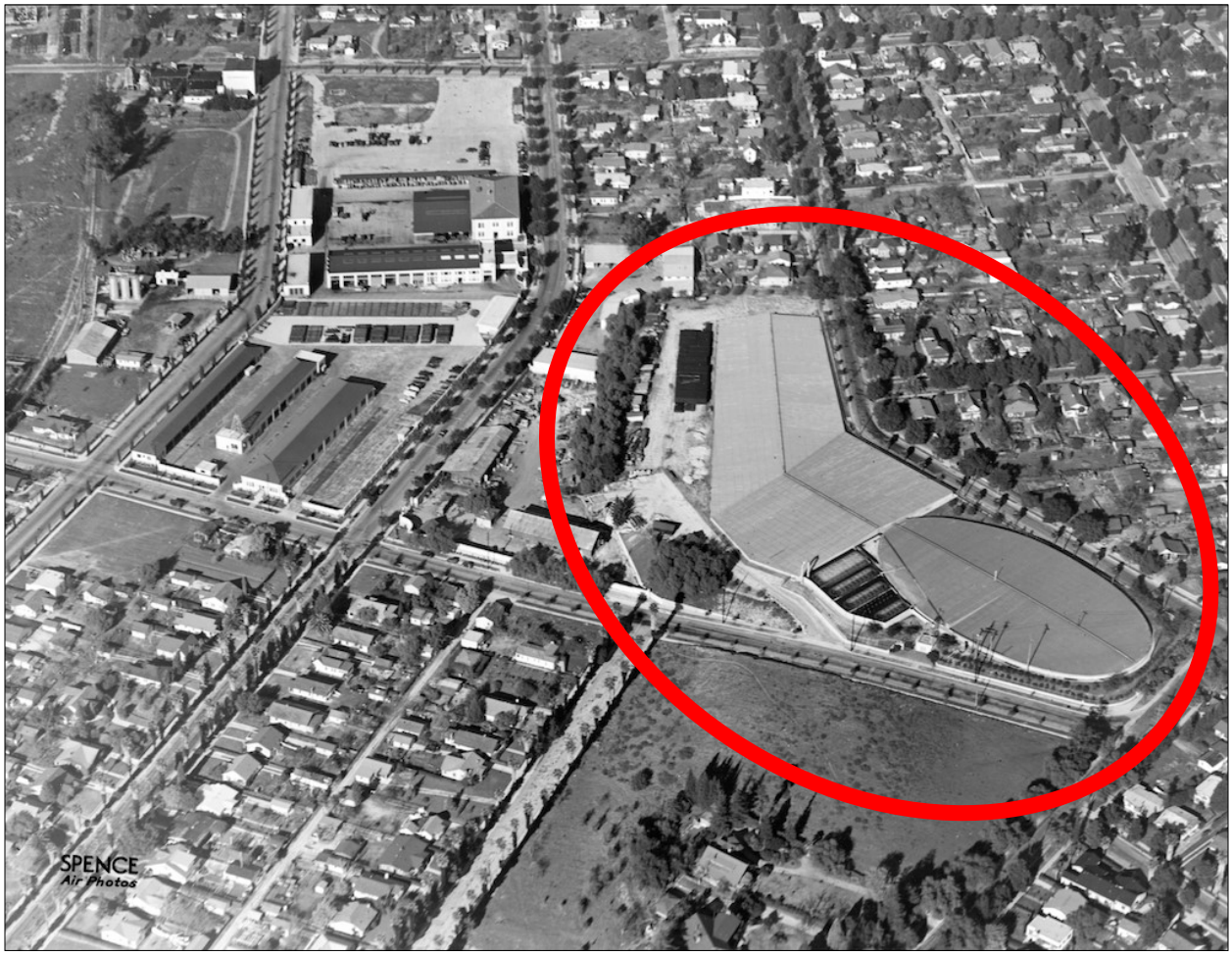


Historic Photo 3: Historic aerial, view west, subject property circled in red (1937, UCLA Department of Geography, Benjamin and Gladys Thomas Air Photo Archives, Fairchild Aerial Surveys Collection)



Historic Photo 4: Crop of previous, historic aerial, view west (1937, UCLA Department of Geography, Benjamin and Gladys Thomas Air Photo Archives, Fairchild Aerial Surveys Collection)

Attachment D: Historic Photographs



Historic Photo 5: Historic aerial, view north, subject property circled in red (1937, UCLA Department of Geography, Benjamin and Gladys Thomas Air Photo Archives, Spence Collection)

Attachment D: Historic Photographs



Historic Photo 6: Historic aerial, view east, subject property circled in red (1966, UCLA Department of Geography, Benjamin and Gladys Thomas Air Photo Archives, Fairchild Aerial Surveys Collection)



Historic Photo 7: Crop of previous, historic aerial, view east (1966, UCLA Department of Geography, Benjamin and Gladys Thomas Air Photo Archives, Fairchild Aerial Surveys Collection)

Attachment D: Historic Photographs



Historic Photo 8: Historic aerial, view southwest, subject property circled in red (1966, UCLA Department of Geography, Benjamin and Gladys Thomas Air Photo Archives, Fairchild Aerial Surveys Collection)



Historic Photo 9: Crop of previous, historic aerial, view southwest (1966, UCLA Department of Geography, Benjamin and Gladys Thomas Air Photo Archives, Fairchild Aerial Surveys Collection)

Attachment E: List of Reservoirs in Pasadena

	Reservoir	**Date of construction**
1	Lida	1948
2	Mirador	1929 (empty until 1952)
3	Annandale	1926
4	Eagle Rock	1922
5	Gould 1 and 2	1991
6	Windsor	Before 1912
7	Sheldon 1	1916
8	Sheldon 2	1939
9	Sunset 1	c. 1888
10	Sunset 2	1900
11	Calaveras	1926
12	Allen	1931
13	Santa Anita	Before 1922
14	Murray	Before 1954
15	Don Benito 1 and 2	1957
16	Thomas (previously Coronet)	1953
17	Jones	1952

Data from G&E Engineering Systems, Inc., "Seismic Vulnerability Assessment, City of Pasadena Water System," prepared for City of Pasadena, December 10, 2006

Appendix E

Energy Calculations

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Construction Energy Use

Off-Road Construction Equipment Energy Use										
Phase	**Equipment**	**Fuel**	**HP**	**Equipment Count**	**Hours/Day**	**Work Days**	**Gallons /Hour**	**Gallons /Day**	**Total Gallons**	**Total KBtu**
Demolition	Excavators	Diesel	36	3	8	67	0.71126182	17.07028	1143.709	158975.5524
	Concrete/Industrial Saws	Diesel	33	1	8	67	1.38367574	11.06941	741.6502	103089.377
	Rubber Tired Dozers	Diesel	367	2	8	67	7.5283731	120.454	8070.416	1121787.818
Site Preparation	Tractors/Loaders/Backhoes	Diesel	84	4	8	206	1.60670138	51.41444	10591.38	1472201.195
	Rubber Tired Dozers	Diesel	367	3	8	206	7.5283731	180.681	37220.28	5173618.445
Grading	Excavators	Diesel	36	1	8	239	0.71126182	5.690095	1359.933	189030.6319
	Rubber Tired Dozers	Diesel	367	1	8	239	7.5283731	60.22698	14394.25	2000800.661
	Graders	Diesel	148	1	8	239	3.12926942	25.03416	5983.163	831659.6756
	Tractors/Loaders/Backhoes	Diesel	84	3	8	239	1.60670138	38.56083	9216.039	1281029.438
Paving	Pavers	Diesel	81	2	8	14	1.74370364	27.89926	390.5896	54291.95641
	Paving Equipment	Diesel	89	2	8	14	1.63159905	26.10558	365.4782	50801.46789
	Rollers	Diesel	36	2	8	14	0.69855163	11.17683	156.4756	21750.10343
Building Construction	Cranes	Diesel	367	1	7	526	5.46274241	38.2392	20113.82	2795820.641
	Forklifts	Diesel	82	3	8	526	1.70598714	40.94369	21536.38	2993557.044
	Generator Sets	Diesel	14	1	8	526	0.21669889	1.733591	911.8689	126749.7817
	Tractors/Loaders/Backhoes	Diesel	84	3	7	526	1.60670138	33.74073	17747.62	2466919.661
	Welders	Diesel	46	1	8	526	1.1896911	9.517529	5006.22	695864.6021
								Total	**154949.3**	**21537948.05**

Notes:
1. Equipment types and horsepower from CalEEMod defaults.
2. Equipment count and hours from CalEEMod for the AQ/GHG report.
3. Fuel consumption factors from CARB OFFROAD2017- ORION Web Database, for Los Angeles county, aggregate model years for 2022. https://www.arb.ca.gov/orion/
4. 1 Gallon of diesel = 139,000 Btu

On-Road Construction Energy Use										
Phase	Trip Type (Fleet Mix)	Trips	Distance (miles)	Work Days	Total VMT	gallons diesel/VMT	Total diesel gallons	gallons gas/VMT	Total gasoline gallons	Total KBtu
Demolition	Worker (LDA, LDT1, LDT2)	15	18.5	67	18592.5	0.00018144	3.37343967	0.035061	651.8685	81300.60214
Demolition	Hauling (HHDT)	27	20	67	36180	0.15182035	5492.86039	0.000203	7.333497	764416.9485
Site Preparation	Worker (LDA, LDT1, LDT2)	18	18.5	206	68598	0.00018144	12.4464819	0.035061	2405.103	299962.8186
Grading	Worker (LDA, LDT1, LDT2)	15	18.5	239	66322.5	0.00018144	12.0336132	0.035061	2325.322	290012.5957
Grading	Hauling (HHDT)	11	20	239	52580	0.15182035	7982.71419	0.000203	10.65769	1110918.827
Paving	Worker (LDA, LDT1, LDT2)	15	18.5	14	3885	0.00018144	0.70489784	0.035061	136.2113	16988.18552
Building Construction	Worker (LDA, LDT1, LDT2)	3	18.5	526	29193	0.00018144	5.29680378	0.035061	1023.531	127654.0798
Building Construction	Vendor (HHDT, MHDT)	1	10.2	526	5365.2	0.12166228	652.742456	0.01339	71.84157	99639.55606
				Total	**280716.2**		**14162.1723**		**6631.868**	**2790893.613**

Notes:
1. Fleet mix and trip distances from CalEEMod defaults.
2. Fuel consumption factors weighted average for fleet mix from CARB EMFAC2107, for Los Angeles, aggregate model years for 2022, aggregate speeds. https://www.arb.ca.gov/emfac/2017/.
3. 1 Gallon of diesel = 139 KBtu; 1 gallon of gasoline = 124 KBtu

Construction Total		
Gallons Diesel	Gallons Gas	KBtu
169,111.44	**6,631.87**	**24,328,842**

GWTP Operational Energy Use

GWTP Electricity and Natural Gas			
Type	**Gal Diesel**	**KWhr**	**KBtu**
Natural Gas	-	-	-
Electricity	-	5,188,000	17,702,193
Generators	102	-	14,200
Total	**102**	**5,188,000**	**17,702,193**

