Appendix J

Water Supply Assessment Reports

J1

Water Supply Memorandum

CITY OF RIO VISTA

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MEMO

To: Krystine Ball, City of Rio Vista

From: Cecil Dillon, City Engineer

Date: July 24, 2024

RE: Brann Ranch Project Analysis

This document is for informational purposes only.

I am attaching three documents that describe the City of Rio Vista's on going management and planning for their existing and future water systems. The first document, 2020 Urban Water Management Plan, Revision 1 submitted May 6, 2022, is a state mandated plan that is updated every five years. This plan indicates the measures taken by the City to ensure they will continue to have a reliable water source and infrastructure.

The second document, Water Supply Assessment for the Brann Ranch Project, was prepared specifically to determine the current and future water demands of the proposed project. The analysis determined that the water supply will meet the Brann Ranch Project water demands.

The third document, ENGEO Groundwater Elevation Data Report through December 2023, is an annual report. Over the past 20 years the City's ground water levels have remained stable with typical seasonal fluctuations. The annual water demand has increased with no significant effect on the ground water levels.

The City has two wells that require treatment to reduce the arsenic levels. Well 10 has an onsite filtration system that removes arsenic to acceptable levels before the source water enters the public distribution system. The water at Well 14 requires mixing with the water from Well 11 in a 2 million gallon storage tank. The blended water has acceptable arsenic levels and is discharged into the public distribution system.

The City has water conservation measures in place due to the State mandated Water Conservation Regulations. The City's current Landscape Ordinance follows required Regulations and any water use notices sent out are due to noncompliance with the Landscape Ordinance. These measures are required by the State and are not a result of the City's water supply.

The City of Rio Vista's water wells draw groundwater from the Sacramento Valley Groundwater Basin. The average depth of the pumped groundwater is 200 feet to 550 feet below the ground. As the ENGEO annual reports show the ground water depth has been stable for the past 20 years. Private wells located outside of the City limits are typically not as deep as the City wells and draw water from different zones. The shallow wells can be effected by seasonal variations and droughts.

In 2010 the City initiated a water CIP program to replace old and undersized water system infrastructure. Approximately 80% of the antiquated water system has been replaced. The current water distribution system is in excellent condition.

In summary the City of Rio Vista's water system is well maintained and capable to accommodate the proposed Brann Ranch Project.

J2

2020 Urban Water Management Plan

CITY OF RIO VISTA
2020 URBAN WATER MANAGEMENT PLAN

ADOPTED JUNE 16,2021
SUBMITTED JULY 1, 2021
REVISION 1 SUBMITTED MAY 6, 2022



PREPARED FOR:
THE CITY OF RIO VISTA
PUBLIC WORKS DEPARTMENT

PREPARED BY:

DILLON & MURPHY
ENGINEERING

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APPENDIX A: (notices)

- DWR Submission
- Notice of Hearing Document & article
- Notice to City and County Agencies
- Resolution of UWMP Adoption

APPENDIX B: (drought info)

- DWR Bulletin 118
- CA Drought Declaration Document

APPENDIX C: (climate info)

- CIMIS Monthly Evapotranspiration Data
- Adapt.org Climate Projections

Appendix D: (water system)

- Water Service Area Map
- ENGEO Water Well Supply Data
- ENGEO Water Well Monitoring Contract
- NV5 Water System Evaluation Table 3-2
- NV5 Water System Evaluation Figure 3-3
- Kennedy Jenks Technical Memorandum SCWA – Partner Agency 2020-2045 Population Projections

Appendix E: (required tables)

- 2020 UWMP Urban Water Submittal Tables
- 2020 SBX 7-7 Tables
- Energy Use Tables

Appendix F:

- Rio Vista Land Use Exhibit
- City Code related to Landscape Conservation Ordinance 643
- *Water Conservation for Rio Vista*, Rio Vista Beacon, May 15, 2013.
- *Water Conservation and Education Information*, Tri-fold Brochure, 2013.
- Why Are Those Fire Hydrants Dripping Water, News Release
- Arsenic Protection for Your Drinking Water, News Release
- *Upgrading Rio Vista's Water Delivery System*, Rio Vista Beacon, September 4, 2013.
- *City of Rio Vista Water Meter Retrofit Cost/Benefit Analysis*, Preliminary Report, MC Engineering, October 1, 2012
- DMM A Water Survey Program *CBA*
- DMM F High Efficiency Washing Machine Rebate Program *CBA*
- DMM H School Education Program *CBA*
- DMM N High Efficiency toilet Replacement Program *CBA*

- *Ordinance No. 006-2015*
- *Ordinance No. 643*
- *City of Rio Vista Water Conservation Urgency Ordinance Section 3 Section 17.68.025*
- *Ordinance No. 02-2014*
- City of Rio Vista NWWWTF Recycled Water Use Feasibility, January 21, 2013

CHAPTER 1: INTRODUCTION AND OVERVIEW

1.1 Introduction

The Urban Water Management Plan will address the following water-planning fundamentals:

a) Prepare a detailed look at current and future water use, including assessing and error-checking available baseline data and examining long-term planning documents like municipalities' General Plans and Specific Plans.
b) Analyze potable water supplies, including reviewing water rights and contracts, assessing water deliveries, ascertaining restrictions on water availability under certain regulatory and hydrological conditions, and other opportunities or limitations explained in documentation for each water supply.
c) Analyze water supply reliability by integrating the water use analyses with the water supply analyses to provide a water service reliability picture under normal conditions, single dry- year conditions, and five consecutive dry years through at least 2040.
d) Prepare a realistic Drought Risk Assessment by including integrated water supplies and projected water use in a hypothetical five-year drought condition; and
e) Develop an effective Water Shortage Contingency Plan that specifies opportunities to reduce demand and augment supplies under numerous, and even unpredictable, water shortage conditions.

1.2 Lay Description

The City's water supply is provided 100% by ground water. The groundwater has been monitored for the past 20 years. The result of the ground water monitoring has indicated the water source is very stable and not declining. Since the first UWMP in 2010 the City has reduced their per capita water usage substantially. The reduction in water usage can be attributed to many causes including, consumer education, water consumption ordinances, installation of water meters and on-going water CIP program that has replaced aged and failing pipelines. If unexpected water concerns arise the City has numerous management strategies as outlined in the UWMP to mitigate potential problems. The City has a very reliable water source. The City also has the knowledge and the systems in place to ensure the water system continues to operate reliably in the future.

CHAPTER 2: PLAN PREPARATION

2.1 Plan Preparation

Water Code sections 10620 and 10621 require all "urban water suppliers" to prepare and adopt an urban water management plan and to update that plan every five years.

2.2 Basis for Preparing A Plan

The City of Rio Vista (City) qualifies as an urban water supplier as defined in California Water Code section 10617 because the City is a public agency directly providing water for municipal purposes to more than 3,000 customers. Accordingly, the City has prepared this Urban Water Management Plan (UWMP).

This UWMP has been prepared in conformance with the California Urban Water Management Planning Act, Water Code section 10610 et seq. (UWMP Act). In Water Code section 10610.4 of the Act, the Legislature declared:

a) The management of urban water demands and efficient use of water shall be actively pursued to protect both the people of the state and their water resources.

b) The management of urban water demands and efficient use of urban water supplies shall be a guiding criterion in public decisions.

c) Urban water suppliers shall be required to develop water management plans to achieve the efficient use of available supplies and strengthen local drought planning.

The Legislature has amended the UWMP Act several times, most recently in 2018. The 2018 amendments added several additional requirements and elements to urban water management plans. As these amendments signify, urban water management is an increasingly complex field and can be very costly depending on the technology and precision desired. However, the level of precision and sophistication required by a particular water supplier depends largely on the size of the water service area and the complexity of the water supplies and infrastructure used to acquire, store, treat, and convey those supplies to individual water users within that supplier's service area. In general, the larger and more diverse a water supplier's system, service area, and population are, the more cost and effort required and invested in water planning. The Legislature recognized this reality by stating that its intent in enacting the UWMP Act was "to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied" Water Code § 10630.

See table 2-1 & 2-2 in Appendix E.

2.3 Regional Planning

Not applicable to the City.

2.4 Individual Reporting and Compliance

The City has developed an individual UWMP that reports solely on its distribution service area. Individual UWMPs address all requirements of the Water Code including water use targets and baselines (for SB x7-7 Water Conservation Act of 2009 reporting). The City has notified and coordinated with appropriate regional agencies and constituents.

2.5 Calendar Years and Units Of Measure

The City uses calendar year for reporting.

The City uses acre-feet when reporting water volumes.

See table 2-3 in Appendix E.

2.6 Coordination and Outreach

During the preparation of the 2020 UWMP, the City noticed surrounding cities, counties, and utility districts 60 days prior to a public hearing for the 2020 UWMP. The City notified the public via newspaper article with date of hearing and location of draft UWMP.

See Supporting Documents and Correspondence in Appendix A and Table 10-1 in Appendix E.

CHAPTER 3: SYSTEM DESCRIPTION

3.1 Service Area Description

The City of Rio Vista is located 48 miles southwest of Sacramento and 65 miles northeast of San Francisco. The City was incorporated on December 30, 1893. There are currently 4,225 acres of land within the City's water service boundary, of which 2,213 are currently developed.

The City provides a small-town atmosphere that includes a mix of rural and suburban lifestyles but provides easy access to the larger urban amenities found in San Francisco and Sacramento. Rio Vista lies on the banks of the Sacramento River and is an easy drive to the Napa Wine Country, Sierra ski resorts, and Lake Tahoe.

In addition to the town proper, the City's Planning Area includes unincorporated surrounding areas located within the City's sphere of influence. These unincorporated areas may, in the future, request services from, or annexation to the City. The City's full planning area includes approximately 4,225 acres of unincorporated land.

3.2 Service Area Boundary Maps

See Water Service Boundary Map in Appendix D.

3.2 Service Area Climate

Table 3-1 shows climate information for the past 10 years in Rio Vista, CA. The table includes yearly rainfall and average temperatures. The information comes from the California Irrigation Management Information System (CIMIS). The station used is Twitchell Island – San Francisco Bay Station 140.

Table 3-1: Rio Vista Climate Data Summary

YEAR	TOTAL RAINFALL PERCIPITATION (INCHES)	AVERAGE TEMPERATURE (F)
2010	18.4	58.3
2011	13.5	57.1
2012	17.4	59.3
2013	5.4	59.7
2014	16.5	61.9
2015	5.9	60.8
2016	17.2	61.2
2017	10.6	61.6
2018	16.5	60.9
2019	19.1	61.2
2020	5.7	62.5

SOURCE: CLIMIS.WATER.CA.GOV STATION 140 - TWITCHELL ISLAND

See Appendix C for monthly CIMIS data.

3.3 Service Area Population

Water Code section 10631(a) requires projected population estimates in five-year intervals. Submittal Table 3-1 in Appendix E presents the current and projected population of the City through 2045. As indicated, between 2020 and 2045, the City's population is expected to increase from approximately 10,000 to 14,850 residents. The City obtained these population estimates from Solano County Water Agency Technical Memorandum dated 27 April 2021. These estimates were obtained from the City of Rio Vista DoF Projected Populations (MODIFIED). See Appendix D for Technical Memorandum.

Solano County requires that any urban development be annexed to a city (Solano County Orderly Growth Initiative, 1994). There are no urban populations in the unincorporated areas of Solano County.

3.4 Land Use Within Service Area

Rio Vista has 9 land use districts (land use designations) as defined by the Rio Vista General Plan 2001 as:

1. Neighborhood Core
2. Neighborhood Service/Mixed Use
3. Neighborhood Residential
4. Existing City Districts

5. Residential Estate
6. Agricultural
7. Industrial/Employment
8. Special District
9. Public Facilities

The City's water service area is comprised of the above 9 land use districts. The City does not foresee additional land use districts being created for future developments or expansions.

See Appendix F for Rio Vista Land Use.

CHAPTER 4: WATER USE CHARACTERIZATION

4.1 Non-Potable Water Versus Potable Water Use

The City does not supply non-potable water. All water use is considered potable water.

4.2 Past, Current, And Projected Water Use By Sector

Water Code section 10635 requires as assessment of the reliability of water service to customers during normal, dry, and multiple dry years. The City has projected water use in five-year increments up to 2045.

4.2.1 Water Use Sectors

The following water use sectors are applicable:

Single-Family Residential
Multi-Family
Commercial
Industrial
Landscape
Distribution System Water Loss

The following water use sectors are non-applicable:

Institutional and governmental
Sales to other Agencies
Saline water intrusion barriers, groundwater recharge, or conjunctive use
Agricultural

4.2.2 Water Use Sectors in Addition To Those Listed In Water Code

Not applicable. The City only uses the above water use sections.

4.2.3 Past Water Use

See Table 4-1 on following pages for 2006-2020 water use.

Table 4-1: Past Water Use

PAST WATER USE	
YEAR	TOTAL AMOUNT OF WATER USED IN SYSTEM
2006	2539
2007	2993
2008	3177
2009	2516
2010	2419
2011	2238
2012	2185
2013	2442
2014	2658
2015	1793
2016	2007
2017	2117
2018	2083
2019	2129
2020	2025

The above table includes the normal year (2009), the 3 driest years on record (2013, 2015, & 2020), and the 5 consecutive driest years on record (2013-2017).

4.2.4 Distribution System Water Loss

The City's distribution system water loss for the year 2020 was 78 acre-feet. This was calculated from the "water losses" AWWA worksheet.

See Submittal Table 4-4 in Appendix E for the past 5 year distribution system water loss and Submittal Table 4-2 in Appendix E for projected distribution system water loss every 5 year until 2045.

4.2.5 Current Water Use

The actual 2020 water use was 181 GPCD. The City supplied 2025-acre feet to 5,379 municipal connections. The 2020 population of Rio Vista was 9,987.

See Submittal Table 4-1 in Appendix E for current 2020 water use.

4.2.6 Projected Water Use

The City has projected its water use until 2045.

The City commissioned NV5 to prepare a 2019 Water System Evaluation. The report evaluated the existing water system and its ability to meet existing water demands with current water supply. It also projected future water demands in the City.

The City has projected the future water use using 194 GPCD and multiplying that by the population estimates. The projected rate was developed in the 2019 Water System Evaluation.

The City's water use projections do not include future water savings from codes, standards, ordinances, or transportation and land use plans.

The City's Water Year Types:
Normal year - 2009
Single Dry year – 2015 (Even though 2013 was the driest year on record, 2015 had the least amount of water used.)
Five-consecutive year drought – 2013-2017 (lowest average water use in a 5-year period.)

See Submittal Table 4-2 in Appendix E for projected water use.

4.2.7 Characteristic Five-Year Water Use

See Table 4-2: Future Water Use below that projects the next 5 year water use under normal conditions and under drought year conditions. The City has reduced its water use in 2020 to the same GPCD that was used during the second driest year (2015) in the 5 year drought period. This reduction shows that the City is achieving less water use during drought years.

Table 4-2: Future Water Use

FUTURE WATER USE NEXT 5 YEARS					
		UNCONSTRAINED (NORMAL CONDITIONS)		CONSTRAINED (DROUGHT CONDITIONS)	
YEAR	POP	ACFT	GPCD	ACFT	GPCD
2021	10187	2214	194	2214	194
2022	10387	2257	194	2176	187
2023	10587	2301	194	2146	181
2024	10787	2344	194	2127	176
2025	10987	2388	194	2092	170

4.3 Worksheets and Reporting Tables

See Appendix E for submittal tables.

4.4 Water Use for Lower Income Households

Water code 10631.1 requires inclusion of lower income households in the projected water use. The city has included the projected water use for lower income households in this UWMP. A lower income household has an income below 80 percent of area median income, adjusted for family size. The City has 5.5-9.3% poverty according to the Census Website. The City includes all households in there estimations regardless of income.

See Submittal Table 4-5 in Appendix E for confirmation of inclusion in water use projections.

4.5 Climate Change Considerations

Water Code 10630 requires accounting for impacts from climate change. 2020 was the second driest year on record according to the precipitation amounts in Appendix C. The City analyzed climate change projections from CAL-Adapt.org as a part of the projected water use and demands. See Appendix C for climate projections.

The City reduced their water use to below the projected 80% 2020 target of 248 GPCD. The actual water used was 181 GPCD. The City reduced its water use to the same daily per capita level it was in 2015, the least amount of water used since 2006.

CHAPTER 5: SBX7-7 BASELINES, TARGETS, AND 2020 COMPLIANCE

5.1 Guidance for Wholesale Suppliers

This section does not pertain to the City as we are not wholesalers.

5.2 SBX7-7 Forms and Summary Tables

See Appendix E for SBX7-7 verification form and SBX7-7 2020 Compliance Form.

See Appendix E for submittal tables 5-1 & 5-2.

5.3 Baseline and Target Calculations for 2020 UWMP

Target method 1 – 80 percent of baseline was used for the 2015 UWMP and is used for the 2020 UWMP.

The City did not encounter any of the situations described in the Methodology Guidebook section 4.

5.4 Methods for Calculating Population and Gross Water Use

Appendix P of the UWMP Guidebook was used in determining the general requirements for baseline periods, baseline GPCD, Target confirmation, and 2020 Target.

5.4.1 Service Area Population

The service area population is based off Solano County Water Agency Technical Memorandum SCWA – Partner Agency 2020-2045 Population Projections dated April 27 2021. See Appendix D for Technical Memorandum.

5.4.2 Gross Water Use

The City uses calendar years. The period used to calculate the 2020 gross water use was January 2020 – December 2020.

No exclusions or deductions were made to the gross water total.

5.5 2020 Compliance Daily Per Capita Water Use (Gpcd)

80% water reduction 2020 compliance was determined to be 248 GPCD from the 2015 UWMP.

The City's actual 2020 use was 181 GPCD. The City meets the 2020 compliance. The City reduced its water use to 58% of the 10-15 year baseline (310 GPCD) calculated in the 2015 UWMP.

The City did not use any adjustments for the 2020 gross water total.

5.6 Regional Alliance

The City is not part of a regional alliance. This section is not applicable.

CHAPTER 6: WATER SUPPLY CHARACTERIZATION

6.1 Water Supply Analysis Overview

The City of Rio Vista water distribution system consists of pipes ranging from 4-inch to 16-inch in diameter. There are currently 6 active groundwater wells and 2 storage tanks in service. See Appendix D – NV5 Water System Evaluation Figure 3-3 for a schematic of the existing water distribution system. Groundwater from the Solano sub-basin is the sole source of water supply for the City since 1893.

6.1.1 Specific Analysis Applicable to All Water Supply Sources

The City has 10 groundwater wells and currently only 6 actively supply water to the distribution system. Well 16 is the newest well and is currently under construction for arsenic treatment. Once the construction is complete the well will be able to supply water to the system. Similarly, Well 14 is only operated when the water can be blended with Well 11. Wells 7, 8 and 12 are out of service and rehabilitation is not actively being considered. Each well includes a chlorination pump and are equipped with diesel electric generators onsite. All wells are equipped with supervisory control and data acquisition (SCADA) system controls. Logic controls turn pumps ON and OFF based on local pressures. See Appendix D – NV5 Water System Evaluation Table 3-2 for a summary of the existing wells including capacity, installation date, and depths of the existing wells.

Rio Vista does not import, or export surface water supplies at this time, and it expects to rely on groundwater for the future planning horizon of this UWMP.

However, it is important to note that other water supply options are available to the City if needed in the future or in an emergency. Future water sources may include additional wells, recycled water, the Sacramento River, and purchased water from the North Bay Aqueduct (NBA). For the City to utilize the NBA an agreement with the Solano County Water Agency (SCWD), which controls the NBA water in Solano County, for access to the NBA for supplemental water source would have to be acquired. However, because Rio Vista is a significant distance from the NBA facility, it is more likely the City would exchange its rights to that water for additional Sacramento River water if needed.

See Submittal Table 4-3 in Appendix E.

6.1.2 Other Characterizations Considerations

See Appendix D NV5 Water System Evaluation Figure 3-3 showing the City's water system.

6.2 Narrative Sections for Suppliers UWMP Water Supply Characterization

6.2.1 Purchased or Imported Water

The City does not purchase or import water. This section is not applicable.

6.2.2 Groundwater

The City relies on groundwater for its primary source of water. Water code section 10631(b)(4) requires a detailed description of groundwater source, sustainability, locations, and projected pumping. See Appendix D – NV5 Water System Evaluation Table 3-2 for a summary of the existing wells including capacity, installation date, and depths of the existing wells.

6.2.2.1 Basin Descriptions

The City draws its water supply from the Solano sub-basin (5-021.66) at the southeastern limit of the Sacramento Valley Groundwater Basin (5-021). This groundwater basin is currently not adjudicated.

The Solano sub-basin is bounded by the Sacramento River to the east, Putah Creek on the north, and the North Mokelumne and San Joaquin rivers on the south and southeast. The western edge of the basin is defined by the hydrologic divide between the Sacramento River and the San Francisco Bay drainages. The Suisun-Fairfield groundwater basin lies immediately to the west of the Solano sub-basin. The Solano sub-basin also contains at least two distinct freshwater- bearing zones: an upper alluvial layer, ranging from 60-130 feet thick; and the thicker Tehama formation, which provides most of the groundwater used in the area. Additional saline water- bearing formations underlie the Tehama formation. Primary waterways in and bordering the basin include the Sacramento, Mokelumne, and San Joaquin Rivers, the Sacramento River Deep Water Ship Channel, and Putah Creek.

Wells in the upper alluvium can provide substantial yields when situated near the Sacramento River; otherwise, these shallower wells can be relatively low yielding. Most wells in the Solano sub-basin tap the Tehama formation, which ranges from 1,500-2,500 feet thick, and can also provide very high yields of several thousand gallons per minute per well. The USGS has developed some localized groundwater yield and storage estimates, although those estimates do not apply to the full Solano sub-basin or the Tehama formation within Solano County. Appendix A provides the full Solano groundwater sub-basin description, from DWR's Bulletin 118. The subbasin is not listed over drown.

The Solano sub basin is comprised of five Groundwater Sustainability Agencies (GSA): City of Vacaville GSA, Northern Delta GSA, Sacramento County GSA, Solano Irrigation District GSA, and the Solano Subbasin GSA. The City of Rio Vista is a member of the Solano Subbasin GSA. The City is engaged in groundwater monitoring and study efforts as a participant of the GSA. The Solano Subbasin GSA is currently in the process of developing a Ground Water Sustainability Plan (GSP). The GSP is anticipated to be completed and adopted by January 31, 2022.

In addition, some rural residential landowners have individual shallow groundwater wells that serve their domestic needs. The SCWA Integrated Regional Water Management Plan (IRWMP) estimates the groundwater basin supply to be 23,300-acre feet annually (AFA).

6.2.2.2 Multiple Groundwater Basins

The City does not use multiple groundwater basins.

6.2.2.3 Other Considerations

There are no other considerations at this time.

6.2.2.4 Past Five Years

See Submittal Table 6-1 in Appendix E for the past 5-year volume pumped data.

6.2.3 Surface Water

The City does not use surface water as a water source.

6.2.4 Stormwater

The City does not use stormwater as a water source.

6.2.5 Wastewater and Recycled Water

Water Code Section 10633 requires information on recycled water and its potential for use as a water source in the service area of the urban water supplier.

6.2.5.1 Recycled Water Coordination

Because of the City's small size and the relatively abundant groundwater supplies that it has enjoyed, there has been little effort historically to develop or utilize recycled water. The City has considered and would be amenable to recycled water use in the future. The City of Rio Vista has two wastewater treatment plants, the Beach WWTP located at 1000 Beach Drive and the Northwest WWTP located at 3000 Airport Road.

6.2.5.2 Wastewater Collection, Treatment, and Disposal

Beach Facility Description

The Beach Wastewater Treatment Facility is owned by the City of Rio Vista. The U.S. Army Corps of Engineers owns the property and has granted the City of Rio Vista a right of way in order to operate and maintain its sewage treatment and pumping facility on this property. The 0.65 MGD treatment system consists of bar screening and grit removal, two primary clarifiers, two activated sludge reactors, two secondary clarifiers, and chlorination / de-chlorination for disinfection. Sludge is dewatered by belt filter press dewatering followed by solar greenhouse drying to Class A bio-solids quality. Wastewater effluent is discharged through an outfall at Discharge Point No. 001, 77 feet offshore in the Sacramento River, a water of the United States, within Sacramento-San Joaquin Delta.

Northwest Facility Description

The Northwest Wastewater Treatment Facility is owned by the City of Rio Vista. The facility was constructed to provide wastewater treatment for an adult community development (Trilogy) and other new housing developments. The 1 MGD design treatment system consists of fine screenings, followed by activated sludge treatment via anoxic and aerobic basins, followed by membrane biological reactors (MBR) which separate the liquid from the solids. The effluent from the MRBs is disinfected using ultraviolet light. The sludge dewatered by belt filter press dewatering followed by solar greenhouse drying to Class A bio-solids quality. Wastewater effluent is pumped via approximately a 2-mile pipeline and discharged through an outfall at Discharge Point No. 001, approximately 200 feet offshore into the Sacramento River, a water of the United States, within Sacramento-San Joaquin Delta.

Neither plant has the infrastructure to deliver recycled treated wastewater at this time.

Information for the volumes of effluent treated can be found in Submittal Table 6-3 in Appendix E. No water from these two treatment facilities is currently being recycled and used within the service area boundaries. All treated water is currently discharged into the Sacramento River.

Potential recycled water customers exist in the City and surrounding areas. In the future, the City hopes to develop these opportunities if they are cost effective. For instance, local agriculture would be the largest potential user of recycled water. Other potential applications for recycled water include green belts and common areas in large developments as they are built. For instance, the Trilogy and Liberty development is intended to be the primary users of recycled water. Infrastructure has been installed; however, more development will be needed to fully implement the usage of non-potable recycled water at that location and future locations around the City.

The City currently does not have the funding to develop all possible recycled water infrastructure but is actively seeking and will continue to seek out innovative funding and grant opportunities from private and government sources.

6.2.5.3 Recycled Water Description

The City does not currently use recycled water as a water source.

6.2.5.4 Potential, Current, and Projected Recycled Water Uses

The City is currently planning on upgrading their UV system at the NWTF to meet title 22 requirements, after which it could supply its effluent to be used for landscape and irrigation. This would also require an expansion of the recycled water distribution infrastructure, which currently goes to the Trilogy and Liberty developments. There is no timeframe on the anticipated upgrading of the system.

6.2.5.5 Actions to Encourage and Optimize Future Recycled Water Use

The City has considered and would be amenable to recycled water use in the future. Starting in the early 1990's all developments have required dedicated recycled water lines for future use. Due to funding constraints the use of recycled water is not currently an option for the City to reduce its overall water use.

6.2.6 Desalinated Water

The City is not located near a supply of water high in total dissolved solids (TDS) that would warrant or allow for the development of a desalination facility; therefore, desalinated water is not feasible and is not discussed further in this plan.

6.2.7 Water Exchanges and Transfers

Being surrounded by agricultural land, there are no active municipal water supply systems adjacent to the city. Transfer and exchange opportunities are, therefore, limited.

6.2.7.1 Exchanges

The City does not have any water exchanges.

6.2.7.2 Transfers

As a member of the Solano County Water Authority, the City of Rio Vista eventually will hold rights to up to 1,600-acre feet of water from the North Bay Aqueduct (NBA). It is important to note that the 1,600-acre-foot value is a maximum amount that would vary depending on hydrology and State Water Project (SWP) allocation. Currently, the SWP estimates that on average it can deliver approximately 60-70 percent of full contractual amounts. (See SWP Reliability Report issued by DWR.) However, the City's location is some distance from an available NBA connection. This makes it

unlikely that the City will use the NBA as a direct source of water supply because the cost to construct intertie and conveyance facilities would be very costly considering the City's population and funding. However, the possibility exists for the City to make use of the surface water by constructing a groundwater recharge project or an agreement to transfer or exchange this contractual water right for Sacramento River water diversions with the Solano County Water Agency or another entity within its service area. Even in such a scenario, the City would need to develop infrastructure to recharge or divert and use the Sacramento River water. Because of the additional costs of infrastructure and the fact that the City's existing groundwater supplies are considered adequate to provide reliable water supplies throughout the planning horizon of this UWMP, these additional supplies are not needed to meet future, projected demands. These opportunities for additional supplies are mentioned here in the spirit of full disclosure and compliance with the UWMP Act, and for purposes of documenting that if an emergency need arises, or if future City water demands unforeseeably increase substantially above those projected here, the NBA or Sacramento River supplies could be developed. In an emergency, the costs of temporary infrastructure would likely be less than permanent facilities and funding could be provided by the state or federal government.

6.2.8 Future Water Projects

At this time, the City has no projects for the development of additional water supply planned. The current array of wells is expected to meet short-term water demands. However, as demands increase, the City will monitor existing groundwater well production and capacity and construct additional wells if needed to satisfy future demands in the service area. The City's 2003 Water Master Plan projected that approximately 15 wells would be required to meet future full planned growth and development. This would involve adding 9 1,000 gpm wells to the City's existing system. As mentioned earlier, the City has contracted for ongoing well and groundwater monitoring and reporting with ENGEO, Incorporated.

See Submittal Table 6-7 in Appendix E.

6.2.9 Summary of Existing and Planned Sources Of Water

6.2.9.1 Description of Supplies

The City uses groundwater as their supply. The City does not use any other sources at this time.

6.2.9.2 Quantification of Supplies

The City commissioned *ENGEO Incorporated* to prepare a 2002 report titled *Groundwater Evaluation for Rio Vista*. The report reevaluated the groundwater basin in and around the City limits to help determine the future capability of providing water for existing and planned developments. The report concludes that the groundwater basin will likely meet the future groundwater demands established by the projected population growth for the next 20 years. Monitoring the static and pumping levels of the

wells in order to better understand the impacts of the increased demand on the aquifer is recommended. Since February 2005, the City has contracted with ENGEO to collect and analyze well monitoring data. Over 60 months of well data have been collected and synthesized. This monitoring indicates that groundwater levels at various wells may fluctuate during particular months or seasonally according to the City's operational use of its array of wells, but that overall, well levels and trends remain stable. In addition, an updated groundwater report was developed in 2016 that concluded that groundwater levels are stable and not declining, consistent with previous investigations. This is noteworthy since the basin has experience drought conditions from 2011-2015. More data on this monitoring effort is reported below and in Appendix D. Analysis of each individual well shows that GWE drawdown and static GWE make quick recoveries (about 4-5 months depending on the amount pumped), preventing against problems associated with rapid seasonal or climactic changes. Furthermore, the City of Rio Vista contracted *ENGEO* in 2016 to complete a well water piezometer monitoring program to further ensure proper groundwater sustainability practices. Additionally, the City contracted with NV5 in 2017 for a Water System Evaluation.

California Bulletin 118 discusses the Solano sub-basin in detail. There is currently no calculated groundwater budget for the Solano sub-basin. A groundwater management plan has not been prepared for the Solano groundwater sub-basin. California Bulletin 160, *California Water Plan Update 2016* also provides no indication that the basin is in overdraft conditions.

Supplies were calculated using the target 2020 GPCD. This was multiplied by the projected populations.

See Submittal Table 6-9 in Appendix E for projected water supply quantification.

6.2.10 Special Conditions

6.2.10.1 Climate Change Impacts

Using data and projections listed in previous section 3.4 & 4.5 the City incorporated Climate Change impacts into their water demand and use predictions.

6.2.10.2 Regulatory Conditions

Not Applicable.

6.2.10.3 Other Locally Applicable Criteria

Not applicable.

6.3 Submittal Tables

The following Submittal Tables can be found in appendix E.

6.3.1 Submittal Table 6-1: Groundwater Volume Pumped

6.3.2 Submittal Table 6-2r: Wastewater Collected Within Service Area In 2020

6.3.3 Submittal Table 6-3r: Wastewater Treatment and Discharge Within Service Area In 2020

6.3.4 Submittal Table 6-4: Recycled Water in Service Area

6.3.5 Submittal Table 6-5: 2015 Recycled Water Use Projected Compared To 2020 Actual

6.3.6 Submittal Table 6-6: Methods To Expand Future Recycled Water Use

6.3.7 Submittal Table 6-7: Expected Future Water Supply Projects Or Programs

6.3.8 Submittal 6-8: Water Supplies – Actual

6.3.9 Submittal 6-9: Water Supplies – Projected

6.4 Energy Intensity

See Table O-1a in Appendix E.

The City currently uses 756.2 kWh/MG of energy to run its water system.

CHAPTER 7: WATER SERVICE RELIABILITY AND DROUGHT RISK ASSESSMENT

7.1 Introduction

Water service reliability reflects the City's ability to meet the water needs of its customers, including end-use customers and retail urban suppliers, with water supplies under varying conditions. The City's UWMP will consider the reliability of meeting customer water use by analyzing plausible hydrological variability, regulatory variability, climate conditions, and other factors that affect a Supplier's water supply and its customers' water uses.

The City has completed their water meter project. All water supply customers are now metered. The City has a Capital Improvement Program (CIP) that replaces the existing water system infrastructure. The program is funded through a monthly fee that consumers pay.

7.2 Water Service Reliability Assessment

Water Code 10635 (a) requires Every Supplier must provide their expected water service reliability for a normal year, single dry year, and five consecutive dry years projections for 2025, 2030, 2035, and at least through 2040.

7.2.1 Constraints on Water Sources

See section 6.2.9.2 – quantification of supplies for a more detailed description of the City's groundwater reliability. The City sources its water from Solano sub-basin. Currently there are not anticipated constraints on the Solano sub-basin. The Solano sub-basin is not subject to critical conditions of overdraft per CA DWR Bulletin 18 (interim update 2016). Climate change impacts were incorporated in our review of water qualifications. Section 3.5 lists data and projections used.

7.2.2 Year Type Characterization

7.2.2.1 Types of Years

Normal year - 2009

Single Dry year – 2015

Five-consecutive year drought – 2013-2017

7.2.2.2 Sources of Water Data

Historic water precipitation was downloaded from CIMIS. Yearly precipitation totals were downloaded for station 140 – Twitchell island 2010-2020.

Groundwater information for Sacramento valley – Solano subbasin was obtained from DWR's Bulletin 118 Update. See Appendix B.

7.2.3 Water Service Reliability

7.2.3.1 Water Service Reliability Normal Year

Section 6.2.9.2 Quantification of Supplies describes the process used to estimate the normal year supply.

Section 4.2.6 Projected Water Use describes the process used to estimate the normal year demand.

See Submittal Table 7-2 in Appendix E.

7.2.3.2 Water Service Reliability – Single Dry Year 2015

Using the base year of 2015, the third driest year on record, the supply and demand for the single dry year was estimated. 2015 had a supply of 1,793 acre-feet, 181 GPCD. Using the 181 GPCD the supply and demand was projected for the next 20 years in 5-year increments. The projection shows that the City's water supply will be able to handle demand during a single dry year.

See Submittal Table 7-3 in Appendix E.

7.2.3.3 Water Service Reliability – Five Consecutive Dry Years 2013-2017

Historic data for the five consecutive dry years was not used in projecting the 5 year supply and demand analysis. The historic data projects higher usage than is currently used. Comparing the 2013-2017 water supplies with the normal year produces percentages above 100%. See table 7-1 appendix E for percentages of normal. The City used the GPCD listed in table 4-2 Future water use with constrained conditions. Using those GPCD the City projection shows that the City's water supply will be able to handle demand during a multiple dry year period.

See Submittal Table 7-4 in appendix E for 5-year supply and demand comparison.

7.3 Drought Risk Assessment

7.3.1 Data, Methods, And Basis for Water Shortage Condition

Data used for the drought risk assessment include climate change predictions, historic rain amounts, and water use and demand records. The climate data projections used were downloaded from CAL-Adapt. The historic data was downloaded from CIMIS. The historic water use was provided by the City of Rio Vista.

The DRA estimates were developed from reviewing the previous drought years on record with the climate change projections.

7.3.2 Water Source Reliability

Groundwater from the Solano sub-basin is the sole source of water supply for the City since 1893. The Solano sub-basin is not considered “Critically over drafted basin/subbasin.” Per the Bullen 118 .

See section 6.2.9.2 for more information on projected quantification of supplies.

See Appendix B for the groundwater bulletin.

7.3.3 Total Water Supply and Use Comparison

See Submittal Table 7-5 in Appendix E.

Table 7-5 is a five-year drought risk assessment table to address water code 10635(b). The table compares a five-year drought supply vs water use. The DRA water use and supply was calculated using the lowest water use year and projecting from there.

Submittal Table 7-1 does not accurately portray a 5-year drought scenario due to water use increasing in the last 2 years of the 5 year period. In order to have a more reasonable drought scenario the projections used 181 GPCD in year 1 and decreased the use each following year.

The City does not project shortfall to occur during a five-year drought. The City’s supply would equal the City’s demand during a drought scenario.

An annual time step was used in the DRA.

7.3.4 Optional Planning Tool Workbook

The planning tool workbook was not used.

8.0 WATER SHORTAGE CONTINGENCY PLAN

The City does not currently have a Water Shortage Contingency ordinance. A draft ordinance is attached in Appendix B, as required in Water Code section 10632(a)(8). However, the City has prepared a Local Hazard Mitigation Plan and has sent it to Association of Bay Area Governments (ABAG) for their review as part of their regional hazard mitigation planning efforts.

As explained previously, the City does not anticipate future water shortages due to supply limitations because the City uses groundwater exclusively for its supply, and therefore the City deems a catastrophic supply interruption very unlikely. To cope with other temporary interruptions in supply, it is important to note that the City has water storage tanks at high elevation points to meet instantaneous demands. Water would be delivered via gravity feed to existing customers.

In the event of any catastrophe, the City would immediately notify residents to reduce water use and ration supplies. City buildings and City owned facilities would also discontinue or limit water use.

8.1 Water Supply Reliability Analysis

The City has a single source of water, the Solano groundwater sub-basin. The City has used this supply since the City was incorporated in 1893. Historically, the City's groundwater supply has been able to fully satisfy demand during single-year and extended-period droughts. For the reasons explained below, the City concludes that it can meet current and future demands with its existing groundwater supply (subject to development of additional wells if needed).

See Submittal Tables 7-2, 7-3, and 7-4 in Appendix E.

Based on historical pumping records and ongoing monitoring data and regional management programs, the City is confident that its water demands can continue to be met with local groundwater from the Solano sub-basin. The history of the basin is valuable to understand this conclusion. Historically, the area overlying the sub-basin was used extensively for agricultural production. Early agricultural users relied heavily on groundwater, and over time the aquifer was depleted, and groundwater levels lowered. The Solano Project was built to alleviate groundwater concerns and provide a supply of high-quality surface water to the region. After construction of the Solano Project, groundwater levels in the basin began to rise. By the 1970s and 1980s, groundwater levels had rebounded substantially. Current groundwater levels across the basin are at or near record highs. Most of the hydrographs show a small decline in water levels over the early 1990s, in response to the 1987-1992 drought, but show that water levels also recovered quickly to pre-drought levels.

The DWR does not consider the basin to be in overdraft. Additionally, the City has conducted, through a contract with ENGEO, a multi-year effort to monitor and report on the water levels, water quality, and overall functioning of the City's existing

groundwater wells. Data from this monitoring indicates that groundwater levels are not in decline in the Rio Vista area and that well productivity is high and stable.

Overall, it is also important to note that groundwater is the source of only a small portion of water for other water users and suppliers in this basin. Other water users in the Solano sub-basin that currently rely on groundwater for some portion of their supply have other sources to rely on, including the NBA. It is likely that the SCWA member agencies will be able to meet planned demands from these sources and thereby decrease reliance on groundwater. Thus, overall groundwater use in the basin is not anticipated to see a significant increase.

If monitoring indicates an increase in groundwater withdrawal is beginning to cause groundwater level declines, conjunctive use planning will enable the area's water suppliers, including the City, to limit groundwater withdrawal to sustainable levels. For example, Rio Vista may be able to exchange surface water allocations or purchased supplies with other groundwater users via in- lieu use arrangements. Under such arrangements, the other users would then reduce groundwater pumping to allow Rio Vista to increase withdrawals without causing basin-wide overdraft. In some years, when surface water supplies are limited, more groundwater may be withdrawn, but on a long-term basis groundwater use in the basin can be managed at sustainable levels for the City's anticipated growth. Groundwater management efforts, adequate overall regional supplies, and the ability of the SCWA agencies to exchange and purchase additional surface water supplies will enable proactive management of groundwater supplies over the coming 20 years.

8.2 ANNUAL WATER SUPPLY AND DEMAND ASSESSMENT PROCEDURES

8.2.1 Decision-Making Process

The City will conduct a Water Supply and Demand Assessment annually. The assessment will incorporate the supply and demand data described in the next section. The City will use a 20% reduction for the dry year analysis. The shortage corresponds to Water Shortage Contingency Plan Level 2 as defined in 8.3.

8.2.2 Data and Methodologies

1. Evaluation Criteria
    - Supply well constraints: annual water amounts pumped, ground water elevation, well depth, and any requirements for additional wells to be developed.
    - Distribution system constraints: scheduled and/or unplanned treatment plant outages, upgrades to the system through CIP projects, and storage capabilities
    - Solano Groundwater Sustainability Agency constraints: any constraints required by the GSA
    - Executive order constraints: any constraints required by executive orders

2. Water Supply: The City obtains its groundwater supply from the Solano Subbasin. Currently there are no pumping restrictions per the GSA. The subbasin is not in overdraft and can meet future demands even in a dry year. The City contracts with ENGEO to monitor and analyze the City's wells using pizometers for stability, depth, etc. The City's operational limitations would be reviewed annually for a regular year and a dry year. The GSA or Executive Orders could restrict pumping in the future and will be reviewed annually.

3. Current Year Unconstrained Customer Demand: In chapter 4 the City calculated the expected water use with no constraints. In chapter 7 the City calculated the future supply in an unconstrained year and in the drought risk assessment. Per the analysis in chapter 4 & 7 the City expects the groundwater supply to be sufficient for unconstrained customer demands. The City will review the expected unconstrained demands annually for a regular year and for a dry year.

4. Current Year Available Supply: In chapter 6 the City analyzed the available water supply. The City does not anticipate the supply to be reduced at this time. The City's demand will equal the supply in the current year and 1 dry year. The City will review the current year supply annually for a regular year and a dry year.

5. Infrastructure Considerations: The City contracts with NV5 for water system hydraulic modeling and evaluations. The City uses the recommendations from the water system analysis to determine CIP project locations and well requirements. The City will review the analysis and CIP projects annually for any constraints it may identify.

8.3 Six Standard Water Shortage Levels

The City has developed a six-stage action plan to invoke during a declared water shortage. The plan includes voluntary and mandatory rationing; depending on the causes, severity, and anticipated duration of water supply shortages, if known. Action stages may be triggered by a shortage at any time of the year. If it appears that it may be a dry year, mainly due to insufficient precipitation and further dropping of the groundwater table, the City can take action in advance of a crisis.

See Submittal Table 8-1 in appendix E

8.4 Shortage Response Actions

8.4.1 Demand Reduction

Priorities for use of available water during shortages are listed below in Table C according to ranking.

- Minimum health and safety allocations - for interior residential needs (includes single family, multifamily, mobile homes and convalescent facilities); and firefighting and public safety needs;

- Commercial, industrial, institutional/governmental operations - for maintaining economic base of community;
- Existing landscaping - trees and shrubs;
- New demand - proposed construction projects

Based on information provided by the California Department of Water Resources, commonly accepted estimates of interior residential water use in the United States are presented in Table C on the following page. These water use estimates indicate per capita health and safety water requirements for various appliances and fixtures. A health and safety allotment of 68 gallons per capita per day (gpcd) is essential for basic interior water use with no habit or plumbing fixture change. However, if there is prolonged water shortage or a disaster, then customers would be required to make changes in their interior water use habits (for instance, not flushing toilets unless necessary or taking less frequent showers). These reductions will be reinforced through a public awareness campaign during periods of threatened water supply.