Notes:
1. Electricity and Natural Gas use provided by Kennedy Jenks.
2. 1 KWhr = 3.412142 KBtu.
3. 1 Gal Diesel = 139 kBtu

Appendix F-1

Construction Noise Levels

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Construction Noise Levels
Source: Roadway Construction Noise Model (RCNM),Version 1.1

Site Preparation

Equipment	Percentage Use	Maximum Noise Level at 100 feet (dBA)	Hourly Noise Level at 100 feet (dBA Leq)
Dozer	40	75.6	71.7
Dozer	40	75.6	71.7
Dozer	40	75.6	71.7
Backhoe	40	71.5	67.6
Backhoe	40	71.5	67.6
Backhoe	40	71.5	67.6
Backhoe	40	71.5	67.6
Combined Total			78.3

Demolition

Equipment	Percentage Use	Maximum Noise Level at 100 feet (dBA)	Hourly Noise Level at 100 feet (dBA Leq)
Concrete Saw	20	83.6	76.6
Excavator	40	74.7	70.7
Excavator	40	74.7	70.7
Excavator	40	74.7	70.7
Dozer	40	75.6	71.7
Dozer	40	75.6	71.7
Combined Total			80.4

Grading

Equipment	Percentage Use	Maximum Noise Level at 100 feet (dBA)	Hourly Noise Level at 100 feet (dBA Leq)
Excavator	40	74.7	70.7
Grader	40	79	75
Dozer	40	75.6	71.7
Backhoe	40	71.5	67.6
Backhoe	40	71.5	67.6
Backhoe	40	71.5	67.6
Combined Total			78.8

Building Construction

Equipment	Percentage Use	Maximum Noise Level at 100 feet (dBA)	Hourly Noise Level at 100 feet (dBA Leq)
Crane	16	74.5	66.6
Flat Bed Truck	40	68.2	64.3
Flat Bed Truck	40	68.2	64.3
Flat Bed Truck	40	68.2	64.3
Generator	50	74.6	71.6
Backhoe	40	71.5	67.6
Backhoe	40	71.5	67.6
Backhoe	40	71.5	67.6
Welder / Torch	40	68	64
Combined Total			76.7

Appendix F-2

Supplemental Noise Letter

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HELIX Environmental Planning, Inc.
7578 El Cajon Boulevard
La Mesa, CA 91942
619.462.1515 tel
619.462.0552 fax
www.helixepi.com

February 10, 2023 00407.00036.001

Paul Chau
Kennedy/Jenks Consultants, Inc.
300 North Lake Avenue, Suite 1020
Pasadena, CA 91101

Subject: Supplementary Noise Analysis for the Pasadena Water & Power Sunset Complex Project

Dear Mr. Chau:

HELIX Environmental Planning, Inc. (HELIX) completed a study of the existing and proposed noise environment associated with the Bangham Well, Glorieta Pump Station, and two proposed emergency generators for the Pasadena Sunset Complex Project (project). This letter report presents the findings of ambient noise measurements taken at the project site to establish baseline conditions and presents the anticipated noise levels that would be generated by the construction and operation of these project components.

PROJECT LOCATION

The project is located in the City of Pasadena (City) in Los Angeles County (Figure 1, *Regional Location*). The project is located 600 feet east of Interstate 210 (Foothill Freeway) and 0.75 mile north of State Route 134 (Ventura Freeway). The approximately 9.15-acre project site is located within Assessor's Parcel Number 5728-021-916 and is bordered by Sunset Avenue to the east, East Mountain Street to the south, Glen Avenue to the west, and mixed residential and commercial properties to the north (Figure 2, *Aerial Photograph*).

PROJECT DESCRIPTION

The project proposes the demolition of the existing Sunset Reservoir complex and replacement with new reservoirs, along with a groundwater treatment facility. The two existing reservoirs would be removed and replaced with new prestressed concrete reservoirs. Additionally, a new ground water treatment plant would be developed to treat for perchlorate and volatile organic compounds. Replacement and construction of associated piping, inlet and outlet, valves, and hardscaping would also occur across the project area.

This letter specifically addresses improvements to Bangham Well, Glorieta Pump Station, and two proposed emergency generators. The existing Bangham Well Building and Glorieta Pump Station locations would remain. Components of the Bangham Well improvements would include a variable frequency drive system but, in general, would replace existing features with similar components. Glorieta Pump Station would receive façade improvements and electrical upgrades, with no changes to mechanical equipment. Two emergency generators are proposed to provide power to the facility in the event of a power outage. One generator would be located west of Glorieta Pump Station, and one would be located at the northern end of the project near the Bangham Well. See Figure 3, *Project Components*.

NOISE DESCRIPTORS AND METHODOLOGY

All noise level or sound level values presented herein are expressed in terms of decibels (dB), with A-weighting (dBA) to approximate the hearing sensitivity of humans. Time-averaged noise levels are expressed by the symbol L_{EQ}, with a specified duration.

Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or Hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz (kHz), or thousands of Hertz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

The amplitude of pressure waves generated by a sound source determines the loudness of that source. A logarithmic scale is used to describe sound pressure level (SPL) in terms of dBA units. The threshold of hearing for the human ear is about 0 dBA.

Because decibels are logarithmic units, SPL cannot be added or subtracted through simple addition. Under the decibel scale, a doubling of sound energy corresponds to a 3 dBA increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level would be 3 dBA higher than one source under the same conditions.

NOISE REGULATIONS

Regulations pertaining to noise at the project site are contained in the Pasadena Municipal Code, and the applicable policies are described below.

City of Pasadena Municipal Code

Section 9.36.040 – Ambient Noise Level

Section 9.36.040 of the Pasadena Municipal Code defines “ambient noise level” as the measured ambient noise level measured by a sound level meter using A weighting. For specified noise types, the following adjustments shall be made to the measured ambient noise level during daytime (6:00 AM to 11:00 PM) periods:

a. Except for noise emanating from any electrical transformer or gas metering and pressure control equipment existing and installed prior to the effective date of the ordinance codified herein, any steady audible tone: + 5;

b. Repeated impulsive noise: + 5;

c. Noise occurring more than 5 but less than 15 minutes per hour: - 5;

d. Noise occurring more than 1 but less than 5 minutes per hour: - 10;

e. Noise occurring less than 1 minute per hour: -20.

Section 9.36.050 – General Noise Sources

Section 9.36.050 of the Pasadena Municipal Code prohibits the generation of noise that exceeds the ambient noise level at the property line of any property by more than 5 decibels.

Section 9.36.060 – Interior Noise Standard – Multifamily Residential Property

Section 9.36.0760 of the Pasadena Municipal Code provides an interior noise standard of 60 dBA from 7:00 AM to 10:00 PM and 50 dBA from 10:00 PM to 7:00 AM within multi-family residential dwelling units.

Section 9.36.070 – Construction Projects

Section 9.36.070 of the Pasadena Municipal Code prohibits the operation of construction equipment and construction activity within 500 feet of a residential district except from 7:00 AM to 7:00 PM Monday through Friday, and from 8:00 AM to 5:00 PM on Saturday. Operation of construction equipment is prohibited on Sunday and on defined holidays.

Section 9.36.080 – Construction Equipment

Section 9.36.080 of the Pasadena Municipal Code prohibits the operation of powered construction equipment that generates a noise level of 85 dBA when measured within a radius of 100 feet from such equipment.

Section 9.36.090 – Machinery, Equipment, Fans and Air Conditioning

Section 9.36.090 of the City of Pasadena Municipal Code declares that except for emergency work, no machinery, equipment, pump, fan, air conditioning apparatus, or similar mechanical device shall be operated such that the noise level at a property line exceeds the ambient noise level by more than 5 decibels. Emergency work is defined as work made necessary to restore property to a safe condition following a public calamity or work required to protect persons or property from an imminent exposure to danger or work by private or public utilities when restoring utility service.

EXISTING NOISE ENVIRONMENT

Two measurements of the ambient noise conditions surrounding the project site were conducted over a 19-hour period from 3:00 PM on December 13, 2022 through 10:00 AM on December 14, 2022. These

long-term measurements were taken using a Piccolo II Noise Meter. The first measurement (M1) was taken at the northeastern corner of the project site, and the second (M2) was taken near the southeastern edge of the project site. The measurement locations are shown on Figure 3, and the results of the measurements are shown in Attachment A. Based on these measurements, the ambient nighttime (10:00 PM to 4:00 AM) noise level at the project site was determined to be 61.5 dBA L_{EQ}.

A reference measurement of a pump motor within the Glorieta Booster Station was taken at a distance of five feet and indicated that these units generate an average noise level of 89.5 dBA at this distance. This short-term measurement was taken with a Larson Davis LxT Sound Level Meter.

PROJECT NOISE GENERATION

Construction Activities

The Pasadena Municipal Code allows the operation of construction equipment that generates a noise level of up to 85 dBA when measured within a radius of 100 feet from such equipment. Installation of replacement parts at the pump stations and the new emergency generators would not require the use of heavy-duty construction equipment generating noise levels in excess of 85 dBA at 100 feet, and would not exceed the Municipal Code threshold.

Project Operation

Noise generating components associated with the existing operation of Glorieta Booster Station and Bangham Well include pumps and fans. Specifications associated with the proposed emergency generators were not available; therefore, this analysis assumes a typical Kohler 1,000-kilowatt generator with a Class II enclosure would be installed. This unit would generate a noise level of 76 dBA at 23 feet (Attachment B). The sound power level associated with these components is provided in Table 1, *Noise Source Data*.

Table 1
NOISE SOURCE DATA

Source	Noise Levels[1] (dB) Measured at Octave Frequencies								Overall Noise Level (dBA)
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
Existing Pump	57.0	76.9	82.8	87.1	103.0	99.3	82.0	105.0	105.0
Pump Through Vent Openings	42.0	49.4	54.9	58.5	75.5	76.6	59.3	45.6	79.9
Planned Generator	84.0	93.0	93.0	96.0	98.0	99.0	96.0	89.0	103.9
Wall Mounted Fans	71.5	77.2	80.5	85.4	84.9	81.8	76.0	75.3	88.9

dB = decibels; Hz = Hertz; dBA = A-weighted decibels
[1] Sound Power Levels (S_{WL}).

At the Glorieta Booster Station, pumps are located within a vented building, through which noise primarily emanates from the vents on the north and south ends of the building. Fans that vent this building are located at the north end of the building. The pumps associated with Bangham Well are located within a three-sided enclosure that is approximately eight feet in height. The open side faces

south, towards the project site, and away from residential land uses to the north. The two emergency generators would be located west of the Glorieta Booster Station and southwest of Bangham Well, as shown on Figure 3.

These noise sources were modeled using CadnaA software, and the resulting modeled noise levels at receivers placed along residential property lines were calculated. At residences east of Sunset Avenue, a seven-foot wall separates residences from the roadway and was included in the noise model. Modeled receiver locations are shown on Figure 3, and the calculated noise level at each receiver is presented in Table 2, *Project Noise Level at Residential Land Uses*. Noise levels are presented at each receiver for noise resulting from each individual component of the Sunset Complex, as well as a combined noise level with all components running.

Table 2
PROJECT NOISE LEVEL AT RESIDENTIAL LAND USES

Source	Receiver 1 (dBA L_{EQ})	Receiver 2 (dBA L_{EQ})	Receiver 3 (dBA L_{EQ})	Receiver 4 (dBA L_{EQ})	Receiver 5 (dBA L_{EQ})
Pump	44.9	51.2	51.4	50.6	55.4
Fan	47.7	-	-	-	-
Pump and Fan	49.5	-	-	-	-
Emergency Generators	58.2	58.5	59.0	57.4	64.8
All Sources	**58.7**	**59.2**	**59.7**	**58.2**	**65.2**

dBA = A-weighted decibels; L_{EQ} = hourly average noise level
Note: Fans are only located at the Glorieta Booster Station; therefore, noise levels from fans at receivers near the Bangham Well Building is negligible.

CONCLUSION

The noise levels presented in this letter provide baseline ambient noise conditions and noise planning information for the construction and operation of the Bangham Well, Glorieta Booster Station, and two proposed emergency generators at the Pasadena Sunset Reservoir Complex.

Sincerely,

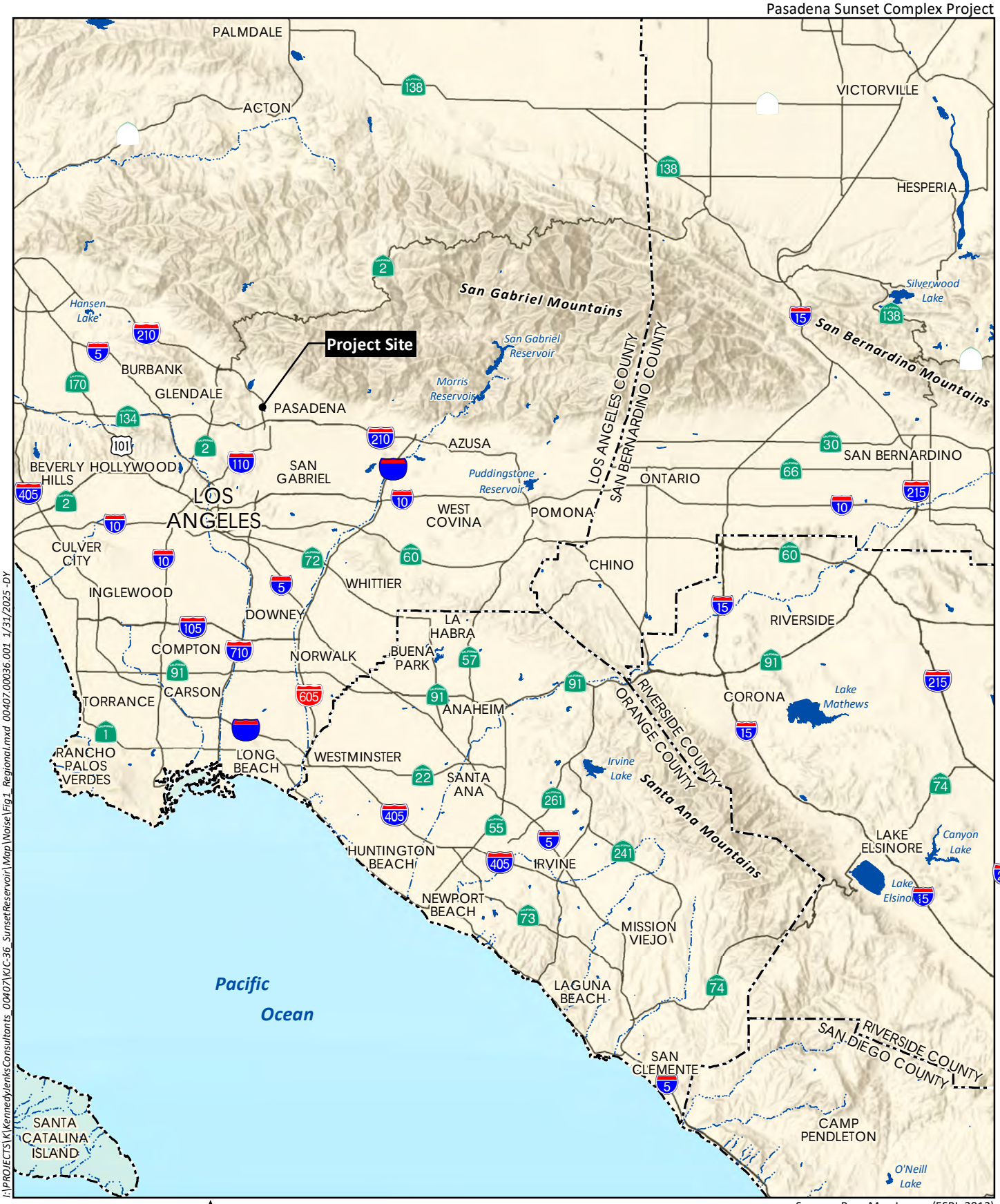
Charles Terry
Principal Acoustician

Jason Runyan
Noise Specialist, Project Manager

Attachments:

Figure 1: Project Location
Figure 2: Aerial Photograph
Figure 3: Project Components
Attachment A: Ambient Noise Level Measurements
Attachment B: Generator Specifications

Figures



I:\PROJECTS\K\KennedyJenksConsultants_00407\KC-36_SunsetReservoir\Map\Noise\Fig1_RegionalLmxd 00407.00036.001 1/31/2025 -DY

0 10 Miles

Source: Base Map Layers (ESRI, 2013)

HELIX Environmental Planning

Regional Location

Figure 1

Pasadena Sunset Complex Project



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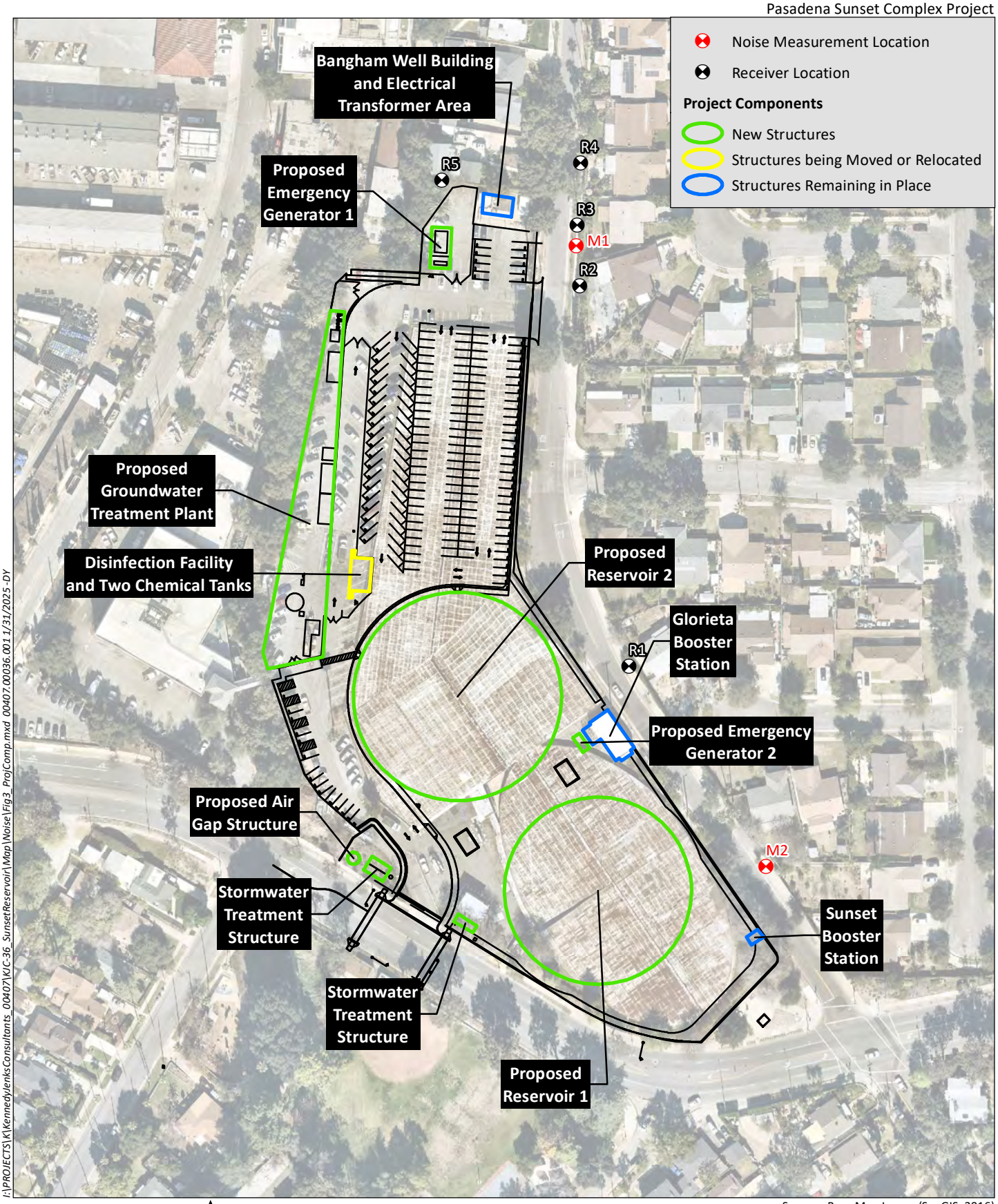
0 200 Feet

Source: Aerial (Nearmap, 2020)

HELIX Environmental Planning

Aerial Photograph

Figure 2



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0 150 Feet

Source: Base Map Layers (SanGIS, 2016)