Table C - Estimated Per Capita Health and Safety Water Consumption

	Non-Conserving Fixtures			Habit Changes			Conserving Fixtures[2]		
Unit	Daily Use	Unit Use	gal/day	Daily Use	Unit Use	gal/day	Daily Use	Unit Use	gal/day
Toilets	5 flushes	5.5 gpf	27.5	3 flushes	5.5 gpcd	16.5	5 flushes	1.5 gpf	7.5
Shower	5 min	4.0 gpm	20.0	4 min	3.0 gpm	12.0	5 min	2.0 gpm	10.0
Washer[1]	12.5 gpcd		12.5	11.5 gpcd		11.5	11.5 gpcd		11.5
Kitchen	4 gpcd		4.0	4 gpcd		4.0	4 gpcd		4.0
Other	4 gpcd		4.0	4 gpcd		4.0	4 gpcd		4.0
Total (gpcd)			68.0			48.0			37.0
					Reduction (%)	*29.4*			*22.9*

1 Reduced washer use results from larger loads.
2 Fixtures include ULF 1.6 gpf toilets, 2.0 gpm showerheads, and efficient clothes washers.

8.4.2 Supply Augmentation

As described above sections 8.1 – 8.2 the City does not expect to require water augmentation in a drought scenario. In the previous drought years of 2013-2017, and 2020 the City did not need to augment supplies. The current groundwater levels in the Sub-Solano Basin are high enough that drought years should not trigger a need to augment their supply.

8.4.3 Operational Changes

With normal water supply conditions, water production is recorded daily at each wellhead. Totals are reported weekly to the Water Services Supervisor, and monthly to the Director of Municipal Utilities.

Reporting escalates with advanced stages of water shortages. During water emergency shortages, production figures would be reported to the Public Works Superintendent hourly and to the Community Development and Public Works Director and City Manager daily. Reports would also be provided to the City Council and the Public Safety Department. If reduction goals are not met, the City Council would be notified so that additional action may be taken (i.e. a water shortage emergency may be declared).

8.4.4 Additional Mandatory Restrictions

As previously mentioned, a no waste ordinance has been in effect. The ordinance prohibits various wasteful water uses identified in Table D below. Warnings and penalties are levied for infractions to the ordinance.

Table 8-1 - Water shortage contingency — mandatory prohibitions

Examples of Prohibitions	**Stage When Prohibition Becomes Mandatory**
Using potable water for street washing	Stage 4
Washing Cars	Stage 2
Outdoor water use restrictions	Stage 4
Sidewalk/street cleaning	Stage 2
Plumbing leaks	Stage 1
No new service connections	Stage 4

Additional consumption reduction methods that could be instituted during a drought period include, but are not limited to:

- use prohibitions (especially for landscape irrigation);
- additional water conservation enforcement;
- voluntary rationing, mandatory rationing;
- reduction of water pressure in water lines where feasible;
- reduced frequency and or duration of line flushing;
- flow restrictions;
- expansion of leak detections and repair programs;
- installation of water kits, plumbing fixture replacements;
- restriction on building permits;
- installation of pool covers; and
- water shortage pricing.

8.4.5 Emergency Response Plan

In accordance with the City of Rio Vista's emergency response procedures, the City has developed a comprehensive water shortage contingency plan. The plan is consistent with the provisions of the City's emergency response procedures to implement during an interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.

The City of Rio Vista has two water storage tanks totaling 3 million gallons of system storage. One of the storage tanks is equipped with a booster pumping station with backup power. These tanks will supply water for essential needs in the case of emergencies. The City has chlorination pumps at each well site that may be put into operation when needed. The City's wells have diesel engine electric generators with enough fuel to run 48 hours without refueling.

The City can contact bottled water companies in cases of emergencies. The Sacramento River containing non-portable water travels through the city. Local trucking firms can transport water along with the City's fire tanker trucks. Residents would need to boil or disinfect non-potable water.

The City recognizes the importance of water demand management measures in reducing water demand and will continue to implement these measures. Also, the City would increase media attention to the water supply situation during a shortage and would step up public water education programs.

When a water shortage appears imminent, a City water shortage response team would be activated by the City Council, City Manager, and Director of Development Services. The team includes the City Manager's Office, Development Services Department, Public Safety Department (Emergency Fire Services and Police Department), and Finance Department.

8.4.6 Seismic Risk Assessment and Mitigation Plan

Below is an example of actions the City would undertake if a catastrophe were imminent or declared.

- Determine extent of water shortage
- Activate the water shortage response team
- Monitor existing storage
- Obtain additional water supplies
- Develop alternative water supplies
- Determine where immediate funding will come from
- Contact and coordinate with other agencies
- Put employees and contractors on-call
- Communicate with the public

There are no known active faults in Rio Vista but there are faults in the Vacaville region approximately 25 miles away. In the event of earthquake or other natural disaster, the Rio Vista City Council can declare a state of emergency by resolution, state the nature of the disaster, and determine how long the City will remain under such a directive to deal with the emergency. In the event of loss of power, emergency back-up generators will be used to provide power for necessary utilities.

8.4.7 Shortage Response Action Effectiveness

See Submittal Table 8-2 & 8-3 for response effectiveness.

8.5 Communication Protocols

Summary of communication protocols includes but is not limited to:

- Informing customers – leaflets inserted into monthly bills, updates on the website
- The public & interested parties – local flyers, website updates, council meetings
- Local, regional, state governments – email, phone call, meetings, etc.

8.6 Compliance And Enforcement

Any customer violating the regulations and restrictions on water use set forth in the City's no waste ordinance shall receive a written warning for the first such violation. Upon a second violation, the customer shall receive another warning. A third violation within a twelve-month period triggers the levy of a $20 fine. A fourth violation triggers a $50 fine; a fifth violation triggers a $100 fine; and a sixth violation triggers a $200 fine. Subsequent fines are levied at $200 each. Excessive use penalties are defined further in the City’s Water Shortage Contingency Plan.

8.7 Legal Authorities

The current City Ordinance 017-2016 is in Appendix F. Any new ordinances are available on the Rio Vista City website.

The City shall declare a water shortage emergency in compliance with water code section Division I, Section 350.

The City shall coordinate with any city or county within which it provides water supply services for the possible proclamation of a local emergency as defined in Section 8558 of the Government Code. Currently the City does not supply water to any surrounding cities or counties. It does not plan to supply them in the future.

8.8 Financial Consequences Of Wscp

Water rates need to be set up to enable water suppliers to cover the costs in pumping, storing, treating, and delivering water. Revenues need to be collected to build reserves for future water system repairs, maintenance, and replacement. Water shortages increase costs to the water supplier by increasing expenses for public educational campaigns, stricter conservation efforts, and facility development. Other costs for repairs, maintenance, and replacement are fixed.

The City maintains a water fund for future projects and emergency repairs which is currently accumulating at a rate of $144,000 per month. In the event revenues are impacted significantly due to reduced volumetric use during droughts, or supply interruptions, these funds will be directed to cover operating expenses during such shortfalls.

8.9 Monitoring And Reporting

The City contracts with ENGEO for groundwater monitoring. ENGEO has installed pizometers at all wells and can read the well information in real time.

The City does daily monitoring and reporting.

8.10 WSCP Refinement Procedures

The City monitors it system is real time. If a trend were to occur that was outside of projected drought supply scenarios the City would re-evaluate the WSCP.

8.11 Special Water Feature Distinction

n/a

8.12 Plan Adoption, Submittal, And Availability

The Water Shortage Contingency Plan is available 30 days prior to June 15th. The document will be available at the City's website.

The City will adopt the Water Shortage Contingency Plan at the June 15th City Council meeting.

The WSCP will be submitted with the UWMP at the provided online portal.

9.0 DEMAND MANAGEMENT MEASURES

9.1 Demand Management Measures For Wholesale Suppliers

This section does not pertain to the City as it is not wholesalers.

9.2 Existing Demand Management Measures For Retail Suppliers

The City has 18 existing DMMs (DMM A – DMM R). This section presents the city's program to implement and monitor the practicable DMMs; as well as the required cost benefit analysis (CBAs) for those that are not currently implemented or scheduled to be implemented.

9.2.1 Water Waste Prevention Ordinances

DMM M - Water Waste Prohibition

The City Code (Section 13.04.190) in order to eliminate waste of water and reduce high per capita consumption of water declares that it is unlawful for any person, persons, firm or entity to waste water. The text of that section follows:

13.04.190 Wasting water—Procedures and penalties.

In addition to those procedures described in Section 13.04.110 *(ie, required installation of meters if excessive water use is noted)*, the city in order to eliminate waste of water and reduce the high per capita consumption of water declares that it is unlawful for any person, persons, firm or entity to waste water and a determination of waste by such user shall cause the same to suffer that and those penalties hereafter described:

A. The city police department shall ascertain if waste is being committed.

B. Upon a determination that waste has been committed, the violator shall receive written notification from the police department of the waste.

C. Should waste continue, as the same is determined by the police department, and not be corrected after due notice, then thereafter the violation shall result in disconnection of the service and shall be treated as a misdemeanor punishable by a fine not less than twenty-five dollars ($25.00) and not more than five hundred dollars ($500.00) and/or six months in the county jail.

D. Should the water connection of the violator be disconnected for waste, then in order for the violator to have water service reconnected, due application for reconnection must then be made in accordance with Sections 13.04.080 and 13.04.120. (Prior code § 25-19).

DMM O - Water Efficient Landscape Ordinance

Water is a limited and precious resource. The purpose of this chapter is to assist the City of Rio Vista in achieving water conservation through proper plant selection, installation, and maintenance practices. The benefits of water conservation and landscape standards are many and diverse. For example, these standards are intended to maintain and improve the quality of development currently being established in the City of Rio Vista and to upgrade the appearance and function of existing developments; to buffer incompatible land uses; and to provide an attractive streetscape to pedestrians, bicyclists, and motorists.

A. Appropriate planning and design for local conditions;
B. Limiting turf to location where it provides functional benefits; Efficient irrigations systems;
C. The use of soil amendments to improve the structural characteristics of the soil;
D. The use of mulches, where appropriate;
E. The use of drought-tolerant plants; and
F. Appropriate and timely maintenance.

DMM P – Urgency Ordinance No. 006-2015

Section 17.68 of the Rio Vista Municipal Code related to water conservation and landscaping to comply with the California State Water Resources Control Board's adopted mandatory water conservation regulations, and includes, but is not limited to, no lawn/garden watering or other outdoor water use between 9 a.m. and 7 p.m. on any day. Users with odd-numbered street addresses will use outdoor water only on Sundays & Wednesdays, and users with even-
numbered street addresses will use outdoor water only on Saturdays and Tuesdays.

DMM Q – Water Conservation Urgency Ordinance (Revision)

Section 3. Section 17.68.025 Water and Resource Conservation is hereby amended to read as follows:

A. The penalties for the waste of water and the procedures to impose such penalties are specified in Chapter 13.04.190. Acts constituting a waste of water are as follows:

1. Failure to comply with the following schedule when watering lawns, plants, or garden, or using outdoor water for other irrigation purposes.

   (A) No lawn/garden watering, or other outdoor water use, will be allowed between nine o'clock (9:00 A.M.) and seven o'clock (7:00 P.M.) on any day.
   (B) Subject to the limitations set forth in Section 17.68.025(A)(1)(a), users with odd-numbered street addresses shall use outdoor water only on Sundays and Wednesdays.
   (C) Subject to the limitations set forth in Section 17.68.025(A)(1)(a), users with even-numbered street addresses shall use outdoor water only· on Saturdays and Tuesdays.

(D) The Director of Public Works or his or her designee may waive the requirements of Sections 17.68.025(A)(1)(a)-(c) if such waiver is necessary for health or safety reasons, as evidenced by the water user, and to the Director's satisfaction. In no case shall any user water more than two (2) days a week.

2. Watering lawns or gardens such that excess water leaves the property or area being watered.

3. Watering outdoor landscaping while raining, or within forty-eight (48) hours after measurable rainfall.

4. Washing vehicles, equipment or boats on days that do not coincide with irrigation times and days for the address where the vehicle is being washed, or using an open hose which is not equipped with a shut-off nozzle.

5. Hosing down driveways, streets, parking lots, and building exteriors without the consent of the Director of Public Works or his or her designee except for valid health or safety reasons.

6. Having leaky faucets or plumbing fixtures on the premises.

7. Having improper connections to the City water system or on site faucets or hose bibs without a properly installed and maintained reduced pressure backflow device to prevent contamination of the potable water supply (i.e.: a RV may not connect to a residential faucet without a certified reduced pressure backflow device that is properly installed, maintained and annually inspected).

8. Operating evaporated coolers which are not equipped with a re-circulating pump.

9. The use of potable water in a fountain or other decorative water feature, except where the water is part of a re-circulating system.

10. The irrigation with potable water of ornamental turf on public street medians.

11. The irrigation with potable water of landscapes outside of newly constructed homes and buildings in a manner inconsistent with regulations or other requirements established by the California Building Standards Commission and the Department of Housing and Community Development.

12. The washing of a car, boat, trailer, or other mobile equipment except at a commercial car wash, using only reclaimed water, or by using a bucket or a water-hose equipped with an automatic shutoff nozzle.

DMM R - Ordinance 007-2016

"Section 17.68.010 State model water efficient landscaping ordinance adopted by reference" is hereby amended as follows:

The City adopts by reference the California State Model Water Efficient Landscaping Ordinance (AB 1881), and any amendments thereto, as the law of the city. One copy of the California State Model Water Efficient Landscaping Ordinance has been, and is now, filed in the office of the community development director, and the ordinance is adopted by reference as if incorporated and set out in full in this chapter.

A. Applications required to be submitted to the City pursuant to the California State Model Water Efficiency Landscaping Ordinance shall be submitted to and reviewed by the community development director or designee.

B. In the event that an applicant disagrees with an administrative decision made by the City pursuant to this Section and/or the California State Model Water Efficiency Landscaping Ordinance, the applicant may appeal the decision to the planning commission in accordance with Chapter 17.60.

C. Any person or entity that is in violation of this section and/or the California State Model Water Efficient Landscaping Ordinance shall be given a written notification of their noncompliance. If the violation is not satisfactorily resolved following the issuance of the notice, such violation shall become an infraction punishable pursuant to Chapter 1.16.

D. The City may impose fees to offset its costs in processing applications submitted pursuant to the State Model Water Efficient Landscaping Ordinance. Such fees shall be nonrefundable and paid by the applicant at the time the application is submitted.

"Section 17.68.200 Water and Resource Conservation" is enacted to read as follows:

1. The penalties for the waste of water and the procedures to impose such penalties are specified in Section 13.04.020. Acts constituting a waste of water are as follows:
   a) Failure to comply with the following schedule when watering lawns, plants, or gardens, or using outdoor water for other irrigation purposes. a. No lawn/garden watering, or other outdoor water use, will be allowed between nine o'clock (9:00 A.M.) and seven o'clock (7:00 P.M.) on any day;

   b) Subject to the limitations set forth in Section 17.68.200(A)(1)(a), users with odd-numbered street addresses shall use outdoor water only on Sundays and Wednesdays;

c) Subject to the limitations set forth in Section 17.68.200(A)(1)(a), users with even-numbered street addresses shall use outdoor water only on Saturdays and Tuesdays; and

d) The Director of Public Works or his or her designee may waive the requirements of Sections 17.68.200(A)(1)(a)-(c) if such waiver is necessary for health or safety reasons, as evidenced by the water user, and to the Director's satisfaction. In no case shall any user water more than two (2) days a week.

2. Watering lawns or gardens such that excess water leaves the property or area being watered.

3. Watering outdoor landscaping while raining, or within forty-eight (48) hours after measurable rainfall.

4. Washing vehicles, equipment or boats on days that do not coincide with irrigation times and days for the address where the vehicle is being washed, or using an open hose which is not equipped with a shut-off nozzle.

5. Hosing down driveways, streets, parking lots, and building exteriors without the consent of the Director of Public Works or his or her designee except for valid health or safety reasons.

6. Having leaky faucets or plumbing fixtures on the premises.

7. Having improper connections to the City water system or on site faucets or hose bibs without a properly installed and maintained reduced pressure backflow device to prevent contamination of the potable water supply (i.e.: a RV may not connect to a residential faucet without a certified reduced pressure backflow device that is properly installed, maintained and annually inspected).

8. Operating evaporated coolers which are not equipped with a recirculating pump.

9. The use of potable water in a fountain or other decorative water feature, except where the water is part of a recirculating system.

10. The irrigation with potable water of ornamental turf on public street medians.

11. The irrigation with potable water of landscapes outside of newly constructed homes and buildings in a manner inconsistent with regulations or other requirements established by the California Building Standards Commission and the Department of Housing and Community Development.

12. The washing of a car, boat, trailer, or other mobile equipment except at a commercial car wash, using only reclaimed water, or by using a bucket or a water-hose equipped with an automatic shutoff nozzle.

B. To ensure all water use is paid for by the user in a timely manner, and is therefore, not wasted, the City may hold the property owner of record liable for all unpaid water fees. This requirement is in addition to the joint and several liability requirements outlined in Section 13.04.135. In a form provided by the City, the property owner of record may provide that it is the tenant's responsibility to pay for water use. However, the property owner of record would remain liable for any unpaid water fees in the event that the tenant fails to pay for water use.

9.2.2 Metering

DMM D - Commodity Rate Metering
The City requires all new connections to be metered and many residents have meters installed. Those customers who have meters (i.e.; residential and all commercial/industrial) are charged a base rate depending on meter size as well as a volumetric rate.

A new water rate study is anticipated since the meter retrofit program is close to completion. In addition, the rates will be reevaluated periodically based on comprehensive usage evaluations.

9.2.3 Conservation Pricing

DMM K - Conservation Pricing
The City does have a Conservation Pricing program. Currently all commercial users are metered and they pay volumetric prices for each unit of water delivered. Additionally, residential users with meters are billed volumetrically per City Ordinance. A new water rate study is anticipated and in addition the rates will be reevaluated periodically based on comprehensive usage evaluations and conservation goals.

9.2.4 Public Education And Outreach

DMM B - Residential Plumbing Retrofit
The City will be adopting the 2010 California Green Building Standards Code, and the 2010 California Plumbing Code, which will conform to the legal requirements for maximum water usage for fixture retrofits and replacements for residential uses, including 1.28 gallon water closets and 0.5 gallon urinals after July 1, 2011.

However the City has no plans to implement a fixture retrofit incentive program (i.e.; offer rebates) to residences constructed before 1994, as the costs to fund and administer such a program is not cost effective for much the same reasons as a high efficiency toilet replacement program is not cost effective (*Reference DMM N below*). A general fixture retrofit program may provide somewhat more water savings than toilet replacements alone (i.e.; 15%, Reference American Water Works Association Research Foundation, Residential End Uses of Water, 1999, Table 5.4); however, even without associated additional rebate costs, the costs far exceed the value of water savings reasonably attainable.

DMM F - High Efficiency Washing Machines
In published materials the City recommends that whenever possible residents upgrade their dish washing and clothes washing machines with high water efficiency units. Residents should also remember to use full loads for both dish and clothes washing each time they are done. It is also recommended resident take advantage of rebates for high efficiency washing machines sponsored by PG&E from time to time, as energy savings are an additional benefit.

However, the City has no plans to implement its own washing machine rebate program as the cost of the program far exceeds the value of water that may be saved.

Please see Appendix F for the required CBA.

DMM G - Public Information Program
The City provides information to the public on a regular basis through the use of the City's internet homepage, mailings, and public meetings. The City conservation coordinator meets monthly with the Citizens' Water and Wastewater Monitoring Committee (WWMC) and the committee regularly provides updates to the entire community through news stories and public announcements and billing mail rs. Please see Appendix F for example water system and conservation articles and mailers.

DMM H - School Education Programs
The City will continue to reach out to the school district to provide educational data and information for water conservation programs for students. Educating students about the importance of water conservation frequently results in their parents being more conservation conscious.

However, given the costs, the City cannot fund a specific school education program or specific printed materials for this program; and has no plans to implement such an expanded program in the foreseeable future.

Please see Appendix F for the required CBA.

9.2.5 Programs to Assess and Manage Distribution System Real Loss

DMM A – Water Survey Programs for Residential Customers
The City does not intend to implement a staffed water survey program for the foreseeable future because the cost of such a program cannot be justified by the potential water savings. *Please refer to Appendix F for the required CBA.*

On a City wide basis, a full leak detection survey program is not feasible until the meter retrofit program is completed *(Ref: Section 6.3 DMM C below).* However, the City is asking current users to survey their own homes for leaks and inefficient sprinkler settings in addition the City has a large landscape demonstration program at the airport open for public viewing which showcases climate appropriate vegetation and efficient irrigation practices.

DMM C – System Water Audits

The City has an active SCADA system monitoring the City's water well activity and other parameters. City employees are also highly knowledgeable about the existing system. The City is planning on systematically installing and retrofitting new meters system wide over the next 5 to 10 years (before 2025), and a water system audit will be completed before the start of that program.

The City has conducted a Water System Evaluation in February 2019. The reports evaluation and findings have been evaluated and will be implemented as funding allows. See Appendix D for The City of Rio Vista Water System Evaluation.

Additionally, the City has been successful in continually detecting and repairing leaking water mains in a timely fashion to assist in conservation and consistent water deliveries. The City currently uses sonic technologies to listen for leaks when exercising and locating mainline valves. The City is currently implementing a sewer system condition assessment monitoring program and as part of that program water infrastructure is being GIS located and conditions assessed. It is City practice to perform a sonic leak detection of water pipes before any pavement restoration project. The City may extend the sewer system asset management system to the water system as budgetary considerations allow.

9.2.6 Water Conservation Program Coordination and Staffing Support

DMM L - Water Conservation Coordinator

The Director of Community Development and Public Works currently serves as the Water Conservation Coordinator for the City. As part of new projects that include landscape improvements (Section17.68.040), the plans must include water conservation calculation per State A.B. 325 since 1992.

These plans are reviewed for compliance to City Water Conservation Ordinance section 6.12 and State requirements. The WCC will track the time spent on these activities. The WCC also is in contact with the various development areas to coordinate water savings as necessary to manage the City's water system effectively and expects to approximately 100 hours per year to water system management and conservation tasks, including consultations with commercial and industrial users that may involve water audits if the WCC deems it may be effective in reducing substantial water usage. Other City staff under the direction of the WCC routinely provides water users conservation information when called out to respond to user reported problems, or to perform routine maintenance and checks of installed water meters.

9.2.7 Other Demand Management Measures

DMM E - Large Landscape Conservation

The City has approximately 300 Commercial and industrial accounts that in total use approximately 10% of total City water demand. Some, including the schools, the cemetery, and some other businesses, have dedicated irrigation meters.

On March 19, 2009, the City Council adopted Ordinance No. 643, adopting a water conservation and landscape ordinance to achieve water conservation through proper plant selection, installation and maintenance practices for landscaping associated with new commercial, industrial, institutional, mixed-use, common areas, multiple family, and new single family dwellings. Wherever feasible the City Water Conservation Coordinator will encourage large landscape accounts to replace high water demand plants with more water efficient plants suitable for this micro climate.

Once dedicated irrigation meters are installed on commercial/industrial accounts with large landscapes the City will evaluate the feasibility of addition incentives to install more efficient irrigation systems and controllers, or landscape replacement projects and, will institute such programs if they are found to be cost effective.

Please refer to Appendix F _ Ordinance 643, Water Conservation and Education Information, Tri-fold Brochure, 2013 for further information regarding this program.

DMM I - Conservation Programs for Commercial, Industrial, and Institutional Accounts

The City Water Conservation Coordinator will continue to regularly reach out to Commercial, Industrial, and Institutional users to insure they are using good water conservation methods and encourage them to comply with the guidelines of Ordinance No. 643 as well as install water conserving fixtures and equipment, and instituting water conservation practices. Examples include: installation low flow fixtures and nozzles, high efficiency washing machines, waste handling procedures that minimize the need for wash-downs, etc.)

Opportunities to supply large commercial users recycled water will be pursued when feasible, however the City submitted a Recycled Water Use Feasibility Study, dated January 21, 2013 to the Regional Water Quality Control Board – Central Valley Region to comply with Order R5-2010-0081 and found the cost to implement recycled water usage at the local golf course (most feasible existing user) was prohibitive, and the associated impact on the salinity of the groundwater may require costly mitigation that cannot be quantified until the regulation of salinity impacts are more fully defined via the Regional Board's CV_SALTS process. *Please refer to Appendix F for the Recycled Water Us Feasibility Study, dated January 21, 2013.*

However, for the same rationale as presented in DMM A, the City does not intend to implement a staffed conservation program for commercial and industrial users for the foreseeable future because the cost of such a program cannot be justified by the potential water savings. Commercial and Industrial accounts account for approximately 10% of the total City water use and with about the same percentage of connections. This indicates there is no significant difference in the CBA from that presented in DMM A except for a proportionate reduction in cost and benefit, w*ith the following adjustments: The cost of the program is approximately 10% of that presented in DMM A (which is probably low given the generally higher costs of commercial fixtures), and the*

potential water savings for those that participate is twice as great as assumed for DMM A (26% instead of 13).

9.3 Reporting Implementation

As described in section 9.2 the following DMMs have been implemented:

DMM M – Water Waste Prohibition

DMM O Water efficient Landscape Ordinance

DMM P – Urgency Ordinance No. 006-2015

DMM Q – Water Conservation Urgency Ordinance (revision)

DMM R – Ordinance 007-20016 (revision)

DMM D – Commodity Rate Metering

DMM G – Public Information Program

DMM C – System Water Audits

DMM L – Water Conservation Coordinator

DMM E – Large Landscape Conservation

The following have not been implemented but may be implemented in the future for water use reductions:

DMM K – Conservation Pricing

DMM I – Conservation Programs for Commercial, Industrial, and Institutional Accounts

The following are not currently implemented due to feasibility. See Appendix F for cost benefit analysis for the non-implemented DMMs:

DMM B – Residential Plumbing Retrofit

DMM F – High Efficiency Washing Machines

DMM H – School Education Programs

DMM A – Water Survey Program for Residential Customers

10 PLAN ADOPTION, SUBMITTAL, AND IMPLEMENTATION

10.1 Inclusion of All 2020 Data

The 2020 UWMP includes all 2020 data.

10.2 Notice of Public Hearing

10.2.1 Notice to Cities and Counties

10.2.1.1 60 Day Notification

See Appendix A for notice of public hearing sent to local cities and counties.

10.2.1.2 Notice of Public Hearing

See Appendix A for notice of public hearing sent to local cities and counties.

10.2.1.3 Submittal Tables

See appendix E for submittal tables, SBX 7-7 Tables, and Energy Use Table.

10.2.2 Notice to The Public

See Appendix A for notice of public hearing.

10.3 Public Hearing and Adoption

10.3.1 Public Hearing

Public hearing was held on June 16, 2021.

10.3.2 Adoption

UWMP and WSCP was adopted on June 16,2021. See resolution in Appendix A.

10.4 Plan Submittal

10.4.1 Submitting a UWMP and WSCP to DWR

The UWMP & WSCP to be submitted to DWR prior to July 1, 2021.

10.4.2 Electronic Data Submittal

The UWMP & WSCP to be submitted electronically using the WUE data Portal.

10.4.3 Submitting a UWMP, including WSCP, to the California State Library

The UWMP & WSCP to be submitted to the California State Library.

10.5 Public Availability

The UWMP & WSCP are on the Cities website for public viewing.

SOURCES

Among other reports, data, and City files, the City relied on the following sources for preparation of this UWMP:

California Department of Finance. Population projections. Accessed March 2021. https://www.dof.ca.gov/Forecasting/Demographics/Estimates/

California Department of Water Resources. *California's Groundwater: Bulletin 118-80*. https://water.ca.gov/Programs/Groundwater-Management/Bulletin-118

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_____. 1995. Delta Protection Commission Legal Delta and Zone map.

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_____. 2003. *Guidebook for Implementation of SB 610 and SB 221 of 2001*.

_____. 2004. *California's Groundwater: Bulletin 118*. Sacramento Valley Groundwater Basin Solano Subbasin. Last update 2/27/2004.

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_____. September 2003. *City of Rio Vista Master Plan for the Water Supply and Delivery System*. Completed by Creegan + D'Angelo Consulting Civil and Structural Engineers.

_____. December 2005. Urban Water Management Plan. Completed by Tetra Tech, Inc.

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_____. "Progress Report for Hydrogeologic Consultation and Evaluation of Well Data – May 2006 through April 2007". May 18, 2007.

_____. “Progress Report for Evaluation of Water Supply Well Data – September through November 2007”. April 3, 2008.

_____. “Summary Progress Report for Hydrogeologic Consultation and Evaluation of Well Data”. September 1, 2006.

_____. “Memo to the City of Rio Vista: Hydrogeologic and Available Water Supply Trend Analysis”. October 6, 2006.

ENGEO. Groundwater Evaluation, City of Rio Vista. May 6, 2016.

_____. “Progress Report for Evaluation of Water Well Supply Data Through April 2016”. May 6, 2016.

ENGEO. Groundwater Instrumentation Analysis, City of Rio Vista. May 10, 2016 - present.

_____. “Proposal for Groundwater Instrumentation Analysis”. May 10, 2016.

Priest, D.F. et al. 1993. *California’s 1987-92 Drought: A summary of six years of drought*.
California Department of Water Resources.

Solano County Water Agency. February 2005. *Integrated Regional Water Management Plan and Strategic Plan*.

_____. 2005. *Urban Water Management Plan*.

_____. 2021 SCWA – Partner Agency 2020-2045 Population Projections

NV5. City of Rio Vista Water System Evaluation Final Draft. February 2019.

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Thomasson, H.G., Jr., Olmsted F.H., and LeRoux E. F. 1960. Geology, water resources and usable ground-water storage capacity of part of Solano County, California: U.S. Geological Survey Water-Supply Paper 1464.

Western Region Climate Center. Data for Antioch Pump Plant 3, 1955-2020. Accessed March 2021. https://cimis.water.ca.gov/UserControls/Reports/MonthlyReportViewer.aspx

RESOLUTION NO. 2021-042

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF RIO VISTA ADOPTING THE 2020 URBAN WATER MANAGEMENT PLAN (UWMP) AND WATER SHORTAGE CONTINGENCY PLAN (WSCP)

WHEREAS, the State of California requires an Urban Water Management Plan (UWMP) be prepared per California Water Code Section 10620 (e); and

WHEREAS, the State of California requires a Water Shortage Contingency Plan (WSCP) be prepared per California Water Code Section 10632 (a); and

WHEREAS, Dillon and Murphy Engineering has prepared the 2020 UWMP and WSCP in accordance with DWR guidelines; and

WHEREAS, notice of date of public hearing was sent to cities and county agencies 60 days prior to hearing; and

WHEREAS, notice to the public was given 30 days prior to the hearing on the City website, the local newspaper, and the community bulletin boards; and

WHEREAS, the City Council has performed a review of the 2020 UWMP and WSCP and acknowledges that minor changes may need to be made prior to submission of the UWMP and WSCP to the Department of Water Resources; and

NOW THEREFORE, THE CITY COUNCIL OF THE CITY OF RIO VISTA does hereby adopt and approve the 2020 UWMP and WSCP, subject to minor changes as maybe necessary.

BE IT FURTHER RESOLVED that City Council hereby directs that the City Clerk shall cause this resolution to be recorded in the office of the Solano County Recorder.

PASSED AND ADOPTED this **15th** day of **June, 2021.** I, **JOSE JASSO, CITY CLERK OF THE CITY OF RIO VISTA, HEREBY CERTIFY** the foregoing resolution was introduced and passed at a regular meeting of the Rio Vista City Council by the following roll call vote:

AYES: **Council Members Dolk, King, Stanish, VM Hampton and Mayor Kott**
NOES: **None**
ABSENT: **None**
ABSTAIN: **None**

ATTEST:

Jose Jasso, MMC, City Clerk

CITY OF RIO VISTA, CALIFORNIA INCORPORATED DEC. 30, 1893

CITY OF RIO VISTA
Department of Public Works
One Main Street, Rio Vista, California 94571
Phone (707) 374-6451 Ext. 1106

April 9, 2021

Mr. Girum Awoke
Public Works Director
City of Vacaville
650 Merchant Street
Vacaville, CA 95688-6908

Re: 2021 Urban Water Management Plan Update

Dear Mr. Awoke,

In accordance with the Urban Water Management Planning Act (CA Water Code Section 10642), the City of Rio Vista (City) is informing all city and county agencies in our service area that we are currently reviewing and updating the City's Urban Water Management Plan (UWMP). The UWMP will provide an analysis of projected water demand and supply over the next 20 years, as well as an updated water conservation plan that meets state requirements. The update is due to the California Department of Water Resources (DWR) by July 1, 2021.

The draft UWMP will be available for public review 30 days prior to the scheduled public hearing, which is tentatively scheduled for June 15, 2021. We will notice you if the public hearing date at which the UWMP will be considered is rescheduled.

Please contact me at (707) 374-6451, ext. 1116 or at: rborre@ci.rio-vista.ca.us if you have any questions.

Sincerely,

Robin Borre
Director of Public Works

cc: Robert Hickey, City Manager
Margaret Roberts, City Clerk
Mona Ebrahimi, City Attorney
Cecil Dillon, City Engineer

CITY OF RIO VISTA
Department of Public Works
One Main Street, Rio Vista, California 94571
Phone (707) 374-6451 Ext. 1106

April 9, 2021

Mr. William Tarbox
Public Works Director
City of Benicia
250 East L Street
Benicia, CA 94510

Re: 2021 Urban Water Management Plan Update

Dear Mr. William Tarbox,

In accordance with the Urban Water Management Planning Act (CA Water Code Section 10642), the City of Rio Vista (City) is informing all city and county agencies in our service area that we are currently reviewing and updating the City's Urban Water Management Plan (UWMP). The UWMP will provide an analysis of projected water demand and supply over the next 20 years, as well as an updated water conservation plan that meets state requirements. The update is due to the California Department of Water Resources (DWR) by July 1, 2021.

The draft UWMP will be available for public review 30 days prior to the scheduled public hearing, which is tentatively scheduled for June 15, 2021. We will notice you if the public hearing date at which the UWMP will be considered is rescheduled.

Please contact me at (707) 374-6451, ext. 1116 or at: rborre@ci.rio-vista.ca.us if you have any questions.

Sincerely,

Robin Borre
Director of Public Works

cc: Robert Hickey, City Manager
Margaret Roberts, City Clerk
Mona Ebrahimi, City Attorney
Cecil Dillon, City Engineer

CITY OF RIO VISTA
Department of Public Works
One Main Street, Rio Vista, California 94571
Phone (707) 374-6451 Ext. 1106

April 9, 2021

Mr. Matthew Hobbs
Water & Power Operations Manager
Suisan-Solano Water Authority
810 Vaca Valley Parkway, Suite 201
Vacaville, CA 95688

Re: 2021 Urban Water Management Plan Update

Dear Mr. Hobbs,

In accordance with the Urban Water Management Planning Act (CA Water Code Section 10642), the City of Rio Vista (City) is informing all city and county agencies in our service area that we are currently reviewing and updating the City's Urban Water Management Plan (UWMP). The UWMP will provide an analysis of projected water demand and supply over the next 20 years, as well as an updated water conservation plan that meets state requirements. The update is due to the California Department of Water Resources (DWR) by July 1, 2021.

The draft UWMP will be available for public review 30 days prior to the scheduled public hearing, which is tentatively scheduled for June 15, 2021. We will notice you if the public hearing date at which the UWMP will be considered is rescheduled.

Please contact me at (707) 374-6451, ext. 1116 or at: rborre@ci.rio-vista.ca.us if you have any questions.

Sincerely,

Robin Borre
Director of Public Works

cc: Robert Hickey, City Manager
Margaret Roberts, City Clerk
Mona Ebrahimi, City Attorney
Cecil Dillon, City Engineer

CITY OF RIO VISTA
Department of Public Works
One Main Street, Rio Vista, California 94571
Phone (707) 374-6451 Ext. 1106

April 9, 2021

Mr. Michael Hether
Assistant Director of Public Works/Utilities
City of Fairfield
1000 Webster Street
Fairfield, CA 94533-4883

Re: 2021 Urban Water Management Plan Update

Dear Mr. Walker,

In accordance with the Urban Water Management Planning Act (CA Water Code Section 10642), the City of Rio Vista (City) is informing all city and county agencies in our service area that we are currently reviewing and updating the City's Urban Water Management Plan (UWMP). The UWMP will provide an analysis of projected water demand and supply over the next 20 years, as well as an updated water conservation plan that meets state requirements. The update is due to the California Department of Water Resources (DWR) by July 1, 2021.

The draft UWMP will be available for public review 30 days prior to the scheduled public hearing, which is tentatively scheduled for June 15, 2021. We will notice you if the public hearing date at which the UWMP will be considered is rescheduled.

Please contact me at (707) 374-6451, ext. 1116 or at: rborre@ci.rio-vista.ca.us if you have any questions.

Sincerely,

Robin Borre
Director of Public Works

cc: Robert Hickey, City Manager
Margaret Roberts, City Clerk
Mona Ebrahimi, City Attorney
Cecil Dillon, City Engineer

CITY OF RIO VISTA
Department of Public Works
One Main Street, Rio Vista, California 94571
Phone (707) 374-6451 Ext. 1106

April 9, 2021

Ms. Erica Ahmann-Smithies
Public Works Director
City of American Canyon
4381 Broadway Street, Suite 201
American Canyon, CA 94503

Re: 2021 Urban Water Management Plan Update

Dear Ms. Ahmann-Smithies,

In accordance with the Urban Water Management Planning Act (CA Water Code Section 10642), the City of Rio Vista (City) is informing all city and county agencies in our service area that we are currently reviewing and updating the City's Urban Water Management Plan (UWMP). The UWMP will provide an analysis of projected water demand and supply over the next 20 years, as well as an updated water conservation plan that meets state requirements. The update is due to the California Department of Water Resources (DWR) by July 1, 2021.

The draft UWMP will be available for public review 30 days prior to the scheduled public hearing, which is tentatively scheduled for June 15, 2021. We will notice you if the public hearing date at which the UWMP will be considered is rescheduled.

Please contact me at (707) 374-6451, ext. 1116 or at: rborre@ci.rio-vista.ca.us if you have any questions.

Sincerely,

Robin Borre
Director of Public Works

cc: Robert Hickey, City Manager
Margaret Roberts, City Clerk
Mona Ebrahimi, City Attorney
Cecil Dillon, City Engineer

CITY OF RIO VISTA

One Main Street, Rio Vista, California 94571
Phone: (707) 374-6451 Fax: (707) 374-6763

Notice of Public Hearing
2020 Urban Water Management Plan

In accordance with the Urban Water Management Planning Act (CA Water Code Section 10642), the City of Rio Vista (City) is informing all residence in our service area that we are currently reviewing and updating the City's Urban Water Management Plan (UWMP). The UWMP will provide an analysis of projected water demand and supply over the next 20 years, as well as an updated water conservation plan that meets state requirements. The update is due to the California Department of Water Resources (DWR) by July 1, 2021.

The draft UWMP will be available for public review 30 days prior to the scheduled public hearing, which is tentatively scheduled for June 15, 2021. The document can be found on the City's website: www.riovistacity.com.

We will notice the public if the public hearing date at which the UWMP will be considered is rescheduled.

PROOF OF PUBLICATION
(2015.5 C.C.P.)

STATE OF CALIFORNIA
County of Solano

This Space For Filing Stamp

I am a citizen of the United States and a resident of Solano County. I am over the age of eighteen years and not a party to, or interested in, this Legal or Public Notice matter, I am the principal Legal Advertising Clerk for the

DAILY REPUBLIC
1250 Texas Street
P.O. Box 47
Fairfield, CA 94533

a newspaper of general circulation printed and published mornings, daily and Sunday, in the City of Fairfield, County of Solano, which has been adjudged a newspaper of general circulation by the Superior Court of the County of Solano, State of California, Case Number 25875, on June 30, 1952.

I certify under penalty of perjury that the attached Legal or Public Notice has been published in each regular and entire issue of the Daily Republic, and not in any supplement, on the following date(s):

May 3, 10,

in the year: 2021

By: Lana Vargas

Lana Vargas, Legal Advertising Clerk

Date: May 10, 2021

CITY OF RIO VISTA
One Main Street, Rio Vista, California 94571
Phone: (707) 374-6451 Fax: (707) 374-6763

Notice of Public Hearing
2020 Urban Water Management Plan

In accordance with the Urban Water Management Planning Act (CA Water Code Se tion 10642), the City of Rio Vista (City) is informing all residence in our service area th we are currently reviewing and updating the City's Urban Water Management Plan (U MP). The UWMP will provide an analysis of projected water demand and supply over t next 20 years, as well as an updated water conservation plan that meets state requi ments. The update is due to the California Department of Water Resources (DWR) July 1, 2021.

The draft UWMP will be available for public review 30 days prior to the scheduled pub hearing, which is tentatively scheduled for June 15, 2021. The document can be fou on the City's website: www.riovistacity.com.

We will notice the public if the public hearing date at which the UWMP will be consider is rescheduled.
DR# 00046473
Published: May 3, 10, 2021

Legal Notices

CITY OF RIO VISTA

One Main Street, Rio Vista, California 94571
Phone: (707) 374-6451 Fax: (707) 374-6763

Notice of Public Hearing
2020 Urban Water Management Plan

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ORDER TO SHOW CAUSE FOR
CHANGE OF NAME
CASE NO. FCS056212

TO ALL INTERESTED PERSONS: Petitioner: LILLIAN SUZETTE TORRES filed a petition with this court for a decree changing names as follows:
Present name: LILLIAN SUZETTE TORRES
Proposed name: LILLIAN SUZETTE TORRES-MENDEZ
THE COURT ORDERS that all persons interested in this matter appear before this court at the hearing indicated below to show cause, if any, why the petition for change of name should not be granted. Any person objecting to the name changes described above must file a written objection that includes the reasons for the objection at least two court days before the matter is scheduled to be heard and must appear at the hearing to show cause why the petition should not be granted. If no written objection is timely filed, the court may grant the petition without a hearing.

NOTICE OF HEARING
Date: June 16, 2021 Time: 9:00 am Dept.: 8 Room: I
The address of the court is:
SUPERIOR COURT OF CALIFORNIA,
COUNTY OF SOLANO
OLD SOLANO COURTHOUSE
580 TEXAS STREET FAIRFIELD, CA 94533

A copy of this Order to Show Cause shall be published at least once each week for four successive weeks prior to the date set for hearing on the petition in the following newspaper of general circulation, printed in this county:
RIO VISTA BEACON DATE: APRIL 20, 2021
PUB DATES: MAY 05, 12, 19, 26 2021

RVB 002700

Estate Sale
Friday May 14th
and Saturday May 15th.
10-5 pm.
325 Riverview St.
Rio Vista.
Robin's Nest
707-374-4004

Office Building for Rent
Office building for rent 2.5 miles from Rio Vista on Cattey Lane. 2600 square feet, with heat, air, water and sewer paid.
Contact
Robert 209-603-6765

WANTED
Wanted classic cars trucks and RVs running or not no smog OK no Junk please also we buy boats price open call
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Large RV Sites for Rent
Restrooms, large trees for shade.
Sacramento Delta.
$750.00 a month.
Plus deposit.
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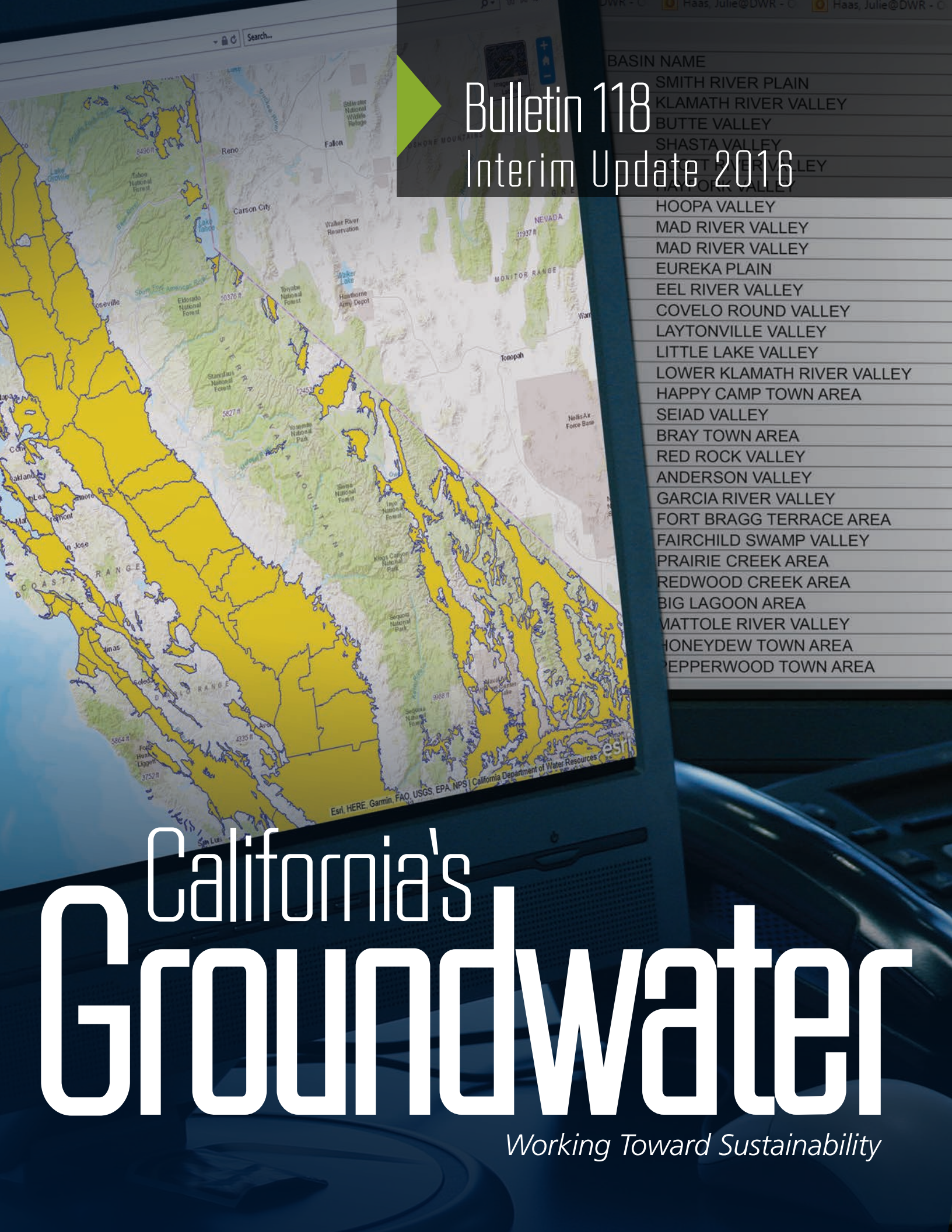
Help Wanted
Williams Mobile Service/ Rio Vista Tire is looking for a Mechanic & tire person please apply @ 3047 Cattey Ln. Rio Vista

Looking For a Hairdresser?