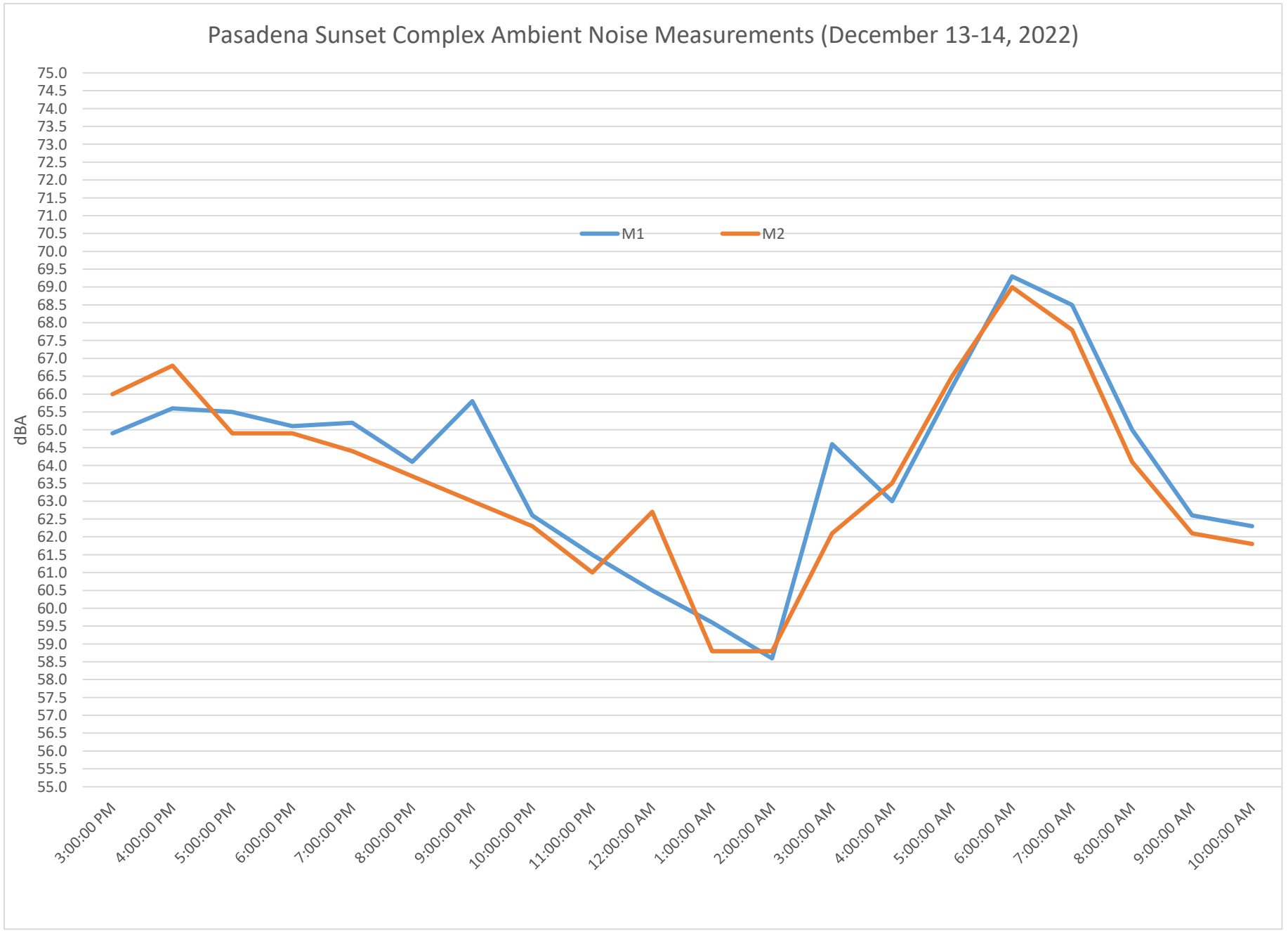
HELIX Environmental Planning

Project Components

Figure 3

Attachment A

Ambient Noise Level Measurements


Pasadena Sunset Complex Ambient Noise Measurements (December 13-14, 2022)
dBA
M1
M2
75.0
74.5
74.0
73.5
73.0
72.5
72.0
71.5
71.0
70.5
70.0
69.5
69.0
68.5
68.0
67.5
67.0
66.5
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3:00:00 PM
4:00:00 PM
5:00:00 PM
6:00:00 PM
7:00:00 PM
8:00:00 PM
9:00:00 PM
10:00:00 PM
11:00:00 PM
12:00:00 AM
1:00:00 AM
2:00:00 AM
3:00:00 AM
4:00:00 AM
5:00:00 AM
6:00:00 AM
7:00:00 AM
8:00:00 AM
9:00:00 AM
10:00:00 AM

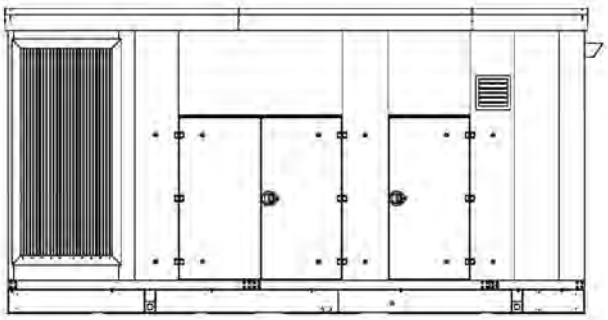
Attachment B

Generator Specifications

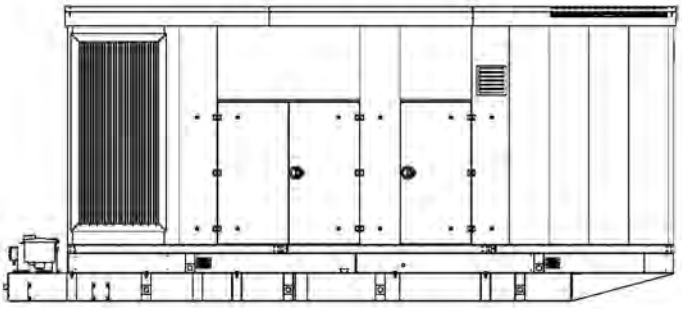
KOHLER.

Industrial Generator Set Accessories

Sound Enclosure and Subbase Fuel Tank Package



Level 1 Sound Enclosure with Lift Base



Level 2 Sound Enclosure with Subbase Fuel Tank
(shown with optional spill containment)

Enclosure and Subbase Fuel Tank Combinations

Four enclosure configurations are available with the subbase fuel tanks:

- Sound Enclosure Level 1
- Sound Enclosure Level 1, AQMD Ready
- Sound Enclosure Level 2
- Sound Enclosure Level 2, AQMD Ready

Available Approvals and Listings

- ❑ UL 2200 Listing
- ❑ UL142 Listing (fuel tanks)
- ❑ CSA Approval
- ❑ IBC Seismic Certification
- ❑ California OSHPD Approval (KD800-KD1750 models)
- ❑ cUL Listing (fuel tanks only)
- ❑ Hurricane Rated Enclosure - Available on aluminum Sound Level 2 enclosures, KD800-KD1750 models (Impact rated for Large Missile Level E and Wind load rated per Florida Building Code, tested to TAS201-94, TAS202-94 and TAS203-94 standards)

NOTE: Some models may have limited third-party approvals; see your local distributor for details.

Applicable to the following models: KD800 - KD2500 (includes KD1250-A, KD1250-4, KD2500-4)

Sound Level 1 Enclosure Standard Features

- Internal silencers with flexible exhaust connectors and exhaust elbows.
- Mounts to lift base and optional subbase fuel tank.
- Aluminum construction with six large, hinged, removable doors for easy maintenance.
- Fade-, scratch-, and corrosion-resistant Kohler® Power Armor™ automotive-grade textured finish.
- Lockable, flush-mounted door latches.
- Air inlet louvers to reduce rain and snow entry.
- Sloped roof to reduce the buildup of moisture and debris.
- Acoustic insulation that meets UL 94 HF1 flammability classification.
- Sound level 1 enclosure is designed to 150 mph (241 kph) wind load rating.
- Sound level 1 enclosure uses internal silencers, acoustic insulation and acoustic-lined air inlet hoods.

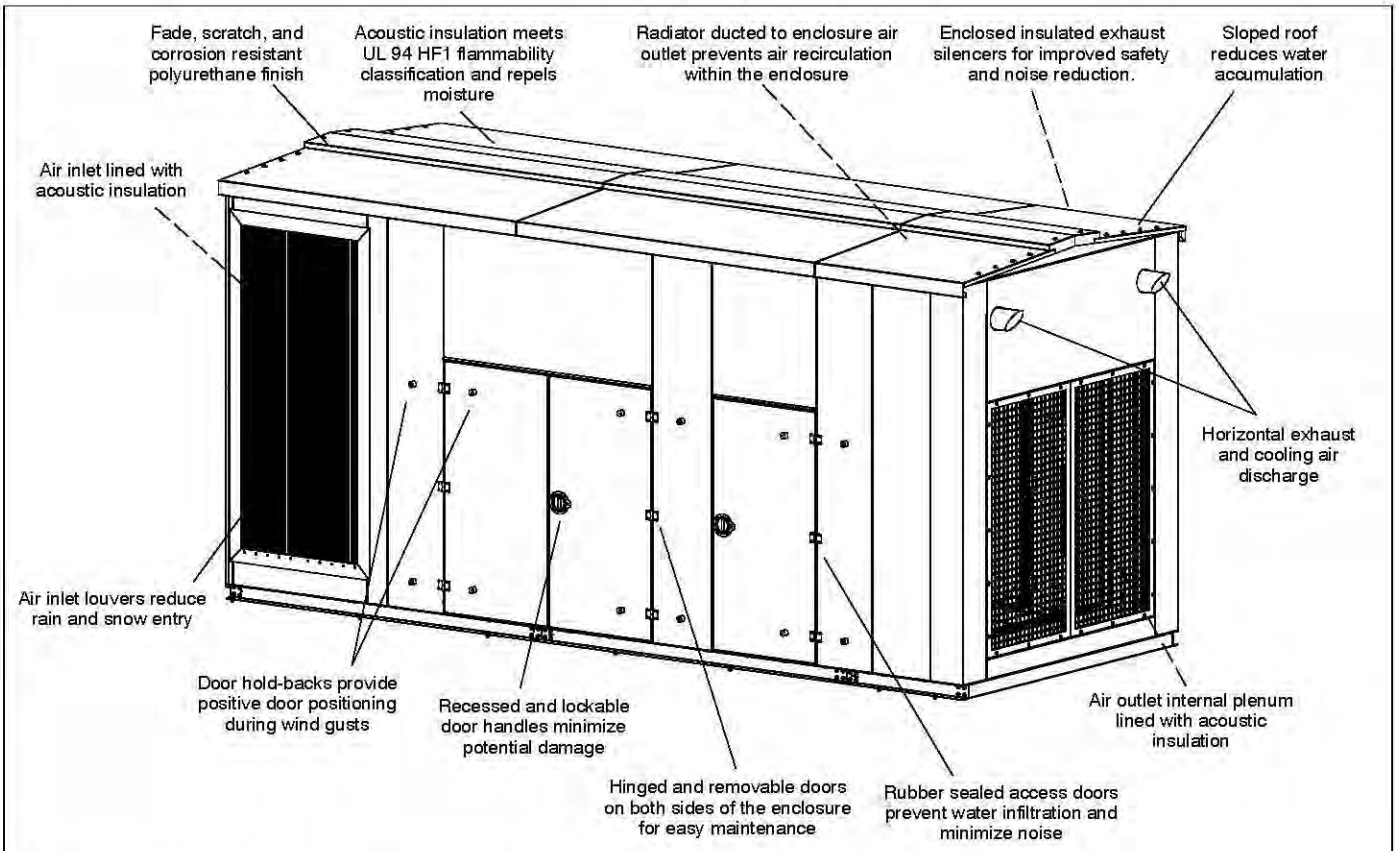
Sound Level 2 Enclosure Standard Features

- Includes all of the sound level 1 enclosure features with the addition of up to 51 mm (2 in.) acoustic insulation material, intake sound baffles, secondary silencers, and vertical air discharge with rain caps.
- Vertical outlet hood with 90 degree angles to redirect air and reduce noise.
- Sound level 2 enclosure is certified to 186 mph (299 kph) wind load rating for KD800-2500 models.

Subbase Fuel Tank Features

- The fuel tank has a Power Armor Plus™ textured epoxy-based rubberized coating.
- The above-ground rectangular secondary containment tank mounts directly to the generator set, below the generator set skid (subbase).
- Both the inner and outer tanks have UL-listed emergency relief vents.
- Flexible fuel lines are provided with subbase fuel tank selection.
- The containment tank's construction protects against fuel leaks or ruptures. The inner (primary) tank is sealed inside the outer (secondary) tank. The outer tank contains the fuel if the inner tank leaks or ruptures.
- The above ground secondary containment subbase fuel tank meets UL 142 requirements.
- State tanks with varying capacities are available. Florida Dept. of Environmental Protection (FDEP) File No. EQ-634 approved.

Aluminum Sound Enclosures



Note: Sample sound level 1 (SL1) enclosure shown; other models are similar.
Enclosure ships assembled on lifting base.

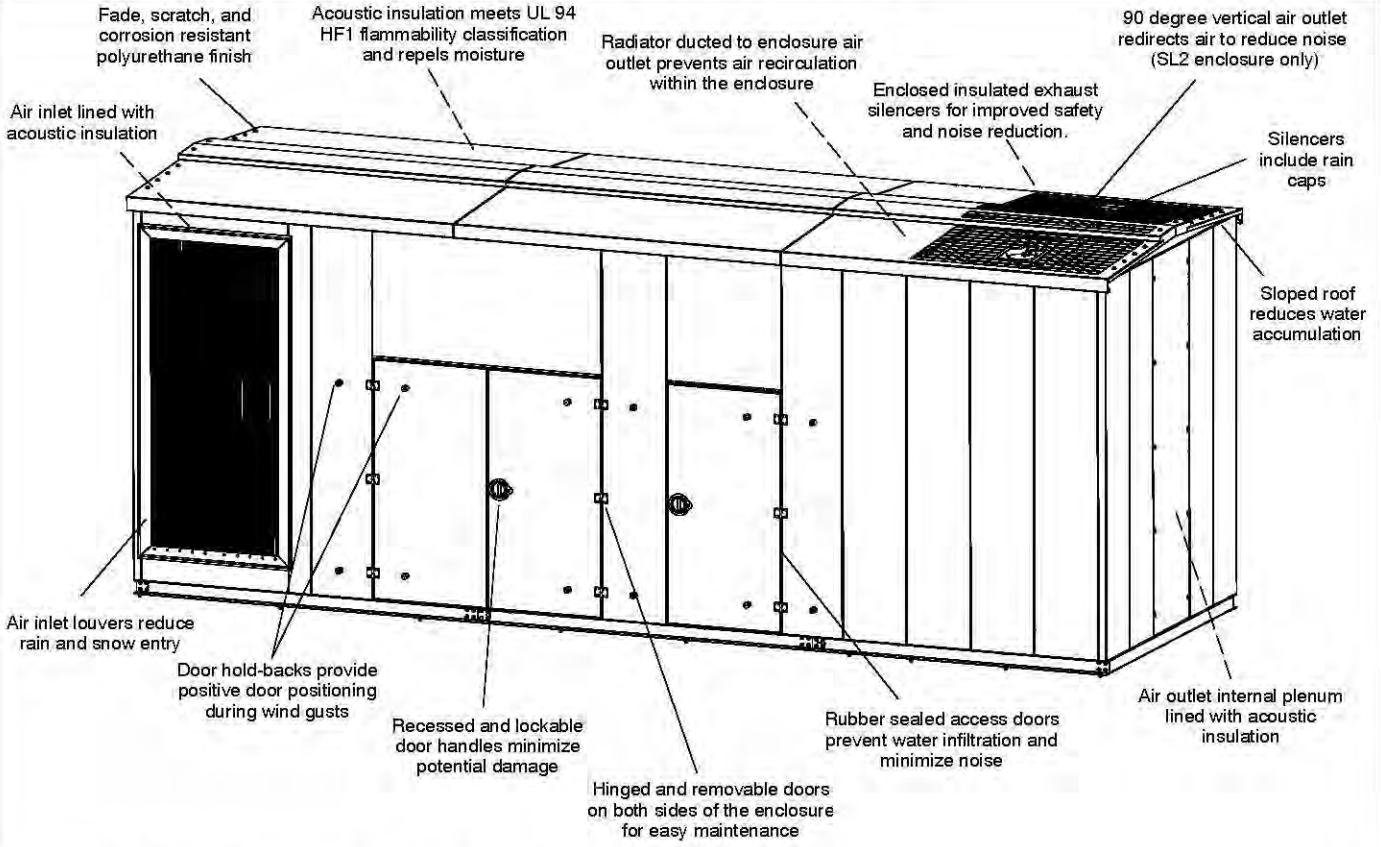
ADV-8927

Level 1 Sound Enclosure Features

- Heavy-duty formed panels, solid construction. Preassembled package offering corrosion resistant, dent resilient structure mounting directly to lift base or fuel tank.
- Polyurethane enamel paint. Superior finish, durability, and appearance.
- The enclosure has a sloped roof to reduce the buildup of moisture and debris.
- Internal exhaust silencers offering maximum component life and operator safety.

  NOTE: Installing an additional length of exhaust tail pipe may increase backpressure levels. Please refer to the generator set spec sheet for the maximum backpressure value.
- Service access. Multiple personnel doors for easy access to generator set control and servicing of the fuel fill, fuel gauge, oil fill, and battery.
- Interchangeable modular panel construction. Allows complete serviceability or replacement without compromising enclosure design.
- Bolted panels facilitate service, future modification upgrades, or field replacement.
- Cooling/combustion air intake. Fixed air intake louvers.
- Sound-attenuating design using critical silencers. Acoustic insulation UL 94 HF1 listed for flame resistance.
- Horizontal air discharge. Sound level 1 (SL1) enclosures use a horizontal design that directs exhaust and cooling air out the end of the enclosure.

Aluminum Sound Enclosures



Note: Sample sound level 2 (SL2) enclosure shown; other models are similar.
Enclosure ships assembled on lifting base.

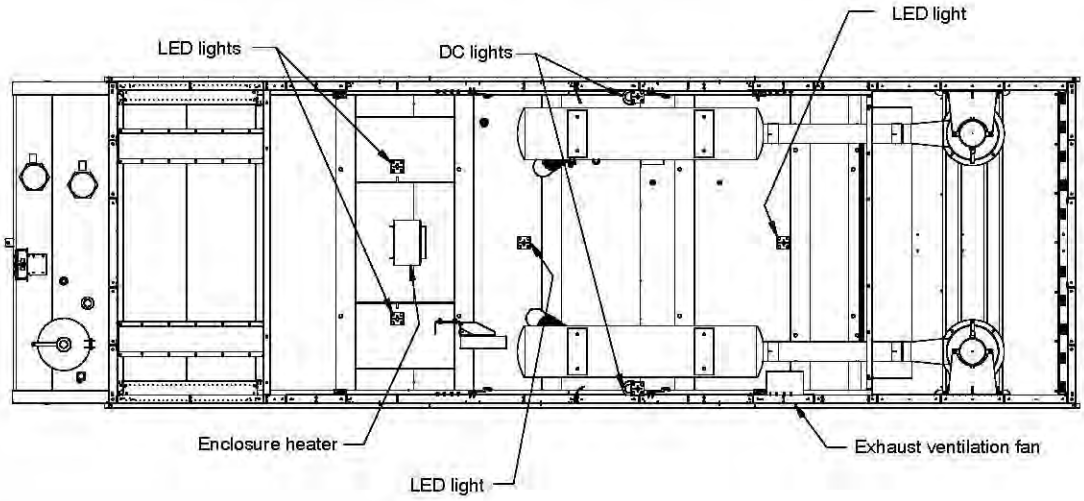
ADV-8927

Level 2 Sound Enclosure Features

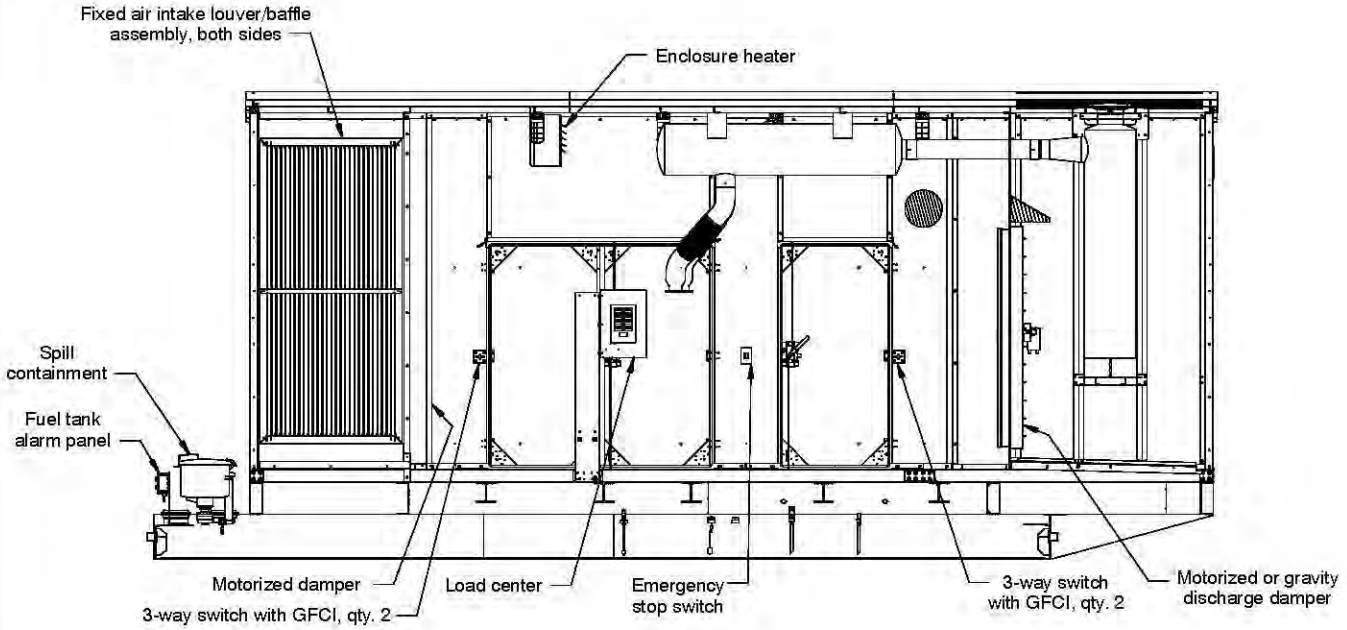
- Heavy-duty formed panels, solid construction. Preassembled package offering corrosion resistant, dent resilient structure mounting directly to lift base or fuel tank.
- Polyurethane enamel paint. Superior finish, durability, and appearance.
- The enclosure has a sloped roof to reduce the buildup of moisture and debris.
- Internal exhaust silencers offering maximum component life and operator safety.
- Service access. Multiple personnel doors on both sides for easy access to generator set control and servicing of the fuel fill, fuel gauge, oil fill, and battery.
- Interchangeable modular panel construction. Allows complete serviceability or replacement without compromising enclosure design.
- Bolted panels facilitate service, future modification upgrades, or field replacement.
- Cooling/combustion air intake. Fixed air intake louvers.
- Sound-attenuating design using additional secondary silencers and up to 51 mm (2 inches) of added acoustic insulation, UL 94 HF1 listed for flame resistance.
- Vertical air discharge. Sound level 2 (SL2) models use a vertical air discharge design that redirects exhaust and cooling air up and above the enclosure to reduce noise.