I have been licensed for 30 + years. I have been extensively trained by Matrix as an educator for their hair color line , teaching both in salons and in Beauty Schools in Sacramento as well as the Bay Area.
I can cut, color and perm both women and men's hair.
My name is Kathy and I can be reached by calling (925) 708-6121.
Please call for an appointment.
I look forward to meeting you.



Bulletin 118
Interim Update 2016

California's Groundwater

Working Toward Sustainability

This publication includes web-based content. It is possible that web addresses referenced in this publication will change with time and that printed copies will not reflect changes. If any difficulties are experienced accessing web-based content, please visit the on-line version of this publication at:

https://water.ca.gov/Programs/Groundwater-Management/Bulletin-118
or call (916) 653-5791 for assistance.

Bulletin 118 Interim Update 2016

California's Groundwater

Working Toward Sustainability

December 22, 2016



Acronyms and Abbreviations

BBAT	Basin Boundary Assessment Tool
BBMRS	Basin Boundary Modification Request System
CASGEM	California Statewide Groundwater Level Elevation Monitoring
DWR	California Department of Water Resources
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
SGMA	Sustainable Groundwater Management Act
Water Code	California Water Code

Forward



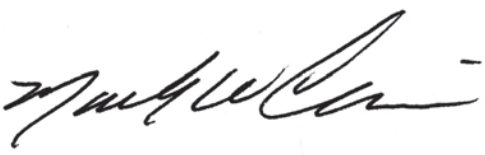
The Department of Water Resources' (DWR) Bulletin 118 series, *California's Groundwater,* is the state's premier groundwater publication. It is the official compendium of information about the occurrence, characteristics, and management of groundwater in California.

California entered into a new era of water management in 2014 with the passage of the Sustainable Groundwater Management Act (SGMA). SGMA provides for the sustainable management of groundwater through the formation of locally-organized groundwater sustainability agencies, and the development and implementation of groundwater sustainability plans based on groundwater basins identified, delineated, and characterized in Bulletin 118.

The various requirements and deadlines of SGMA necessitate that Bulletin 118 be updated now through this interim update, rather than the comprehensive update of Bulletin 118 scheduled for 2020. Information provided in this interim update--groundwater basins subject to critical conditions of overdraft, groundwater basin boundary modifications, and the priority rankings of California's groundwater basins—is essential to the timely formation of groundwater sustainability agencies, and the development and implementation of groundwater sustainability plans.

This publication is yet another major achievement in fulfilling DWR's commitment to assist local agencies in managing groundwater sustainably. Other recent achievements include landmark regulations for the development of groundwater sustainability plans and regulations for groundwater basin boundary modification requests by local agencies. DWR will also release best management practices for the sustainable management of groundwater by year's end.

There are still many challenges ahead of us as we progress toward the sustainable management of groundwater throughout California. These challenges are significant, but I'm confident that local agencies, with continued support from DWR, will successfully implement SGMA and ensure that California's precious groundwater is sustained for generations to come.



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Well drilling near Tule Lake

Introduction

Groundwater is a major part of California's water supply. During average hydrologic conditions, groundwater provides close to 40 percent of the water in California for urban, rural, and agricultural uses. This percentage increases during dry years when water in rivers, streams, and lakes is in short supply. For many areas of the state, groundwater is the only water supply available year-round.

A new era for California's groundwater began in September 2014 with the passage of the Sustainable Groundwater Management Act (SGMA). SGMA established a path for the sustainable management of groundwater through the formation of locally organized groundwater sustainability agencies and locally developed groundwater sustainability plans.

The purpose of this interim update is to provide up-to-date information on groundwater basins subject to critical conditions of overdraft, groundwater basin boundaries, and basin prioritization. That information is essential to the successful implementation of SGMA, including the timely formation of groundwater sustainability agencies and the development of groundwater sustainability plans.

This update is the latest in a series of Bulletin 118 publications that provide important information about California's groundwater. Together with previous updates of Bulletin 118, this update also builds on the body of information about California's groundwater provided by the following recent DWR publications:

- *California's Groundwater Update 2013: A Compilation of Enhanced Content for California Water Plan Update 2013* **(https://water.ca.gov/Programs/California-Water-Plan/Water-Plan-Updates).**
- *Public Update for Drought Response: Groundwater Basins with Potential Water Shortages and Gaps in Groundwater Monitoring (2014).* **(https://water.ca.gov/-/media/DWR-Website/Web-Pages/Water-Basics/Drought/Files/Publications-And-Reports/Drought-Response-Groundwater-Basins---April-2014.pdf).**

KEY FEATURES OF SGMA

- *Provides for the sustainable management of groundwater through the formation of groundwater sustainability agencies (GSAs), and the development and implementation of groundwater sustainability plans (GSPs)*
- *Requires GSAs and GSPs for all groundwater basins identified by the California Department of Water Resources (DWR) as high- or medium-priority.*
- *Authorizes the intervention of the State Water Resources Control Board in the event that no GSA, or equivalent local authority, is formed for a high- or medium-priority basin, or if an adequate GSP is not submitted for those basins.*
- *Establishes criteria for the sustainable management of groundwater and authorizes DWR to establish best management practices for groundwater.*

For more information about SGMA, visit: **https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management**

California Water Code Section 12924

(a) The department, in conjunction with other public agencies, shall conduct an investigation of the state's groundwater basins. The department shall identify the state's groundwater basins on the basis of geological and hydrological conditions and consideration of political boundary lines whenever practical. The department shall also investigate existing general patterns of groundwater extraction and groundwater recharge within those basins to the extent necessary to identify basins that are subject to critical conditions of overdraft.

(b) The department may revise the boundaries of groundwater basins identified in subdivision (a) based on its own investigations or information provided by others.

(c) The department shall report its findings to the Governor and the Legislature not later than January 1, 2012, and thereafter in years ending in 5 or 0

- *Public Update for Drought Response: Groundwater Basins with Potential Water Shortages, Gaps in Groundwater Monitoring, Monitoring of Land Subsidence, and Agricultural Land Fallowing (2014)* **(https://water.ca.gov/LegacyFiles/cagroundwater/docs/November%202014%20Public%20Update%20for%20Drought%20Response.pdf).**

A comprehensive update of Bulletin 118 is scheduled for 2020 in accordance with California Water Code Section 12924 and the California Water Action Plan **(www.resources.ca.gov/california_water_action_plan/).** The 2020 update will build on information provided by this interim update, the rest of the Bulletin 118 series, and the reports listed in the previous paragraph. It will also include an inventory and assessment of efforts by groundwater sustainability agencies and the State to implement SGMA, information on groundwater management successes and challenges, and recommendations for the future. More information about the 2020 update is provided in the final section of this update.

California State Capitol



Previous Bulletin 118 Publications

DWR has long recognized the need to provide information about California's groundwater to improve understanding about the resource and inform water management decisions. DWR's Bulletin 118 series serves as the State's official compendium of information about groundwater resources throughout California, including the definition, boundaries, and characteristics of the state's groundwater basins.

Three statewide versions of Bulletin 118, California's Groundwater were published prior to this interim update:

Bulletin 118, 1975

Bulletin 118, 1975 is the first publication of the Bulletin 118 series that is statewide in scope. It identifies over 400 groundwater basins and subbasins in California and provides some summary information on basin and aquifer characteristics, groundwater use, and water quality concerns.

Bulletin 118, Update 1980

This update provides information on changes to some of the groundwater basin boundaries identified in Bulletin 118, 1975 along with summary information on basin characteristics, groundwater use, and other information. This update identifies 11 groundwater basins as being subject to critical conditions of overdraft. Additional basins and areas are identified as being of "special concern."

Bulletin 118, 2003

Update 2003 includes online technical descriptions and geographic information system compatible maps for 515 groundwater basins and subbasins in California. Update 2003 also includes information about groundwater management in the state and provides recommendations for the future. The list of groundwater basins subject to critical conditions of overdraft, published in the 1980 update of Bulletin 118, was not reevaluated for Update 2003.

These three Bulletin 118 publications were preceded by *Water Quality Investigations Report No. 3, Ground Water Basins in California,* published in 1952 by the California Department of Public Works and Division of Water Resources (the predecessor to DWR). This report identifies alluvial basins and other areas believed to contain usable groundwater.

In addition to the statewide Bulletin 118 publications several regional versions of Bulletin 118 were published in the past that focus on individual areas of the state. The regional versions of Bulletin 118 address the groundwater resources of Sonoma County, South San Francisco Bay Area, Livermore and Sunol valleys, Sacramento Valley, and Sacramento County.

The documents discussed above can be accessed at: **https://water.ca.gov/Programs/Groundwater-Management/Bulletin-118**



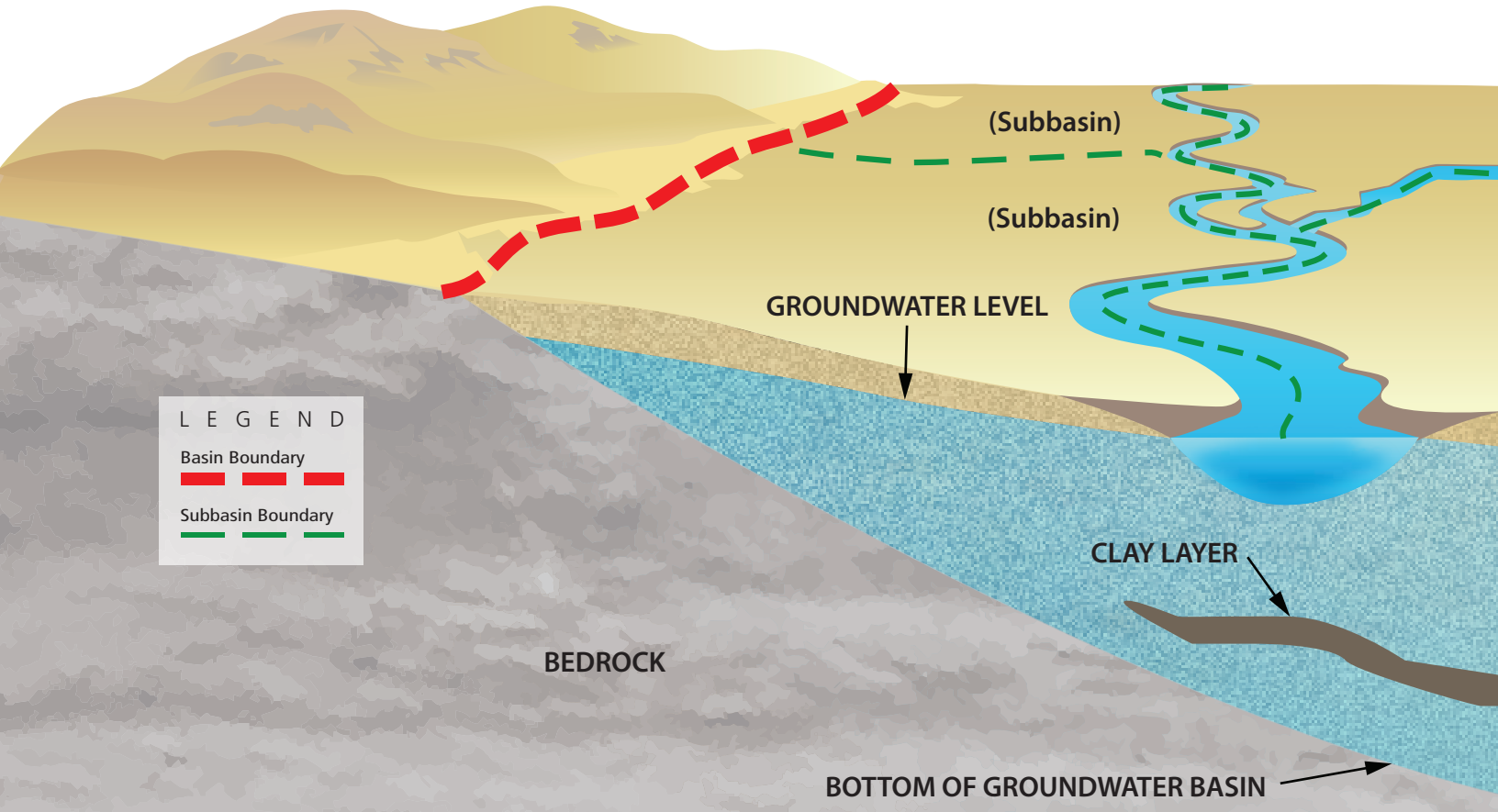
Agricultural well near Marysville

What is a groundwater basin[a]?

Title 23, Division 2, Chapter 1.5, Subchapter 1, Article 2, Section 341(g)(1) of the California Code of Regulations refers to a groundwater basin as an:

". . . aquifer or stacked series of aquifers with reasonanably well-defined boundaries in a lateral direction, based on features that significantly impede groundwater flow, and a definable bottom . . . "

The diagram below is an illustration of a groundwater basin in its most basic sense. The lateral boundaries of the illustrated basin are located where porous sediments depositied in the valley, such as sand, gravel, and silt, meet the bedrock that comprises the neighboring mountains. The physical bottom of the basin occurs where the porous valley deposits contact the underlying bedrock. For groundwater management purposes, the effective bottom of a groundwater basin is sometimes defined as the depth below which generally only unsuitable brackish or saline groundwater can be found[b].



The spaces between individual grains of the valley deposits hold water that has percolated down from the land surface. Accumulated groundwater can flow laterally to a well. Groundwater can also flow out into depressions in the land surface, such as a river channel, where the groundwater level is high. The layer of clay shown in the diagram separates the porous valley deposits into two aquifers.

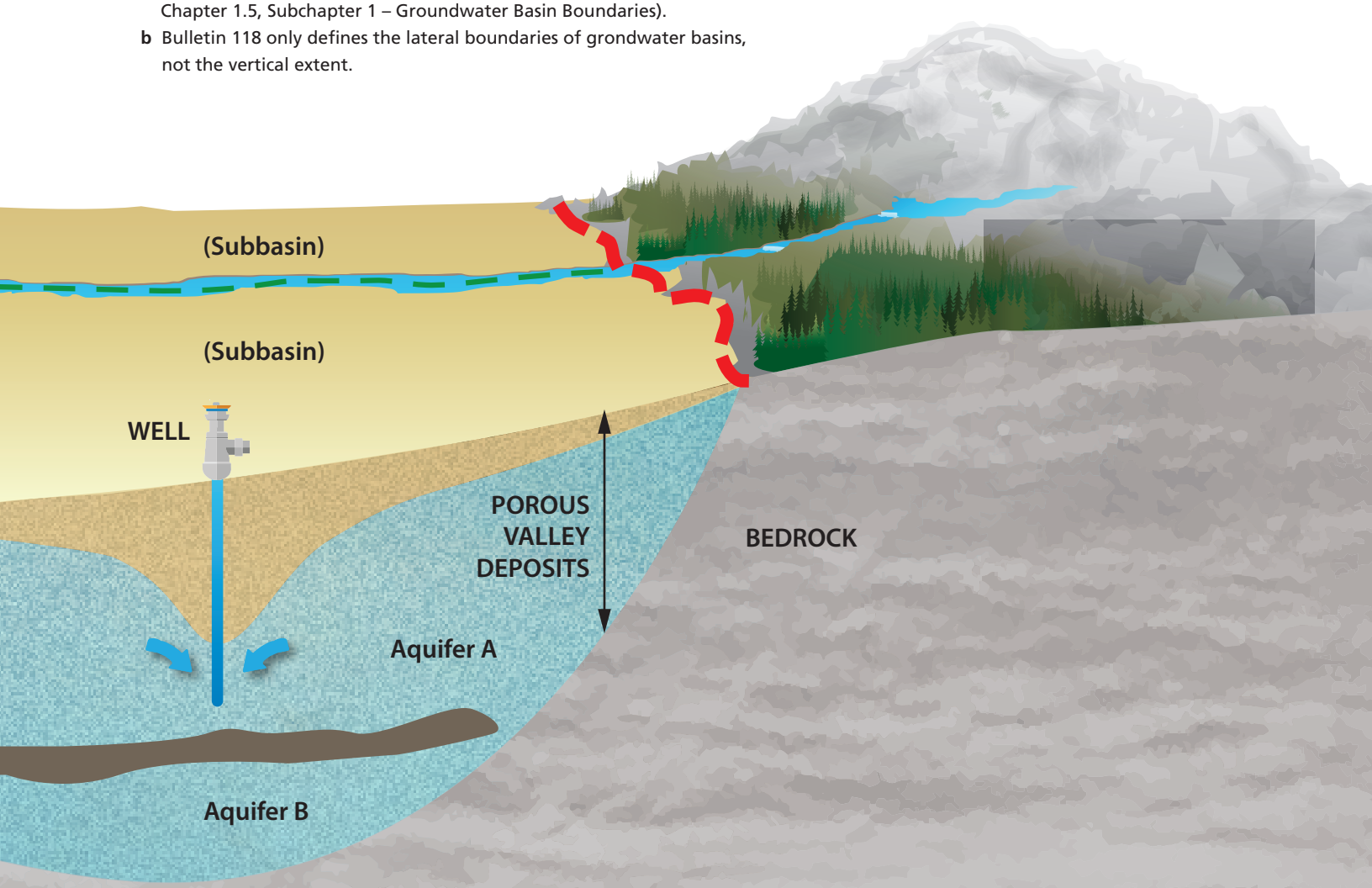
Numerous groundwater basins in California have been divided into smaller units, referred to as *subbasins.* The lateral boundaries of subbasins are established by DWR based on geologic factors, hydraulic considerations, or institutional boundaries.

Additional information on the various types of groundwater basins and subbasins, and their boundaries, is included in Bulletin 118, Update 2003 (pages 88 through 90), available at: **https://water.ca.gov/Programs/Groundwater-Management/Bulletin-118**

NOTES

a This information is for general understanding purposes only and does not supplant regulations established by DWR (California Code of Regulations Title 23, Division 2, Chapter 1.5, Subchapter 1 – Groundwater Basin Boundaries).

b Bulletin 118 only defines the lateral boundaries of grondwater basins, not the vertical extent.





Agricultural well in the San Joaquin Valley

Groundwater Basins Subject to Critical Conditions of Overdraft

BACKGROUND

The first statewide version of Bulletin 118 was published in 1975. Bulletin 118, 1975 includes information about groundwater basins in overdraft and the adverse effects that could occur from overdraft.

In 1978, the California Water Code (Water Code) was amended tasking DWR with investigating the State's groundwater basins, defining their boundaries, and identifying basins "subject to critical conditions of overdraft" (Section 12924). DWR released the first update of the statewide version of Bulletin 118 in 1980. That update defined the terms "overdraft" and "subject to critical conditions of overdraft," and listed 11 groundwater basins as being subject to critical conditions of overdraft. The next statewide update of Bulletin 118, in 2003, did not revise the 1980 list because no comprehensive assessment of groundwater overdraft conditions was performed.

APPROACH

DWR began a statewide assessment of groundwater basin overdraft conditions in 2015 to update the 1980 list of basins subject to critical conditions of overdraft. The assessment was based on readily available information on groundwater conditions and observed effects of overdraft.

Time Period Selection

The first step of the assessment effort was the selection of a suitable time period for evaluating groundwater basin conditions. After a review of past overdraft analyses by DWR, the following criteria were used for the selection of the time period for evaluating groundwater basin conditions:

- It should not include the current drought which began in 2012.
- It should be as a recent as possible.
- Mean annual statewide precipitation over the time period should be equivalent to the long-term mean annual precipitation.

BASINS SUBJECT TO CRITICAL CONDITIONS OF OVERDRAFT AND SGMA

SGMA mandates that all groundwater basins identified by DWR as high- or medium-priority by January 31, 2015, must have groundwater sustainability agencies established by June 30, 2017. The act also requires that all high- and medium-priority basins classified as being subject to critical conditions of overdraft in Bulletin 118, as of January 1, 2017, be covered by groundwater sustainability plans, or their equivalent, by January 31, 2020. Groundwater sustainability plans, or their equivalent, must be established for all other high- and medium-priority basins by January 31, 2022

For more information about SGMA, visit: **https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management**

What is *Groundwater Overdraft?*

Bulletin 118, Update 2003 describes groundwater overdraft as:

"... the condition of a groundwater basin or subbasin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years, during which the water supply conditions approximate average conditions. Overdraft can be characterized by groundwater levels that decline over a period of years and never fully recover, even in wet years. If overdraft continues for a number of years, significant adverse impacts may occur, including increased extraction costs, costs of well deepening or replacement, land subsidence, water quality degradation, and environmental impacts." (Page 96)

What is a *Groundwater Basin Subject to Critical Conditions of Overdraft?*

Bulletin 118, Update 1980 defines a groundwater basin subject to critical conditions of overdraft as:

"A basin is subject to critical conditions of overdraft when continuation of present water management practices woud probably result in sigificant adverse overdraft-related environmental, social, or economic impacts." (Page 3)

- The time period should be a minimum of 10 years in duration and include both wet and dry years.
- The net change in water in storage in the unsaturated zone over the entire time period should be minimal.

DWR evaluated statewide precipitation data obtained from the Western Regional Climate Center for Water Years 1895 through 2014 to determine a suitable time period for evaluating groundwater basin conditions. Figure 1 is a graph of the cumulative departure of annual statewide precipitation from the long-term mean annual statewide precipitation of 22.19 inches, from Water Years 1895 through 2014.

Following the time-period selection criteria listed in the preceding paragraph, it was determined that the time period for the assessment of critical conditions of overdraft would be Water Years 1989 through 2009. The selected assessment period:

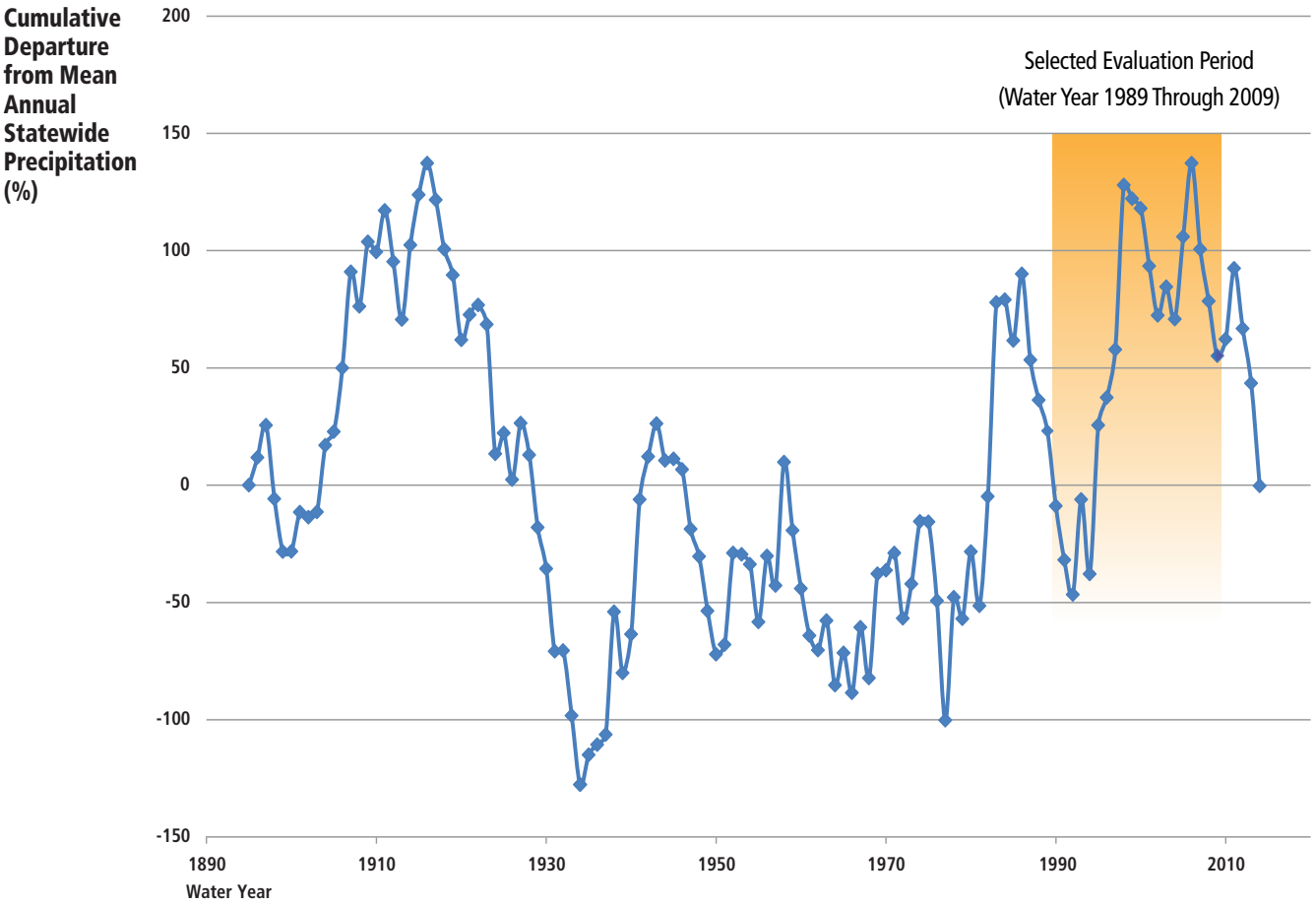


FIGURE 1 – Cumulative Departure of Annual Statewide Precipitation from the Long-Term Mean Annual Statewide Precipitation of 22.19 inches from Water Years 1895–2014

- Does not include the current drought.
- Has a mean annual statewide precipitation of 22.39 inches (only about 1 percent more than the long-term mean).
- Includes two wet periods when annual statewide precipitation exceeded the long-term mean precipitation for multiple years; the first lasting four consecutive years and the second lasting two consecutive years.
- Includes three dry periods when annual statewide precipitation was less than the long-term mean precipitation; the first, second, and third dry periods lasting three, four, and three consecutive years, respectively.
- Starts and ends after three consecutive years of below-average precipitation, thereby minimizing the impact of a possible net difference in unsaturated zone water content over the entire assessment period.

What is a water year?

A water year starts October 1 and ends September 30 of the following calendar year *(California Water Code Section 10721 [aa])*. A water year is designated by the calendar year it ends on. For example, the water year that started on October 1, 2015, and ended September 30, 2016, is referred to as Water Year 2016.

Groundwater-Level Trend Assessment

A groundwater-level trend assessment was performed using readily accessible data for groundwater basins delineated in Bulletin 118, Update 2003. Data were not available for all basins.

The trend assessment was performed to identify basins that experienced a consistant trend of declining groundwater levels through the entire assessment period. Groundwater level data after Water Year 2009 were also reviewed for any evidence that groudwater level declines and overdraft had ceased to continue after the assessment period. The overall goal of the groundwater level trend assessment was to help identify groundwater basins that might have experienced adverse impacts of overdraft during the assessment period. Adverse impacts of overdraft are described below.



Nested monitoring wells (multiple casings in a single borehole)

The primary source of groundwater-level data for the trend assessment was DWR's Water Data Library **(http://wdl.water.ca.gov/waterdatalibrary/).** DWR used additional sources of data, such as published reports where available, and data from the California Statewide Groundwater Level Elevation Monitoring (CASGEM) Program database **(https://water.ca.gov/Programs/Groundwater-Management/Groundwater-Elevation-Monitoring--CASGEM),** to supplement Water Data Library data.

Adverse Impacts of Overdraft

The deciding factor for the identification of groundwater basins subject to critical conditions of overdraft was the documented observation of one or more adverse impacts of overdraft, including:

- Land subsidence.
- Sea water intrusion into a coastal basin aquifer.
- Water of unusable quality being caused to migrate and make a groundwater supply unusable.
- Groundwater levels declining during a period of normal or above-normal water supply.

DWR collected readily available information on observed adverse impacts of overdraft in basins to determine where such impacts had been reported during the assessment period. This information was obtained from federal, State, and local agency publications, and from reports by private consultants. If adverse impacts of overdraft had been reported in a portion of a groundwater basin during the assessment period, then the adverse impact was assigned to the entire basin for classification purposes.

RESULTS

Preliminary Determination

After the groundwater basin overdraft assessment effort was completed, DWR developed a preliminary list of basins determined to be subject to critical conditions of overdraft. This list included all groundwater basins identified in Bulletin 118-1980 as subject to critical conditions of overdraft and additional basins newly identified as subject to critical conditions of overdraft.

During July 2015, DWR contacted counties and major water agencies associated with basins identified in the preliminary list and encouraged them to provide additional information that DWR could consider for the draft and final determinations of basin conditions. In response, several organizations provided additional information and entered into discussions with DWR. Changes were made to the preliminary list of groundwater basins subject to critical conditions of overdraft after the newly submitted information was considered by DWR.

Draft and Final Determinations

In August 2015, DWR released a draft list of 21 groundwater basins identified as being subject to critical conditions of overdraft. The draft list was anounced though a news release and through DWR's website. The list was also presented at a public meeting of the California Water Commission and at a DWR-hosted and webcasted public meeting in the city of Clovis.

Public comments on the draft list were collected for more than 30 days. Fifteen sets of comments were submitted pertaining to eight of the 21 identified basins. Comments in favor and against the draft designations were received.

In January 2016, following the review of comments received for the draft list, DWR released the final list of groundwater basins subject to critical conditions of overdraft. No changes were made between the August 2015 draft list and the January 2016 final list. The January 2016 final list of basins subject to critical conditions of overdraft is presented in Table 1.

Groundwater Basins Subject to Critical Conditions of Overdraft and Basin Boundary Modifications

In response to the requirements of SGMA, DWR developed emergency regulations in 2015, and instituted a process in early 2016, for local agencies to submit groundwater basin boundary modification requests to DWR.
The basin boundary modification request submittal and review process was completed with the final approval of the basin boundary modifications by DWR on October 18, 2016. Boundary changes were made to correct known errors and inconsistencies in basin boundaries (referred to as "administrative adjustments") and to address jurisdictional, geologic, hydrologic, and other considerations. The basin boundary modification regulations, process, and results are discussed in the following section.



DWR staff measuring the groundwater level in a monitoring well

Of the 21 groundwater basins identified in January 2016 as being subject to critical conditions of overdraft, six basins received major boundary modifications, 13 basins underwent relatively minor boundary changes, and the boundaries of two basins remained unchanged as the result of the boundary modification process. None of the modifications moved an area of a basin with adverse impacts of overdraft to a basin that is not identified as subject to critical conditions of overdraft.

Table 2 summarizes the relative scope of boundary modifications for each of the basins identified in January 2016 as being subject to critical conditions of overdraft. Table 3 provides summary descriptions of the boundary modifications for the six overdrafted basins that received major modifications. The locations of all groundwater basins subject to critical conditions of overdraft are shown in Figure 2.

TABLE 1 – Groundwater Basins Subject to Critical Conditions of Overdraft – January 2016

Basin Number[a]	Basin/Subbasin Name[a]
3-1	Soquel Valley
3-2	Pajaro Valley
3-4.01	180/400-Foot Aquifer
3-4.06	Paso Robles Area
3-8	Los Osos Valley
3-13	Cuyama Valley
4-4.02	Oxnard
4-6	Pleasant Valley
5-22.01	Eastern San Joaquin
5-22.04	Merced
5-22.05	Chowchilla
5-22.06	Madera
5-22.07	Delta-Mendota
5-22.08	Kings
5-22.09	Westside
5-22.11	Kaweah
5-22.12	Tulare Lake
5-22.13	Tule
5-22.14	Kern County
6-54	Indian Wells Valley
7-24	Borrego Valley

a As identified and delineated in Bulletin 118: *California's Groundwater,* Update 2003.

TABLE 2 – Relative Scope of Boundary Modifications for Each Groundwater Basin Identified as Subject to Critical Conditions of Overdraft

Basin Number (Bulletin 118, Update 2013)[a]	Basin Number (2016)	Basin/Subbasin Name (2016)	Relative Scope of Changes[b]
3-1	3-001	San Cruz Mid-County[c]	Major
3-2	3-002.01	Pajaro Valley	Major
3-4.01	3-004.01	180/400-Foot Aquifer	Major
3-4.06	3-004.06	Paso Robles Area	Major
3-8	3-008	Los Osos Valley	Minor
3-13	3-013	Cuyama Valley	None
4-4.02	4-004.02	Oxnard	Minor
4-6	4-006	Pleasant Valley	Minor
5-22.01	5-022.01	Eastern San Joaquin	Minor
5-22.04	5-022.04	Merced	Minor
5-22.05	5-022.05	Chowchilla	Minor
5-22.06	5-022.06	Madera	Minor
5-22.07	5-022.07	Delta-Mendota	Minor
5-22.08	5-022.08	Kings	Minor
5-22.09	5-022.09	Westside	Minor
5-22.11	5-022.11	Kaweah	Minor
5-22.12	5-022.12	Tulare Lake	Minor
5-22.13	5-022.13	Tule	Minor
5-22.14	5-022.14	Kern County	Major
6-54	6-054	Indian Wells Valley	None
7-24	7-024.01	Borrego Springs[d]	Major

NOTES

a As identified in Bulletin 118, *California's Groundwater,* Update 2003

b Major changes involved relatively large areas being added to, or removed from, a basin. Minor changes included small adjustments in the location of a basin boundary and relatively small areas being added to, or removed from, a basin.

c Formerly "Soquel Valley"

d Formerly "Borrego Valley"



Agriculture near Oxnard

TABLE 3 – Summary of Major Boundary Changes for Groundwater Basins Subject to Critical Conditions of Overdraft

Basin Number (2016)	Basin/Subbasin Name (2016)	Summary of Changes
3-001	San Cruz Mid-County Basin	The former Soquel Valley Basin (3-1) was expanded to include portions of three adjacent basins— West Santa Cruz Terrace Basin (3-026), the former Santa Cruz Purisima Formation Basin (3-21), and the original Pajaro Valley Basin (3-2). The Soquel Valley Basin was then renamed to be the San Cruz Mid-County Basin.
3-002.01	Pajaro Valley Subbasin	Various portions of the original Pajaro Valley Basin were moved to three adjacent subbasins/basins-- 180/400 Foot Aquifer Subbasin (3-004.01), Langley Area Subbasin (3-004.09), and the newly formed San Cruz Mid-County (3-001) Basin. A portion of the former Santa Cruz Purisima Formation Basin (3-21) was added to this basin. The Pajaro Valley Basin was also reclassified as a subbasin.
3-004.01	180/400-Foot Aquifer Subbasin	A portion of the original 180/400-Foot Aquifer subbasin was moved to the Pajaro Valley Subbasin (3-002.01).
3-004.06	Paso Robles Area Subbasin	A new subbasin, "Atascadero Area"(3-004.11), was created from a portion of the original Paso Robles Area Subbasin. The Atascadero Area Subbasin is not subject to critical conditions of overdraft.
5-022.14	Kern County Subbasin	A new subbasin, "White Wolf" (5-022.18), was created from a portion of the original Kern County Subbasin. The White Wolf Subbasin is not subject to critical conditions of overdraft.
7-024.01	Borrego Springs Subbasin	The Borrego Valley Basin (7-24) was divided into 2 new subbasins; "Borrego Springs" (7-024.01) and "Ocotillo Wells" (7-024.02). The Borrego Springs Subbasin is subject to critical conditions of overdraft whereas the Ocotillo Wells Subbasin is not.

FIGURE 2 – Groundwater Basins Subject to Critical Conditions of Overdraft



Basin/Subbasin Number*	Basin/Subbasin Name
3-001	Santa Cruz Mid-County
3-002.01	Pajaro Valley
3-004.01	180/400-Foot Aquifer
3-004.06	Paso Robles Area
3-008	Los Osos Valley
3-013	Cuyama Valley
4-004.02	Oxnard
4-006	Pleasant Valley
5-022.01	Eastern San Joaquin
5-022.04	Merced
5-022.05	Chowchilla
5-022.06	Madera
5-022.07	Delta-Mendota
5-022.08	Kings
5-022.09	Westside
5-022.11	Kaweah
5-022.12	Tulare Lake
5-022.13	Tule
5-022.14	Kern County
6-054	Indian Wells Valley
7-024.01	Borrego Springs

**See Appendix B, Figure B-2 for an explanation of the California groundwater basin/subbasin numbering system.*

Map created from B-118 basin boundary data – updated by DWR on October 18, 2016. The list of basins with critical conditions of overdraft was finalized in 2016, after the revisions to the B-118 basin boundaries were finalized.



Agriculture in the Salinas Valley

Groundwater Basin Boundary Modifications

BACKGROUND

In 2014, with the passage of SGMA, Section 10722.2 was added to the Water Code allowing local agencies, or an entity directed by the court in an adjudication action, to request that DWR revise the boundaries of a groundwater basin, including the establishment of new subbasins. Section 10722.2 does not affect DWR's existing authority to revise basin boundaries under Water Code Section 12924.

Section 10722.2 requires that local agency basin boundary modification requests include information justifying and supporting requested modifications. Water Code Section 10722.2 also requires that, by January 1, 2016, DWR adopt emergency regulations for the submittal, processing, and consideration of modification requests.

Regulations Development

In 2015, DWR initiated efforts to develop emergency regulations for local agencies to request groundwater basin boundary modifications. A comprehensive, multi-phased public engagement process was followed during the development of the regulations. Outreach efforts included news releases, web announcements, advisory group meetings, public meetings, and multiple updates to the California Water Commission.

On October 21, 2015, DWR presented draft final groundwater basin boundary regulations to the California Water Commission for adoption. The regulations (California Code of Regulations Title 23, Division 2, Chapter 1.5, Subchapter 1) were adopted by the commission and became effective November 16, 2015, after being submitted to the State Office of Administrative Law. In general, the adopted regulations address:

- The types of groundwater basin boundary modification requests DWR will consider
- Procedures for submitting boundary modification requests and related public input
- Information necessary for supporting modification requests
- Methods and criteria used by DWR to evaluate modification requests
- DWR's procedures for adopting boundary modifications.

Figure 3 provides a general overview of two categories of groundwater basin modifications covered by the regulations — "scientific" and "jurisdictional." Another category, referred to as "other," was included in the regulations to cover any basin boundary modifications not addressed by aforementioned categories. Additional information about the basin boundary regulations and their development is available at: http://water.ca.gov/groundwater/sgm/bb_development.cfm.

APPROACH

Groundwater basin boundary modifications were conducted in two phases. The first phase consisted of "administrative adjustments" to basin boundaries to correct known inconsistencies and errors. During the second phase, local agency basin boundary modification requests were received and reviewed by DWR in accordance with the regulations discussed in the previous paragraphs. Boundary modifications were completed for all basins with approved modification requests.

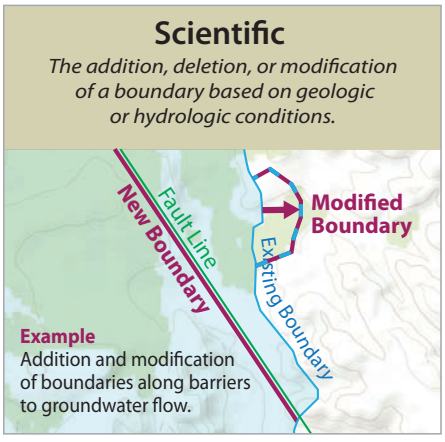
Administrative Adjustments

DWR made administrative adjustments to groundwater basin boundaries to address known inconsistencies and errors. The administrative adjustments were made to conform the graphical location and configuration of basin boundaries to the corresponding written basin boundary descriptions provided in Bulletin 118, Update 2003. Administrative adjustments were based on information from the following sources:

- Waterways: National Hydrography Dataset created by U.S. Geological Survey in cooperation with the U.S. Environmental Protection Agency, U.S. Department of Agriculture, Forest Service, and other federal, State, and local partners. (Version: NHDH_CA_931v220)
- County boundaries: CAL FIRE dataset created by the California Department of Forestry and Fire Protection. (File: cbty24k15_1, published November, 2015)

FIGURE 3 – Overview of Scientific and Jurisdictionally Based Groundwater Basin Boundary Modifications

The illustrations to the right depict the general types of basin boundary modifications requested by local agencies. Additional information about the various types of basin boundary modifications can be found at **https://water.ca.gov/Programs/Groundwater-Management/Basin-Boundary-Modifications.**





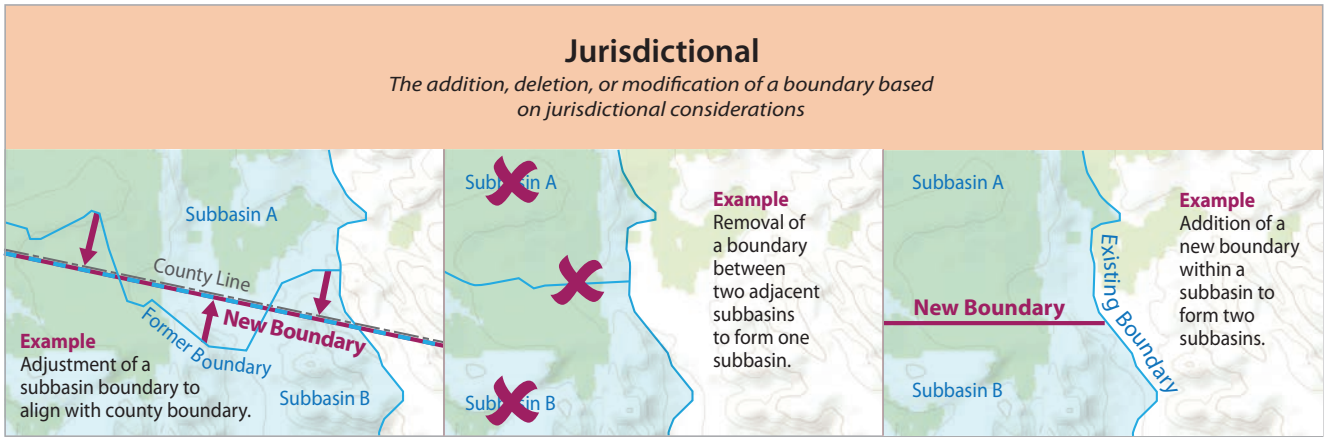
Hollywood looking toward downtown Los Angeles

- Geologic boundaries: California Geological Survey (CGS) 1:250,000 scale maps, (CGS Regional Geologic Map Series and CGS Geologic Atlas of California). U.S. Geological Survey Maps published as of September 1, 2016.

The administrative adjustments were completed prior to the period established for the submission of local agency basin boundary modification requests. All administrative adjustments were posted on DWR's website and were discussed during public meetings held for the development of the basin boundary regulations.

Groundwater Basin Boundary Modification Requests

The time period established by DWR for the submission of local agency basin boundary modification requests, and related public comments,



was January 1, 2016, through March 31, 2016. The request submission period was followed by a 30-day public comment period.

In general, all modification requests were required to include information about:

- The requesting agency
- The proposed modification and affected basin
- Efforts to consult with affected agencies and affected systems, and input received
- Public notices and meetings where the proposed modifications were discussed or considered
- Public input that was received

Scientifically based modification requests were also required to include technical information supporting the modification request. Jurisdictionally based modification requests were required to include information about groundwater management efforts and considerations, including how the proposed modification would promote sustainable groundwater management.



Agricultural well in the Salinas Valley

Process Support Tools

DWR established the Basin Boundary Modification Request System (BBMRS) to enable local agencies to submit groundwater basin boundary modification requests online, and for the public and other stakeholders to review those requests and provide comments. All of the basin boundary modification requests, supporting information, and public comments submitted during the 2016 boundary modification effort can be viewed using the BBMRS at: http://sgma.water.ca.gov/basinmod/.

DWR also established the Basin Boundary Assessment Tool (BBAT) to support local agencies during the 2016 basin boundary modification effort by providing online map-based information for the formulation of boundary modification requests. Information available from the BBAT included:

- Groundwater basin boundaries and descriptions published in Bulletin 118, Update 2003, along with all administrative adjustments
- The locations and boundaries of adjudicated basins
- Basin priority
- Geology
- Boundaries of counties, watersheds, water agencies, federal lands, and tribal lands



Pacoima spreading grounds (groundwater recharge facility)—San Fernando Valley

Groundwater Basin Boundary Modification Request Review

Fifty-four basin boundary modification requests were received. Thirty-nine requests were approved, 12 were denied, and 3 were not accepted because they were incomplete. Appendix A lists the 39 basins where local agency-requested boundary modifications were approved, along with information about the type of modifications. The 15 basins where boundary modifications were received, but were denied or incomplete, are also listed.

Draft modifications for the approved requests were released to the public July 1, 2016, and were presented at a series of public meetings in mid-July 2016, together with information about the modification submittal and review process. The draft basin boundary modifications, along with comments received during the mid-July public meetings, were presented to the California Water Commission for comment on July 20, 2016.

RESULTS

DWR evaluated comments received for the draft groundwater basin boundary modifications and finalized the modifications on October 18, 2016. As a result of the basin boundary modification process, there are now 517 identified groundwater basins and subbasins in California. Current boundaries for California's groundwater basins and subbasins are shown in Appendix B. Scalable views and information about the basins and subbasins, including their descriptions, are available using the DWR Groundwater Information Center Interactive Map at: **https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer**.



Agriculture in San Luis Obispo County

Groundwater Basin Prioritization

BACKGROUND

In 2009, Senate Bill X7-6 added Part 2.11 to Division 6 of the Water Code (Section 10920 et seq.) establishing provisions and requirements for local agencies to conduct groundwater-level monitoring. Water Code Section 10933 requires that DWR identify the extent of groundwater-level monitoring within each of the groundwater basins identified by DWR and to prioritize those basins. The legislation directed DWR to consider all of the following criteria for basin prioritization:

1. Population overlying the basin;
2. Rate of current and projected growth of the population overlying the basin;
3. Number of public supply wells that draw from the basin;
4. Total number of wells that draw from the basin;
5. Irrigated acreage overlying the basin;
6. Degree to which persons overlying the basin rely on groundwater as their primary source of water.
7. Any documented impacts on the groundwater within the basin, including overdraft, subsidence, saline intrusion, and other water quality degradation;
8. Any other information determined to be relevant by the Department.

DWR prioritized the state's groundwater basins identified in Bulletin 118, Update 2003 into four categories: high, medium, low, and very low. DWR released the draft list in December 2013. The final list was published in June 2014 after public comments were received and considered. The June 2014 basin priority list, and information pertaining to the prioritization process completed in 2014, are available at: **https://water.ca.gov/Programs/Groundwater-Management/Basin-Prioritization.**



Vineyard in the Paso Robles area



Vineyard in Kern County

GROUNDWATER BASIN PRIORITY AND THE CALIFORNIA STATEWIDE GROUNDWATER ELEVATION MONITORING (CASGEM) PROGRAM

In 2009, Senate Bill X7-6 added provisions for groundwater monitoring to the California Water Code (Section 10920 et seq.). The bill authorized DWR to establish permanent, locally managed, groundwater-elevation monitoring and reporting for all groundwater basins identified in Bulletin 118.

DWR established the CASGEM online system in 2011 as the means for local agencies to submit groundwater elevation information and to provide for public access to that information. CASGEM Program participation is essentially required for high- and medium-priority basins under Executive Order B-29-15.

More information on the CASGEM Program can be found at: **https://water.ca.gov/Programs/Groundwater-Management/Groundwater-Elevation-Monitoring--CASGEM/**

Groundwater Basin Prioritization under the Sustainable Groundwater Management Act

In 2014, Water Code Section 10933(b)(8) was amended adding adverse impacts on local habitat and local streamflows to the list of factors to be used for the prioritization of California's groundwater basins.

SGMA requires that, by January 31, 2015, DWR establish an initial priority of the state's groundwater basins using the amended list of prioritization factors. The act further requires DWR to reassess the priority of the state's groundwater basins any time the boundaries of basins defined in Bulletin 118 are modified (Water Code Section 10722.4).

Initial Prioritization

DWR determined that information relating to adverse impacts on local habitat and streamflows from groundwater extractions was not readily available to allow the reprioritization of groundwater basins by January 31, 2015. As a result, the June 2014 basin prioritization was adopted by DWR as the initial basin priority for the purposes of SGMA.

APPROACH

Following the completion of the groundwater basin boundary modification effort on October 18, 2016, DWR began a reassessment of the priority of the state's groundwater basins in accordance with Water Code Section 10722.4.

NOTICE

The reassessment of the prioritization of California's groundwater basins was still underway when this interim update was published in 2016. This update will be amended in 2017 to include the approach for, and results of, the basin reprioritization upon completion of that effort.

The basin priority update process will include public meetings and workshops to solicit input. More information about the reprioritization of California's groundwater basins is available at: **https://water.ca.gov/Programs/Groundwater-Management/Basin-Prioritization**.



Windmill and storage tank in Cuyama Valley

Bulletin 118—Comprehensive Update 2020

The most recent comprehensive update of Bulletin 118 was published in 2003. Since that time, much has changed in relation to water management in California, including the ongoing drought which began in 2012, and passage of SGMA in 2014.

Water Code Section 12924 requires DWR to update Bulletin 118 in years ending in "5 and 0." The California Water Action Plan also directs DWR to update Bulletin 118 **(www.resources.ca.gov/california_water_action_plan/).** The next comprehensive update of Bulletin 118 is scheduled for 2020.

The 2020 comprehensive update will build on previous Bulletin 118 updates and other DWR groundwater-related publications. Reports by various federal, State and local agencies, including groundwater sustainability plans and related publications by groundwater sustainability agencies, will serve as an important source of information for the update. Table 4 provides a general summary of content planned for the 2020 update.

Efforts to develop the 2020 comprehensive update of Bulletin 118 are scheduled to begin in 2017. DWR will coordinate the development of the 2020 update with other federal, State, and local agencies, and will hold a series of public workshops to provide information about the development effort and receive public input.



A vineyard drip irrigation system supplied by groundwater

"DWR will cooridinate the development of the 2020 update with other federal, State and local agencies . . ."

TABLE 4 – Summary of Planned Content for Bulletin 118, Update 2020

Updated information on the occurrence and characteristics of groundwater in California
√ Groundwater basin boundaries, including information provided in this interim update and any subsequent basin boundary modifications.
√ Hydrologic and geologic characteristics of the state's groundwater basins.
√ Information on groundwater quality conditions, including naturally occurring contaminants and impacts related to anthropogenic chemicals, sea water intrusion, and salinity accretion.
Updated Information on Groundwater Management and Related Topics
√ Status of Sustainable Groundwater Management Act (SGMA) implementation efforts and an assessment of progress toward achieving the sustainable management of groundwater, including case studies.
√ Status of groundwater management efforts for areas not covered by SGMA, such as adjudicated groundwater basins.
√ Groundwater use and managed recharge.
√ Groundwater level conditions, including impacts related to drought.
√ The occurrence and effects of groundwater overdraft, including updated information on land subsidence.
√ Interaction of groundwater and surface water and related impacts.
√ Groundwater dependent ecosystems.
√ Projected impacts of climate change on groundwater resources and related management considerations.
√ Groundwater monitoring efforts and data management systems.
√ Updated groundwater basin priority determinations.
√ New groundwater laws and regulatory requirements.
Opportunities for the Future
√ Recommendations for eliminating knowledge and technology gaps that impede proper understanding and the sustainable management of California's groundwater.
√ Groundwater management recommendations, including legislation.
√ Recommendations for Bulletin 118, Update 2025.

Appendix A

Summary of 2016 Groundwater Basin Boundary Modification Requests

TABLE A-1 – Summary of 2016 Groundwater Basins Boundary Modification Requests[a]

Basin/Subbasin (2003 Basin Numbers and Designations)	Requesting Agency	Requested Modification Type(s)	Decision[b]
1-2.01 Klamath River Valley – Tule Lake	Tulelake Irrigation District	Scientific	Approved
2-9.01 Santa Clara Valley – Niles Cone 2-9.04 Santa Clara Valley – East Bay Plain	Alameda County Water District	Jurisdictional	Approved
3-1 Soquel Valley 3-2 Pajaro Valley 3-21 Santa Cruz Purisima Formation 3-26 West Santa Cruz Terrace	Soquel-Aptos Groundwater Management Committee	Scientific & Jurisdictional	Approved
3-2 Pajaro Valley 3-4.01 Salinas Valley – 180/400-Foot Aquifer 3-4.09 Salinas Valley – Langley Area 3-21 Santa Cruz Purisima Formation	Pajaro Valley Water Management Agency	Jurisdictional	Approved
3-3.01 Gilroy-Hollister Valley–- Llagas Area	Santa Clara Valley Water District	Scientific	Approved
3-4.06 Salinas Valley – Paso Robles Area	Heritage Ranch Community Service District	Scientific	Denied
3-4.06 Salinas Valley – Paso Robles Area	Monterey County Water Resources Agency	Jurisdictional	Denied
3-4.06 Salinas Valley – Paso Robles Area	Templeton Community Services District	Scientific	Approved
3-4.10 Salinas Valley – Corral De Tierra Area 3-4.08 Salinas Valley – Seaside Area	Monterey Peninsula Water Management District	Scientific	Approved
3-8 Los Osos Valley	San Luis Obispo County	Scientific	Denied
3-13 Cuyama Valley	Santa Barbara County Water Agency	Scientific	Denied
3-14 San Antonio Creek Valley	Santa Barbara County Water Agency	Scientific & Jurisdictional	Approved
3-18 Carpinteria 3-49 Montecito	Carpinteria Valley Water District	Scientific	Denied
3-21 Santa Cruz Purisima Formation 3-27 Scotts Valley 3-50 Felton Area	Scotts Valley Water District	Scientific & Jurisdictional	Approved
3-53 Foothill	City of Santa Barbara	Scientific	Approved
4-2 Ojai Valley	Ojai Basin Groundwater Management Agency	Scientific	Approved
4-3.01 Ventura River Valley – Upper Ventura River	Ventura River Water District	Scientific	Approved
4-4.02 Santa Clara River Valley – Oxnard 4-6 Pleasant Valley 4-8 Las Posas Valley	Fox Canyon Groundwater Management Agency	Scientific & Jurisdictional	Approved
4-4.07 Santa Clara River Valley – Santa Clara River Valley East	Castaic Lake Water Agency	Scientific	Approved

TABLE A-1 – Summary of 2016 Groundwater Basins Boundary Modification Requests[a] (continued)

Basin/Subbasin (2003 Basin Numbers and Designations)	Requesting Agency	Requested Modification Type(s)	Decision[b]
5-4 Big Valley	Lassen County	Scientific	Denied
5-21.51 Sacramento Valley – Corning 5-21.52 Sacramento Valley – Colusa	Tehama County Flood Control & Water Conservation District	Jurisdictional	Approved
5-21.52 Sacramento Valley – Colusa 5-21.66 Sacramento Valley – Solano 5-21.67 Sacramento Valley – Yolo 5-21.68 Sacramento Valley – Capay Valley	Yolo County Flood Control & Water Conservation District	Jurisdictional	Approved
5-21.60 Sacramento Valley – North Yuba	Yuba County Water Agency	Other	Approved
5-21.61 Sacramento Valley – South Yuba 5-21.64 Sacramento Valley – North American	Placer County	Jurisdictional	Approved
5-21.65 Sacramento Valley – South American 5-22.16 San Joaquin Valley – Cosumnes	Omochumne-Hartnell Water District	Scientific & Jurisdictional	Denied
5-22.01 San Joaquin Valley – Eastern San Joaquin 5-22.16 San Joaquin Valley – Cosumnes	Eastern San Joaquin County Groundwater Basin Authority	Jurisdictional	Approved
5-22.05 San Joaquin Valley – Chowchilla	Chowchilla Water District	Jurisdictional	Approved
5-22.05 San Joaquin Valley – Chowchilla 5-22.06 San Joaquin Valley – Madera	New Stone Water District	Jurisdictional	Approved
5-22.06 San Joaquin Valley – Madera 5-22.07 San Joaquin Valley – Delta-Mendota	Aliso Water District	Jurisdictional	Approved
5-22.06 San Joaquin Valley – Madera 5-22.07 San Joaquin Valley – Delta-Mendota 5-22.08 San Joaquin Valley – Kings 5-22.09 San Joaquin Valley - Westside 5-22.15 San Joaquin Valley - Tracy	San Luis and Delta-Mendota Water Authority	Jurisdictional	Approved
5-22.08 San Joaquin Valley – Kings	Kings River Conservation District	Jurisdictional	Approved
5-22.09 San Joaquin Valley - Westside	Westlands Water District	Jurisdictional	Approved
5-22.09 San Joaquin Valley – Westside 5-22.10 San Joaquin Valley – Pleasant Valley	Pleasant Valley Water District	Scientific & Jurisdictional	Approved
5-22.10 San Joaquin Valley – Pleasant Valley 5-22.14 San Joaquin Valley – Kern County	Devils Den Water District	Jurisdictional	Approved
5-22.11 San Joaquin Valley – Kaweah 5-22.12 San Joaquin Valley – Tulare Lake	Corcoran Irrigation District	Jurisdictional	Approved
5-22.12 San Joaquin Valley – Tulare Lake	Kings River Conservation District	Jurisdictional	Approved
5-22.12 San Joaquin Valley – Tulare Lake	Tulare Lake Basin Water Storage District	Jurisdictional	Approved
5-22.13 San Joaquin Valley – Tule 5-22.14 San Joaquin Valley – Kern County	Delano-Earlimart Irrigation District	Jurisdictional	Approved

TABLE A-1 – Summary of 2016 Groundwater Basins Boundary Modification Requests[a] (continued)

Basin/Subbasin (2003 Basin Numbers and Designations)	Requesting Agency	Requested Modification Type(s)	Decision[b]
5-22.14 San Joaquin Valley – Kern County	Olcese Water District	Scientific	Denied
5-22.14 San Joaquin Valley – Kern County	Tejon-Castac Water District	Scientific	Approved
5-22.15 San Joaquin Valley – Tracy	City of Brentwood	Scientific and Jurisdictional	Denied
6-12 Owens Valley	Inyo County Water Department	Scientific	Denied
7-21.01 Coachella Valley – Indio	Mission Springs Water District	Scientific	Incomplete (denied)
7-24 Borrego Valley	Borrego Water District	Scientific	Approved
8-1 Coastal Plain of Orange County	City of La Habra	Scientific & Jurisdictional	Incomplete (denied)
8-1 Coastal Plain of Orange County	Orange County Water District	Scientific	Approved
8-2.01 Upper Santa Ana Valley – Chino	Inland Empire Utilities Agency	Scientific & Jurisdictional	Approved
8-2.03 Upper Santa Ana Valley – Riverside-Arlington	Western Municipal Water District of Riverside	Jurisdictional	Denied
8-2.03 Upper Santa Ana Valley – Riverside-Arlington 8-2.04 Upper Santa Ana Valley – Rialto-Colton 8-2.06 Upper Santa Ana Valley – Bunker Hill 8-2.07 Upper Santa Ana Valley – Yucaipa	San Bernardino Valley Municipal Water District	Jurisdictional	Approved
8-2.08 Upper Santa Ana Valley – San Timoteo	Yucaipa Valley Water District	Jurisdictional	Incomplete (denied)
8-2.09 Upper Santa Ana Valley – Temescal 8-4 Elsinore	City Of Corona	Scientific & Jurisdictional	Approved
8-5 San Jacinto	Eastern Municipal Water District	Scientific	Approved
9-7 San Luis Rey Valley	City of Oceanside	Scientific & Jurisdictional	Denied
9-17 Sweetwater Valley 9-18 Otay Valley 9-19 Tijuana Basin	City of San Diego	Scientific	Approved

NOTES

a Additional information about the boundary modification requests is available at: https://water.ca.gov/Programs/Groundwater-Management/Basin-Boundary-Modifications

b Some requests were approved in part, or as amended/changed.

Appendix B

Groundwater Basins and Subbasins (2016)

FIGURE B-1 – California Groundwater Basins and Subbasins and DWR Hydrologic Regions



FIGURE B-2 – California Groundwater Basins/Subbasins Numbering System

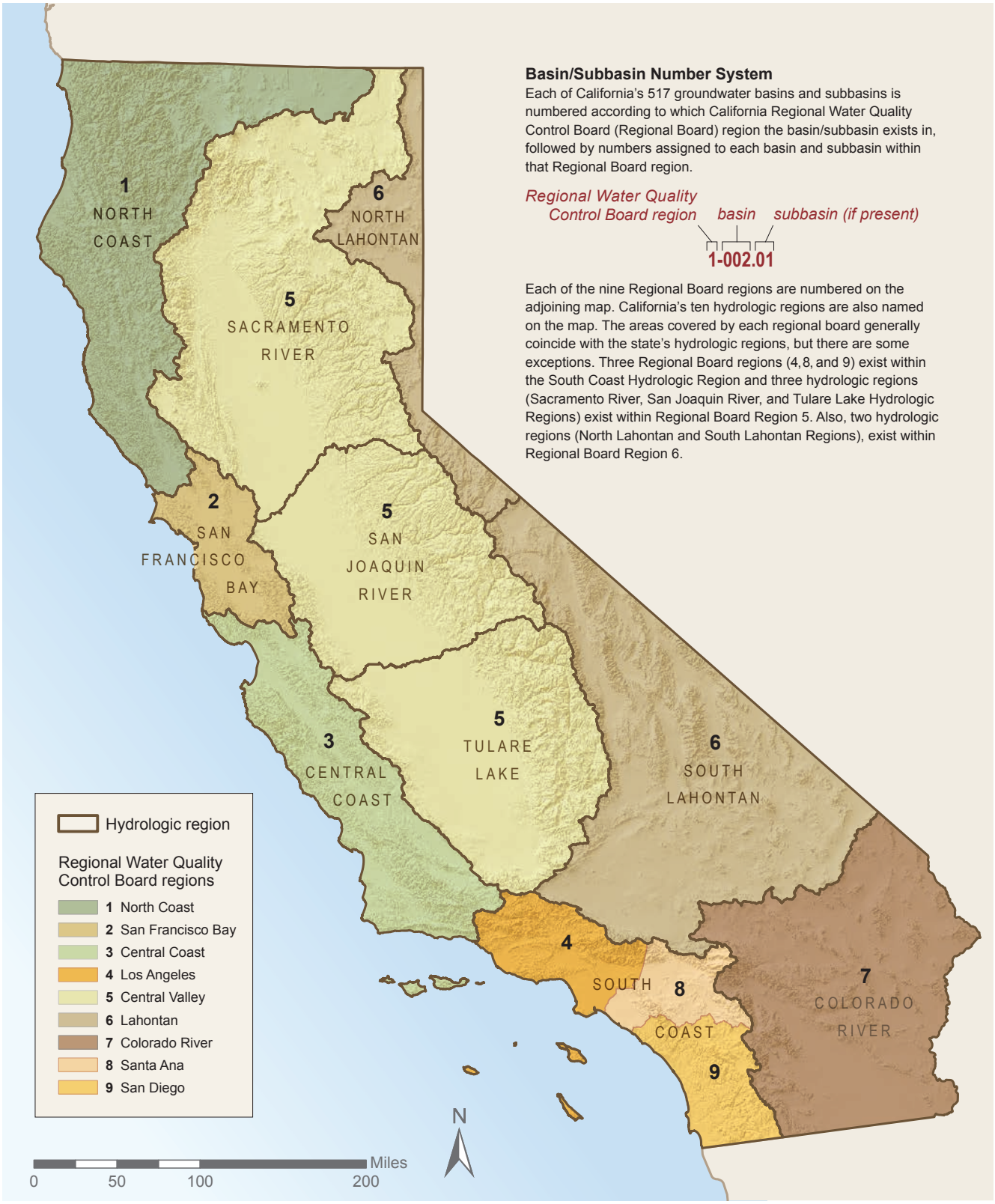


FIGURE B-3 – Groundwater Basins and Subbasins within the North Coast Hydrologic Region



FIGURE B-4 – Groundwater Basins and Subbasins within the San Francisco Bay Hydrologic Region



FIGURE B-5 – Groundwater Basins and Subbasins within the Central Coast Hydrologic Region



FIGURE B-6 – Groundwater Basins and Subbasins within the South Coast Hydrologic Region



FIGURE B-7 – Groundwater Basins and Subbasins within the Sacramento River Hydrologic Region



FIGURE B-8 – Groundwater Basins and Subbasins within the San Joaquin River Hydrologic Region



FIGURE B-9 – Groundwater Basins and Subbasins within the Tulare Lake Hydrologic Region



FIGURE B-10 – Groundwater Basins and Subbasins within the North Lahontan Hydrologic Region

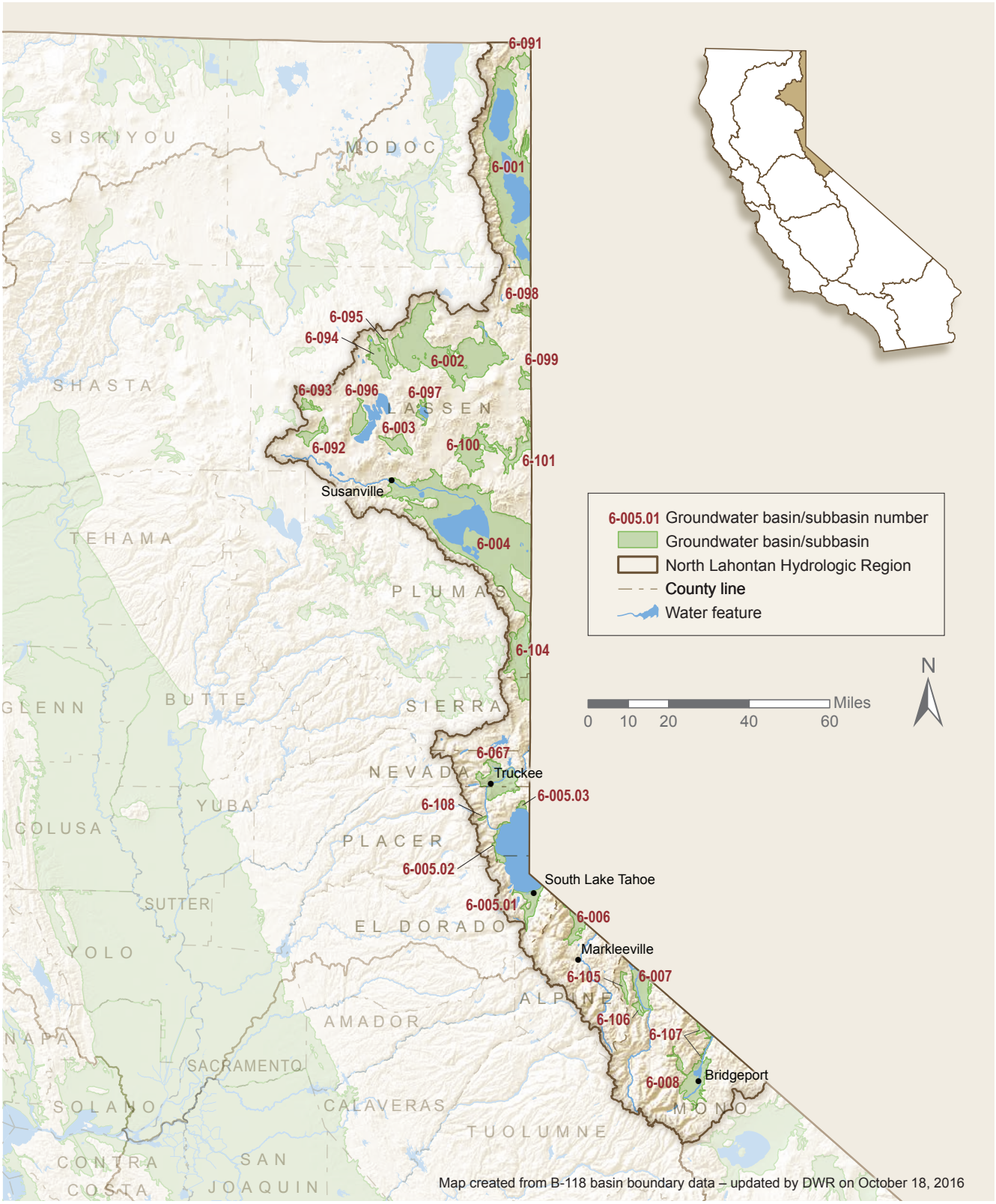


FIGURE B-11 – Groundwater Basins and Subbasins within the South Lahontan Hydrologic Region

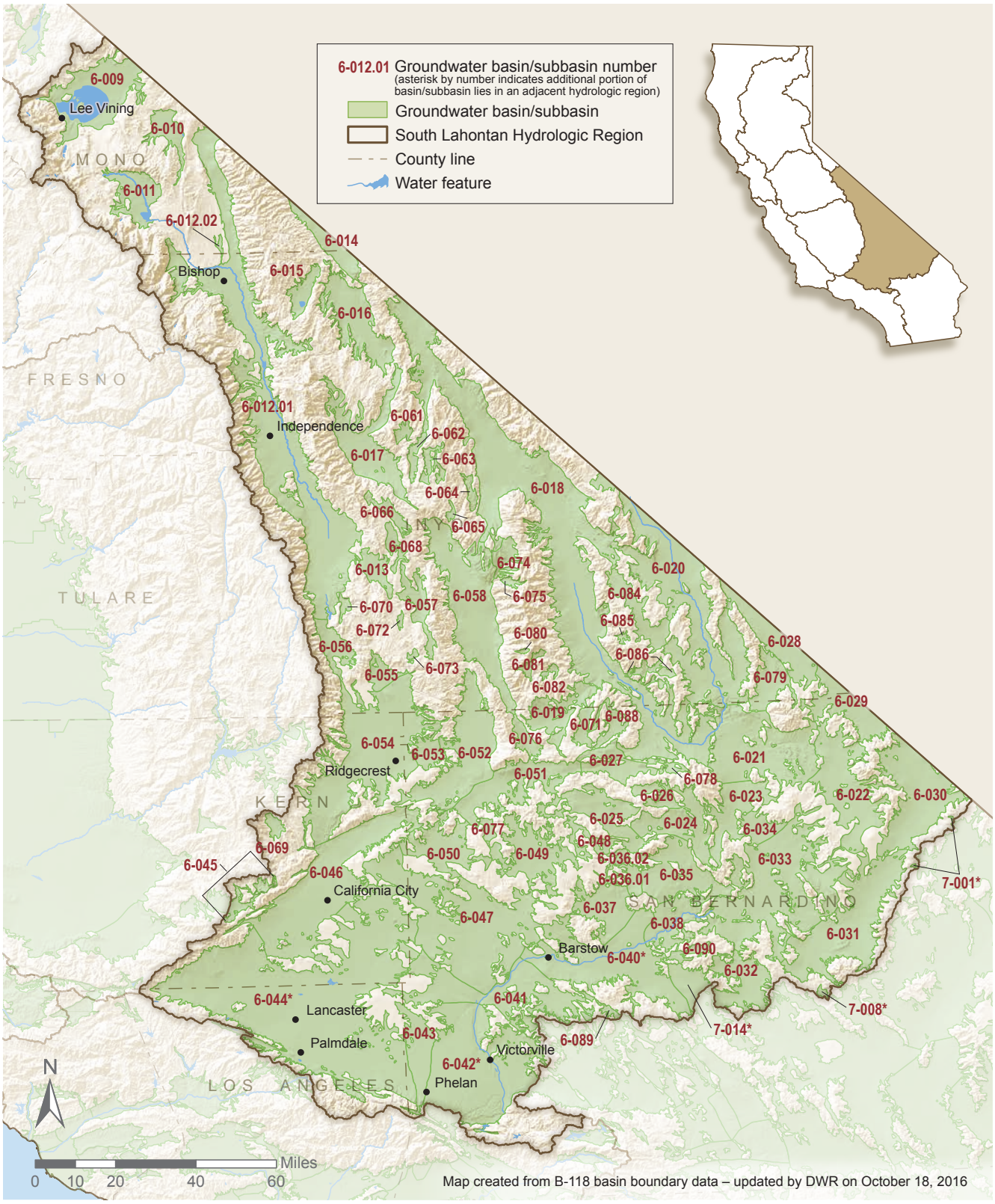
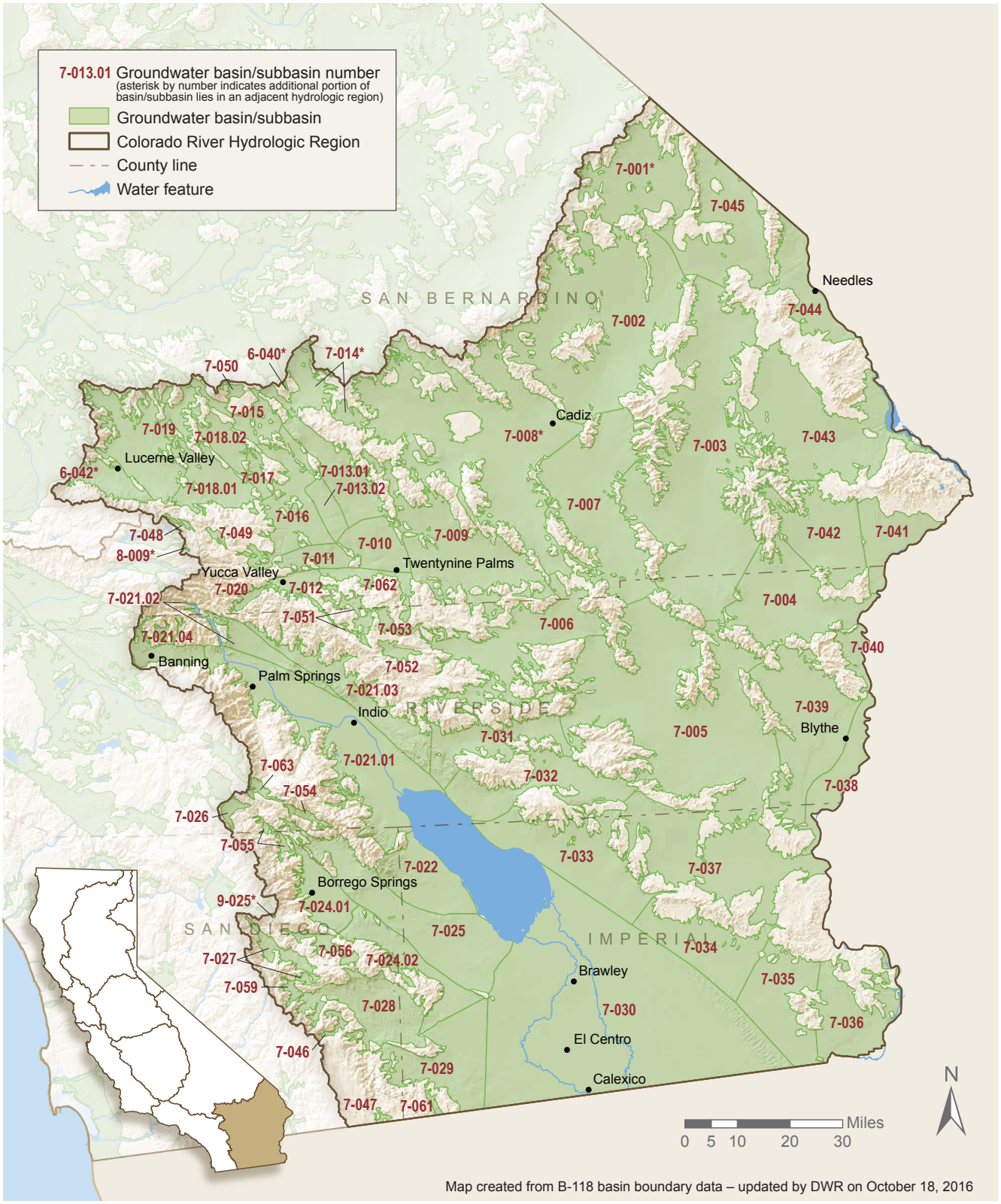


FIGURE B-12 – Groundwater Basins and Subbasins within the Colorado River Hydrologic Region





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State of California

EXECUTIVE ORDER B-40-17

WHEREAS California has endured a severe multi-year drought that has threatened the water supplies of communities and residents, devastated agricultural production in many areas, and harmed fish, animals and their environmental habitats; and

WHEREAS Californians responded to the drought by conserving water at unprecedented levels, reducing water use in communities by more than 22% between June 2015 and January 2017; and

WHEREAS the State Water Resources Control Board, the Department of Water Resources, the Department of Fish and Wildlife, the Office of Emergency Services, and many other state agencies worked cooperatively to manage and mitigate the effects of the drought on our communities, businesses, and the environment; and

WHEREAS the State provided 66,344,584 gallons of water to fill water tanks for communities suffering through drought-related water shortages, outages, or contamination, and provided emergency assistance to drill wells and connect communities to more robust water systems; and

WHEREAS the State took a number of important actions to preserve and protect fish and wildlife resources, including stream and species population monitoring, fish rescues and relocations, infrastructure improvements at trout and salmon hatcheries, and infrastructure to provide critical habitat for waterfowl and terrestrial animals; and

WHEREAS the State established a Statewide Water Efficiency and Enhancement Program for agricultural operations that provides financial assistance for the implementation of irrigation systems that save water; and

WHEREAS water content in California's mountain snowpack is 164 percent of the season average; and

WHEREAS Lake Oroville, the State Water Project's principal reservoir, is 101 percent of average, Lake Shasta, the federal Central Valley Project's largest reservoir, is at 110 percent of average, and the great majority of California's other major reservoirs are above normal storage levels; and

WHEREAS despite winter precipitation, the effects of the drought persist in areas of the Central Valley, including groundwater depletion and subsidence; and

WHEREAS our changing climate requires California to continue to adopt and adhere to permanent changes to use water more wisely and to prepare for more frequent and persistent periods of limited water supply; and

WHEREAS increasing long-term water conservation among Californians, improving water use efficiency within the State's communities and agricultural production, and strengthening local and regional drought planning are critical to California's resilience to drought and climate change.

NOW, THEREFORE, I, EDMUND G. BROWN JR., Governor of the State of California, in accordance with the authority vested in me by the Constitution and statutes of the State of California, do hereby **TERMINATE THE JANUARY 17, 2014 DROUGHT STATE OF EMERGENCY** for all counties in California except the Counties of Fresno, Kings, Tulare, and Tuolumne.

I FURTHER ORDER THAT:

1. The orders and provisions contained in my April 25, 2014 Emergency Proclamation, as well as Executive Orders B-26-14, B-28-14, B-29-15, and B-36-15 are rescinded.

2. The orders and provisions contained in Executive Order B-37-16, **Making Water Conservation a California Way of Life**, remain in full force and effect except as modified by this Executive Order.

3. As required by the State Emergency Plan and Government Code section 8607(f), the Office of Emergency Services, in coordination with other state agencies, shall produce an after-action report detailing the State's response to the drought and any lessons learned in carrying out that response.

MAINTAINING CONSERVATION AS A WAY OF LIFE

4. The State Water Resources Control Board (Water Board) shall continue development of permanent prohibitions on wasteful water use and requirements for reporting water use by urban water agencies, and to provide a bridge to those permanent requirements, shall maintain the existing emergency regulations until they expire as provided by the Water Code. Permanent restrictions shall prohibit wasteful practices such as:

    - Hosing off sidewalks, driveways and other hardscapes;
    - Washing automobiles with hoses not equipped with a shut-off nozzle;
    - Using non-recirculated water in a fountain or other decorative water feature;
    - Watering lawns in a manner that causes runoff, or within 48 hours after measurable precipitation; and
    - Irrigating ornamental turf on public street medians.

5. The Water Board shall rescind those portions of its existing emergency regulations that require a water supply stress test or mandatory conservation standard for urban water agencies.

6. The Department of Water Resources (Department) shall continue work with the Water Board to develop standards that urban water suppliers will use to set new urban water use efficiency targets as directed by Executive Order B-37-16. Upon enactment of legislation, the Water Board shall adopt urban water use efficiency standards that include indoor use, outdoor use, and leaks as well as performance measures for commercial, industrial, and institutional water use. The Department shall provide technical assistance and urban landscape area data to urban water suppliers for determining efficient outdoor use.

7. The Water Board and the Department shall continue to direct actions to minimize water system leaks that waste large amounts of water. The Water Board, after funding projects to address health and safety, shall use loans from the Drinking Water State Revolving Fund to prioritize local projects that reduce leaks and other water system losses.

8. The Water Board and the Department shall continue to take actions to direct urban and agricultural water suppliers to accelerate their data collection, improve water system management, and prioritize capital projects to reduce water waste. The California Public Utilities Commission is requested to work with investor-owned water utilities to accelerate work to minimize leaks.

9. The Water Board is further directed to work with state agencies and water suppliers to identify mechanisms that would encourage and facilitate the adoption of rate structures and other pricing mechanisms that promote water conservation.

10. All state agencies shall continue response activities that may be needed to manage the lingering drought impacts to people and wildlife. State agencies shall increase efforts at building drought resiliency for the future, including evaluating lessons learned from this current drought, completing efforts to modernize our infrastructure for drought and water supply reliability, and shall take actions to improve monitoring of native fish and wildlife populations using innovative science and technology.

CONTINUED DROUGHT RESPONSE IN FRESNO, KINGS, TULARE, AND TUOLUMNE COUNTIES

11. The Water Board will continue to prioritize new and amended safe drinking water permits that enhance water supply and reliability for community water systems facing water shortages or that expand service connections to include existing residences facing water shortages.

12. The Department and the Water Board will accelerate funding for local water supply enhancement projects and will continue to explore if any existing unspent funds can be repurposed to enable near-term water conservation projects.

13. The Water Board will continue to work with local agencies to identify communities that may run out of drinking water, and will provide technical and financial assistance to help these communities address drinking water

shortages. It will also identify emergency interconnections that exist among the State's public water systems that can help these threatened communities. The Department, the Water Board, the Office of Emergency Services, and the Office of Planning and Research will work with local agencies in implementing solutions to those water shortages.

14. For actions taken in the Counties of Fresno, Kings, Tulare, and Tuolumne pursuant to directives 11–13, the provisions of the Government Code and the Public Contract Code applicable to state contracts, including, but not limited to, advertising and competitive bidding requirements, as well as Division 13 (commencing with section 21000) of the Public Resources Code and regulations adopted pursuant to that Division, are hereby suspended. These suspensions apply to any actions taken by state agencies, and for actions taken by local agencies where the state agency with primary responsibility for implementing the directive concurs that local action is required, as well as for any necessary permits or approvals required to complete these actions.

15. California Disaster Assistance Act Funding is authorized until June 30, 2017 to provide emergency water to individuals and households who are currently enrolled in the emergency water tank program.

16. State departments shall commence all drought remediation projects in Fresno, Kings, Tulare, and Tuolumne Counties within one year of the date of this Executive Order.

This Executive Order is not intended to, and does not, create any rights or benefits, substantive or procedural, enforceable at law or in equity, against the State of California, its agencies, departments, entities, officers, employees, or any other person.

I FURTHER DIRECT that as soon as hereafter possible, this Order be filed in the Office of the Secretary of State and that widespread publicity and notice be given of this Order.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this 7th day of April 2017.

EDMUND G. BROWN JR.
Governor of California

ATTEST:

ALEX PADILLA
Secretary of State

RESOLUTION NO. _____

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF RIO VISTA DECLARING AN EMERGENCY AND AN IMMEDIATE NEED TO CURTAIL ALL NON-ESSENTIAL WATER USE

WHEREAS, on [DATE/TIME], there was an event [to be specified] resulting sudden and unexpected impact to the community water system that has [or will] limit the ability of the City to obtain and distribute the customary amount of water to [all/some] of our citizens; and

WHEREAS, City staff's attempts to mitigate the effect of [specified event] have been unsuccessful, and City staff advises that there is an immediate need to limit all non-essential water use to mitigate the loss or impairment of public health, safety, property, and essential public services.

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Rio Vista finds:

1. The above-referenced recitals are true and correct and incorporated herein by reference.

2. That the public interest and necessity demand the immediate curtailment of non-essential water usage including but not limited to: [specify, ie street washing, landscape/yard irrigation, fountain or water feature use, vehicle washing, pool use…]

3. That the City Manager or his designee is authorized to expend an amount not to exceed $_____ to facilitate notification of the affected citizens and enforcement and monitoring compliance with this resolution.

4. Violation of this ordinance is considered a waste of water as specified by City Code 13.04.190.

4. That the City Council shall review the emergency action at its next regular meeting scheduled for _____ to determine whether the emergency situation has been eliminated and whether there is a need to take further action as a result of the emergency.

PASSED AND ADOPTED on this ___ day of _____, 20___ by the following vote:

AYES:
NOES:
ABSENT:
ABSTAIN:

_____
Mayor

Attest:

_____
Anna Olea-Moger, MMC
City Clerk

DRAFT

Monthly Report

California Irrigation Management Information System (CIMIS)

Rendered in ENGLISH Units.