Aluminum Sound Enclosure Options

Top view of SL2 enclosure, shown with roof removed for illustration only:



Side view of SL2 enclosure, shown with side panels removed for illustration only:

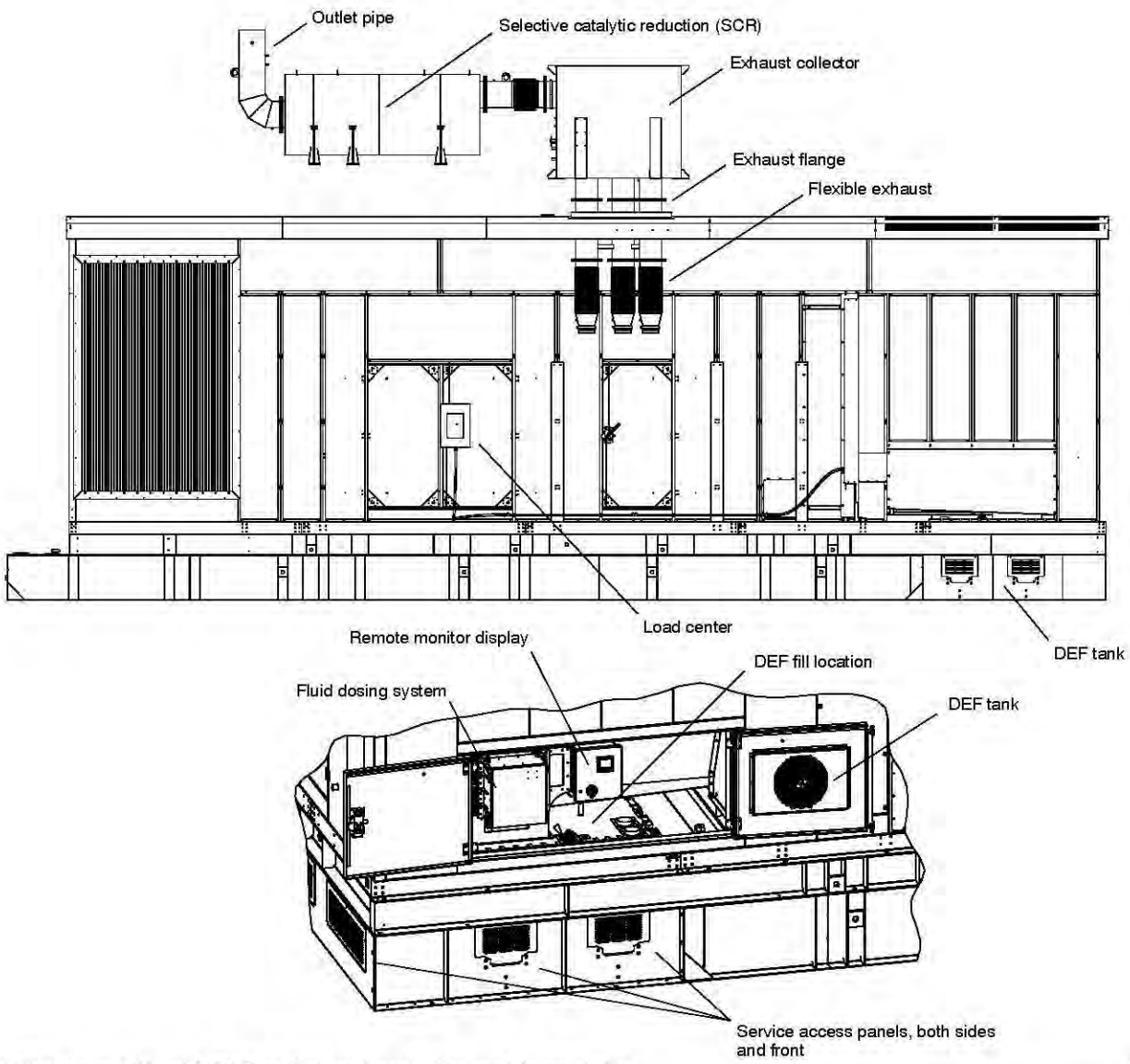


Note: Sample sound level 2 (SL2) enclosure shown; other models are similar.

ADV-8919-5

Tier 4 Aluminum Sound Enclosure

KD2500-4, Side view of SL2 enclosure, shown with side panels removed for illustration only:



Note: Sample sound level 2 (SL2) enclosure shown; other models are similar.

ADV-9179-2

Tier 4, Level 2 Sound Enclosure Features

- Availabe on KD1250- 4 and KD2500- 4
- Tier 4 options only available with sound level 2 enclosures.
- Includes all of the sound level 1 and 2 enclosure features with the addition of DEF tank, SCR, and exhaust collector.
- Remote monitor display
- Locates DEF tanks and lines
- Correctly sizes DEF and diesel tanks
- Service box for control and filter mounting
- Platforms not included
- Diesel fuel state tank is standard
  - KD1250- 4
    - State tank, 5863 L (1549 gal.) or 11205 L (2960 gal.)
    - DEF tank capacity,
      - 620 L (164 gal.) with 5863 L (1549 gal.) state tank
      - 1241 L (328 gal.) with 11205 L (2960 gal.) state tank
  - KD2500- 4
    - State tank, 14130 L (3733 gal.)
    - DEF tank capacity, 1241 L (328 gal.)

Aluminum Sound Enclosure Options

Basic Electrical Package (BEP)

Distribution Panel/Load Center. Prewired AC power distribution of all factory-installed features including block heater, two GFCI-protected internal 120-volt service receptacles, internal lighting, and commercial grade wall switches. Single-phase or three-phase load center powered by building source power and protected by a main circuit breaker, rated for 100, 125, or 200 amps as noted, with capacity and circuit positions for future expansion. AC power distribution installed in accordance with NEC and all wiring within EMT thin wall conduit. LED AC lights located within UL-listed fixtures designed for wet locations.

- ❑ BEP, single-phase, 120/208, 60 Hz or 120/240 VAC, 60 Hz. Includes 100 amp electrical panel, two 3-way switches, four LED lights, and two GFCI receptacles. *
- ❑ BEP, three-phase, 120/208, 60 Hz or 120/240VAC, 60 Hz. Includes 125 amp electrical panel, two 3-way switches, four LED lights, and two GFCI receptacles.
- ❑ BEP, 200 amp, single-phase, 120/208, 60 Hz or 120/240 VAC, 60 Hz. Includes 200 amp electrical panel, two 3-way switches, four LED lights, and two GFCI receptacles. *
- ❑ BEP, 200 amp, three-phase, 120/208, 60 Hz or 120/240VAC, 60 Hz. Includes 200 amp electrical panel, two 3-way switches, four LED lights, and two GFCI receptacles.

DC Light Package

DC Light Package (DLP). Prewired, internal DC light package offering an economical alternative light source within the enclosure, as a complement to the BEP or a source of light when AC power is not available. Battery drain limited with fuse protection and controlled through a 0- 60 minute, spring-wound, no-hold timer.
Available in LED.

Electrical Accessories

Wiring Kits. Electrical wiring for accessories. BEP required.

- ❑ Alternator heater wiring (KD1250- 2500 only)
- ❑ Block heater wiring, single-phase *
- ❑ Block heater wiring, three-phase
- ❑ Battery charger wiring
- ❑ Wire DEF tank heater †
- ❑ Wire power supply (Tier 4 system heaters) §

Emergency Stop Switch

- ❑ Generator set emergency stop switch, qty. 1.

* Not available options with Tier 4 generator set enclosures.
† Only available on enclosed Tier 4 generator set enclosures.
§ Only available on open or enclosed Tier 4 generator sets.

Stepdown Transformers. 100 amp BEP required, 60 Hz only. KD1250- 2500 only. *

- ❑ Single-phase, 120/240 V *
- ❑ Three-phase, 120/208 V *

Disconnect Switches. Disconnect switch for stepdown transformer. 60 Hz only. *

- ❑ Single-phase *
- ❑ Three-phase *

Enclosure Heater

Heater, 3.7/5 kW Ceiling Mounted. Electrical utility heater prewired to load center internal to enclosure. Rated at 17100 Btu. Includes adjustable louvers offering down flow and horizontal air tuning, built-in thermostat with automatic fan delay controls.

- ❑ Heater kit with 1 heater, single/three phase, 208/240 VAC, 60 Hz. BEP required.
- ❑ Heater kit with 2 heaters, for KD1250- 2500 only, single/three phase, 208/240 VAC, 60 Hz. 200 amp BEP required.

Exhaust Fan

- ❑ Exhaust Ventilation Fan. Mounted inside the enclosure. BEP required.

Motorized Inlet Louvers. 60 Hz only; BEP required.