January 2010 - January 2021

Printed on Monday, March 8, 2021

Twitchell Island - San Francisco Bay - Station 140

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan 2010	0.71	3.98	121	9.4	51.9 K	38.5	44.8	99	80	93	42.8	6.0 K	51.8
Feb 2010	1.40 K	1.89 K	233 K	10.8 K	59.8	42.2	50.3 K	98 K	69 K	87	46.5	5.8 K	54.2 K
Mar 2010	3.74 K	1.83 K	420 K	9.8 K	64.2 K	40.1	54.4 K	94 K	47 K	73 L	43.7 L	6.3 K	55.3 K
Apr 2010	4.59	2.17	494 K	10.2	65.5	44.3	54.6	91	51	71	45.0	7.7 K	57.9
May 2010	6.90	0.78	605 K	10.6 K	72.1	48.6 K	60.1	86	40	61 K	45.8 K	9.6 K	61.5
Jun 2010	8.53	0.00	703	13.4	82.9	57.4 K	69.5	79	36	55	51.9	9.2 K	67.1
Jul 2010	8.73	0.00	716	13.9	85.0	56.5 K	69.2	84	36	58	53.2	10.1 K	69.5
Aug 2010	7.29	0.00	632	14.1	84.2	54.2	67.6	91	37	61	53.7	8.1 K	69.4
Sep 2010	5.70	0.00	485 K	13.5	85.5 K	54.2 K	69.7	86	33	56	52.4	7.2 K	68.3
Oct 2010	3.52	0.94	330	12.3	74.9	50.1 K	62.1	91	43	66	49.9	5.9 K	64.8
Nov 2010	2.06	2.25	251	9.7	63.3 K	39.2 K	51.1	95	50	75	43.1	5.1	57.3
Dec 2010	0.70	4.59 K	120	9.7	53.8 K	39.5	46.1	98	75	91	43.4	4.9 K	53.8 K

Monthly Report

Tots/Avgs	53.87	18.4	426	11.5	70.3	47.1	58.3	91	50	71	47.6	7.2	60.9

Twitchell Island - San Francisco Bay - Station 140

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan 2011	0.78	1.41	144	7.9	49.4 K	33.3 K	40.3	99	78	93	38.3	4.1 K	50.2
Feb 2011	2.38	2.41	295	7.9	59.1 K	35.5	47.0	93	48	72	38.0	7.1 K	50.0
Mar 2011	2.78	4.60	325	10.6	61.8 K	42.2 K	51.6	96	61	81	45.9	7.7 K	53.7
Apr 2011	5.38	0.11	539 K	10.5 K	67.4	45.7 K	56.3	88	46	67 K	44.9 K	8.7 K	58.2
May 2011	6.45	0.83	593	10.5	71.8	47.9	59.5	86	41	62	45.6	8.0 K	61.1
Jun 2011	7.73	1.37	645	13.2	81.2	54.5	67.4	85	39	59	51.8	9.0 K	65.8 K
Jul 2011	8.86	0.00	712	14.6	86.6	57.0 K	71.1	85	37	57	54.6	9.4 K	70.1
Aug 2011	7.71	0.00	619	14.5	87.4	56.0	70.3	89	33	58	54.4	8.1 K	71.0
Sep 2011	5.66	0.02	475	14.6	87.3	55.7	70.4	88	35	58	54.6	7.0 K	70.7
Oct 2011	3.44	1.44	343	13.0	76.2 K	47.7 K	61.2	94	44	70	51.0	5.5 K	65.9
Nov 2011	1.88 K	1.09	214	8.7	59.5 K	37.2 K	47.2 K	95 K	58 K	80	40.5	5.0 K	57.7
Dec 2011	1.83 K	0.25 K	208	6.6	57.8	29.3 K	42.5 K	91 K	47 K	73	33.2	4.9 K	50.6
Tots/Avgs	54.88	13.5	426	11.0	70.5	45.2	57.1	91	47	69	46.1	7.0	60.4

Twitchell Island - San Francisco Bay - Station 140

Month Year	Total ETo (in)	Total Precip	Avg Sol Rad	Avg Vap Pres	Avg Max Air Temp	Avg Min Air Temp	Avg Air Temp	Avg Max Rel Hum	Avg Min Rel Hum	Avg Rel Hum	Avg Dew Point	Avg Wind Speed	Avg Soil Temp

Monthly Report

		(in)	(Ly/day)	(mBars)	(°F)	(°F)	(°F)	(%)	(%)	(%)	(°F)	(mph)	(°F)
Jan 2012	1.80 K	2.11	222	8.0	59.7	32.7 K	45.5	96	51	77	38.2	5.2 K	49.1
Feb 2012	2.68 K	0.96	311 K	8.6	62.7	38.8 K	50.3	91	46	69	39.9	6.4 K	51.7
Mar 2012	3.21	3.90	355 K	9.5 K	62.4	41.4	51.9	92	51	71 K	42.5 K	7.0 K	53.9
Apr 2012	5.06	2.24	537 K	11.7 K	69.5	47.3 K	57.8	90	49	70 K	48.0 K	7.2 K	59.7
May 2012	8.15	0.00	681	11.1	78.2	51.5	64.6	80	35	54	47.1	9.8 K	65.2
Jun 2012	9.06	0.04	709	11.9	82.4 K	56.0 K	68.8	76	32	51	48.8	10.9 K	67.6
Jul 2012	8.47 K	0.00 K	678 K	14.0 K	86.3	56.6 K	70.5 K	83 K	35 K	56	53.5	8.7 K	71.1 K
Aug 2012	7.98	0.00	623	13.8	88.3	57.1 K	71.4	80	33	53	53.0	8.2 K	70.8
Sep 2012	5.94	0.00	516	12.7	85.7	53.4	68.2	83	31	54	50.9	7.0 K	69.0
Oct 2012	3.82	0.67	354	12.8	75.8 K	50.8 K	62.6	89	43	66	50.7	6.2 K	65.7
Nov 2012	1.76	3.39 K	229 K	11.4 K	65.8	42.2 K	53.4 K	96 K	57 K	81	47.4	4.3 K	59.2 K
Dec 2012	1.11	4.11 K	159 K	9.3 K	55.4	38.5 K	46.9	95	66	83 K	41.9 K	5.7 K	52.9 K
Tots/Avgs	59.04	17.4	448	11.2	72.7	47.2	59.3	88	44	65	46.8	7.2	61.3

Twitchell Island - San Francisco Bay - Station 140

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan 2013	1.61	0.71	234 K	7.5	55.2	33.1	43.1	94	55	78	36.4	4.5	46.1
Feb 2013	2.71	0.26	353 K	7.8	62.4	35.9	48.7	92	42	67	37.7	6.0 K	48.5

Monthly Report

Mar 2013	4.23	0.61 K	432 K	10.1 K	68.8	43.7 K	55.9	89	43	65 K	44.2 K	6.6 K	53.7
Apr 2013	6.94	0.79	598 K	10.3	75.3 K	50.1 K	62.3	79	37	55	44.7	10.0 K	59.6
May 2013	8.27	0.30	662 K	11.2	78.5	53.8	65.9	74	36	53	47.2	10.3 K	63.7
Jun 2013	8.38	0.09	659	14.2 K	84.2 K	59.0 K	70.8	76	40	56 K	53.4 K	10.2 K	68.3
Jul 2013	8.26	0.00	613 K	14.7	87.4	58.3 K	71.5	81	36	56	54.8	9.7 K	71.2
Aug 2013	7.60	0.00	601 K	15.3	85.8	58.9	70.6	83	38	60	55.8	9.5 K	69.4
Sep 2013	5.91	0.53	486 K	13.9	82.5	57.3 K	69.0	81	38	58	52.9	8.6 K	68.9
Oct 2013	4.36	0.00	393	9.7	76.7	46.0	60.7	82	31	54	43.4	5.9 K	62.1
Nov 2013	2.49	1.52	258 K	9.3	67.2	41.2	53.6	89	43	67	42.0	4.8 K	56.1
Dec 2013	1.81	0.54	230	6.6	57.9	32.4	43.7	91	42	67	33.1	4.5 K	48.0
Tots/Avgs	62.57	5.4	460	10.9	73.5	47.5	59.7	84	40	61	45.5	7.6	59.6

Twitchell Island - San Francisco Bay - Station 140

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan 2014	1.96	0.10	252 K	8.2	64.5 K	37.0	49.4	92	41	67	38.9	4.1	47.5
Feb 2014	1.90	4.78	260 K	10.6	62.5	44.5 K	52.9	93	58	77	45.5	6.7 K	51.9
Mar 2014	3.91 K	1.07 K	402 K	10.7 K	68.8	47.2	57.5 K	86 K	48 K	67	45.9	7.1 K	56.3 K
Apr 2014	5.53 K	1.07 K	558 K	11.6 K	72.9	48.5	60.2 K	87 K	44 K	65	48.2	7.9 K	60.4 K
May 2014	8.55	0.00	666 K	11.1	80.2 K	53.8 K	66.8	73	34	51	47.2	10.0 K	66.5

Monthly Report

Jun 2014	8.88 K	0.00 K	722 K	13.1 K	85.0 K	56.3 K	70.4 K	78 K	35 K	52 K	51.6 K	9.7 K	68.0 K
Jul 2014	8.59	0.00 L	663 K	15.3 L	87.4	59.9 K	72.6 K	81	38	57 L	55.9 L	10.1 L	71.0
Aug 2014	7.65	0.00	598	15.2 K	85.9	59.6 K	71.0	83	38	59 K	55.8 K	9.5	71.1
Sep 2014	5.91	0.22	506 K	14.9 K	85.1	58.7 K	70.1	85	37	60 K	55.2 K	8.5 K	70.1
Oct 2014	4.14 K	0.37 K	374 K	12.3	80.3	51.5 K	65.5 K	86	36	60 L	49.9 L	5.5	66.4
Nov 2014	1.86	1.30 K	231 K	11.1 K	65.7	44.4	54.4 K	94 K	55 K	76	46.9	4.4 K	59.9 K
Dec 2014	1.07	7.56	137 K	11.4 K	58.2 K	46.1 K	51.7 K	94	73	85 L	46.5 L	6.4 K	56.8 K
Tots/Avgs	59.95	16.5	447	12.1	74.7	50.6	61.9	86	45	65	49.0	7.5	62.2

Twitchell Island - San Francisco Bay - Station 140

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan 2015	1.36	0.12 K	205 K	9.4	58.4 K	37.7	46.9	96	65	85	42.6	3.7	51.6
Feb 2015	2.27	1.49 K	297 K	11.1 K	65.0 K	43.6 K	54.0 K	93 K	59 K	78 K	46.8 K	5.9 K	55.0 K
Mar 2015	4.53	0.24	451 K	11.3 K	73.0 K	46.9 K	59.4	90	41	65 K	47.4 K	6.2	57.9
Apr 2015	6.37	0.64	588 K	9.8 K	72.6	47.3 K	59.9	81	36	56 K	43.4 K	8.9 K	60.4
May 2015	7.10	0.00 K	645 K	11.6	72.8	50.1	60.6	85	46	64	48.4	10.0	64.0
Jun 2015	8.67	0.08	701 K	14.0 K	86.2 K	57.7 K	71.5 K	80	36	54 K	53.4 K	9.4 K	70.2
Jul 2015	8.71	0.00	665 K	15.2 K	85.4	60.2 K	71.9 K	80	41	58 L	55.6 L	10.5 K	72.7
Aug 2015	7.82	0.01	614 K	15.1	86.4 K	60.1	71.9	82	36	57	55.6	9.7	72.6

Monthly Report

Sep 2015	5.82	0.01	483 K	12.5	85.8 K	55.3 K	70.3 K	79	30	51 K	50.3 K	6.6	69.7
Oct 2015	4.17	0.07	364	13.2	81.8	54.0 K	66.9 K	87	36	59 K	51.8 K	5.8	67.6 K
Nov 2015	2.19 K	1.51 K	257 K	8.7 K	62.1	38.7 K	50.0 K	89	47	69 K	39.6 K	5.3 K	58.2 K
Dec 2015	1.41	1.78	180	8.4 K	55.3	37.5	46.1 K	93	58	78 K	39.4 K	6.2 K	52.3
Tots/Avgs	60.42	5.9	454	11.7	73.7	49.1	60.8	86	44	65	47.9	7.3	62.7

Twitchell Island - San Francisco Bay - Station 140

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan 2016	1.13	4.31	154 K	10.1 K	56.2	42.3 K	48.9	94	70	85 K	44.3 K	6.4 K	51.6
Feb 2016	2.58 K	0.72	327	10.6	66.0 K	41.0	53.2 K	95 K	53 K	77 L	45.6 L	5.0 K	54.2 K
Mar 2016	3.41	3.80	377 K	11.6 K	66.0	46.2 K	55.7	92	57	75 L	47.7 L	7.2 K	58.6 K
Apr 2016	5.81	1.09	553 K	11.4 K	73.1 K	49.5	60.9 K	87	44	63 K	47.6 K	8.2	62.4 K
May 2016	7.32	0.08	616	12.4	78.6 K	53.3	65.2 K	82	41	60 K	50.2 K	8.9	65.6
Jun 2016	9.17	0.00	722 K	12.7	88.3 K	57.3 K	72.3 K	78	29	48 K	50.7 K	9.1 K	73.4 K
Jul 2016	9.14	0.00	726 K	14.2	90.0 K	58.7	73.3 K	82	31	52 K	53.9 K	8.8	78.3 L
Aug 2016	7.72	0.00	608 K	14.9 K	87.5	57.9	70.4	89 K	34 K	59	55.2	9.9	74.9 L
Sep 2016	6.15	0.00	506 K	13.2	87.0 K	55.5 K	70.0	87	30	53	51.9	8.1 K	70.4
Oct 2016	3.10 K	3.03 K	304 K	13.9 K	76.0 K	51.6 K	62.7 K	95 L	48 L	71 L	52.7 L	5.6 K	64.3 K
Nov 2016	1.75 K	1.09	235	13.2 K	68.0 K	44.3	55.3 K	100	63	87 K	51.5 K	3.8	58.4

Monthly Report

Dec 2016	1.25	3.07	181	9.4 K	57.6	37.5	46.3 K	99	65	86 L	41.6 L	4.9	49.0
Tots/Avgs	58.53	17.2	442	12.3	74.5	49.6	61.2	90	47	68	49.4	7.2	63.4

Twitchell Island - San Francisco Bay - Station 140

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan 2017	1.06 K	5.93	181 K	10.4 K	55.6	39.4 K	46.8 K	100	79	94 L	44.8 L	6.6 K	48.1
Feb 2017	1.62 K	0.08	261 K	10.1 K	61.3	45.0 K	52.3 K	76 K	61 K	91 L	50.3 L	6.5 K	52.5 K
Mar 2017	4.22 K	1.75 K	441 K	4.4 K	69.0 K	45.5 K	56.6	36 K	18 K	70 L	47.2 L	5.4	54.9 K
Apr 2017	4.79	0.79 K	504 K	11.3	69.6	48.1	58.5	90	47	68	47.4	6.7	59.8
May 2017	7.38 K	0.03	664 K	12.7 K	78.8 K	53.1 K	65.2 K	83 K	41 K	60 K	50.6 K	8.2	65.0 K
Jun 2017	8.93 K	0.00	702 K	14.1 K	87.2 K	59.1 L	72.2 K	76 K	35 K	53 L	53.4 L	9.9 K	71.6 K
Jul 2017	9.75	0.00	711 K	13.6 K	92.2 K	61.0 K	75.5 K	74	26	46 K	52.7 K	9.0	76.3 K
Aug 2017	8.31 K	0.00	606	15.3	89.7 K	61.8 K	73.9 K	79 K	34 K	55 K	55.9 K	9.9	75.3 L
Sep 2017	5.82 K	0.00	467	14.5 K	87.3 K	59.3 K	72.2 K	80 K	34 K	53 L	53.4 L	7.5 K	73.3 L
Oct 2017	4.42 K	0.11	375	10.0 K	81.7 K	47.2	63.5 K	85	27	51 K	43.7 K	5.0	66.2
Nov 2017	1.54 K	1.80	203	12.0 K	66.2 K	45.0 K	55.1 K	97	57	80 K	48.9 K	3.4	59.2 K
Dec 2017	1.73 K	0.06	224 K	7.8	63.1 K	34.0	46.9	95	43	72	37.7	3.1	49.3
Tots/Avgs	59.57	10.6	445	11.4	75.1	49.9	61.6	81	42	66	48.8	6.8	62.6

Monthly Report

Twitchell Island - San Francisco Bay - Station 140

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan 2018	1.01 K	4.33	163 K	11.2 K	58.7 K	42.7 K	50.1 K	99	75	91 K	47.4 K	3.2 K	51.7 K
Feb 2018	2.37 K	0.25	387 K	8.3	66.3 K	37.5 K	51.2 K	92	36	63 K	38.5 K	1.5 K	50.6 K
Mar 2018	3.03 K	3.45	403 K	10.7 K	65.4 K	42.5	53.6	96	54	76 K	45.9 K	1.5 K	53.8 K
Apr 2018	5.31	2.14	569 K	11.8 K	70.7	48.0	58.8	92	48	69 L	48.3 L	7.3	59.9
May 2018	7.61	0.01	674 K	12.4	75.6	53.3	63.5	83	46	63	50.2	10.6 K	64.6
Jun 2018	8.82	0.00	734 K	13.0	86.1 K	57.2	70.9 K	76	33	51 K	51.5 K	8.7 K	72.2
Jul 2018	9.47	0.00	647 K	13.9 K	90.6	61.3	74.3	76	29	49 K	53.2 K	10.9	75.1
Aug 2018	7.87 K	0.00	587	13.8 K	86.4	59.5 K	71.4	78	34	54 K	53.0 K	9.0	73.7
Sep 2018	6.21	0.00	508	12.6	86.5	55.2 K	69.5	81	29	52	50.6	7.7	70.5
Oct 2018	4.50	0.06	370	11.4 K	81.0	51.8	65.1	83	31	54 K	47.1 K	6.6 K	66.3
Nov 2018	2.04	2.86 K	212	9.3 K	69.3 K	40.5 K	53.9 K	90	40	66 K	41.3 K	4.1 K	57.9
Dec 2018	1.41	3.37	195 K	9.8	59.5	40.4	49.0	97	61	82	43.5	4.5 K	52.5
Tots/Avgs	59.65	16.5	454	11.5	74.7	49.2	60.9	87	43	64	47.5	6.3	62.4

Twitchell Island - San Francisco Bay - Station 140

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)

Monthly Report

Jan 2019	1.42	0.78 K	212 K	10.9 K	60.3 K	41.6	49.7 K	98	67	88 K	46.1 K	5.0 K	51.0
Feb 2019	1.83	7.75 K	283 K	9.2	57.1 K	39.9	47.8	97	59	80	41.5	7.1 K	50.0 K
Mar 2019	3.53	4.07 K	417 K	11.0	65.4	44.5	54.5	96	52	76	46.7	5.8	53.6
Apr 2019	5.48 K	0.41 K	575 K	13.4 K	74.1 K	51.0 K	61.8 K	93	50	71 L	51.6 L	6.4	59.5
May 2019	6.25	2.02	592 K	12.9 K	74.0	51.7	61.5	91	49	70 K	51.3 K	8.8	62.6
Jun 2019	8.60 K	0.00	668	13.8 K	87.0 K	58.7 K	71.9 K	76	35	52 K	52.8 K	9.5 K	68.5
Jul 2019	8.52	0.00	627	14.4 K	89.5 K	59.7	73.8	78	31	51 K	54.2 K	8.3	72.1
Aug 2019	7.86 K	0.00	578	15.5 K	91.9 K	61.9 K	75.5 K	80	32	52 K	56.3 K	8.4	73.3
Sep 2019	5.91	0.13	479	13.7	86.4 K	57.7 K	71.3 K	81	30	53 K	52.7 K	7.5 K	70.8 K
Oct 2019	4.76 K	0.02	393 K	8.5 K	80.6 K	45.4 K	62.3 K	80	21	44 K	39.1 K	5.7 K	63.2
Nov 2019	2.35	0.60	253	9.5	72.3 K	40.2	54.3	95	37	66	42.6	4.4 K	57.4 K
Dec 2019	1.06	3.33	165 K	11.1 K	58.5	42.8 K	49.8 K	99	71	89 K	46.7 K	4.9 K	53.0 K
Tots/Avgs	57.57	19.1	437	12.0	74.8	49.6	61.2	89	45	66	48.5	6.8	61.3

Twitchell Island - San Francisco Bay - Station 140

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan 2020	1.49	0.96	228 K	10.6 K	58.6	40.2	48.7 K	100	71	90 K	45.8 K	4.4	50.5
Feb 2020	3.58 K	0.01	424 K	8.6	69.6 K	40.2	53.7 K	91	35	62 K	39.9 K	5.6 K	51.8
Mar 2020	3.91	1.16 K	441 K	10.1	65.5 K	44.1	53.9	94	50	72	44.4	6.2	54.4

Monthly Report

Apr 2020	5.84 K	1.43	567 K	11.5	73.5 K	51.1 K	60.9 K	85	44	64 K	47.9 K	8.1	59.2
May 2020	7.65 K	0.22 K	640 K	12.2 K	82.1 K	54.9 K	67.8 K	82 K	34 K	54 K	49.5 K	7.9	66.1 K
Jun 2020	9.18	0.00	722 K	13.0 K	87.8 K	59.6	72.4 K	73	30	48 K	51.1 K	9.7	71.8 K
Jul 2020	9.66	0.01	707 K	13.5 K	88.7	59.3	72.4	78	30	51 K	52.4 K	11.6 K	73.2
Aug 2020	8.25 K	0.09	582 K	15.2 K	92.8 K	61.8 L	76.7 K	76 K	31 K	52 L	55.1 L	8.8	75.3 L
Sep 2020	6.04 K	0.00	458	15.0 K	90.2 K	61.6 K	74.4 K	82 K	30 K	54 L	55.3 L	7.8 K	72.9 K
Oct 2020	4.59 K	0.02	373 K	11.4 K	86.4 K	52.0 K	68.2 K	81 K	25 K	51 L	48.4 L	5.2 K	68.7 K
Nov 2020	2.44 K	0.37	290 K	8.8 K	69.1 K	38.4 K	52.7	93	35	64 K	40.6 K	4.3 K	58.1
Dec 2020	1.59 K	1.42 K	221 K	8.6	60.7 K	38.1	48.2 K	96	52	76 K	40.4 K	4.1	51.7
Tots/Avgs	64.22	5.7	471	11.5	77.1	50.1	62.5	86	39	62	47.6	7.0	62.8

Twitchell Island - San Francisco Bay - Station 140

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan 2021	1.83 K	0.53 K	235 K	9.6 K	61.2 K	39.5	49.3 K	96	59	83 L	43.2 L	5.3 K	51.0
Tots/Avgs	1.83	0.5	235	9.6	61.2	39.5	49.3	96	59	83	43.2	5.3	51.0

Flag Legend	
M - All Daily Values Missing	K - One or More Daily Values Flagged
J - One or More Daily Values Missing	L - Missing and Flagged Daily Values

Monthly Report

Conversion Factors		
W/sq.m = Ly/day/2.065	inches * 25.4 = mm	(F-32) * 5/9 = c
	mBars * 0.1 = kPa	--

Local Climate Change Snapshot



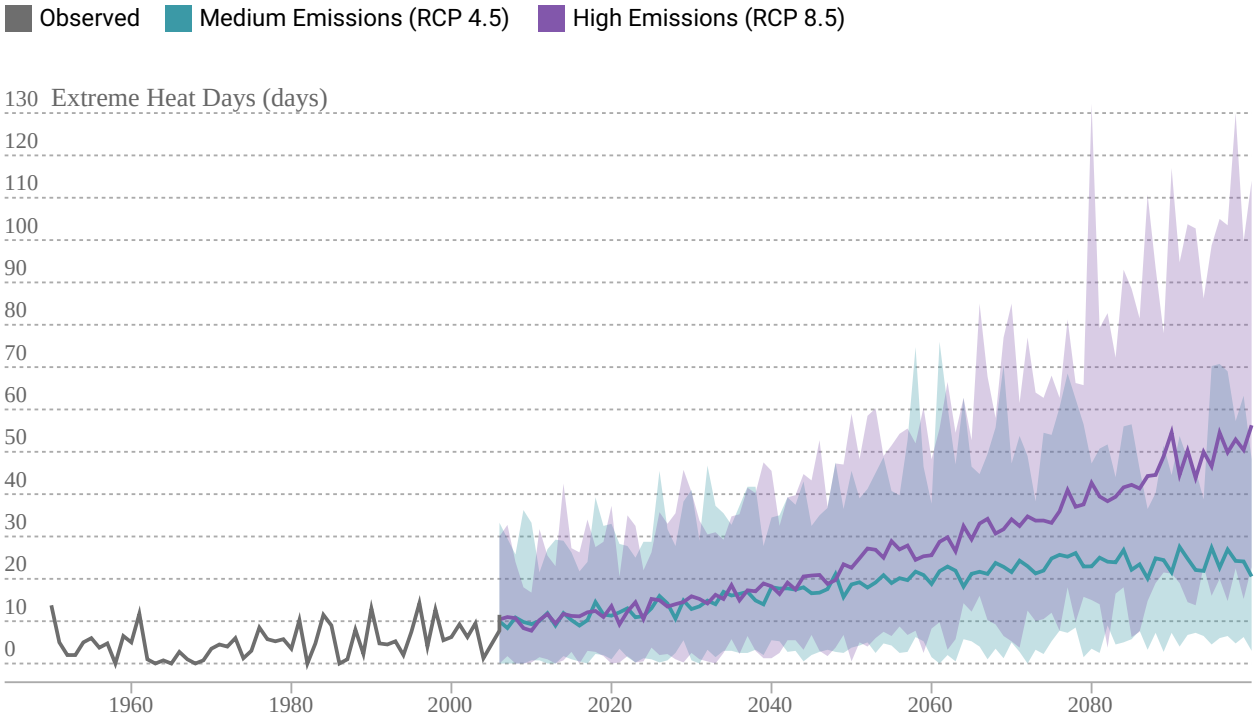
Rio Vista

California

Overall temperatures are projected to rise in California during the 21st century. While the entire state will experience temperature increases, the local impacts will vary greatly with many communities and ecosystems already experiencing the effects of rising temperatures.

Extreme Heat Days

Number of days in a year when daily maximum temperature is above a threshold temperature of 101.3 °F Note: Threshold temperature used in this tool is location specific. It is defined as the 98th percentile value of historical daily maximum/minimum temperatures (from 1961–1990, between April and October) observed at a location.



Observed (1961-1990) 30yr Average: 4 days

		30yr Average	30yr Range
Baseline (1961-1990)			
MODELED HISTORICAL	-	5 days	4 - 6 days
Mid-Century (2035-2064)			
MEDIUM EMISSIONS (RCP 4.5)	+14 days	19 days	13 - 29 days
HIGH EMISSIONS (RCP 8.5)	+18 days	23 days	14 - 36 days
End-Century (2070-2099)			
MEDIUM EMISSIONS (RCP 4.5)	+19 days	24 days	15 - 43 days
HIGH EMISSIONS (RCP 8.5)	+37 days	42 days	28 - 76 days

1. Data derived from 32 LOCA downscaled climate projections generated to support California's Fourth Climate Change Assessment. Details are described in Pierce et al., 2018.
2. Observed historical data derived from Gridded Observed Meteorological Data. Details are described in Livneh et al., 2015.
3. Data presented are aggregated over all LOCA grid cells that intersect Rio Vista boundary.
4. Threshold temperature for a location is defined as the 98th percentile value of historical daily maximum/minimum temperatures (from 1961–1990, between April and October) observed at that location

Local Climate Change Snapshot



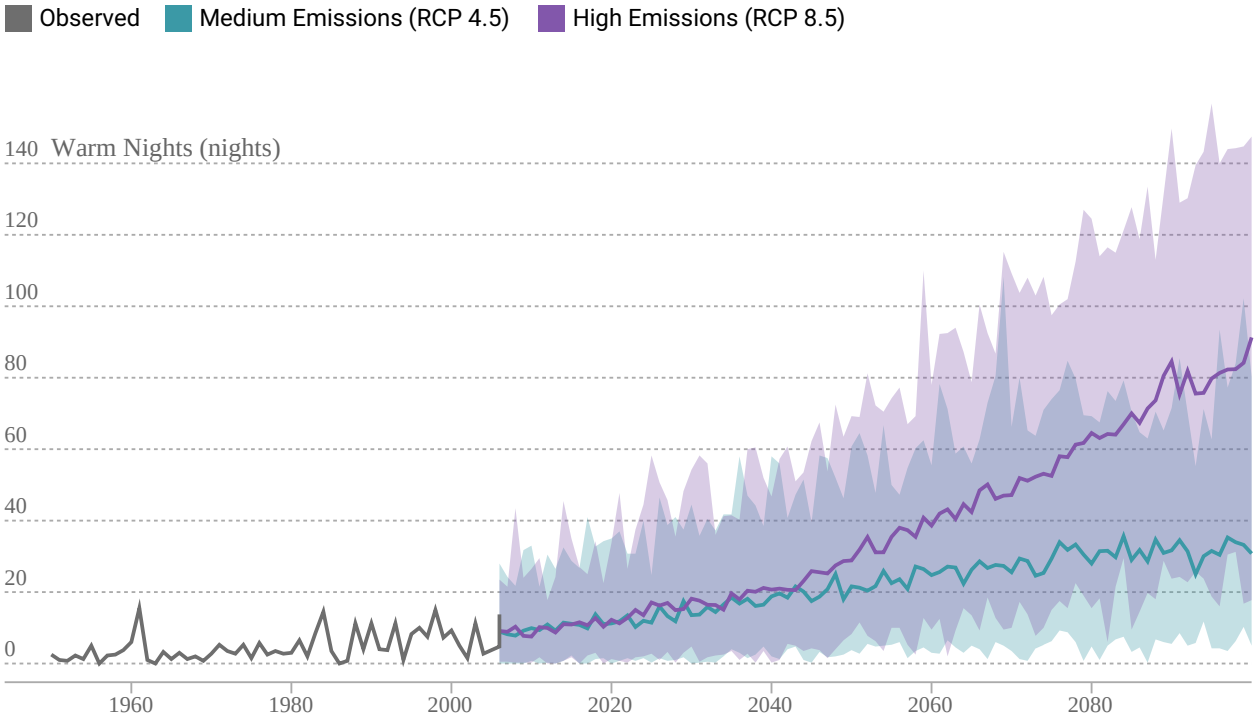
Rio Vista

California

Overall temperatures are projected to rise in California during the 21st century. While the entire state will experience temperature increases, the local impacts will vary greatly with many communities and ecosystems already experiencing the effects of rising temperatures.

Warm Nights

Number of days in a year when daily minimum temperature is above a threshold temperature of 64.8 °F Note: Threshold temperature used in this tool is location specific. It is defined as the 98th percentile value of historical daily maximum/minimum temperatures (from 1961–1990, between April and October) observed at a location.



Observed (1961-1990) 30yr Average: 4 nights

		30yr Average	30yr Range
Baseline (1961-1990)			
MODELED HISTORICAL	-	4 nights	1 - 8 nights
Mid-Century (2035-2064)			
MEDIUM EMISSIONS (RCP 4.5)	+17 nights	21 nights	10 - 38 nights
HIGH EMISSIONS (RCP 8.5)	+26 nights	30 nights	13 - 51 nights
End-Century (2070-2099)			
MEDIUM EMISSIONS (RCP 4.5)	+27 nights	31 nights	12 - 64 nights
HIGH EMISSIONS (RCP 8.5)	+64 nights	68 nights	27 - 114 nights

1. Data derived from 32 LOCA downscaled climate projections generated to support California's Fourth Climate Change Assessment. Details are described in Pierce et al., 2018.
2. Observed historical data derived from Gridded Observed Meteorological Data. Details are described in Livneh et al., 2015.
3. Data presented are aggregated over all LOCA grid cells that intersect Rio Vista boundary.
4. Threshold temperature for a location is defined as the 98th percentile value of historical daily maximum/minimum temperatures (from 1961–1990, between April and October) observed at that location

Local Climate Change Snapshot



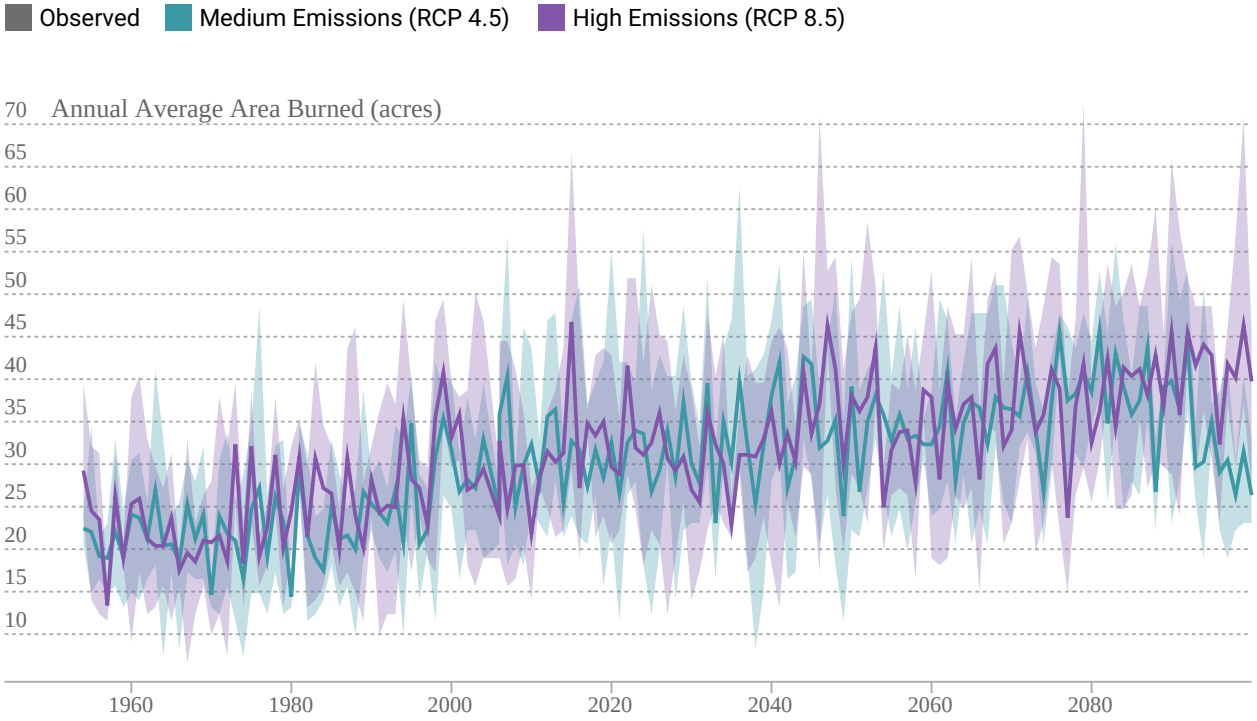
Rio Vista

California

The frequency, severity and impacts of wildfire are sensitive to climate change as well as many other factors, including development patterns, temperature increases, wind patterns, precipitation change and pest infestations. Therefore, it is more difficult to project exactly where and how fires will burn. Instead, climate models estimate increased risk to wildfires. The information presented here (Annual Average Area Burned) can help inform at a high level if wildfire activity is likely to increase. However, this information is not complete - many regions across the state have no projections (such as regions outside combined fire state and federal protection responsibility areas), and more detailed analyses and projections are needed for local decision-making. These projections are most robust for the Sierra Nevada given model inputs. However, as we have seen in recent years, much of California can expect an increased risk of wildfire, with a wildfire season that starts earlier, runs longer, and features more extreme fire events.

Annual Average Area Burned

Average of the area projected to be at risk to burning in a year.



		30yr Average	30yr Range
Baseline (1961-1990)			
MEDIUM EMISSIONS (RCP 4.5)	-	22.1 acres	20.6 - 23.2 acres
HIGH EMISSIONS (RCP 8.5)	-	23.6 acres	21.3 - 24.7 acres
Mid-Century (2035-2064)			
MEDIUM EMISSIONS (RCP 4.5)	+11.8 acres	33.9 acres	30.7 - 36.3 acres
HIGH EMISSIONS (RCP 8.5)	+10.8 acres	34.4 acres	32.2 - 36.2 acres
End-Century (2070-2099)			
MEDIUM EMISSIONS (RCP 4.5)	+14.2 acres	36.3 acres	34.6 - 39.6 acres
HIGH EMISSIONS (RCP 8.5)	+15.5 acres	39.1 acres	36.5 - 42.1 acres

1. Data derived from wildfire simulations generated to support California's Fourth Climate Change Assessment. Details are described in Westerling et al., 2018.
2. Data presented are aggregated over all LOCA grid cells that intersect Rio Vista boundary.
3. Rio Vista boundary may contain locations outside the combined fire state and federal protection responsibility areas. These locations were excluded from wildfire simulations and have no climate projections.

Local Climate Change Snapshot



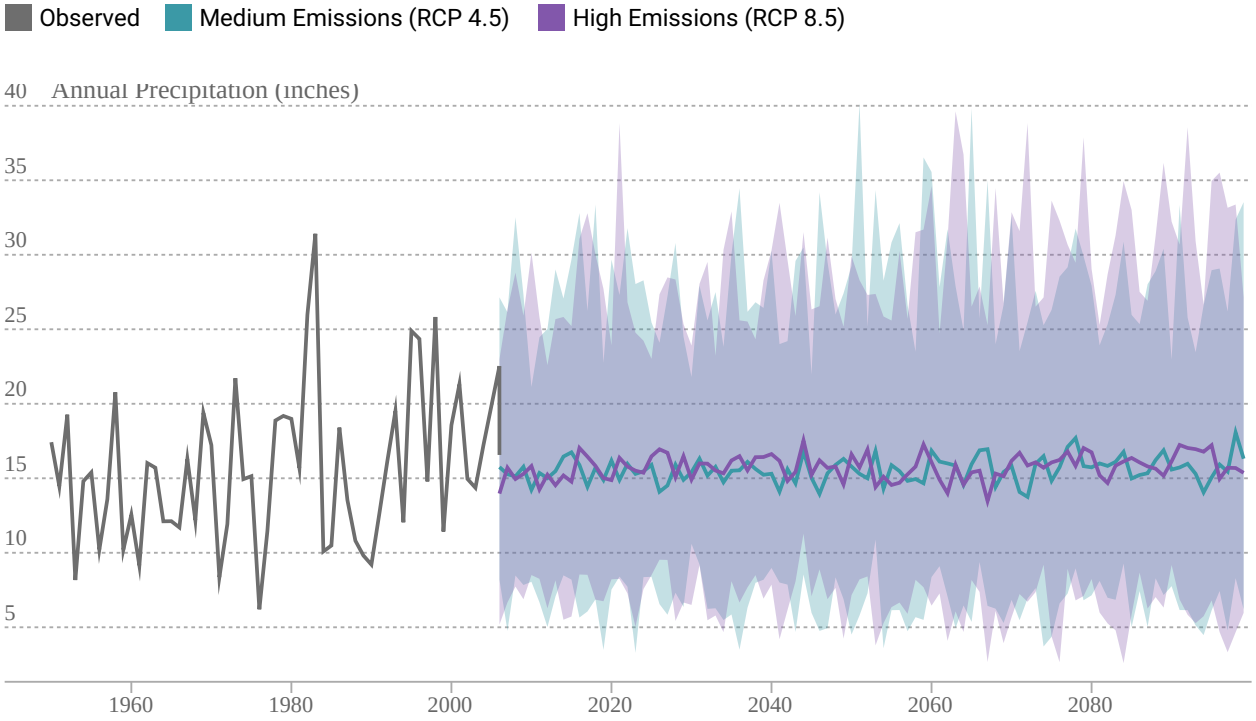
Rio Vista

California

California's climate varies between wet and dry years. Research suggests that for much of the state, wet years will become wetter and the dry years will become drier. Dry years are also likely to be followed by dry years, increasing the risk of drought. While California does not see the average annual precipitation changing significantly in the next 50-75 years, precipitation will likely be delivered in more intense storms and within a shorter wet season. We are already seeing some of the impacts from a shift towards larger year to year fluctuations.

Annual Precipitation

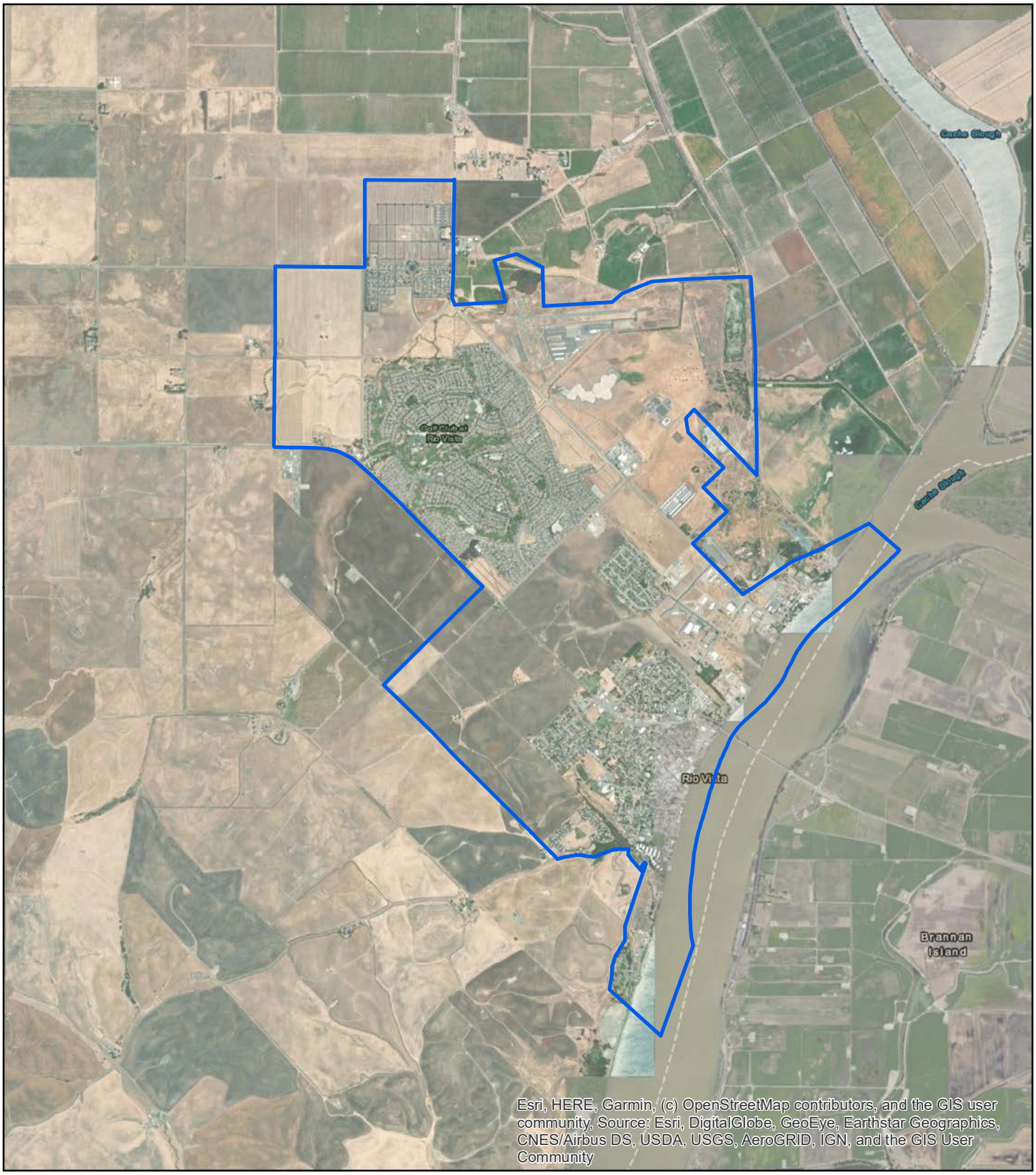
Total precipitation projected for a year



Observed (1961-1990) 30yr Average: 14.8 inches

		30yr Average	30yr Range
Baseline (1961-1990)			
MODELED HISTORICAL	-	15.7 inches	14.4 - 17.1 inches
Mid-Century (2035-2064)			
MEDIUM EMISSIONS (RCP 4.5)	-0.3 inches	15.4 inches	13.5 - 20.6 inches
HIGH EMISSIONS (RCP 8.5)	0.0 inches	15.7 inches	12.7 - 20.3 inches
End-Century (2070-2099)			
MEDIUM EMISSIONS (RCP 4.5)	+0.1 inches	15.8 inches	13.2 - 19.6 inches
HIGH EMISSIONS (RCP 8.5)	+0.4 inches	16.1 inches	11.1 - 21.7 inches

1. Data derived from 32 LOCA downscaled climate projections generated to support California's Fourth Climate Change Assessment. Details are described in Pierce et al., 2018.
2. Observed historical data derived from Gridded Observed Meteorological Data. Details are described in Livneh et al., 2015.
3. Data presented are aggregated over all LOCA grid cells that intersect Rio Vista boundary.



DOCUMENT PATH: S:\D&M_GIS_Projects\Rio Vista\R2029\SERVICE AREA BOUNDARY MAP.mxd

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SERVICE AREA

CITY OF RIO VISTA

PUBLIC WATER SYSTEM 4810004
SERVICE AREA

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0 495 990 1,980 2,970 3,960
Feet

DILLON & MURPHY ENGINEERING

MARCH 2021

Project No.
5462.000.002

May 6, 2016

Mr. Dave Melilli
Director of Public Works
City of Rio Vista
One Main Street
Rio Vista, CA 94571

Subject: Water Well Supply Study
Rio Vista, California

PROGRESS REPORT FOR EVALUATION OF WATER WELL SUPPLY DATA THROUGH APRIL 2016

References:

1. ENGEO; Groundwater Evaluation, Rio Vista, California; June 21, 2002; Project No. 5462.5.001.01.
2. ENGEO; Hydrogeologic and Available Water Supply Trend Analysis, Rio Vista, California; October 6, 2006; Project No. 5462.6.001.01.
3. ENGEO; Progress Report for Evaluation of Water Well Supply Data through June 2011; August 5, 2011; Project No. 5462.000.002.
4. ENGEO; Preliminary Report of Groundwater Elevation, Groundwater Supply Study, Rio Vista, California; Revised February 13, 2015; Project No. 5462.000.002.

Dear Mr. Melilli:

We are pleased to present this progress report for evaluation of water well supply data through April 2016 collected from nine municipal water supply wells in Rio Vista, California. This report is intended to provide data for the continued analysis of sustainability and water withdrawal from the aquifer under the City of Rio Vista.

The water well data is taken from transducers installed in the well and recorded by the Supervisory Control and Data Acquisition (SCADA) system, which was installed in February 2005 by the instrument contractor, Sierra Controls. Since the installation of the SCADA system, the water well data has been recorded and stored on the Rio Vista SCADA system. This report provides data intended to aid the on-going evaluation and analysis. It does not provide conclusions or opinions regarding long-term characterization, health or sustainability of the aquifer. This report merely updates the aggregation of the groundwater data provided by City of Rio Vista.

This report provides an updated summary of the water well data, along with a brief summary evaluation of observed trends in individual water supply wells. We have condensed the GWE data into monthly drawdown (lowest) and static (highest) elevations, estimated flow as estimated monthly total flow, and displayed the data in a chart format.

Data parameters, including well drawdown, flow rate, total flow and well pressure have historically been recorded from the City of Rio Vista's Water Supply Well Nos. 7, 8, 9, 10, 11, 12, 13, 14, and 15 (Figure 7). *It should be noted that Well Nos. 7 and 9 are not included in this progress report because the transducers were inoperable and only a minimal number of readings are available for Well Nos. 7. Moreover, Well Nos. 8 and 12 are no longer in service and were not included in this analysis. This report only reports on Well Nos. 10, 11, 13, 14, and 15.*

Table 1 - Well Summary

Well Number	Current Status	Manual Readings Currently Taken	Transducer Readings Currently Taken
7	No Transducer	Yes	No
8	Out of Service	No	No
9	No Transducer	No	No
10	Transducer Inoperable	Yes	No
11	Active	Yes	Yes
12	Out of Service	No	No
13	Active	Yes	Yes
14	Active	Yes	Yes
15	Active	Yes	Yes

COLLECTED DATA

This progress report provides and update of previous water supply data through April 2016; however we have compiled earlier well data information collected from May 2005 through July 2015. An important factor to consider in data collection is the presence of numerous and/or large gaps in the data, which may lead to reduced accuracy. In addition, it is not always possible to identify when the data is not accurate, so it is possible that some of the negative trends may in fact may not be occurring.

For this progress report we have plotted the available well data on charts to review trends of GWE for individual well locations. Also, one main consideration is to evaluate how the flow rate from each well affects the GWE; to review this information GWE data was aggregated into monthly values. The upper GWE represents an estimate of static well water elevation from the various aquifers that the wells are screened into. The drawdown GWE represents the lowest level of the well's water elevation while pumping.

It should be emphasized that most of the individual water wells had transducers that experienced periods of inoperability, which are indicated with a gray background on the charts. During those times, the GWEs are not accurate and are included only to provide consistency. In July 2014, a policy was instituted by the City's Department of Public Works to manually read the GWE for each well once a month in order to confirm that the transducers are working and providing accurate GWEs. The GWE trend represents an estimate as to the long-term elevation trend of various aquifers that of each well.

Well 10 (Figure 1)

Well No. 10's transducer was inoperable from July 2009 to August 2014, and became inoperable again in April 2015. During these times, the transducer did not record any groundwater elevations. A manual reading was taken in July 2014 and each month thereafter. The manual readings from the well, which were not taken at a consistent time from month to month, generally measure the ambient water table elevation and the drawdown elevation. In February and March 2015, the transducer recorded static GWE elevation 15 feet above the initial datum, which is inconsistent with the manual readings that report GWE at a lower elevation. It is most likely that GWE readings provided by the transducer are incorrect since it is unlikely that the GWE would have rebounded to fifteen feet above its initial level.

Based on the manual readings and Well No. 10's transducer readings, it appears that the static GWE of this well is stable, though the lack of representative data makes that assertion difficult to substantiate. The well's transducer is not recording any data though manual readings of the water surface elevation continued.

Well 11 (Figure 2)

Well No. 11's transducer was inoperable from June 2009 to August 2014. During this time, it appears that the transducer recorded lower elevations than the actual GWE in the well. A manual reading was recorded in July 2014, which demonstrated that the reported water level on the SCADA system was 120 feet lower than what was measured manually. We understand that the transducer was repaired and was correctly recording the water elevation, until it became inoperable again in June 2015 but was operable again in September of 2015.

Based on the manual readings and Well No. 11s's transducer readings, it appears that the static GWE of this well is stable, though the lack of representative data makes that assertion difficult to substantiate.

Well 13 (Figure 3)

Well No. 13's transducer was inoperable twice, once from March 2006 to June 2007 and again from June 2010 to August 2014. During the first period of inoperability, it appears that the recorded elevations were lower than the actual GWE in the well. During the second period of inoperability, the transducer did not report the GWE. During the period from August 2008 to June 2010, there were multiple readings that were above the estimated static GWE. It is likely

that the transducer was not properly calibrated to the water surface elevation. A manual reading was recorded in July 2014 and each month thereafter. The transducer was repaired and appears to be correctly reporting the water elevation after July 2014 though there were some anomalous readings in December 2015 and January 2016.

Based on the manual readings and Well No. 13's transducer readings, it appears that the static GWE of this well is stable, though the lack of representative data makes that assertion difficult to substantiate.

Well 14 (Figure 4)

Well No. 14's transducer was inoperable from September 2010 to August 2014. During that time, it appears to have recorded lower elevations than the actual GWE in the well. When a manual reading was taken in July 2014, it demonstrated that the reported water level on the SCADA system was 30 feet lower than what was measured manually. The transducer was repaired on July 2014 and appears to be correctly recording the water elevation.

Based on the manual readings and Well No. 14's transducer readings, it appears that the static GWE of this well is stable, though the lack of representative data makes that assertion difficult to substantiate.

Well 15 (Figure 5)

Well No. 15 became active in July of 2013. Based on the transducer data, the wells GWE lowers in the summer months and increases in the winter months. The most likely cause is the large amounts of pumping that takes place during the summer months. There is a discrepancy between the manual readings and the transducer readings between June 2015 and October 2015. During that period the well's transducer shows lower estimated ambient GWE than the manual readings. Further review of the manual readings and the transducer should be performed to evaluate the cause of the discrepancy.

Based on the manual readings and Well No. 15's transducer readings, it appears that the static GWE is seasonal but stable, though the lack of representative data makes that assertion difficult to substantiate.

DISCUSSION

The results of evaluation of water well supply data through April 2016 collected from the municipal water supply wells shows fluctuation in water levels. The general trend does not indicate significant change to the overall static GWE of any of the wells.

In order to provide reliable on going data, it is important that the City continue to maintain its well monitoring equipment. The following should be considered by the City regarding monitoring of the water supply wells:

- Continue manual GWE measurements of wells to verify the accuracy of the transducer measurements.

- Monthly monitoring of the SCADA system's well data to identify any transducers that may be incorrectly reporting data.

- Install a piezometer network to evaluated the static ground water elevation and monitor aquifer GWE. It is our understanding that the city is in the process of evaluating the optimal location for the piezometers and that they have allocated $160,000 for the first phase of piezometers to be installed in the 2016-2017 fiscal year.

We look forward to continuing to monitor and update the GWE and flow reports and providing groundwater analysis services to the City of Rio Vista. We are available at your convenience to discuss any questions or comments you may have.

Sincerely,

ENGEO Incorporated

Alan Moreira, PE QSD Theodore P. Bayham, CEG, GE
am/tpb/bvv

cc: Mr. Cecil Dillon, City Engineer

Attachments: Figure 1 – Well 10 Data
Figure 2 – Well 11 Data
Figure 3 – Well 13 Data
Figure 4 – Well 14 Data
Figure 5 – Well 15 Data
Figure 6 – Well Production by Month
Figure 7 – Well Locations

Figure 1 - Well 10

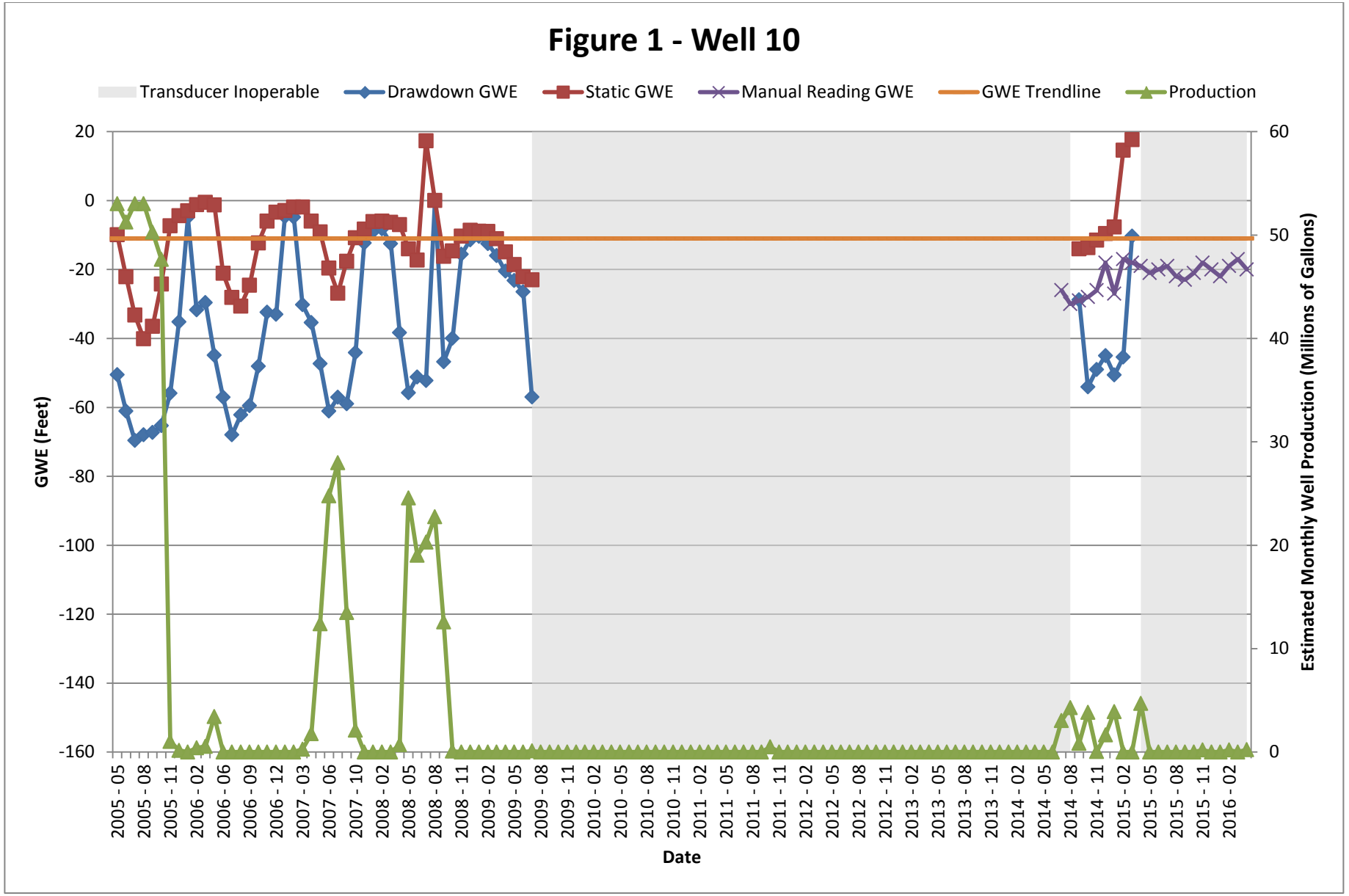

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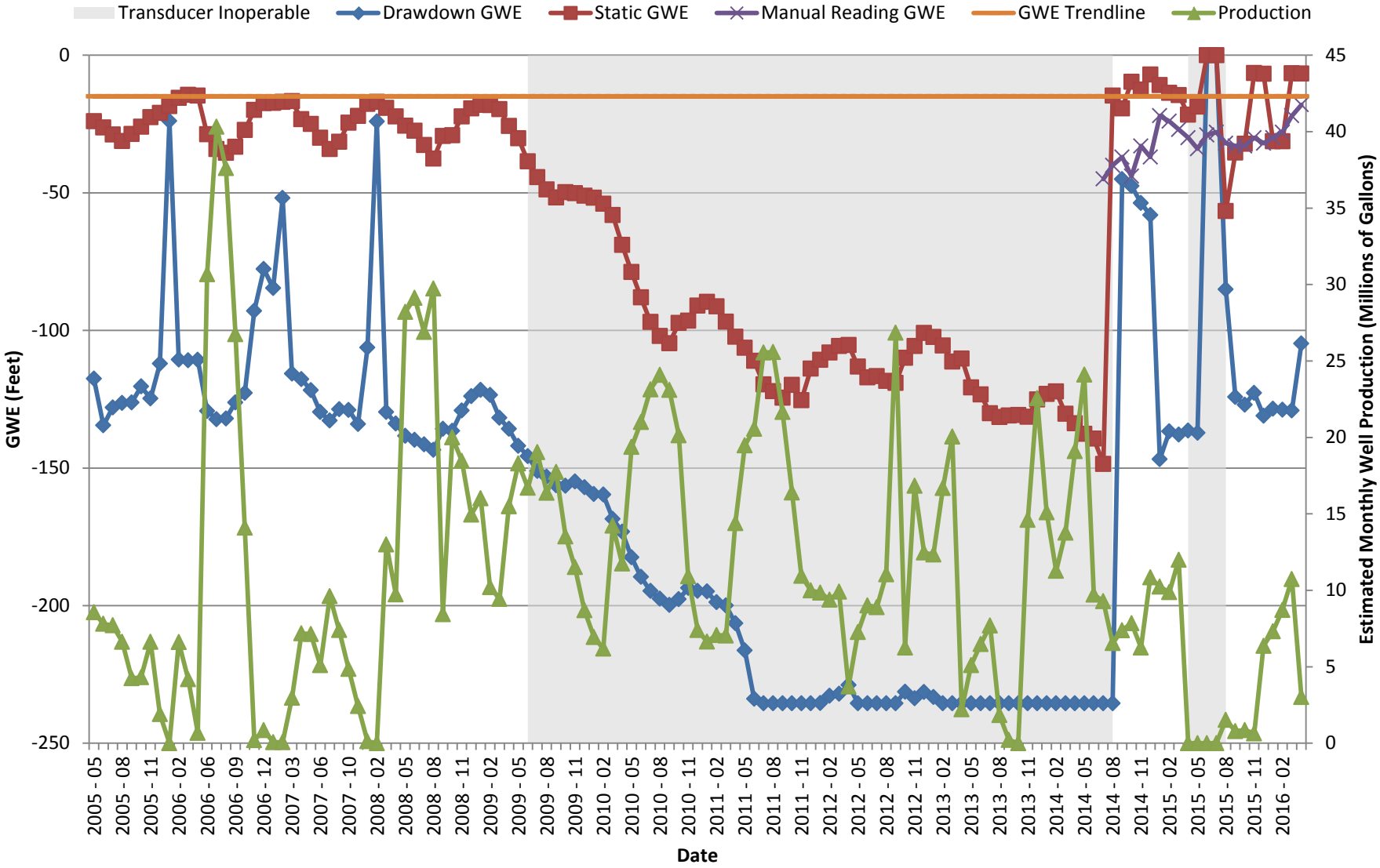
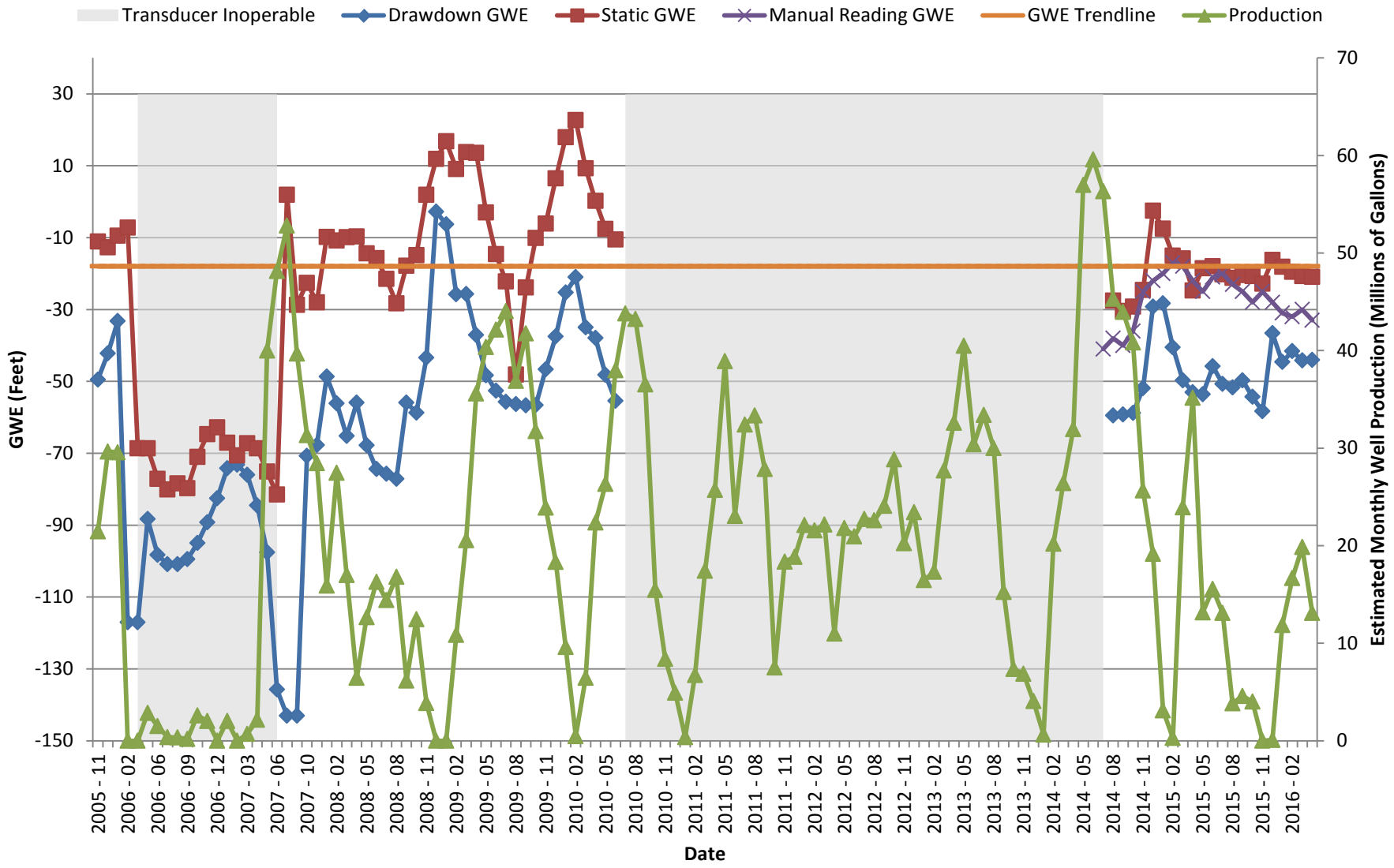
Figure 2 - Well 11



ENGEO
Expect Excellence

Figure 3 - Well 13



5462.000.002
May 6, 2016

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Figure 4 - Well 14

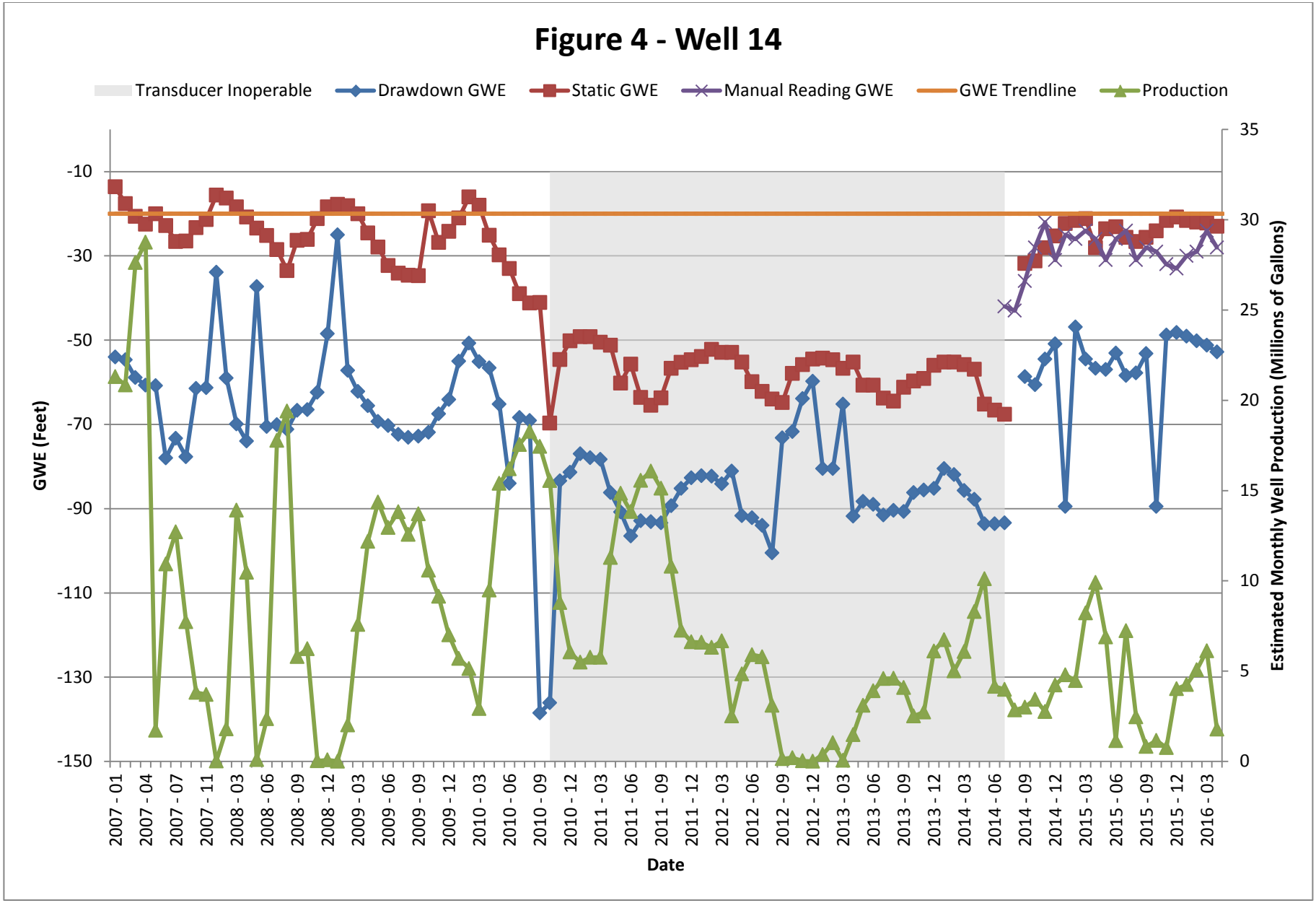

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Figure 5 - Well 15

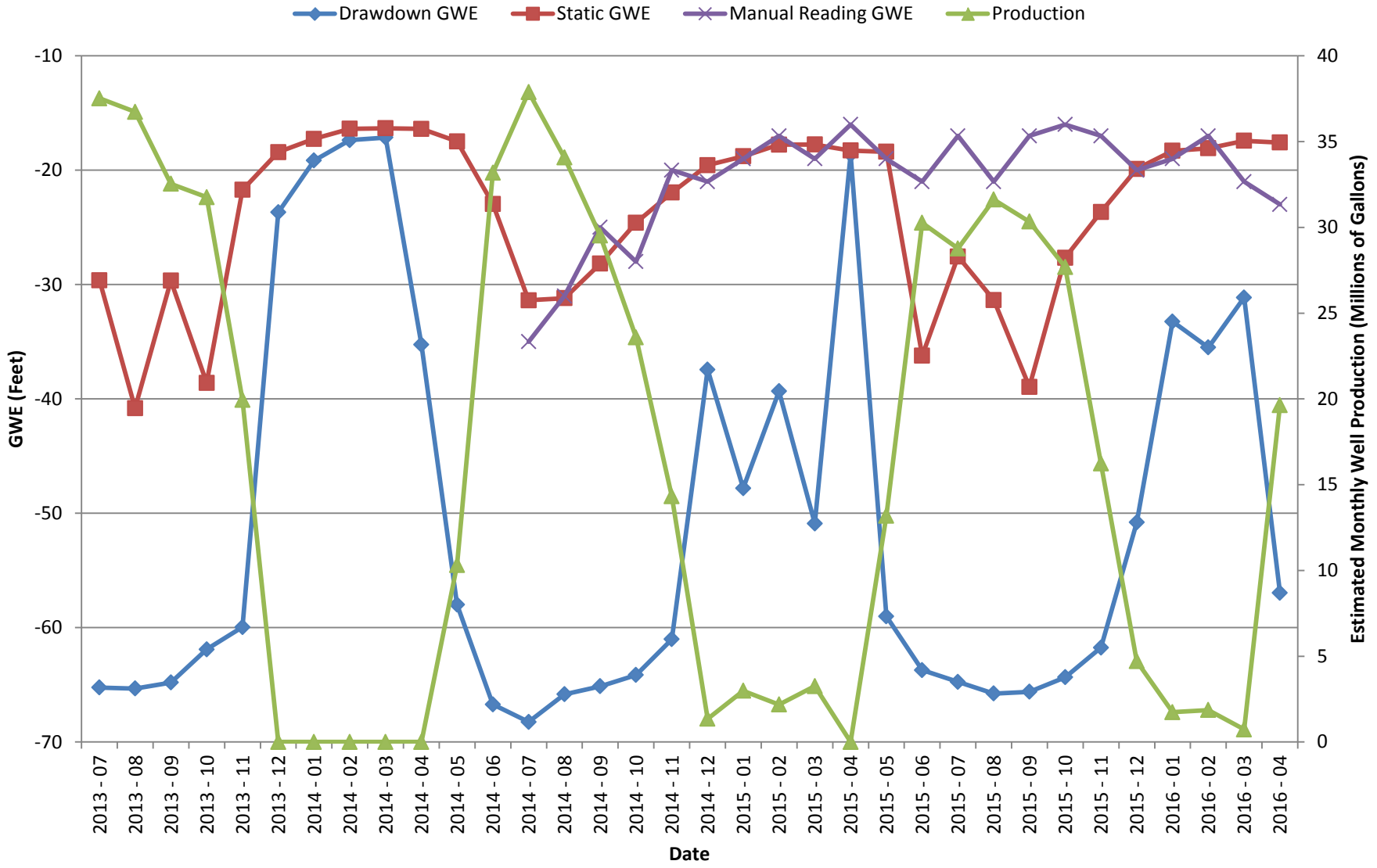

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Figure 6 - Well Production by Month

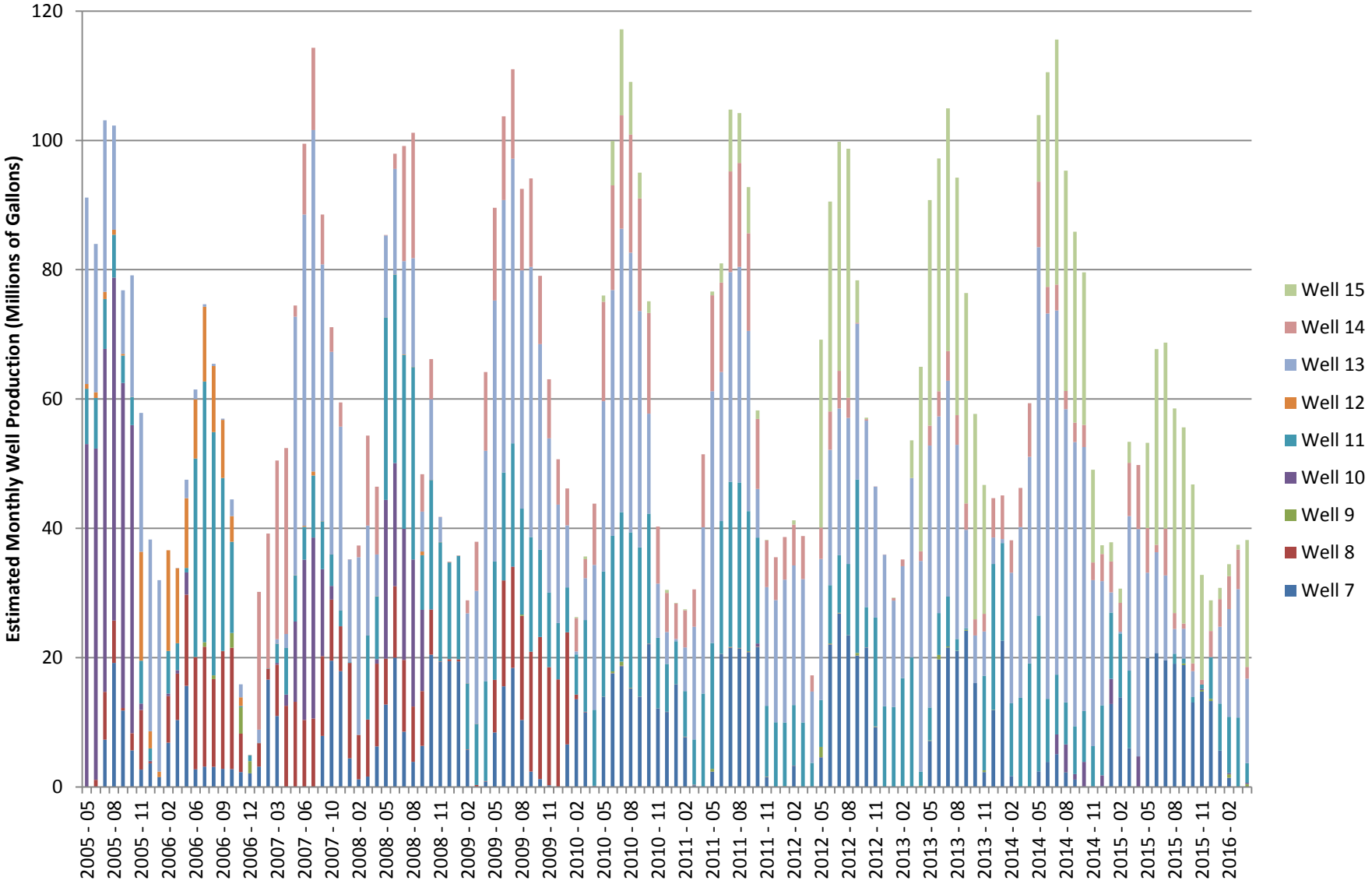

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Figure 7: Well Locaitons

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GEOTECHNICAL
ENVIRONMENTAL
WATER RESOURCES
CONSTRUCTION SERVICES

Project No.
5462.000.004

May 10, 2016

Mr. Dave Melilli
Director of Public Works
City of Rio Vista
One Main Street
Rio Vista, CA 94571

Subject: Groundwater Analysis
Rio Vista, CA

PROPOSAL FOR GROUNDWATER INSTRUMENTATION ANALYSIS

References: 1. ENGEO Project No. 5462.000.001 Contract dated July 31, 2009.

Dear Mr. Melilli:

Thank you for requesting the analysis for the placement of groundwater instrumentation analysis. We have prepared this proposal to review the hydrologic conditions in Rio Vista and assess potential locations for groundwater instrumentation. Our scope and fee also includes the following tasks:

- Aggregation of Historical Data
  - Hydrologic/Subsurface Reports
  - Well Log Data (Both City and Public Wells)
- Analysis of City Property for Potential Locations
- Analysis of Offline Wells (Wells 8 & 12) and Test/Abandon Wells
- Evaluation of Optimal Groundwater Instrumentations/SCADA Connection with Sierra Controls
- Evaluation of Optimal Depths and Locations
- Meeting with City Officials
- Report and Map Creation of Potential Locations with Recommendations for:
  - Depths and Discrete Intervals (if appropriate)
  - Locations
  - Instrumentation
  - Communication System

We propose to offer these services for a fee of **$15,250.**

ENGEO
Expect Excellence

2010 Crow Canyon Place, Suite 250
San Ramon, CA 94583-4634
(925) 866-9000 ♦ FAX (888) 279-2698

ADDENDUM TO
PROFESSIONAL SERVICES AGREEMENT

TO: Mr. Dave Melilli
City of Rio Vista
One Main Street, P. O. Box 745
Rio Vista, CA 94571

DATE: May 10, 2016

ENGEO Project No. 05462.000.004
Phase: 001
ENGEO Contact: Brian Flaherty

PROJECT NAME: City of Rio Vista Groundwater Instrumentation Analysis

ORIGINAL CONTRACT NO.: ENGEO Project No. 5462.000.001

ORIGINAL CONTRACT DATE: July 31, 2009

The undersigned parties agree to make the following changes to the subject contract; all other provisions of the subject contract shall remain in effect.

If the undersigned party differs from that of the original contracting party, the undersigned agrees to all the original terms and conditions of the subject contract. Any limitations shall be an aggregate amount that applies to the original work and all subsequent change orders and/or addendums.

Additional Scope of Services: In accordance with the attached proposal dated May 10, 2016.

Estimated Fees: For a fee of $15,250, in accordance with the attached proposal dated May 10, 2016.

AGREED TO AND ACCEPTED BY:

ENGEO INCORPORATED	**CITY OF RIO VISTA**
BY: _____	BY: Greg Bowman
PRINT NAME: _____	PRINT NAME: GREG BOWMAN
TITLE: _____	TITLE: INTERIM CITY MANAGER
DATE: _____	DATE: 5-10-16

Internal Review: 1. AM 2. JAA

With an estimated average household size in the city of 2.30 persons in 2010, these developments could add approximately 12,400 people, increasing the City's population at buildout by 148 percent. The buildout date for these developments is currently uncertain, but with improved real estate market conditions, an initial portion of these units could be added within the 7.5-year planning period of this housing element

The current market downturn is anticipated to substantially slow population growth in the city for the next several years or until the market recovers. Therefore, while the average annual growth rate between 2000 and 2008 was robust at 7.4 percent (DOF 2008), models of population growth predicated on rapid annual growth rates since 2000 may not accurately reflect the change in market conditions and associated slowing in residential homebuilding. Between 2009 and 2010, the average annual housing growth rate was between 1.7% in 2009 (DOF 2009) and 1.0 % in 2010 (DOF 2010).

Long Term Growth

The 20 year vision of Rio Vista's General Plan allows for an approximate population of over 22,000 persons based on the build - out of all of the proposed planned unit developments including the various single-family, multiple-family and mixed-use areas allowed by policies and the zoning ordinance of the City.

ABAG is responsible for forecasting long-term changes to the population and economy of the Bay Area to assist local governments in identifying policies that address a changing environment. This effort includes *Projections*, ABAG's biennial forecast of population, housing, jobs, and income out to the year 2035 for the nine-county 101-city region. Since 2003, ABAG has included a set of policy assumptions in its models that assign more growth to areas around transit centers in recognition of evolving government polices and market conditions that promote growth in those areas. Past ABAG forecasts have typically been within five percent of actual population, household, and job growth, at the county level (ABAG 2008).

Population projections for the City of Rio Vista from ABAG's *Projections 2007* indicated that the city would have the fastest rate of growth of any city in the region, growing to 13,600 residents by 2015, 19,100 residents by 2025, and 24,500 residents by 2035 (ABAG 2007). In June 2009 ABAG released *Projections 2009* including revised projections for the City of Rio Vista of 11,400 population by 2020 and 15,300 persons by 2035. In addition, ABAG is projecting a total of about 6,240 households and 5,990 total jobs over the next 25 years (i.e. 2035) These revised projections factor in such issues as higher energy costs, environmental trends, and more transit and transit-oriented higher density housing concentrated in the redevelopment areas and larger urban centers (also called Priority Development Areas – or PDA's).

[6] No partial lot density is assumed for previously subdivided small parcels.

[7] Full listing of all parcels available upon request from City.

[8] With recent decline in home values, a substantial number of these R-1 parcels could be developed with housing affordable to households in the upper range of the lower income category. However, to provide a conservative estimate of homes likely to be affordable to lower income households, these parcels have been assumed to be affordable to those in the moderate and above income categories only.

[9] This parcel currently in use as trailer storage facility.

[10] Unit potential likely density assumes that 65 percent of the NC-designated area would be developed with residential uses at 15 dwelling units per acre. The NC land use district requires 50 – 80 percent residential uses and a minimum density of 10 units per acre, with a maximum density of 20 units per acre on an individual site, including necessary infrastructure. Please refer to Table 4-3 in the Land Use Element.

Pending Projects

In addition to ongoing development in the existing Brann and Gibbs Ranch subdivisions, three large residential subdivisions within the City limits are in various stages of the entitlement or construction process.

Trilogy

This age-restricted senior housing subdivision project located in the northwestern portion of the City began building in 1996 and is planned for approximately 3,000 single family units. Approximately 2,000 units have been constructed as of April 2009. The project is centered around an 18-hole public golf course and clubhouse/restaurant. As of April 2011 about five new homes were under construction.

Riverwalk

Riverwalk is an approved 236-acre Planned Unit Development north and east of the intersection of Highway 12 and Church Road. The Riverwalk Project would consist of approximately 743 single-family homes and 180 multi-family residential units, as well as commercial and open space development. The project is proposed to be carried out in six phases over a period of 12 to 15 years. An Environmental Impact Report (EIR) was prepared for the project in 2007. The EIR was certified by the City Council in January 2007, and the project was approved in October 2008.

Del Rio Hills

The Del Rio Hills project site (commonly known as the Esperson property) is located in the City of Rio Vista on approximately 505 acres immediately west of downtown Rio Vista, south of State Route 12, east of Amerada Road, and north of unincorporated Solano County. The project is a proposed Planned Unit Development, designed as a mixed-use community to include low, medium, and high-density residential development, as well as commercial uses, public facilities, school, parks, and open space uses. The current plan proposes to construct 759 low density units (<2-7.9 units per acre), 1,162 medium density units (8-14.9 units per acre), and 502 high density residential units (15-28 units per acre) in three phases. A draft Environmental Impact Report was circulated between December 2008 and April 2009, with public meetings held in February, March, and April to receive public comment. The Draft EIR has been on hold by the applicant since the end of 2009. During mid-2011, the applicant began completing a revised Draft EIR which will incorporate comments/responses provided during the initial review, and a

Legend

- 16-inch Water
- 12-inch Water
- 10-inch Water
- 8-inch Water
- 6-inch Water
- 4-inch Water
- Storage Tank
- Active Wells
- Inactive Wells
- Critical pipeline potentially isolating portions of Town Core
- City Limits
- Parcel/Lot Line



FIGURE 3-3

CITY OF RIO VISTA
2018 WATER SYSTEM EVALUATION

EXISTING WATER DISTRIBUTION SYSTEM

NV5

Document Path: \\nv5.com\panzura\INF\Projects\2262\226218-00000080.00 - Water System Eval\GIS\Figures\Fig3-3_Existing Water.mxd

TABLE 3-2
SUMMARY OF EXISTING GROUNDWATER WELLS

Well Number	Installation Date	Location	Power (hp)	Max Capacity (gpm)	Depth (ft)	Notes
7 **NOT IN SERVICE**	1953	Main Street at Sacramento River	25	500	424	No transducer Chorine injector in pump system Sanitary seal was installed
8 **NOT IN SERVICE**	1955	St. Francis Way near City Public Works offices	40	300	492	Sanitary seal was installed to depth of 75 ft
9	1963	Amador Circle, near Drouin Tank (Reservoir #1)	75	400	910	No transducer Chorine injector in pump system Benzene concentrations above MCL Used to meet summer peaks and fire flows Sanitary seal was installed to depth of 75 ft
10	1985	Old State Highway 84/ River Road	200	1,400	520	Transducer inoperable Chlorine injector system Portable generator for wells 9 and 10 stored here
11	1995	Rutland Drive, Trilogy Development	100	1,200	370	8,500-gallon hydropnuematic tank Chlorine injector Emergency generator
12 **NOT IN SERVICE**	1995	Augusta Court near Olympic Drive, Trilogy Development	100	200	452	8,700-gallon hydropnuematic tank Chlorine injector Emergency generator
13	2003	Trilogy Development, near intersection of Church Road and Harris Road	150	1,000	385	
14 **NOT IN SERVICE**	2005	Trilogy Development, near Reservoir #2	50	800	485	Restricted for blending with Well 11 due to high levels of arsenic.
15	2008	Liberty Development	125	1,200	560	
16 **NOT IN SERVICE**	2017	Trilogy Development near Golf Course		1,000*	-	Arsenic treatment required.
Total				**6,000**		

Source: Table A from 2015 UWMP supplemented with information from 2003 Water Master Plan, 2002 *Groundwater Evaluation for the City of Rio Vista*, and City staff

2.6 City of Rio Vista

2.6.1 Water Service Area Boundary and Current Population

A Google Earth .kml file documenting the City of Rio Vista 2020 water service area boundary was uploaded to the DWR Population Tool. City of Rio Vista service area boundary is outlined below on Figure 10. The entire service area includes the City of Rio Vista as well as an unincorporated sphere of influence.



Source: Imagery from Google Earth (https://www.google.com/earth/). Water service area boundary provided by Rio Vista Department of Public Works on February 3, 2021.

Figure 10: City of Rio Vista with Sphere of Influence

The 2010 and 2020 persons-per-connection as calculated by the DWR Population Tool for the City of Rio Vista water service area was 1.97 (Single-Family and Multi-Family connections aggregated). 2020 population is calculated using 2020 residential connection data and the 2020 persons-per-connection. The 2010-2045 population estimates are summarized below in Table 6.

2.6.2 Population Projection Results

Table 6 summarizes the results of the projection estimates and presents both the 2015 UWMP population projection and the results of the DWR Population Tool for comparison. Narrative descriptions of the methodologies follow.

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Table 6
City of Rio Vista Projected Population Results

Population Estimate Methodology	2010	2015	2020	2025	2030	2035	2040	2045
DWR Population Tool Historical and Projected Populations for the City of Rio Vista (1)	7,329	8,524	9,914	11,531	13,411	15,598	18,141	21,099
City of Rio Vista Solano County General Plan Projected Population, based on % of Solano County (2)	7,360	7,626	7,883	8,168	8,461	8,768	9,110	9,439
City of Rio Vista 2018 ABAG Projected Population (3)	6,535	7,350	7,705	8,080	8,700	11,665	14,630	-
City of Rio Vista DoF Projected Population, based on % of Solano County (4)	7,352	7,643	7,910	8,153	8,405	8,628	8,795	8,915
City of Rio Vista DoF Projected Population (MODIFIED) (5)	7,360	8,245	9,987	10,987	12,088	13,298	14,630	14,830
City of Rio Vista 2015 Urban Water Management Plan Population Projections	N/A	10,112	11,900	13,250	14,600	15,300	N/A	N/A

Note:
(1) DWR Population Tool based on water service area boundary and connection data provided by the City of Rio Vista. 2010 Connection Data: 3717 (SF and MF aggregated). 2020 Connection Data: 5028 (SF and MF aggregated). Annual growth rate is 3.07 percent between 2010 and 2020.
(2) Based on Solano County General Plan 2010-2040 Populations for Solano County and General Plan City/County ratio for the City of Rio Vista.
(3) Based on ABAG 2010-2040 City of Rio Vista Populations.
(4) Based on DOF 2010-2060 Populations for Solano County and ABAG City/County ratio for the City of Rio Vista.
(5) Based on City of Rio Vista DoF E-5 Populations (2010-2020), ABAG Projection (for 2040) and Solano County GP Projections (2040-2045).

Population Projection Using the Solano County General Plan Methodology

The Solano County General Plan annual growth rate from 2010 to 2040 was calculated to be about 0.71 percent. This growth rate reflects the entire Solano County, and this method assumes the same growth rate distributed evenly across the County. Table 6 shows the historic and projected population for the City of Rio Vista service area, using the Solano County projections extrapolated to 2045 and the Plan's city/county ratio for Rio Vista (1.8%).