- ❑ Aluminum construction
- ❑ Insulated aluminum construction
- ❑ Galvanized construction

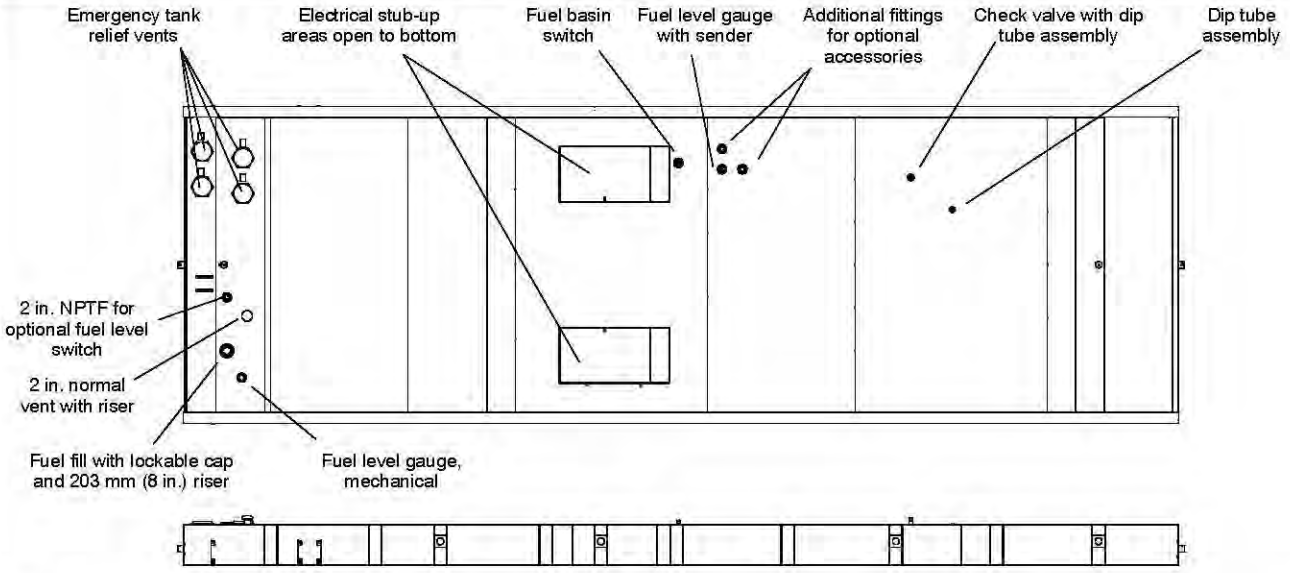
Motorized Outlet Louvers. 60 Hz only; BEP required.

- ❑ Aluminum construction
- ❑ Insulated aluminum construction
- ❑ Galvanized construction

Gravity Air Outlet

- ❑ Aluminum construction

Subbase Fuel Tank



Note: Sample model shown, other models are similar.

ADV-8927

Subbase Fuel Tank Standard Features

- Extended operation. State tanks with various capacities for multiple hour requirements.
- UL listed. Secondary containment generator set base tank meeting UL 142 requirements.
- NFPA compliant. Designed to comply with the installation standards of NFPA 30 and NFPA 37.
- Integral external lift lugs. Enables crane with spreader-bar lifting of the complete package (empty tank, mounted generator set, and enclosure) to ensure safety.
- Emergency pressure relief vents. Vents ensure adequate venting of inner and outer tank under extreme pressure and/or emergency conditions.
- Normal vent with cap. Vent is raised above lockable fuel fill.
- Fuel level gauge with sender.
- Mechanical fuel level gauge.
- Leak detection switch. Annunciates a contained primary tank fuel leak condition at generator set control.
- Electrical stub-up area open to bottom.
- Additional 2 in. NPT fittings for optional accessories.

Subbase Fuel Tank Options

Bottom Clearance

❑ I-beams, provide 102 mm (4 in.) of ground clearance (not available with OSHPD or IBC seismic certification)

Emergency Vent Options

❑ 127 mm (5 in.), IBC
❑ 152.4 mm (6 in.), IBC KD800- 1000 12 hr. tank only

Fuel in Basin Options

❑ Fuel in basin switch, Florida Dept. of Environmental Protection (FDEP) File No. EQ-682 approved
❑ 100% engine fluid containment

Fuel Supply Options

❑ Fire safety valve (installed on fuel supply line)
❑ Ball valve (installed on fuel supply line)

Fuel Fill Options

❑ Fill pipe extension to within 152 mm (6 in.) of bottom of fuel tank
❑ 18.9 L (5 gallon) spill containment
❑ 18.9 L (5 gallon) spill containment with 95% shutoff
❑ 18.9 L (5 gallon) spill containment fill to within 152 mm (6 in.) of bottom of fuel tank
❑ 18.9 L (5 gallon) spill containment, OSHPD/IBC
❑ 18.9 L (5 gallon) spill containment with 95% shutoff, OSHPD/IBC
❑ 28.4 L (7.5 gallon) spill containment, Florida Dept. of Environmental Protection (FDEP) File No. EQ-345 approved
❑ 28.4 L (7.5 gallon) spill containment with 95% shutoff, Florida Dept. of Environmental Protection (FDEP) File No. EQ-345/EQ-257 approved

High Fuel Level Switch

❑ High fuel level switch, 24V
❑ High fuel level switch, 24V, Florida Dept. of Environmental Protection (FDEP) File No. EQ-682 approved
❑ Fuel tank panel, 3 alarm, 24 V
❑ Fuel tank panel, 3 alarm, 24 V, Florida Dept. of Environmental Protection (FDEP) File No. EQ-682 approved

Normal Vent Options

❑ 3.7 m (12 ft.) above grade (without spill containment)
❑ 3.7 m (12 ft.) above grade (with spill containment)

Freestanding Stairs

❑ Stairs only, single door access
❑ Stairs with platform, single door access
❑ Stairs with catwalk, 2 door access, door length only
❑ Stairs with catwalk, 2 door access, full length of enclosure

Tank Marking Options

❑ Decal, Combustible Liquids - Keep Fire Away (qty. 2)
❑ Decal, NFPA 704 identification (qty. 2)
❑ Decal, tank number and safe fuel fill height (qty. 2)

Enclosure and Subbase Fuel Tank Specifications

Fuel Tank Capacity, L (gal.)	Est. Fuel Supply Hours at 60 Hz with Full Load (nominal)	Max. Dimensions, mm (in.)			Max. Weight, † kg (lb.)	Fuel Tank Height, mm (in.)	Sound Pressure Level at 60 Hz with Full Load, dB(A) ‡
		Length	Width §	Height			
KD800 SL1 Sound Enclosure with Internal Silencer and State Code Subbase Fuel Tank *							
Lifting Base	0	6582 (259)	2616 (103)	3350 (132)	10184 (22452)	—	90
3475 (918)	12	7309 (288)		3706 (146)	13772 (30362)	356 (14.0)	
6621 (1749)	24			3934 (155)	14252 (31421)	584 (23.0)	
10573 (2793)	48			4264 (168)	14831 (32698)	914 (36.0)	
15740 (4158)	72	9144 (360)		4366 (172)	16242 (35808)	1016 (40.0)	
KD800 SL2 Sound Enclosure with Internal Silencer and State Code Subbase Fuel Tank *							
Lifting Base	0	7707 (303)	2616 (103)	3350 (132)	10587 (23340)	—	75
3475 (918)	12	8434 (332)		3706 (146)	14175 (31250)	356 (14.0)	
6621 (1749)	24			3934 (155)	14655 (32309)	584 (23.0)	
10573 (2793)	48			4290 (169)	15234 (33586)	915 (36.0)	
15740 (4158)	72	9144 (360)		4366 (172)	16645 (36696)	1016 (40.0)	
KD900 SL1 Sound Enclosure with Internal Silencer and State Code Subbase Fuel Tank *							
Lifting Base	0	6582 (259)	2616 (103)	3350 (132)	10497 (23343)	—	91
3475 (918)	12	7309 (288)		3706 (146)	14085 (31253)	356 (14.0)	
6621 (1749)	24			3934 (155)	14565 (32312)	584 (23.0)	
12969 (3426)	48	8400 (331)		4293 (169)	16348 (36243)	940 (37.0)	
19381 (5120)	72	11050 (435)		4369 (172)	17527 (38840)	1016 (40.0)	
KD900 SL2 Sound Enclosure with Internal Silencer and State Code Subbase Fuel Tank *							
Lifting Base	0	7707 (303)	2616 (103)	3350 (132)	10900 (24231)	—	75
3475 (918)	12	8434 (332)		3706 (146)	14488 (32141)	356 (14.0)	
6621 (1749)	24			3934 (155)	14968 (33200)	584 (23.0)	
12969 (3426)	48			4290 (169)	16751 (37131)	940 (37.0)	
19381 (5120)	72	11050 (435)		4366 (172)	17930 (39728)	1016 (40.0)	
KD1000 SL1 Sound Enclosure with Internal Silencer and State Code Subbase Fuel Tank *							
Lifting Base	0	6582 (259)	2616 (103)	3350 (132)	10810 (23833)	—	92
3475 (918)	12	7309 (288)		3706 (146)	14398 (31743)	356 (14.0)	
6621 (1749)	24			3934 (155)	14878 (32802)	584 (23.0)	
12969 (3426)	48	8400 (331)		4290 (169)	16661 (36733)	940 (37.0)	
19381 (5120)	72	11050 (435)		4366 (172)	17840 (39330)	1016 (40.0)	
KD1000 SL2 Sound Enclosure with Internal Silencer and State Code Subbase Fuel Tank *							
Lifting Base	0	7707 (303)	2616 (103)	3353 (132)	11213 (24721)	—	76
3475 (918)	12	8434 (332)		3706 (146)	14801 (32631)	356 (14.0)	
6621 (1749)	24			3934 (155)	15281 (33690)	584 (23.0)	
12969 (3426)	48			4290 (169)	17064 (37621)	940 (37.0)	
19381 (5120)	72	11050 (435)		4366 (172)	18243 (40218)	1016 (40.0)	
KD1250/1500 SL1 Sound Enclosure with Internal Silencers and State Code Subbase Fuel Tank *							
Lifting Base	0	8831 (348)	3033 (119)	3579 (141)	17116 (37748)	—	93
5863 (1549)	18/15	9594 (378)		3960 (156)	22326 (49234)	381 (15.0)	
9860 (2605)	30/25			4138 (163)	22808 (50296)	559 (22.0)	
11204 (2960)	34/28			4214 (166)	22973 (50661)	635 (25.0)	
19214 (5076)	58/48	11113 (438)		4468 (176)	25277 (55741)	889 (35.0)	
21985 (5808)	66/55			4570 (180)	25684 (56637)	991 (39.0)	
KD1250/1500 SL2 Sound Enclosure with Internal Silencer and State Code Subbase Fuel Tank *							
Lifting Base	0	10420 (410)	3033 (119)	3579 (141)	18031 (39764)	—	79
5863 (1549)	18/15	11147 (439)		3960 (156)	23241 (51250)	381 (15.0)	
9860 (2605)	30/25			4138 (163)	23723 (52312)	559 (22.0)	
11204 (2960)	34/28			4214 (166)	23888 (52677)	635 (25.0)	
19214 (5076)	58/48			4468 (176)	26192 (57757)	889 (35.0)	
21985 (5808)	66/55			4570 (180)	26599 (58653)	991 (39.0)	

* Data in table is for reference only. Height includes enclosure, lift base, and tank (if equipped). Refer to your authorized Kohler distributor for enclosure and subbase fuel tank specification details.

† Max. weight includes the generator set (wet) with the largest alternator option, enclosure, silencers, lift base, and tank (no fuel).

‡ Log average sound pressure level of 8 measured positions around the perimeter of the unit at a distance of 7 m (23 ft.). Refer to TIB-114 for details. Enclosed generator set sound data for some models was not available at time of print.

§ An additional 940 mm (37 inches) of clearance on each side for opening and closing the access doors is recommended.

NOTE: If the Est. Fuel Supply Hours column shows more than one number, the numbers represent each model in that range.

Enclosure and Subbase Fuel Tank Specifications, continued

Fuel Tank Capacity, L (gal.)	Est. Fuel Supply Hours at 60 Hz with Full Load (nominal)	Max. Dimensions, mm (in.)			Max. Weight, † kg (lb.)	Fuel Tank Height, mm (in.)	Sound Pressure Level at 60 Hz with Full Load, dB(A) ‡
		Length	Width §	Height			
KD1250-4 SL2 Sound Enclosure with State Code Subbase Fuel Tank ◆✻							
5863 (1549)	17	11147 (439)	3033 (119)	4640 (183)	22507 (49619)	381 (15.0)	75
11204 (2960)	33			4894 (193)	23731 (52318)	635 (25.0)	
KD1250-A/1350 SL1 Sound Enclosure with Internal Silencers and State Code Subbase Fuel Tank *							
Lifting Base	0	8831 (348)	3033 (119)	3579 (141)	17116 (37748)	—	93
5863 (1549)	18/17	9594 (378)		3960 (156)	22326 (49234)	381 (15.0)	
9860 (2605)	30/29			4138 (163)	22808 (50296)	559 (22.0)	
11204 (2960)	34/32			4214 (166)	22973 (50661)	635 (25.0)	
19214 (5076)	58/56	11113 (438)		4468 (176)	25277 (55741)	889 (35.0)	
21985 (5808)	67/64			4570 (180)	25684 (56637)	991 (39.0)	
KD1250-A/1350 SL2 Sound Enclosure with Internal Silencer and State Code Subbase Fuel Tank *							
Lifting Base	0	10420 (410)	3033 (119)	3579 (141)	18031 (39764)	—	76
5863 (1549)	18/17	11147 (439)		3960 (156)	23241 (51250)	381 (15.0)	
9860 (2605)	30/29			4138 (163)	23723 (52312)	559 (22.0)	
11204 (2960)	34/32			4214 (166)	23888 (52677)	635 (25.0)	
19214 (5076)	58/56			4468 (176)	26192 (57757)	889 (35.0)	
21985 (5808)	67/64			4570 (180)	26599 (58653)	991 (39.0)	
KD1600 SL1 Sound Enclosure with Internal Silencers and State Code Subbase Fuel Tank *							
Lifting Base	0	8831 (348)	3033 (119)	3579 (141)	17343 (38248)	—	94
5863 (1549)	14	9594 (378)		3960 (156)	22553 (49734)	381 (15.0)	
9860 (2605)	23			4138 (163)	23035 (50796)	559 (22.0)	
11204 (2960)	26			4214 (166)	23200 (51161)	635 (25.0)	
19214 (5076)	45	11113 (438)		4468 (176)	25504 (56241)	889 (35.0)	
21985 (5808)	52			4570 (180)	25911 (57137)	991 (39.0)	
KD1600 SL2 Sound Enclosure with Internal Silencer and State Code Subbase Fuel Tank *							
Lifting Base	0	10420 (410)	3033 (119)	3579 (141)	18258 (40264)	—	79
5863 (1549)	14	11147 (439)		3960 (156)	23468 (51750)	381 (15.0)	
9860 (2605)	23			4138 (163)	23950 (52812)	559 (22.0)	
11204 (2960)	26			4214 (166)	24115 (53177)	635 (25.0)	
19214 (5076)	45			4468 (176)	26419 (58257)	889 (35.0)	
21985 (5808)	52			4570 (180)	26826 (59153)	991 (39.0)	
KD1750 SL1 Sound Enclosure with Internal Silencers and State Code Subbase Fuel Tank *							
Lifting Base	0	8831 (348)	3033 (119)	3579 (141)	17343 (38248)	—	95
5863 (1549)	13	9594 (378)		3960 (156)	22553 (49734)	381 (15.0)	
9860 (2605)	21			4138 (163)	23035 (50796)	559 (22.0)	
11204 (2960)	24			4214 (166)	23200 (51161)	635 (25.0)	
19214 (5076)	42	11113 (438)		4468 (176)	25504 (56241)	889 (35.0)	
21985 (5808)	48			4570 (180)	25911 (57137)	991 (39.0)	
KD1750 SL2 Sound Enclosure with Internal Silencer and State Code Subbase Fuel Tank *							
Lifting Base	0	10420 (410)	3033 (119)	3579 (141)	18258 (40264)	—	79
5863 (1549)	13	11147 (439)		3960 (156)	23468 (51750)	381 (15.0)	
9860 (2605)	21			4138 (163)	23950 (52812)	559 (22.0)	
11204 (2960)	24			4214 (166)	24115 (53177)	635 (25.0)	
19214 (5076)	42			4468 (176)	26419 (58257)	889 (35.0)	
21985 (5808)	48			4570 (180)	26826 (59153)	991 (39.0)	

* Data in table is for reference only. Height includes enclosure, lift base, and tank (if equipped). Refer to your authorized Kohler distributor for enclosure and subbase fuel tank specification details.

◆ Tier 4 generator enclosure height includes the fuel tank and enclosure up to the exhaust flange. The height does not include the SCR, or the SCR inlet and outlet pipes.

✻ Tier 4 generator enclosure weight includes the DEF tank but does not include the SCR or the SCR inlet and outlet pipes.

† Max. weight includes the generator set (wet) with the largest alternator option, enclosure, silencers, lift base, and tank (no fuel).

‡ Log average sound pressure level of 8 measured positions around the perimeter of the unit at a distance of 7 m (23 ft.). Refer to TIB-114 for details. Enclosed generator set sound data for some models was not available at time of print.

§ An additional 940 mm (37 inches) of clearance on each side for opening and closing the access doors is recommended.

NOTE: If the Est. Fuel Supply Hours column shows more than one number, the numbers represent each model in that range.

Enclosure and Subbase Fuel Tank Specifications, continued

Fuel Tank Capacity, L (gal.)	Est. Fuel Supply Hours at 60 Hz with Full Load (nominal)	Max. Dimensions, mm (in.)			Max. Weight, † kg (lb.)	Fuel Tank Height, mm (in.)	Sound Pressure Level at 60 Hz with Full Load, dB(A) ‡
		Length	Width §	Height			
KD2000/2250/2500 SL1 Sound Enclosure with Internal Silencers and State Code Subbase Fuel Tank *							
Lifting Base	0	10774 (424)	3488 (137)	4141 (163)	33073 (72909)	—	90
8577 (2266)	15/14/13	11465 (451)		4522 (178)	40485 (89252)	381 (15)	
14130 (3733)	25/22/22			4700 (185)	41216 (90861)	559 (22)	
16451 (4346)	29/26/25			4776 (188)	41497 (91483)	635 (25)	
KD2000/2250/2500 SL2 Sound Enclosure with Internal Silencer and State Code Subbase Fuel Tank *							
Lifting Base	0	12766 (503)	3488 (137)	4141 (163)	35121 (77426)	—	78
8577 (2266)	15/14/13	13491 (531)		4522 (178)	42533 (93766)	381 (15)	
14130 (3733)	25/22/22			4700 (185)	43264 (95378)	559 (22)	
16451 (4346)	29/26/25			4776 (188)	43545 (95997)	635 (25)	
KD2500-4 SL2 Sound Enclosure with Internal Silencer and State Code Subbase Fuel Tank ▲⁂							
14130 (3733)	21	13491 (531)	3488 (137)	4907 (193)	43583 (96084)	559 (22)	78

* Data in table is for reference only. Height includes enclosure, lift base, and tank (if equipped). Refer to your authorized Kohler distributor for enclosure and sub-base fuel tank specification details.

▲ Tier 4 generator enclosure height includes the lift base, tank, and enclosure up to the exhaust flange. The height does not include the exhaust collector, SCR, or the SCR inlet and outlet pipes.

⁂ Tier 4 generator enclosure weight includes the DEF tank but does not include the exhaust collector, SCR, or SCR inlet and outlet pipes.

† Max. weight includes the generator set (wet) with the largest alternator option, enclosure, silencers, lift base, and tank (no fuel).

‡ Log average sound pressure level of 8 measured positions around the perimeter of the unit at a distance of 7 m (23 ft.). Refer to TIB-114 for details. Enclosed generator set sound data for some models was not available at time of print.

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NOTE: If the Est. Fuel Supply Hours column shows more than one number, the numbers represent each model in that range.

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Enclosure and Subbase Fuel Tank Specifications, continued

Fuel Tank Capacity, L (gal.)	Est. Fuel Supply Hours at 60 Hz with Full Load (nominal)	Max. Dimensions, mm (in.)			Max. Weight, † kg (lb.)	Fuel Tank Height, mm (in.)	Sound Pressure Level at 60 Hz with Full Load, dB(A) ‡
		Length	Width §	Height			
KD2000/2250/2500 SL1 Sound Enclosure with Internal Silencers and State Code Subbase Fuel Tank *							
Lifting Base	0	10774 (424)	3488 (137)	4141 (163)	33073 (72909)	—	90
8577 (2266)	15/14/13	11465 (451)		4522 (178)	40485 (89252)	381 (15)	
14130 (3733)	25/22/22			4700 (185)	41216 (90861)	559 (22)	
16451 (4346)	29/26/25			4776 (188)	41497 (91483)	635 (25)	
KD2000/2250/2500 SL2 Sound Enclosure with Internal Silencer and State Code Subbase Fuel Tank *							
Lifting Base	0	12766 (503)	3488 (137)	4141 (163)	35121 (77426)	—	78
8577 (2266)	15/14/13	13491 (531)		4522 (178)	42533 (93766)	381 (15)	
14130 (3733)	25/22/22			4700 (185)	43264 (95378)	559 (22)	
16451 (4346)	29/26/25			4776 (188)	43545 (95997)	635 (25)	
KD2500-4 SL2 Sound Enclosure with Internal Silencer and State Code Subbase Fuel Tank ▲⁂							
14130 (3733)	21	13491 (531)	3488 (137)	4907 (193)	43583 (96084)	559 (22)	78

* Data in table is for reference only. Height includes enclosure, lift base, and tank (if equipped). Refer to your authorized Kohler distributor for enclosure and sub-base fuel tank specification details.

▲ Tier 4 generator enclosure height includes the lift base, tank, and enclosure up to the exhaust flange. The height does not include the exhaust collector, SCR, or the SCR inlet and outlet pipes.

⁂ Tier 4 generator enclosure weight includes the DEF tank but does not include the exhaust collector, SCR, or SCR inlet and outlet pipes.

† Max. weight includes the generator set (wet) with the largest alternator option, enclosure, silencers, lift base, and tank (no fuel).

‡ Log average sound pressure level of 8 measured positions around the perimeter of the unit at a distance of 7 m (23 ft.). Refer to TIB-114 for details. Enclosed generator set sound data for some models was not available at time of print.

§ An additional 940 mm (37 inches) of clearance on each side for opening and closing the access doors is recommended.

NOTE: If the Est. Fuel Supply Hours column shows more than one number, the numbers represent each model in that range.

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