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Population Projection Using the Association of Bay Area Governments Methodology
The ABAG Plan Bay Area 2040 projections from 2010 through 2040 for the City of Rio Vista were used to calculate the City of Rio Vista's water service area population, extrapolated to 2045. The average annual growth rate calculated using this methodology was 2.8 percent. Table 6 shows the projected population for the City of Rio Vista using the ABAG population estimate. The ABAG report states that the City of Rio Vista is expected to see a dramatic growth from the 2010 to 2040 period, with more than 80% growth in households and double the growth in population.

Population Projection Using the Department of Finance Methodology
The annual growth rate that was derived using 2019 DOF Solano County data is 0.46 percent. This growth rate reflects the entire Solano County, and this method assumes the same growth rate distributed evenly across the County. Table 6 shows the historic and projected population for the City of Rio Vista service area, using the DOF annual projections and ABAG's city/county ratio for Rio Vista (1.8%).

City of Rio Vista Department of Finance Modified Projection Methodology

City of Rio Vista population estimates for 2010 to 2020 from Table E-5 by the California Department of Finance were used, with a modified growth curve for projecting to 2045. For the 2020 to 2040 projection, a straight line was assumed between the 2020 Department of Finance estimate and the 2040 population estimate from the ABAG Plan Bay Area 2010-2040 Projections . For the 2040 to 2045 projection, the 2040-2045 growth rate for Solano County derived from the County-wide 2010-2060 projections was applied to the 2040 estimate.

City of Rio Vista 2015 UWMP Methodology
Population and housing projections were utilized by the City of Rio Vista as a tool to project for future water demands within the City of Rio Vista service area. For the 2015 UWMP, population values for 2015-2030 were based on the ABAG projections for the years 2010-2040, whereas population projection for 2035 is based on the City of Rio Vista General Plan Housing Element.

Population Projection Comparison
The population projection estimates for the City of Rio Vista water service area presented in Table 6 are shown graphically on Figure 11. The 2015 UWMP-based projection and DWR Population Tool projection are provided for comparison only.

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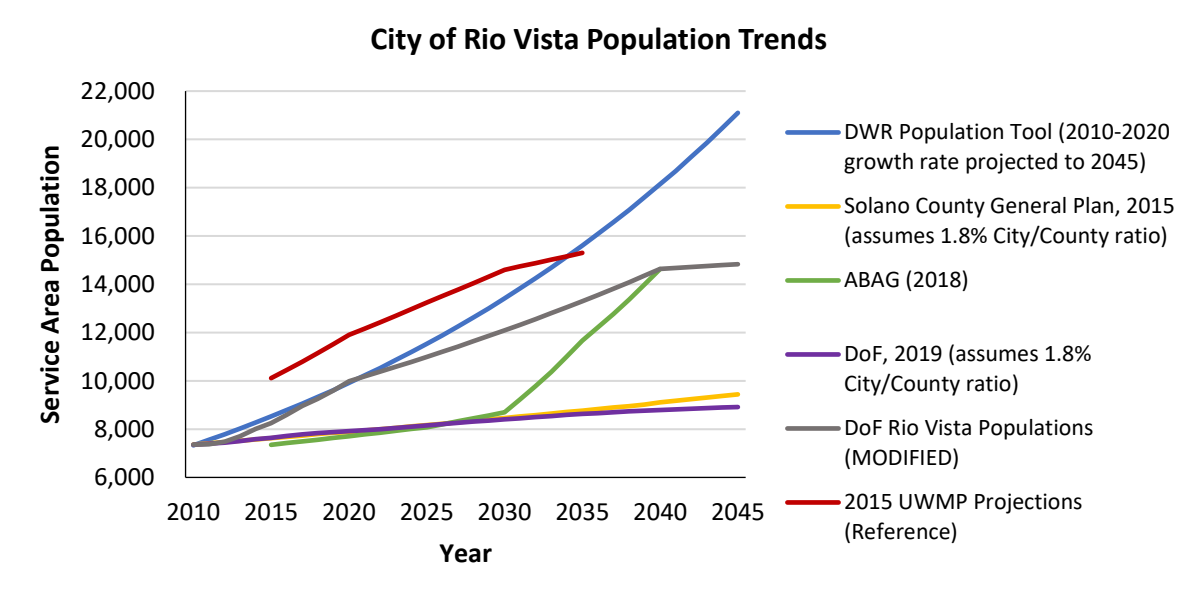
Figure 11: City of Rio Vista Water Service Area Population Projection Comparison



Enclosure: Appendix A: Master Source Data Sets

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Submittal Table 2-1 Retail Only: Public Water Systems			
Public Water System Number	Public Water System Name	Number of Municipal Connections 2020	Volume of Water Supplied 2020 *
Add additional rows as needed			
CA4810004	Rio Vista	5,379	2,025
	TOTAL	5,379	2,025
**** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*			
NOTES:			

Submittal Table 2-2: Plan Identification			
Select Only One	**Type of Plan**		**Name of RUWMP or Regional Alliance** *if applicable* (select from drop down list)
☑	**Individual UWMP**		
	☐	Water Supplier is also a member of a RUWMP	
	☐	Water Supplier is also a member of a Regional Alliance	
☐	**Regional Urban Water Management Plan (RUWMP)**		
NOTES:			

Submittal Table 2-3: Supplier Identification	
Type of Supplier (select one or both)	
☐	Supplier is a wholesaler
☑	Supplier is a retailer
Fiscal or Calendar Year (select one)	
☑	UWMP Tables are in calendar years
☐	UWMP Tables are in fiscal years
If using fiscal years provide month and date that the fiscal year begins (mm/dd)	
Units of measure used in UWMP * (select from drop down)	
Unit	AF
**** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*	
NOTES:	

Submittal Table 2-4 Retail: Water Supplier Information Exchange
The retail Supplier has informed the following wholesale supplier(s) of projected water use in accordance with Water Code Section 10631.
Wholesale Water Supplier Name
Add additional rows as needed
N/A
NOTES:

Submittal Table 3-1 Retail: Population - Current and Projected						
Population Served	2020	2025	2030	2035	2040	2045*(opt)*
	9,987	10,987	12,088	13,298	14,630	14,830

NOTES:
Based on City of Rio Vista DoF E-5 Populations (2010-2020), ABAG Projection (for 2040) and Solano County GP Projections (2040-2045).

Submittal Table 4-1 Retail: Demands for Potable and Non-Potable [1] Water - Actual			
Use Type	2020 Actual		
Drop down list May select each use multiple times These are the only Use Types that will be recognized by the WUEdata online submittal tool	Additional Description (as needed)	Level of Treatment When Delivered Drop down list	Volume[2]
Add additional rows as needed			
Single Family		Drinking Water	1,417
Multi-Family		Drinking Water	80
Commercial		Drinking Water	405
Industrial		Drinking Water	4
Landscape		Drinking Water	41
Losses		Drinking Water	78
		TOTAL	2,025

[1] *Recycled water demands are NOT reported in this table. Recycled water demands are reported in Table 6-4.*
[2] *Units of measure (AF, CCF, MG) must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES:

Submittal Table 4-2 Retail: Use for Potable and Non-Potable[1] Water - Projected						
Use Type	Additional Description (as needed)	Projected Water Use[2] *Report To the Extent that Records are Available*				
Drop down list May select each use multiple times These are the only Use Types that will be recognized by the WUEdata online submittal tool		2025	2030	2035	2040	2045 (opt)
Add additional rows as needed						
Single Family		1,671	1,839	2,023	2,225	2,256
Multi-Family		103	113	124	137	139
Commercial		478	525	578	636	645
Industrial		5	5	6	6	6
Landscape		48	53	58	64	64
Losses		83	92	101	111	113
TOTAL		2,388	2,627	2,890	3,179	3,223

[1] *Recycled water demands are NOT reported in this table. Recycled water demands are reported in Table 6-4.* [2] *Units of measure (AF, CCF, MG) must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES:

Submittal Table 4-3 Retail: Total Water Use (Potable and Non-Potable)						
	2020	2025	2030	2035	2040	2045 (opt)
Potable Water, Raw, Other Non-potable *From Tables 4-1R and 4-2 R*	2,025	2,388	2,627	2,890	3,179	3,223
Recycled Water Demand[1] *From Table 6-4*	0	62	142	236	330	424
Optional Deduction of Recycled Water Put Into Long-Term Storage[2]						
TOTAL WATER USE	2,025	2,450	2,769	3,126	3,509	3,647

[1] Recycled water demand fields will be blank until Table 6-4 is complete

*[2] Long term storage means water placed into groundwater or surface storage that is not removed from storage in the same year. Supplier **may** deduct recycled water placed in long-term storage from their reported demand. This value is manually entered into Table 4-3.*

NOTES:

Submittal Table 4-4 Retail: Last Five Years of Water Loss Audit Reporting	
Reporting Period Start Date (mm/yyyy)	Volume of Water Loss [1,2]
01/2016	80
01/2017	106
01/2018	80
01/2019	83
01/2020	78
[1] *Taken from the field "Water Losses" (a combination of apparent losses and real losses) from the AWWA worksheet.* [2] ***Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*	
NOTES:	

Submittal Table 4-5 Retail Only: Inclusion in Water Use Projections	
Are Future Water Savings Included in Projections? (Refer to Appendix K of UWMP Guidebook) *Drop down list (y/n)*	No
If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, or otherwise are utilized in demand projections are found.	
Are Lower Income Residential Demands Included In Projections? *Drop down list (y/n)*	Yes
NOTES:	

Submittal Table 5-1 Baselines and Targets Summary
From SB X7-7 Verification Form
Retail Supplier or Regional Alliance Only

Baseline Period	Start Year *	End Year *	Average Baseline GPCD*	Confirmed 2020 Target*
10-15 year	*2000*	*2009*	*310*	*248*
5 Year	*2005*	*2009*	*283*	

**All cells in this table should be populated manually from the supplier's SBX7-7 Verification Form and reported in Gallons per Capita per Day (GPCD)*

NOTES:

Submittal Table 5-2: 2020 Compliance **SB X7-7 2020 Compliance Form** *Retail Supplier or Regional Alliance Only*				**From**
2020 GPCD				
Actual 2020 GPCD*	2020 TOTAL Adjustments*	Adjusted 2020 GPCD* *(Adjusted if applicable)*	2020 Confirmed Target GPCD*	Did Supplier Achieve Targeted Reduction for 2020? Y/N
181	*0*	*0*	*248*	*y*
**All cells in this table should be populated manually from the supplier's SBX7-7 2020 Compliance Form and reported in Gallons per Capita per Day (GPCD)*				
NOTES:				

Submittal Table 6-1 Retail: Groundwater Volume Pumped						
☐	Supplier does not pump groundwater. The supplier will not complete the table below.					
☐	All or part of the groundwater described below is desalinated.					
Groundwater Type ***Drop Down List*** *May use each category multiple times*	Location or Basin Name	2016*	2017*	2018*	2019*	2020*
Add additional rows as needed						
Alluvial Basin	Solano Sub-Basin	2007	2117	2083	2129	2025
	TOTAL	2,007	2,117	2,083	2,129	2,025
**** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*						
NOTES:						

Submittal Table 6-2 Retail: Wastewater Collected Within Service Area in 2020						
☐	There is no wastewater collection system. The supplier will not complete the table below.					
	Percentage of 2020 service area covered by wastewater collection system *(optional)*					
	Percentage of 2020 service area population covered by wastewater collection system *(optional)*					
Wastewater Collection			**Recipient of Collected Wastewater**			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated? *Drop Down List*	Volume of Wastewater Collected from UWMP Service Area 2020 *	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area? *Drop Down List*	Is WWTP Operation Contracted to a Third Party? *(optional)* *Drop Down List*
City of Rio Vista	Metered	503	City of Rio Vista	Beach Facility	Yes	No
City of Rio Vista	Metered	296	City of Rio Vista	Northwest Facility	Yes	No
Total Wastewater Collected from Service Area in 2020:		799				
**** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3* **.**						
NOTES:						

Submittal Table 6-3 Retail: Wastewater Treatment and Discharge Within Service Area in 2020

☐ **No wastewater is treated or disposed of within the UWMP service area.** The supplier will not complete the table below.

Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)* [2]	Method of Disposal ***Drop down list***	Does This Plant Treat Wastewater Generated Outside the Service Area? ***Drop down list***	Treatment Level ***Drop down list***	2020 volumes [1]				
							Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area	Instream Flow Permit Requirement
Beach Facility	Sacramento River	77 feet offshore	Discharge Point No. 001	River or creek outfall	No	Secondary, Disinfected - 23	503	447	0	0	
Northwest Facility	Sacramento River	200 feet offshore	Discharge Point No. 002	River or creek outfall	No	Tertiary	296	288	0	0	
						Total	799	735	0	0	0

[1] **Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.

[2] If the **Wastewater Discharge ID Number** is not available to the UWMP preparer, access the SWRCB CIWQS regulated facility website at https://ciwqs.waterboards.ca.gov/ciwqs/readOnly/CiwqsReportServlet?inCommand=reset&reportName=RegulatedFacility

NOTES:

Submittal Table 6-4 Retail: Recycled Water Direct Beneficial Uses Within Service Area

☐ Recycled water is not used and is not planned for use within the service area of the supplier.
The supplier will not complete the table below.

Name of Supplier Producing (Treating) the Recycled Water:	Northwest Treatment Facility
Name of Supplier Operating the Recycled Water Distribution System:	City of Rio Vista
Supplemental Water Added in 2020 (volume) *Include units*	0
Source of 2020 Supplemental Water	Treated Wastewater Effluent

Beneficial Use Type *Insert additional rows if needed.*	**Potential** Beneficial Uses of Recycled Water (Describe)	Amount of **Potential** Uses of Recycled Water (Quantity) *Include volume units* [1]	General Description of 2020 Uses	Level of Treatment *Drop down list*	2020 [1]	2025 [1]	2030 [1]	2035 [1]	2040 [1]	2045 [1] (opt)
Agricultural irrigation										
Landscape irrigation (exc golf courses)	Residential Developmnet Irrigation		Residential Development Irrigation	Tertiary	0	62	142	236	330	424
Golf course irrigation										
Commercial use										
Industrial use										
Geothermal and other energy production										
Seawater intrusion barrier										
Recreational impoundment										
Wetlands or wildlife habitat										
Groundwater recharge (IPR)										
Reservoir water augmentation (IPR)										
Direct potable reuse										
Other (Description Required)										
				Total:	0	62	142	236	330	424
				2020 Internal Reuse						

[1] ***Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES:

Submittal Table 6-5 Retail: 2015 UWMP Recycled Water Use Projection Compared to 2020 Actual		
☐	Recycled water was not used in 2015 nor projected for use in 2020. The supplier will not complete the table below. If recycled water was not used in 2020, and was not predicted to be in 2015, then check the box and do not complete the table.	
Beneficial Use Type	**2015 Projection for 2020 [1]**	**2020 Actual Use[1]**
Insert additional rows as needed.		
Agricultural irrigation		
Landscape irrigation (exc golf courses)	62	0
Golf course irrigation		
Commercial use		
Industrial use		
Geothermal and other energy production		
Seawater intrusion barrier		
Recreational impoundment		
Wetlands or wildlife habitat		
Groundwater recharge (IPR)		
Reservoir water augmentation (IPR)		
Direct potable reuse		
Other (Description Required)		
Total	62	0
[1] **Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.		
NOTE:		

Submittal Table 6-6 Retail: Methods to Expand Future Recycled Water Use			
☐	Supplier does not plan to expand recycled water use in the future. Supplier will not complete the table below but will provide narrative explanation.		
	Provide page location of narrative in UWMP		
Name of Action	Description	Planned Implementation Year	Expected Increase in Recycled Water Use *
Add additional rows as needed			
Pipeline	NWTF Subdivision Recycled Water Project	20xx	62
Dust Control	Construction Activities	20xx	0
		Total	62
***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*			

NOTES:
Planned implementaion year is TBD.

Submittal Table 6-7 Retail: Expected Future Water Supply Projects or Programs						
☐	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.					
☐	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.					
	Provide page location of narrative in the UWMP					
Name of Future Projects or Programs	Joint Project with other suppliers?		Description (if needed)	Planned Implementation Year	Planned for Use in Year Type *Drop Down List*	Expected Increase in Water Supply to Supplier* *This may be a range*
	Drop Down List (y/n)	*If Yes, Supplier Name*				
Add additional rows as needed						
North Bay Recharge Aquaduct Project	Yes	Solano County Water Agency	Conjuctive use groundwater recharge	2035	All Year Types	1,600
Well Augmentation Project	No		9 new 1000 gpm wells to meet future increased demand	2035	All Year Types	14,517
***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*						
NOTES:						

Submittal Table 6-8 Retail: Water Supplies — Actual				
Water Supply	Additional Detail on Water Supply	2020		
Drop down list May use each category multiple times.These are the only water supply categories that will be recognized by the WUEdata online submittal tool		Actual Volume*	Water Quality Drop Down List	Total Right or Safe Yield* (optional)
Add additional rows as needed				
Groundwater (not desalinated)	6 Wells	2,025	Drinking Water	2,025
	Total	2,025		2,025
***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*				
NOTES:				

Submittal Table 6-9 Retail: Water Supplies — Projected											
Water Supply	Additional Detail on Water Supply	Projected Water Supply * Report To the Extent Practicable									
Drop down list May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool		**2025**		**2030**		**2035**		**2040**		**2045** (opt)	
		Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)
Add additional rows as needed											
Groundwater (not desalinated)		3,052	3,052	3,358	3,358	3,694	3,694	4,064	4,064	4,120	4,120
Recycled Water		62	62	142	142	236	236	330	330	424	424
	Total	3,114	3,114	3,500	3,500	3,930	3,930	4,394	4,394	4,544	4,544
***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*											
NOTES											

Submittal Table 7-1 Retail: Basis of Water Year Data (Reliability Assessment)			
Year Type	**Base Year** If not using a calendar year, type in the last year of the fiscal, water year, or range of years, for example, water year 2019-2020, use 2020	**Available Supplies if Year Type Repeats**	
		☐	Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location _____
		☑	Quantification of available supplies is provided in this table as either volume only, percent only, or both.
		Volume Available *	**% of Average Supply**
Average Year	2009	2610	100%
Single-Dry Year	2015	1793	69%
Consecutive Dry Years 1st Year	2013	2442	94%
Consecutive Dry Years 2nd Year	2014	2658	102%
Consecutive Dry Years 3rd Year	2015	1793	69%
Consecutive Dry Years 4th Year	2016	2007	77%
Consecutive Dry Years 5th Year	2017	2117	81%

Supplier may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If a Supplier uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.

***Units of measure (AF, CCF, MG**) must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES:

Submittal Table 7-2 Retail: Normal Year Supply and Demand Comparison					
	2025	2030	2035	2040	2045 *(Opt)*
Supply totals (*autofill from Table 6-9)*	3,114	3,500	3,930	4,394	4,544
Demand totals *(autofill from Table 4-3)*	2,450	2,769	3,126	3,509	3,647
Difference	664	731	804	885	897
NOTES:					

Submittal Table 7-3 Retail: Single Dry Year Supply and Demand Comparison					
	2025	2030	2035	2040	2045 (Opt)
Supply totals*	2,228	2,451	2,696	2,966	3,007
Demand totals*	2,228	2451	2,696	2,966	3,007
Difference	0	0	0	0	0
***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*					
NOTES:					

Submittal Table 7-4 Retail: Multiple Dry Years Supply and Demand Comparison						
		2025*	2030*	2035*	2040*	2045* (Opt)
First year	Supply totals	2,388	2,627	2,890	3,179	3,223
	Demand totals	2,388	2,627	2,890	3,179	3,223
	Difference	0	0	0	0	0
Second year	Supply totals	2,301	2,532	2,785	3,064	3,106
	Demand totals	2,301	2,532	2,785	3,064	3,106
	Difference	0	0	0	0	0
Third year	Supply totals	2,228	2,451	2,696	2,966	3,007
	Demand totals	2,228	2,451	2,696	2,966	3,007
	Difference	0	0	0	0	0
Fourth year	Supply totals	2,166	2,383	2,622	2,884	2,924
	Demand totals	2,166	2,383	2,622	2,884	2,924
	Difference	0	0	0	0	0
Fifth year	Supply totals	2,092	2,302	2,535	2,786	2,824
	Demand totals	2,092	2,302	2,535	2,786	2,824
	Difference	0	0	0	0	0
Sixth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*						
NOTES:						

Submittal Table 7-5: Five-Year Drought Risk Assessment Tables to address Water Code Section 10635(b)

2021	Total
Total Water Use	2,214
Total Supplies	2,214
Surplus/Shortfall w/o WSCP Action	0
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	0%

2022	Total
Total Water Use	2,176
Total Supplies	2,176
Surplus/Shortfall w/o WSCP Action	0
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	0%

2023	Total
Total Water Use	2,146
Total Supplies	2,146
Surplus/Shortfall w/o WSCP Action	0
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	0%

2024	Total
Total Water Use	2,127
Total Supplies	2,127
Surplus/Shortfall w/o WSCP Action	0
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	0%

2025	Total
Total Water Use	2,092
Total Supplies	2,092
Surplus/Shortfall w/o WSCP Action	0
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	
WSCP - use reduction savings benefit	
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	0%

Submittal Table 8-1 Water Shortage Contingency Plan Levels		
Shortage Level	**Percent Shortage Range**	**Shortage Response Actions** **(*Narrative description)***
1	Up to 10%	City Ordinance 007-2016 is currently in place. It restricts landscape watering to certain days. The City would require customers to repair leaks, breaks, and malfunctions in a timely manner.
2	Up to 20%	In addition to the previous shortage response the City would prohibit car washing except at facilities using recycled or recirculating water.
3	Up to 30%	In addition to the previous shortage response the City would expand public information campaigns.
4	Up to 40%	In addition to the previous shortage response the City prohibit water for washing hard surfaces and restrict or prohibit runoff from landscape irrigation.
5	Up to 50%	In addition to the previous shortage response the City would limit landscape irrigation to certain times and increase water waste patrols.
6	>50%	In addition to the previous shortage response the City would restrict all landscape irrigation
NOTES:		

Submittal Table 8-2: Demand Reduction Actions

Shortage Level	Demand Reduction Actions ***Drop down list*** *These are the only categories that will be accepted by the WUEdata online submittal tool. Select those that apply.*	How much is this going to reduce the shortage gap? *Include units used (volume type or percentage)*	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement? ***For Retail Suppliers Only*** *Drop Down List*
Add additional rows as needed				
3	Expand Public Information Campaign	0.36 Acre-feet		No
5	Increase Water Waste Patrols	1% of water use		Yes
4	Landscape - Restrict or prohibit runoff from landscape irrigation	0.20 Acre-feet		Yes
5	Landscape - Limit landscape irrigation to specific times	0.41 Acre-feet		Yes
6	Landscape - Prohibit all landscape irrigation	up to 50% of water use		Yes
1	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	0.15 Acre-Feet		No
2	Other - Prohibit vehicle washing except at facilities using recycled or recirculating water	0.08 Acre-Feet		Yes
4	Other - Prohibit use of potable water for washing hard surfaces	0.13 Acre-feet		Yes

Submittal Table 8-3: Supply Augmentation and Other Actions			
Shortage Level	Supply Augmentation Methods and Other Actions by Water Supplier ***Drop down list*** *These are the only categories that will be accepted by the WUEdata online submittal tool*	How much is this going to reduce the shortage gap? *Include units used (volume type or percentage)*	Additional Explanation or Reference *(optional)*
Add additional rows as needed			
3	Expand Public Information Campaign	0.36 Acre-feet	
NOTES:			

Submittal Table 10-1 Retail: Notification to Cities and Counties		
City Name	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
Benicia	Yes	Yes
Vacaville	Yes	Yes
Fairfield	Yes	Yes
American Canyon	Yes	Yes
County Name *Drop Down List*	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
Solano County	Yes	Yes
NOTES:		

SB X7-7 Table 0: Units of Measure Used in 2020 UWMP* *(select one from the drop down list)*
Acre Feet
**The unit of measure must be consistent throughout the UWMP, as reported in Submittal Table 2-3.*
NOTES:

SB X7-7 Table 2: Method for 2020 Population Estimate	
Method Used to Determine 2020 Population (may check more than one)	
☑	**1. Department of Finance** (DOF) or **American Community Survey** (ACS)
☐	**2. Persons-per-Connection Method**
☐	**3. DWR Population Tool**
☐	**4. Other** DWR recommends pre-review
NOTES:	

SB X7-7 Table 3: 2020 Service Area Population	
2020 Compliance Year Population	
2020	9,987
NOTES:	

SB X7-7 Table 4: 2020 Gross Water Use							
Compliance Year 2020	**2020 Volume Into Distribution System** *This column will remain blank until SB X7-7 Table 4-A is completed.*	**2020 Deductions**					**2020 Gross Water Use**
		Exported Water *	**Change in Dist. System Storage*** (+/-)	**Indirect Recycled Water** *This column will remain blank until SB X7-7 Table 4-B is completed.*	**Water Delivered for Agricultural Use***	**Process Water** *This column will remain blank until SB X7-7 Table 4-D is completed.*	
	2,025	-	-	-	-	-	**2,025**

*** Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source	GROUNDWATER
This water source is *(check one)* **:**	
☑	The supplier's own water source
☐	A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional (+/-)*	Corrected Volume Entering Distribution System
	2,025	-	2,025

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES

SB X7-7 Table 5: 2020 Gallons Per Capita Per Day (GPCD)		
2020 Gross Water *Fm SB X7-7 Table 4*	**2020 Population** *Fm SB X7-7 Table 3*	**2020 GPCD**
2,025	9,987	**181**
NOTES:		

SB X7-7 Table 9: 2020 Compliance

Actual 2020 GPCD[1]	Optional Adjustments to 2020 GPCD (Enter "0" if Adjustment Not Used)			TOTAL Adjustments[1]	Adjusted 2020 GPCD [1] *(Adjusted if applicable)*	2020 Confirmed Target GPCD [1, 2]	**Did Supplier Achieve Targeted Reduction for 2020?**
	Extraordinary Events[1]	Weather Normalization[1]	Economic Adjustment[1]				
181	-	-	-	-	181	248	**YES**

[1] *All values are reported in GPCD*

[2] ***2020 Confirmed Target GPCD*** *is taken from the Supplier's SB X7-7 Verification Form Table SB X7-7, 7-F.*

NOTES:

SB X7-7 Table 0: Units of Measure Used in UWMP* *(select one from the drop down list)*
Acre Feet
**The unit of measure must be consistent with Submittal Table 2-3*
NOTES:

SB X7-7 Table-1: Baseline Period Ranges			
Baseline	**Parameter**	**Value**	**Units**
10- to 15-year baseline period	2008 total water deliveries	3,177	Acre Feet
	2008 total volume of delivered recycled water	-	Acre Feet
	2008 recycled water as a percent of total deliveries	0%	**See Note 1**
	Number of years in baseline period[1, 2]	10	Years
	Year beginning baseline period range	2000	
	Year ending baseline period range[3]	2009	
5-year baseline period	Number of years in baseline period	5	Years
	Year beginning baseline period range	2005	
	Year ending baseline period range[4]	2009	

[1] If the 2008 recycled water delivery is less than 10 percent of total water deliveries, then the 10-15year baseline period is a continuous 10-year period. If the amount of recycled water delivered in 2008 is 10 percent or greater of total deliveries, the 10-15 year baseline period is a continuous 10- to 15-year period.

[2] The Water Code requires that the baseline period is between 10 and 15 years. However, DWR recognizes that some water suppliers may not have the minimum 10 years of baseline data.

[3] The ending year for the 10-15 year baseline period must be between December 31, 2004 and December 31, 2010.

[4] The ending year for the 5 year baseline period must be between December 31, 2007 and December 31, 2010.

NOTES:

SB X7-7 Table 2: Method for Population Estimates	
Method Used to Determine Population (may check more than one)	
☑	**1. Department of Finance** (DOF) or **American Community Survey** (ACS)
☐	**2. Persons-per-Connection Method**
☐	**3. DWR Population Tool**
☐	**4. Other** DWR recommends pre-review
NOTES:	

SB X7-7 Table 3: Service Area Population		
Year		Population
10 to 15 Year Baseline Population		
Year 1	2000	4,571
Year 2	2001	4,850
Year 3	2002	5,129
Year 4	2003	5,408
Year 5	2004	5,689
Year 6	2005	5,966
Year 7	2006	6,244
Year 8	2007	6,523
Year 9	2008	6,802
Year 10	2009	7,081
Year 11		
Year 12		
Year 13		
Year 14		
Year 15		
5 Year Baseline Population		
Year 1	2005	5,966
Year 2	2006	6,244
Year 3	2007	6,523
Year 4	2008	6,802
Year 5	2009	7,081
NOTES:		

SB X7-7 Table 4: Annual Gross Water Use *									
			Deductions					Acre Feet	
Baseline Year *Fm SB X7-7 Table 3*		**Volume Into Distribution System** *This column will remain blank until SB X7-7 Table 4-A is completed.*	**Exported Water**	**Change in Dist. System Storage** (+/-)	**Indirect Recycled Water** *This column will remain blank until SB X7-7 Table 4-B is completed.*	**Water Delivered for Agricultural Use**	**Process Water** *This column will remain blank until SB X7-7 Table 4-D is completed.*	**Annual Gross Water Use**	
10 to 15 Year Baseline - Gross Water Use									
Year 1	2000	1,647			-		-	1,647	
Year 2	2001	1,680			-		-	1,680	
Year 3	2002	1,904			-		-	1,904	
Year 4	2003	2,195			-		-	2,195	
Year 5	2004	2,319			-		-	2,319	
Year 6	2005	1,941			-		-	1,941	
Year 7	2006	1,454			-		-	1,454	
Year 8	2007	2,086			-		-	2,086	
Year 9	2008	2,296			-		-	2,296	
Year 10	2009	2,610			-		-	2,610	
Year 11	0	-			-		-	-	
Year 12	0	-			-		-	-	
Year 13	0	-			-		-	-	
Year 14	0	-			-		-	-	
Year 15	0	-			-		-	-	
10 - 15 year baseline average gross water use								**2,013**	
5 Year Baseline - Gross Water Use									
Year 1	2005	1,941			-		-	1,941	
Year 2	2006	1,454			-		-	1,454	
Year 3	2007	2,086			-		-	2,086	
Year 4	2008	2,296			-		-	2,296	
Year 5	2009	2,610			-		-	2,610	
5 year baseline average gross water use								**2,077**	

*** Units of measure** (AF, MG , or CCF) must remain consistent throughout the UWMP, as reported in Table 2-3.

NOTES:

SB X7-7 Table 4-A: Volume Entering the Distribution System(s)
Complete one table for each source.

Name of Source	Groundwater
This water source is:	
☑	The supplier's own water source
☐	A purchased or imported source

Baseline Year *Fm SB X7-7 Table 3*		Volume Entering Distribution System[1]	Meter Error Adjustment [2] *Optional (+/-)*	Corrected Volume Entering Distribution System
10 to 15 Year Baseline - Water into Distribution System				
Year 1	2000	1,647		1,647
Year 2	2001	1,680		1,680
Year 3	2002	1,904		1,904
Year 4	2003	2,195		2,195
Year 5	2004	2,319		2,319
Year 6	2005	1,941		1,941
Year 7	2006	1,454		1,454
Year 8	2007	2,086		2,086
Year 9	2008	2,296		2,296
Year 10	2009	2,610		2,610
Year 11	0			-
Year 12	0			-
Year 13	0			-
Year 14	0			-
Year 15	0			-
5 Year Baseline - Water into Distribution System				
Year 1	2005	1,941		1,941
Year 2	2006	1,454		1,454
Year 3	2007	2,086		2,086
Year 4	2008	2,296		2,296
Year 5	2009	2,610		2,610

[1] ***Units of measure*** *(AF, MG , or CCF) must remain consistent throughout the UWMP, as reported in Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 5: Baseline Gallons Per Capita Per Day (GPCD)				
Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Annual Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use (GPCD)
10 to 15 Year Baseline GPCD				
Year 1	2000	4,571	1,647	322
Year 2	2001	4,850	1,680	309
Year 3	2002	5,129	1,904	331
Year 4	2003	5,408	2,195	362
Year 5	2004	5,689	2,319	364
Year 6	2005	5,966	1,941	290
Year 7	2006	6,244	1,454	208
Year 8	2007	6,523	2,086	285
Year 9	2008	6,802	2,296	301
Year 10	2009	7,081	2,610	329
Year 11	0	-	-	
Year 12	0	-	-	
Year 13	0	-	-	
Year 14	0	-	-	
Year 15	0	-	-	
10-15 Year Average Baseline GPCD				**310**
5 Year Baseline GPCD				
Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use
Year 1	2005	5,966	1,941	290
Year 2	2006	6,244	1,454	208
Year 3	2007	6,523	2,086	285
Year 4	2008	6,802	2,296	301
Year 5	2009	7,081	2,610	329
5 Year Average Baseline GPCD				**283**
NOTES:				

SB X7-7 Table 6: Baseline GPCD *Summary* *From Table SB X7-7 Table 5*	
10-15 Year Baseline GPCD	310
5 Year Baseline GPCD	283
NOTES:	

SB X7-7 Table 7: 2020 Target Method *Select Only One*		
Target Method		**Supporting Tables**
☑	Method 1	SB X7-7 Table 7A
☐	Method 2	SB X7-7 Tables 7B, 7C, and 7D
☐	Method 3	SB X7-7 Table 7-E
☐	Method 4	Method 4 Calculator *Located in the WUE Data Portal at wuedata.water.ca.gov* Resources *button*
NOTES:		

SB X7-7 Table 7-A: Target Method 1 20% Reduction	
10-15 Year Baseline GPCD	**2020 Target GPCD**
310	**248**
NOTES:	

SB X7-7 Table 7-F: Confirm Minimum Reduction for 2020 Target

5 Year Baseline GPCD *From SB X7-7 Table 5*	Maximum 2020 Target[1]	**Calculated 2020 Target [2]**			**Confirmed 2020 Target[4]**
		As calculated by supplier in this SB X7-7 Verification Form	**Special Situations[3]**		
			Prorated 2020 Target	Population Weighted Average 2020 Target	
283	269	248			**248**

[1] ***Maximum 2020 Target*** *is 95% of the 5 Year Baseline GPCD except for suppliers at or below 100 GPCD.*

[2] ***Calculated 2020 Target*** *is the target calculated by the Supplier based on the selected Target Method, see SB X7-7 Table 7 and corresponding tables for agency's calculated target. Supplier may only enter one calculated target.*

[3] ***Prorated targets and population weighted target*** *are allowed for special situations only. These situations are described in Appendix P, Section P.3*

[4] ***Confirmed Target*** *is the lesser of the Calculated 2020 Target (C5, D5, or E5) or the Maximum 2020 Target (Cell B5)*

NOTES:

Urban Water Supplier: *City of Rio Vista*

Water Delivery Product (If delivering more than one type of product use Table O-1C)

Retail Potable Deliveries

Table O-1B: Recommended Energy Reporting - Total Utility Approach

Enter Start Date for Reporting Period	1/1/2020	**Urban Water Supplier Operational Control**		
End Date	12/31/2020			
☐ Is upstream embedded in the values reported?		**Sum of All Water Management Processes**	**Non-Consequential Hydropower**	
Water Volume Units Used	*AF*	Total Utility	Hydropower	Net Utility
Volume of Water Entering Process (volume unit)		*2025*		*2025*
Energy Consumed (kWh)		*499008*		*499008*
Energy Intensity (kWh/vol. converted to MG)		*756.2*	*#DIV/0!*	*756.2*

Quantity of Self-Generated Renewable Energy

0 kWh

Data Quality *(Estimate, Metered Data, Combination of Estimates and Metered Data)*

Metered Data

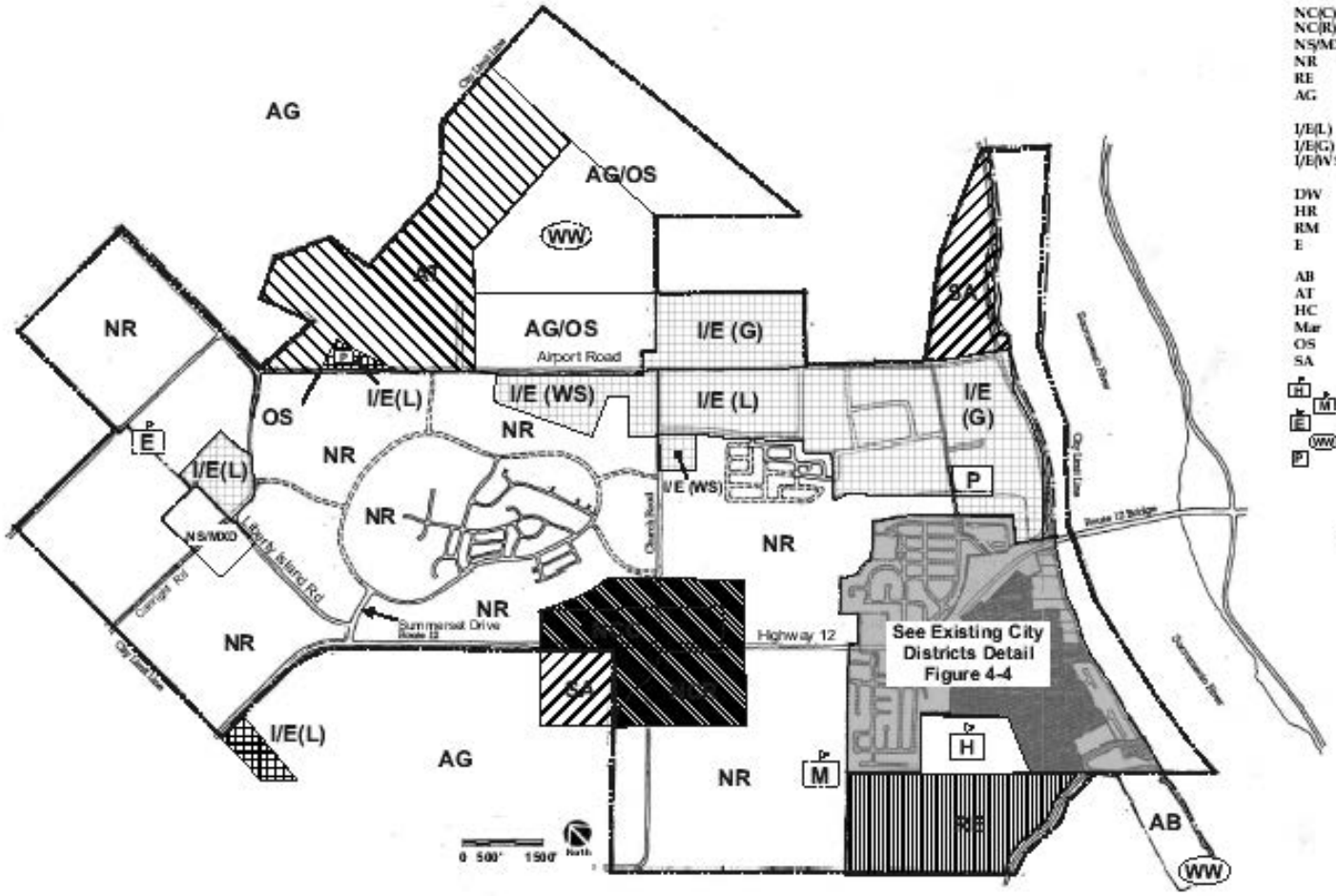
Data Quality Narrative:

Energy Data was compiled from PG&E bills January 2020 - December 2020.

Narrative:

Water is pumped from 6 wells. The City has 2 storage tanks, 1 tank is gravity and 1 tank has booster pumps. The system pipes water from the wells to the tanks and then to the customers.

Figure 4-3
LAND USE MAP



LAND USE DISTRICTS

	NEIGHBORHOOD CORE DISTRICT
NC(C)	Commercial
NC(R)	Residential
NS/MXD	**NEIGHBORHOOD SERVICE/Mixed Use**
NR	**NEIGHBORHOOD RESIDENTIAL**
RE	**RESIDENTIAL ESTATE**
AG	**AGRICULTURAL**
	INDUSTRIAL / EMPLOYMENT DISTRICT
I/E(L)	Limited
I/E(G)	General
I/E(WS)	Warehouse/Service
	EXISTING CITY DISTRICT[1]
DW	Downtown/Waterfront (Figure LU-4)
HR	Historic Residential
RM	Multifamily Residential
E	Edgewater Neighborhood
	SPECIAL DISTRICT
AB	Army Base Reuse Plan
AT	Airport/Transportation
HC	Highway Commercial
Mar	Marina (Private/Commercial)
OS	Open Space
SA	Study Area
	PUBLIC FACILITIES[2]
H	High School
M	Middle School
E	Elementary School
WW	Wastewater Treatment Plant
P	Park, Public Safety/Other

Dual use where proposed

NOTES

1. The map of the Existing City Districts (Figure 4-4) includes some of the above land use districts, as well as those listed below.

2. Specific sites for facilities to be constructed in the future are not currently known. Public facilities symbols on the map for future facilities are intended to convey identified need within a general area, not a specific site. Existing facilities are shown in their approximate current locations.

Rio Vista General Plan 2001

Adopted as Per Ordinance 643:

Chapter 17.68 WATER CONSERVATION AND LANDSCAPING

17.68.010 Purpose.

Water is a limited and precious resource. The purpose of this chapter is to assist the city of Rio Vista in achieving water conservation through proper plant selection, installation, and maintenance practices. The benefits of water conservation and landscape standards are many and diverse. For example, these standards are intended to maintain and improve the quality of development currently being established in the city of Rio Vista and to upgrade the appearance and function of existing developments; to buffer incompatible land uses; and to provide an attractive streetscape to pedestrians, bicyclists, and motorists.

These standards are intended to minimize or soften the visual impact of buildings and parking lots, reduce or eliminate heat and glare, prevent soil erosion, minimize impacts to native wildlife and vegetation, minimize surface runoff and water conservation standards, serve to preserve the city's water resources, and protect water quality. The following xeriscape principles serve as the primary means of achieving water conservation:

A. Appropriate planning and design for local conditions;
B. Limiting turf to locations where it provides functional benefits;
C. Efficient irrigation systems;
D. The use of soil amendments to improve the structural characteristics of the soil;
E. The use of mulches, where appropriate;
F. The use of drought-tolerant plants; and
G. Appropriate and timely maintenance. (Ord. 643 § 2, 2009)

17.68.020 Applicability.

The provisions of this chapter apply as follows:

A. Applicable Projects. This chapter applies to all new projects for which landscaping is proposed that are subject to use permit or site plan and architectural review, except as exempted under subsections B, C, and D of this section. Such projects include: landscaping associated with new commercial, institutional, and mixed-use development; common areas and developer-installed landscaping associated with new multifamily development; front yards and common areas associated with new residential planned unit developments; and common areas and developer-installed, front yard landscaping associated with single-family development of five or more units. This chapter also applies to replacement landscaping proposed for existing commercial, mixed-use, and multifamily development and to replacement landscaping associated with single-family residences previously subject to the requirements of this chapter.

B. Residential Exemptions. This chapter does not apply to private yard areas within single-family and multifamily developments. While the chapter applies to all requests for building permits for new single-family homes, it does not apply to new single-family homes already completed or under permitted construction on single-family lots created prior to the effective date of the ordinance codified in this chapter. Remodel projects for existing, le-

gally conforming, single-family homes and duplexes that entail less than fifty (50) percent of the structure to be remodeled, as determined by the community development director or designee, are also exempt from the provisions of this chapter. The city encourages landscape designers to follow the provisions of this chapter, regardless of this exemption.

C. Discretionary Exemptions. Schools, parks, playgrounds, common-use areas in multifamily residential developments (e.g., play areas and turf areas intended for passive or active recreational use), sports fields, registered historical sites, and cemeteries may be exempted from the water budget requirements set forth in Sections 17.68.030 and 17.68.060, subject to approval of the planning commission.

D. Agricultural Exemption. This chapter does not apply to areas devoted to agricultural cultivation.

E. No Exemption for Wells. The presence of a well on-site shall not be considered grounds for exempting a project that is subject to the provisions of this chapter from any of its requirements.

F. Exceptions to Standard Criteria. If the zoning administrator finds a proposed landscape plan is not in conformance with any of the criteria specified in Sections 17.68.030 through 17.68.090, the permit application shall be disapproved. The zoning administrator may elect, instead, to refer the application to the planning commission for consideration of an exception and/or due to the potential controversial nature of the proposal. In order to grant an exception, the commission must be able to make all of the following findings:

1. The proposed landscape plan would complement the character of surrounding development, the size of the subject property, and the scale of development on site; and

2. The proposed landscaping would not be injurious to the public health, safety or welfare; and

3. The applicant has successfully demonstrated that the majority of improvements to the site are in conformance with the intent of the code and the exception is necessary due to a hardship unique to the location. Hardship, for the purpose of this finding, shall not be based on economic considerations.

G. Appeal by Applicant. In the event that the applicant disagrees with an administrative determination on an application, including water budget requirements, the applicant may appeal to the planning commission in accordance with Chapter 17.60 of this title. The findings for an exception stated in subsection (F)(1)(2) and (3) of this section, must also be made for any such appeal(s) to be granted. The applicant may follow the same appeal procedures for application and fees to appeal a decision of the planning commission to the city council. (Ord. 643 § 2, 2009)

17.68.030 Landscape plans required.

A. General. Prior to the issuance of any building permit for projects subject to this chapter, the necessary landscape plans shall be submitted to, reviewed by, and approved by the community development director or designee. The project applicant shall be required to reimburse the city for staff costs associated with the review and processing of a landscape plan, pursuant to rates set forth in the city fee schedule at the time the application is submitted. The landscape plan may be referred to the planning commission for site plan and architectural review.

B. Nature Of Required Plans. Landscape plans for one existing single-family home or duplex, or for one existing commercial/industrial property developed with a facility less than ten thousand (10,000) square feet in building footprint, may be prepared by the property or business owner as long as they meet the basic requirement of subsection C of this section. For landscape projects associated with larger projects, the plans shall be prepared by a landscape architect, a certified irrigation consultant, or a licensed contractor.

C. Contents of Landscape Plans. Landscape plans shall include the following items:

1. A written summary statement addressing compliance with applicable provisions of this chapter;

2. A planting plan, drawn to scale and showing geographic north, setting forth the following items, as applicable to the project:

a. All landscape features, including areas of vegetation to be preserved, in context with property lines and street names,

b. The location and outline of existing and proposed buildings, and other improvements (fences, utilities, paved areas, etc.) on the site, if any,

c. Existing and proposed parking spaces, other vehicular areas, access aisles, driveways and similar features,

d. All plant materials, designated by name and location, to be installed, preserved or removed,

e. The boundaries of each hydrozone,

f. A legend including the botanical name, common name, container size, spacing if applicable, and quantities of all plant material to be installed,

g. Existing trees to be preserved or removed, labeled by name and size,

h. The location and characteristics of all other landscape materials to be used;

3. A tabulation clearly displaying the relevant statistical information necessary for the community development director or planning commission to evaluate compliance with the provisions of this chapter, which at a minimum shall include the following:

a. The gross landscape area in square feet, square footage of paved areas, and the number of trees to be planted and/or preserved,

b. The annual water budget allowed for the project area, calculated in accordance with Section 17.68.060 (Irrigation design standards and guidelines), and a tabulated estimate of the amount of water use per year (in CCF units) necessary for long-term maintenance based on estimated water needs following the establishment of the landscaping. This estimate shall be prepared in accordance with the landscape coefficient method described in the most recent edition of the Water Use Classification of Landscape Species (WUCOLS) guide (available from the California Department of Water Resources) and shall document estimated water use for each hydrozone based on water use by plant type, planting density, and microclimate,

c. Other such information that may be required by the community development director or planning commission that is reasonable and necessary to determine that the landscape plan meets the requirements of this chapter. (Ord. 643 § 2, 2009)

17.68.040 Landscaping design standards and guidelines.

A. Site Development Concepts for Water Conservation. The following site development concepts shall be applied to applicable projects in order to promote water conservation:

1. The preservation of existing plant communities;

2. The reestablishment of native plant communities;

3. Limited amount of lawn grass areas;

4. The use of site-specific and drought-tolerant plant materials;

5. Site development that retains storm water runoff on site;

6. The use of pervious paving materials.

B. Use Of Site-Specific and Adapted Planting Materials. Plants used in the landscape design shall to the greatest extent feasible:

1. Be appropriate to the conditions in which they are to be planted;

2. Encourage low maintenance, high-quality design;

3. Be otherwise consistent with the intent of this chapter.

Additionally, the use of plant materials adapted to the local microclimate is encouraged in order to reduce water consumption, general maintenance, and dependence on fertilizers and insecticides.

C. Lawn Grass (Turf) Areas.

1. General. A major portion of water demand used for landscape purposes is required for the irrigation of lawn areas. Properly managed non-grass landscape developments of site-specific plantings will typically be able to survive on a reduced water requirement and survive drought conditions better than lawn areas. For that reason, portions of landscaped areas that have been customarily designed as lawns shall be:

a. Preserved as native plant communities;

b. Planted as redeveloped native or locally-adapted drought tolerant areas; and/or

c. Planted in mixes of trees, shrubs, and ground covers at a low density.

2. Selection of Grass Species. Only drought-tolerant turf varieties suitable to the local climate shall be used.

3. Slope Limitation. Lawn grass shall not be planted on slopes that exceed ten (10) percent, unless otherwise authorized by the community development director or the planning commission to address special situations (e.g., berms and erosion control).

4. Windy Conditions. Winds in the Rio Vista area can bend, break, and/or disfigure plants and trees. The following standards will help to reduce damage and waste of landscaping investments:

a. A survey shall be performed by a landscaper to determine the prevailing wind directions in the area and plant vegetative barriers, where possible, to reduce wind effect.

b. Larger shrubs can and should be used to reduce effect on ground cover and small, flowering shrubs. Gardening publications such as the Sunset Western Garden Book shall be consulted to identify planting materials that thrive despite windy conditions.

c. Trees shall be staked with flexible material to allow root development to respond to windy conditions while training the young tree to grow upright.

d. The specifications in Section 17.68.060(D)(2) for required irrigation methods shall be followed.

e. Turf shall not be placed immediately adjacent to hardscape areas (such as sidewalks and roadways) as water will spread onto non-vegetated areas during windy conditions. Typical turf design for windy areas will be curved with a drought tolerant vegetative or non-vegetative ground cover located immediately adjacent to hardscape areas.

f. Drought tolerant ground cover shall be utilized to replace large landscaped areas that would historically have been landscaped with high water demand turf. Living (drought tolerant) ground cover is able to retain soils better and is more attractive in the long-term because nonliving mulch is more likely to be wind borne away for landscaped areas.

5. Riverfront Conditions. The stormwater drains throughout the city lead to the Sacramento River, and the city obtains its primary source of potable water from its ground water aquifer. In addition, pollution impacts local plant and wildlife species, which help to promote the local economy (an example being the bass population) and the aesthetics of the city. Consequently, pollution prevention measures are necessary to protect contamination of these resources. The following standards shall help to prevent pollution:

a. Design for On-Site Rainwater Graywater Use. Where possible, projects shall be designed so that rainwater shed from rooflines flows to landscaping rather than the storm drain sewer. This is especially important near driveway and parking aisles as the oils and pollutants from motorized vehicles will be carried by the rainwater into the storm drain system and then to the Sacramento River.

b. Mulch plantings, and continue to maintain mulching as this not only protects plants from drought conditions but reduces the impact of pests and the need for pesticides, which are carried by watering and rainfall to the Sacramento River and may infiltrate the city's ground water.

6. Trees. Trees conserve energy by shading and provide pollution filtering, oxygen and a pleasant appearance to the streetscape. Tree planting shall comply with the following standards:

a. Existing trees shall be retained and preserved whenever feasible.

b. Trees located in landscape planters or within ten (10) feet of a permanent structure or twenty (20) feet of a sidewalk or roadway shall be installed with root barriers.

c. Number of Trees.

i. Parking Areas. Trees shall be provided and maintained or replaced upon failure to thrive, within parking areas at a minimum ratio of one tree for each five parking spaces.

ii. Street Trees. One tree per two hundred (200) square feet of landscaped area with a minimum of one every twenty (20) feet of commercial frontage and one per thirty (30) feet of residential frontage (which every is more stringent). Street tree type must be approved by the public works director. (Ord. 643 § 2, 2009)

17.68.050 Plant material and installation standards and guidelines.

A. Amendment of Planting Soil. Urban soils that do not contain organic matter, are compacted, or eroded are often lifeless or do not contain needed nutrients for the proposed landscaping and have lost their ability to absorb water or filter pollutants out of the water. Prior to the installation of plant materials, a soils report shall be prepared, and soils within areas to be landscaped shall be amended in accordance with findings for all new development within the city; this requirement may be required for remodel projects as set forth in Section 17.68.020(B) of this chapter.

B. Use of Organic Mulches. The use of organic mulches reduces the growth of weeds and adds nutrients to the soil as well as retains moisture over the root zones of plant materials. The following minimum standard may be modified subject to the approval of the planning commission in the course of its review of a landscaping plan:

1. Application Specifications. A minimum of two inches of organic mulch shall be placed over all newly installed tree, shrub and ground cover planting areas, unless otherwise approved by the planning commission. No impervious materials shall be used under the mulch. (Ord. 643 § 2, 2009)

17.68.060 Irrigation design standards and guidelines.

A. Irrigation Systems Required. Landscaped areas shall be irrigated by the use of an automatic irrigation system with controllers set to apply water as noted in this section. High-water and low-water use areas shall be separately circuited as noted below. Rainfall sensing devices shall be required in order to avoid operation of the system during periods of increased rainfall.

B. Annual Water Budget. The irrigation system shall use an amount of water less than or equal to the allowable annual water budget for each applicable project area. The allowable annual water budget shall be determined by multiplying the total square footage of planting area by 0.257. This results in the number of units of one hundred (100) cubic feet water allowed per year within the planting area. The above multiplier was arrived by the following formula:

AWB = 55 x .75 x PA x .00623, where:

AWB = Annual water budget, also known as maximum water allowance;

55 = ETo, Average of annual reference evapotranspiration in inches per month for the Sacramento River Delta region;

.75 = Local ETo adjustment factor;

PA = Total planting area in square feet; and

.00623 = Conversion factor into 100 cubic feet.

C. Hydrozoning and Scheduling of Irrigation Systems. Water-efficient landscaping is best accomplished by the use of hydrozones in planting and irrigation design. Therefore, the following standards shall be considered the minimum requirements for landscape irrigation design within the city of Rio Vista:

1. Sprinkler Zoning. Irrigation fixtures shall be separately circuited in conformance with the hydrozones defined on the landscaping plan.

2. Control Systems. Automatically controlled irrigation systems shall be operated by an irrigation controller that is able to irrigate high-water requirement areas, such as turf, on a different schedule from low-water requirement areas. The controller shall be rescheduled as necessary and required to respond to a change of seasons and water demand, as well as the change from an establishment period for a newly-installed landscape to a long-term maintenance schedule.

D. Irrigation System Design Guidelines. Landscape irrigation systems shall incorporate the following design principles in order to maximize efficiency and reduce maintenance needs:

1. Impervious Areas. Sprinkler heads shall be selected and located to avoid direct overthrow onto impervious areas such as concrete sidewalks, patio pad areas, asphalt parking areas or roadway surfaces.

2. Wind Control. The use of low-trajectory spray nozzles and drip irrigation systems will reduce the effect of wind velocity on the irrigation system. The spacing of sprinklers on the upwind edge of irrigated areas shall be tightened. For spray type sprinklers, a maximum distance of twelve (12) feet is recommended. Rotor type sprinklers require closer spacing and generally require overlap of the spray line. On an upwind edge, more sprinkler heads are preferable to fewer.



3. Matched Precipitation Sprinklers. Sprinklers with matched precipitation rates will help ensure uniformity in water application.

4. Low Precipitation Sprinklers. The use of low-precipitation sprinklers will help match water application to soil infiltration rates and reduce run-off.

5. Check Valves. The use of check valves prevents the problem of water drainage from low elevation sprinkler heads and helps avoid problems caused by the introduction of air into the irrigation lines.

6. Master Valve and Excess Flow Sensing Devices. These features help prevent water loss from malfunctioning valves or broken irrigation lines.

7. Slopes. Irrigation design should take slopes into consideration in order to avoid run-off. (Ord. 643 § 2, 2009)

17.68.070 Building permit and inspection requirements.

A. Building Permit Required. A building permit shall be required for landscaping plans developed pursuant and subject to this chapter. The building permit plans shall include the landscaping plan as approved by the community development director or the planning commission and an irrigation plan that includes the following:

1. The location, types, and sizes of all components of the irrigation system, including electronic controllers, main lateral lines, valves, application devices, rain shut off and moisture sensors, backflow preventers, etc.;

2. The plan shall distinguish each irrigation circuit (or zone), and show valve size, flow rate in gallons per minute, and sprinkler precipitation rates;

3. Where possible, the landscape plan shall utilize drip irrigation systems.

B. Permit Requirements. Once landscaping subject to the provisions of this chapter has been installed, approval of the building permit and/or issuance of an occupancy permit shall be contingent upon the following:

1. An inspection performed by planning staff to review the landscaping for conformance with the approved plans; and

2. The submittal of a letter, signed by the property owner, verifying compliance with the provisions of this chapter and agreeing to provide ongoing maintenance of the landscaping and associated irrigation system. (Ord. 643 § 2, 2009)

17.68.080 Maintenance standards and guidelines for cultivated landscape areas.

A. General. The owner or assignee of land subject to this chapter shall be responsible for the maintenance of said land in good condition so as to present a healthy, neat, and orderly landscape area.

B. Replacement Requirements. Vegetation that is required to be planted or preserved by this chapter shall be replaced with equivalent vegetation if it is not living within one year of issuance of a certificate of occupancy.

C. Requirement for On-Going Maintenance. The required mulch layer shall be maintained on all landscape projects. Landscaped areas subject to the provisions of this chapter shall be maintained in a healthy, pest-free condition.

D. Watering.

1. General. All watering of planted areas shall be managed so as to conserve water and maintain healthy flora.

2. Operation of Irrigation Systems. Following the establishment of a landscape area, overhead irrigation systems shall be operated between the hours of seven p.m. and seven a.m. or as required by the city of Rio Vista engineer, whichever is more stringent.

3. Maintenance of Irrigation Systems. Irrigation systems shall be maintained as necessary to eliminate waste of water due to loss of heads, broken pipes, or misadjusted nozzles. (Ord. 643 § 2, 2009)

17.68.090 Requirement for separate water meters.

In all new commercial development subject to the provisions of this chapter, a separate water meter shall be required for the purpose of landscaping. A separate water meter shall also be required for common areas associated with new residential condominiums and planned unit developments. (Ord. 643 § 2, 2009)

17.68.100 Conflicts.

If the provisions of this chapter conflict with other ordinances or regulations, the more stringent limitation or requirement shall govern or prevail to the extent of the conflict. (Ord. 643 § 2, 2009)

17.68.110 Definitions.

The following definitions apply to this chapter:

Annual water budget. (AWB) The maximum amount of water per year permitted to be used to irrigate the applicable portion of a project site. The AWB is determined by a calculation outlined in Section 17.68.060 of this chapter.

Cultivated landscape area. Planted areas that are frequently maintained by mowing, irrigating, pruning, fertilizing, etc.

Development. Any proposed material change in the use or character or the land, including, but not limited to, land clearing or the placement of any structure or site improvements on the land.

Ground cover. Plants, other than turf grass, normally reaching an average maximum height of not more than twenty-four (24) inches at maturity.

Hydrozone. An area of landscaping having a consistent water use requirement and served with a single irrigation valve zone.

Irrigation system. A permanent, artificial watering system designed to transport and distribute water to plants.

Landscaping. Any combination of living plants (such as grass, ground cover, shrubs, vines, hedges, or trees) and nonliving hardscape materials or elements (such as rocks, pebbles, sand, mulch, walls, fences decks, patios, or decorative paving materials).

Mulch. Nonliving organic and synthetic materials customarily used in landscape design to retard erosion, retain moisture, and reduce weed growth.

Open space. Open space shall be interpreted to mean:

A. All areas of natural plant communities or area replanted with vegetation after construction, such as re-vegetated natural areas; tree, shrub, hedge or ground cover planting areas, and lawns; and

B. Other areas allowed to be counted as open space as per the city of Rio Vista Zoning Ordinance.

Replacement Landscaping. Replacement landscaping means the replacement of fifty (50) percent or more of an existing landscaped area (or combination of areas on a single parcel) having a minimum size of one thousand (1,000) square feet with new landscape materials that substantially differ in type, size, or water consumption.

Shrub. A self-supporting woody perennial plant of low to medium height characterized by multiple stems and branches continuous from the base, usually not more than ten (10) feet in height at its maturity.

Site-Specific Planting. The selection of plant material that is particularly well suited to withstand the physical growing conditions that are normal for that location.

Tree. Any self-supporting woody perennial plant which has a DBH (diameter at breast height) of two inches or more and which normally attains an overall height of at least fifteen (15) feet at maturity, usually with one main stem or trunk and many branches. It may appear to have several stems or trunks as in several varieties of oak.

Vegetation, Native. Any plant species with a geographic distribution indigenous to all or part of Solano County. (Plant species which have been introduced by man are not native vegetation.)

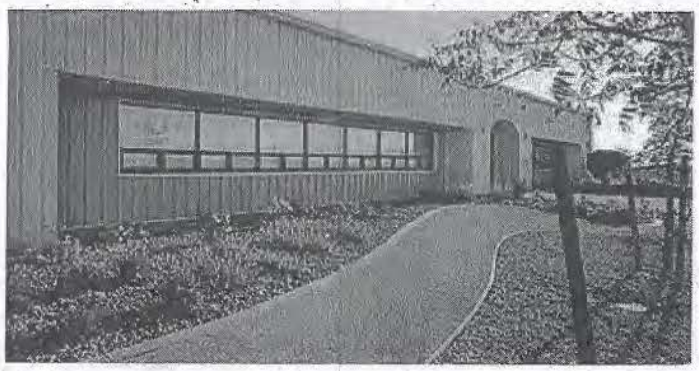
Yard, Front. A front or street-side yard as defined in Title 17 of the Rio Vista Municipal Code.

Yard, Private. A yard area, not otherwise defined as a front or street-side yard, associated with a single residential unit and intended for the private use of a household.

Xeriscape. Landscaping methods that conserve water through the use of drought-tolerant plants and planting techniques, as well as the design of irrigation systems. (Ord. 643 § 2, 2009)

Water Conservation Fo

Water is essential to life. It is available in limited quantities and must be used wisely. Therefore, conservation is essential. California requires every urban water supplier to prepare an Urban Water Management Plan (UWMP) every five years. The City of Rio Vista, with over 3,000 water connections, meets the requirement of an urban



water supplier. The goal of the plan is to ensure long-term resource planning so that adequate water supplies are available to meet existing and future water demands. It has been determined that for California to continue to have enough water to support its growing population, it needs to reduce the amount of water each person uses per day by 20 percent. Rio Vista's plan, to be included in its 2010 UWMP, is to assess the reliability of its water sources over the next 20 years for normal, dry and multiple dry years. When completed, the City's UWMP is submitted to the Department of Water Resources (DWR) for review to assure adequate completion of the requirements. Once DWR has approved the UWMP the City Council must formally adopt the plan at a public hearing, thereby committing the City to implement the plan as stated. The City cannot apply for State Revolving Funds (SRF) and Prop. 84 grants and loans until the City has an approved UWMP

Section 6 of the Rio Vista Urban Water Management Plan (UWMP) presents the City's plan for complying with a majority of the 14 Demand Management Measures (DDM) contained in the Water Code. It is also required to present the reasons specific measures may not be applicable, or economically justifiable at the present time.

DMM A Water Survey Programs for Single-Family and Multi-Family Residential Customers – Until meters are installed City-wide an overall survey is not possible. In the meantime residents will be asked to survey their own usage.

1.Irrigation-check settings and leaks, and whether sprinkler heads need realignment to spray only lawn.

2.Check for other leaks, i.e. faucets (place paper towel under faucet and determine if it becomes wet) and toilets (place food coloring in tank and see if it leaks into bowl)

DMM B Residential Plumbing Retrofit –An overall plumbing retrofit (ie.rebate) program will not be implemented at this time. Rebate programs would need to be funded through water rates, which is why the City is not committing to fund them at this time. This may be an option in the future. Other than adopting the 2010 plumbing and green building codes, the City will urge residents to obtain and utilize water efficient appliances whenever and wherever possible.

DMM C System Water Audits, Leak Detection and Repair - System water audits, leak detection, and repairs will be addressed as part of the future water meter installation and retrofit program that is being developed. The Citizens Water Wastewater Monitoring Committee is currently interviewing water meter companies, and will make a recommendation to the City Council.

The City has replaced questionable water pipes to minimize the chance for development of leaks.

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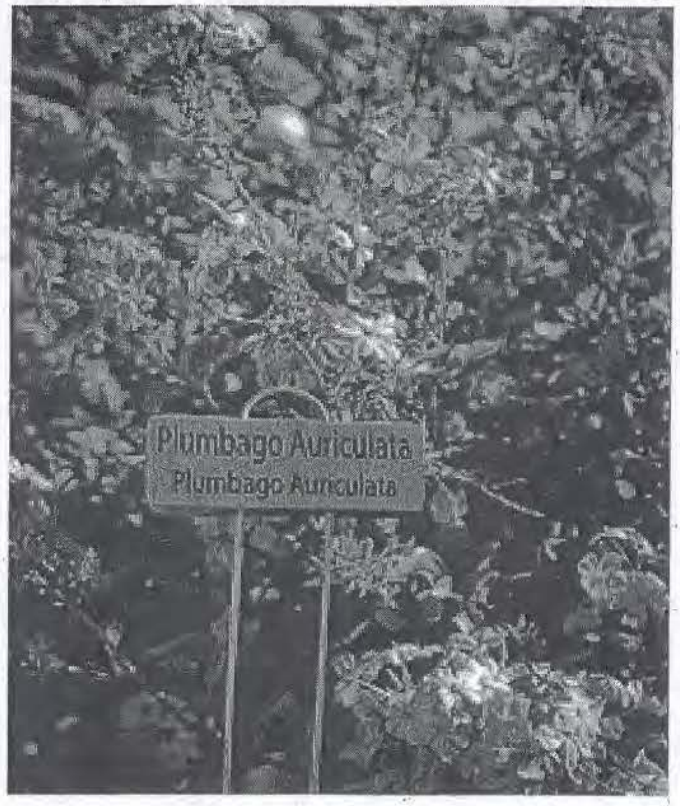

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r Rio Vista

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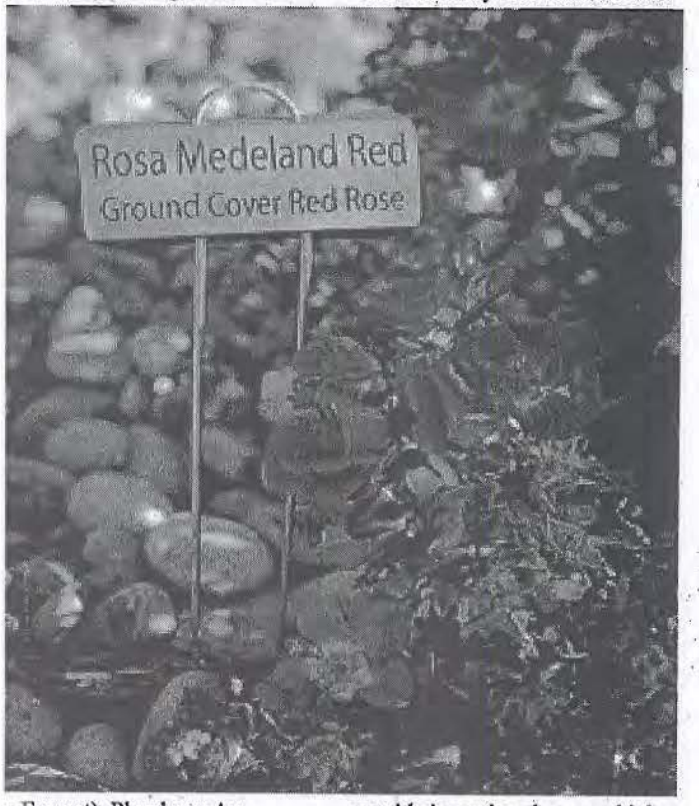

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The City is preparing a notice that will be sent to the residents with their utility bill. The information being considered includes the following:

Laundry Room

Continued on page 11



Continued from page 10

•Use the washing machine for full loads only to save water and energy
•Install a water-efficient clothes washer Save: 16 gallons/load
Kitchen
•Run the dishwasher only when full to save water and energy.
•Install a water and energy-efficient dishwasher. Save 3-8 gallons/load
•Install aerators on the kitchen faucet to reduce flows to less than 1 gallon per minute.
Bathroom
•Install low-flow showerheads. Save: 2.5 gallons
•Take five-minute showers instead of 10-minute showers. Save: 12.5 gallons with a low flow showerhead, 25 gallons with a standard 5.0 gallon per minute showerhead
•Fill the bathtub halfway or less. Save: 12 gallons
•Install a high efficiency toilet. Save: 19 gallons per person per day
•Install aerators on bathroom faucets. Save: 1.2 gallons per person per day.
•Turn water off when brushing teeth or shaving. Save: approximately 10 gallons per day
•Do not use the toilet as a wastebasket.
Landscape
•Water early in the morning or later in the evening when temperatures are cooler. Save: 25 gallons each time you water.
•Check your sprinkler system frequently and adjust sprinklers so only your lawn is watered and not the house, sidewalk or street. Save: 12-15 gallons each time you water.
•Choose a water-efficient irrigation system such as drip irrigation for your trees, shrubs, and flowers. Save: 15 gallons each time you water.
•Put a layer of mulch round trees and plants to reduce evaporation and keep the soil cool. Organic mulch also improves the soil and prevents weeds. Save: 20-30 gallons per 1000 sq. ft each time you water.–
•Plant drought resistant trees and plants (see DMM E). Save: 30-60 gallons per 1000 sq. ft. each time you water
Further information may be obtained from the California Department of Water Resources at: www.water.ca/WaterUseEfficiency/landscape, Sunset magazine's plant finder is another great tool.

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DMM I Conservation Programs for Commercial, Industrial, and Institutional Accounts –The City will continue to reach out to Commercial, Industrial, and Institutional Accounts and users to insure they are using good water conservation methods.

DMM J Wholesale Agency Programs – The City is not a water wholesaler. Therefore, this program is not applicable.

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DMM L Water Conservation Coordinator – The Director of Community Development and Public Works currently serves as the Water Conservation Coordinator for the City. As part of new projects that include landscape improvements (Section 17.68.040), the plans must include water conservation calculation per State A.B. 325 since 1992.
These plans are reviewed for compliance to City Water Conservation Ordinance section 6.12 and State requirements. The City Coordinator will track the time spent on these activities.

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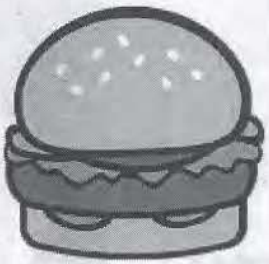
DMM N High Efficient Toilet Replacement - See DMM B.

Rio Vista Museum Hamburger BBQ



Donation: $7.00
Date: May 20, 2013
Time: 5:00 p.m. to 7:00 p.m.
Place: 401 Club, 401 Montezuma Street
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Why Are Those Fire Hydrants Dripping Water?



Driving around downtown Rio Vista, it is difficult to miss those large pressure relief valves attached to various fire hydrants. These were deployed to stabilize the water system while the Water Tank on Amador Circle was taken off-line for major repairs.



This tank was built in 1966. Although the structural integrity of this steel tank appears to be in good shape, the protective coating had been corroding for decades without repair. We are not aware of any coating work since that time. The cathodic protection in the tank also stopped working several years ago.

This tank had been in dire need of major renovation for decades. The corrosion needs to be sand blasted off. Then new epoxy coatings have to be added. The estimated cost approaches $500,000.

Due to the past water rates being too low, these types of major repairs were continually being deferred. Various advocates cried out that major repairs and maintenance did not exist and water rates should be kept low. Obviously the facts speak for themselves. The recent increase in water rates is now allowing these essential major repairs to be completed. Recent replacements of key water mains are also taking place in core Rio Vista.

When the renovation is completed, the water in this tank will be as clean as it was when pumped straight from the wells. Once back on-line again, the residents in Rio Vista from core Rio Vista to Trilogy can be assured that their water from this tank will not be contributing unwanted particles to their drinking water. Although located in core Rio Vista, these particles enter the main water system and circulate throughout all of Rio Vista.



The heavy corrosion on the entry door is the same as what is inside this steel tank.

This project was not budgeted. However, it became a top priority. Other projects were deferred so this one could be completed.

Arsenic Protection for Your Drinking Water



Arsenic filtration system construction-in-progress at Well 10 on River Road.

Your water capital improvement project funds in use.

Well 10 located on River Road is the best water producing well in the City. However, for the past few years it could only be used in emergencies, such as a significant fire.

Why Can Well 10 only be used in emergencies?

The Safe Water Drinking Act gives the US Environmental Protection Agency (EPA) the legal authority to set Maximum Concentration Levels (MCL). This is the level above which the EPA believes, based on the available information, that any compound is detrimental to human health. Well 10 consistently has arsenic concentrations above 14ppb. The MCL for arsenic was originally set at 50 ppb, and Well 10 could be used. On January 22, 2001 the EPA adopted a lower standard that became effective January 23, 2006. The new MCL was set at 10 ppb as new toxicology data provided evidence that levels above 10 ppb were detrimental to human health.

Well 13 and 14 also occasionally have arsenic levels above 10 ppb. By careful blending with water from well 11 in the City's two million gallon tank, the blend has slightly exceeded the 10 ppb MCL only three times in the past three years.

What can be done to make Well 10 useable?

The City hired Stantec. a company with considerable drinking water arsenic removal expertise to evaluate how to best and most economically remove the arsenic. Following a pilot study, Stantec recommended that a filtration method utilizing Green Sand be used to remove the arsenic. The land next to the well necessary to erect the filtration system was owned by a City resident. The City obtained the land from the resident and construction has begun. The project will cost $3,000,000 and require approximately a year to complete. The money to pay for this capital improvement project will come from the Water Enterprise Fund.



This picture of the arsenic filtration vessels at Live Oak offers a vision of Rio Vista's future for water quality.

Bathroom

Install low-flow showerheads. Save: 2.5 gallons

Take five-minute showers instead of 10-minute showers. Save: 12.5 gallons with a low flow showerhead, 25 gallons with a standard 5.0 gallon per minute showerhead

Fill the bathtub halfway or less. Save: 12 gallons

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Check your sprinkler system frequently and adjust sprinklers so only your lawn is watered and not the house, sidewalk or street. Save: 12-15 gallons each time you water.

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Water Conservation and Education Information



Rio Vista Airport Drought Resistant Landscape

2013

Water is essential to life. It is available in limited quantities and must be used wisely. Therefore, conservation is essential.

California requires every urban water supplier to prepare an Urban Water Management Plan (UWMP) every five years. The City of Rio Vista, with over 3,000 water connections, meets the requirement of an urban water supplier. The goal of the plan is to ensure long-term resource planning so that adequate water supplies are available to meet existing and future water demands. It has been determined that for California to continue to have enough water to support its growing population, it needs to reduce the amount of water each person uses per day by 20 percent. Rio Vista's plan, to be included in its 2010 UWMP, is to assess the reliability of its water sources over the next 20 years for normal, dry and multiple dry years. When completed, the City's UWMP is submitted to the Department of Water Resources (DWR) for review to assure adequate completion of the requirements. Once DWR has approved the UWMP the City Council must formally adopt the plan at a public hearing, thereby committing the City to implement the plan as stated. The City cannot apply for State Revolving Funds (SRF) and Prop. 84 grants and loans until the City has an approved UWMP.

Section 6 of the Rio Vista Urban Water Management Plan (UWMP) presents the City's plan for complying with a majority of the 14 Demand Management Measures (DDM) contained in the Water Code. It is also required to present the reasons specific measures may not be applicable, or economically justifiable at the present time.

DMM A Water Survey Programs for Single-Family and Multi-Family Residential Customers – Until meters are installed City-wide, an overall survey is not possible.

In the meantime residents will be asked to survey their own usage.

- Irrigation-check settings and leaks, and whether sprinkler heads need realignment to spray only lawn.
- Check for other leaks, i.e. faucets (place paper towel under faucet and determine if it becomes wet) and toilets (place food coloring in tank and see if it leaks into bowl)

DMM B Residential Plumbing Retrofit –An overall plumbing retrofit (ie.rebate) program is not available at this time. Rebate programs would need to be funded through water rates, which is why the City is not committing to fund them at this time. This may be an option in the future. Other than adopting the 2010 plumbing and green building codes, the City will urge residents to obtain and utilize water efficient appliances whenever and wherever possible.

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The Rio Vista Beacon

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Upgrading Rio Vista's Water Delivery System

GOVT MANDATE WATER CONSERVATION

Installing water meters citywide is required to satisfy the mandates of the California Department of Water Resources (DWR) to reduce water usage by 20 percent by 2025 with an interim target of 10% reduction by 2015. This is difficult to achieve unless the City has 100% metered water on all connections. The City's Urban Water Management Plan must also include a plan to implement water meters citywide. Without this plan approved by the DWR, Rio Vista cannot apply for financial grants and loans for water and wastewater projects.

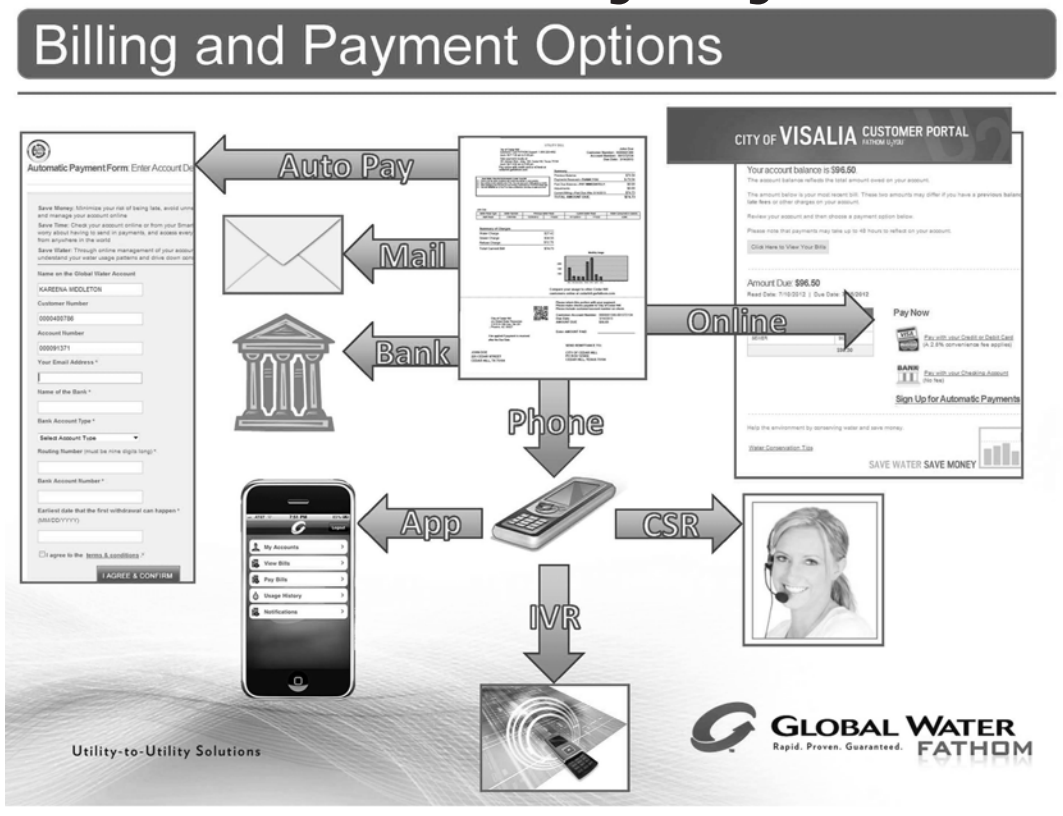
HURRICANE SANDY

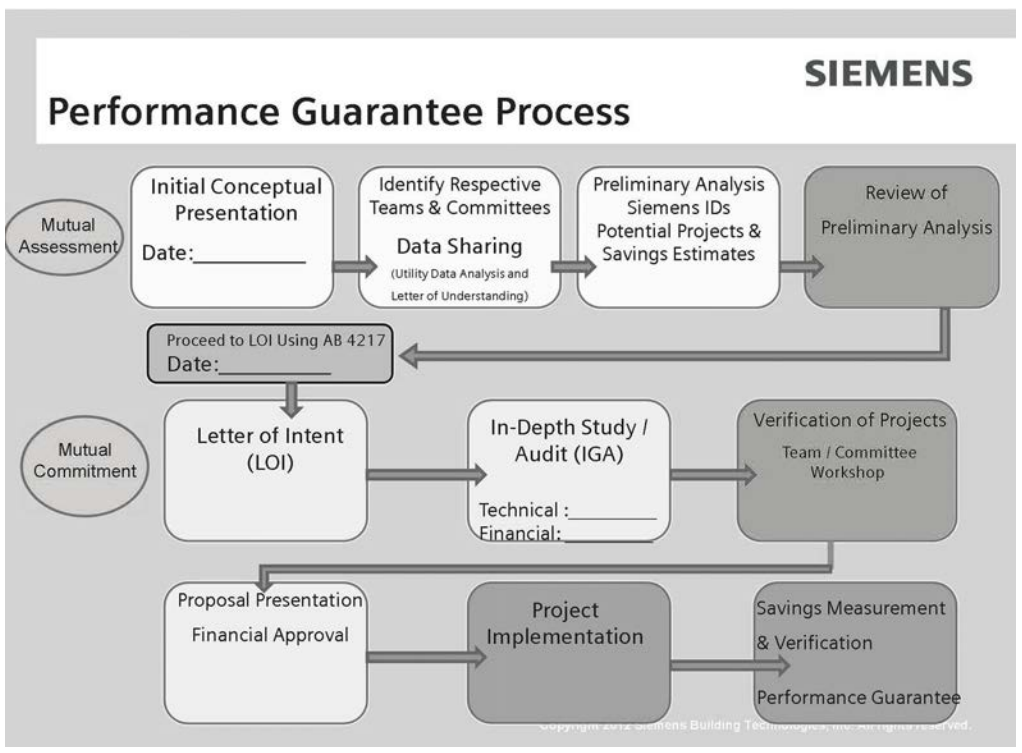
The cost to install water meters in Rio Vista has been estimated to be from 2 million to over 4 million. The problem is how to pay for water meter improvements. The construction material shortage created by Hurricane Sandy continues to have an impact. The commitments to arsenic filtration post Hurricane Sandy have exhausted the Water Enterprise Fund's capacity to pay for additional projects. The arsenic filtration at Well 10 was originally budgeted at $1.5 million. After Hurricane Sandy, this cost estimate doubled to $3 million before any work was even started. The cost to repair aging water pipes has also increased

FUNDING SOURCES

The solution came with David Melilli after he re- joined us in 2011 as Director of Public Works. Mr. Melilli was already intimately familiar with Rio Vista. He served as our Director of Public Works from 2001 to 2003.
He informed our Citizen Committee for Monitoring the Water and Wastewater Enterprise Funds (WWMC) that from his experiences with the cities of Colton, Dixon and Riverbank, there are alternative methods of financing we should explore. He explained there are organizations that provide financing for these projects with a comprehensive turnkey solution for not only the initial installation, but also for the subsequent administration and management.

Our Committee hosted a number of presentations from these organizations to gauge the financial merits of their comprehensive solutions. Our Committee utilized these presentations as a cost free method to gain awareness of what other cities across the USA were doing. These experts travelled to Rio Vista to





share their accomplishments in the hopes of gaining our business.
However, our Committee does not evaluate nor do we participate in the selection of vendors. That responsibility belongs to City Staff and City Officials.

MANY CITIES HAVE INEFFICIENT WATER DELIVERY SYSTEMS

A water delivery system is comprised of the distribution, complete operation, administration and maintenance of the delivery to customers. The presentations by these water project specialists revealed over-and-over the following key points:

It isn't just Rio Vista. Many cities have inefficient water delivery systems. This is not necessarily due to poor management or poor work performance. Budget cuts play a significant role. Staffing levels in some cities are reduced to unrealistic levels. The lack of resources to implement sorely needed technology is also a significant factor. As a result, inaccurate water meters are not replaced. Water leaks are not detected until a pipe bursts. Customers are either not being billed enough or not billed at all. All of this results in a significant loss of revenues.

THE SOLUTION

These presentations have been a real eye opener for our Committee. They revealed how other cities nationwide are currently solving the governmental imposed mandates for water conservation with financial success by making their water system more efficient. In most cases, after implementing a turnkey solution, the lost revenues recovered were enough to fund a substantial upgrade to their water delivery system.

However, it is the ability to successfully implement a total solution that presents the best certainty for success. **If our City will be spending up to $4 million, it cannot afford failure.**

Here are the ingredients for success we sifted from the presentations:

- All water connections (e.g. homes, businesses) must have a 100% functioning water meter, sized appropriately for its use.
- An advance metering infrastructure with the necessary critical support systems to maximize the recovery of lost revenue requires:

1. Real-time water usage database
2. Automated analytics software, such as an electronic asset management system. This detects leak (e.g. leaking toilet, broken sprinkler pipes etc.) by monitoring the water flow 24/7. Customers are immediately alerted, rather than face "sticker shock" at the end of the month.
3. Professional customer care support. Centralized database for all customer information whether it relates to Public Works or Finance. This provides internet and mobile phone access to customers so they can monitor their own water usage.
4. Accounting and revenue management tools, including efficient billings and collection processes
5. Reporting and compliance tools
6. Live work orders to ensure all detected leaks, etc. are quickly fixed.

All of the above work hand-in-hand , resulting in a total comprehensive solution. This is not just a singular approach.

THE COST OF FAILURE IS HIGH

These solutions require staff with years of technological experience, trained in the best practices. Utility staff expertise is the issue moving forward. **Contrary to what some vendors have stated, these are not always easily transferrable to a City's staff, particularly when they are already severely understaffed. This is Rio Vista's predicament.**
When City revenues were falling, Rio Vista's City Staff were the first to be cut. They were hit the hardest. A true but harsh fact, they were not considered to be as important as Firemen and Police, although they were not spared. Given this, how can a City staff already burdened with more than 8 hours work / day be expected to take on even more hours to administer an advanced utility program? The chance of failure is high. This is not to be taken lightly. Rio Vista cannot afford to fail after spending up to $4 million.

OUR RECOMMENDATION

Will these solutions work for Rio Vista? Only a complete audit of our water delivery system from water meters to operational and administrative processes will determine this. There are cities who have signed on to these programs without first doing their homework, only to be stuck with a vendor's solution they are not happy with.
Given this, our Committee will be recommending that the City Council take this first step and direct City Staff to solicit a complete audit of our water delivery system. This audit will determine conservatively the lost revenues our City can recover, the cost of implementing water meters citywide and the financial benefits of outsourcing the additional burden to administer, manage and maintain a highly advanced automated water system.
We wish to acknowledge the Director of Public Works, Mr. David Melilli for advising us of these significant financial options.

This is a report from Rio Vista's Water and Wastewater Monitoring Committee

Independent Living in Your Home: Goal of Complete Accessibility created by local Trilogy resident Gene Vigil

Vigil has been a City Building Inspector for over 16 years and is also a California State Certified Access Specialist (CASp). He has been responsible for both plan review and inspecting commercial and residential projects. This includes enforcing Federal ADA and California accessible codes. Through these experiences he's been involved with big buildings with elevators to small mom and pop sandwich shops. "I've seen some good and a lot of not so good".
Now you can have this Inspector on Your side through his Home Services and businesses can protect themselves
from expensive and needless litigation through his CASp Business Services. Business Services are offered to address ADA and California Accessible Codes. With a CASp inspection, Survey Plan and Certificate your business will be protected from litigation. Developing an accessible plan will also open your business to welcome people of ALL abilities.
Home Services were developed from the desire to prevent accidents in the home that he's experienced with his own family members. Falls in the home could turn tragic and are preventable with a few minor improvements. These improvements aren't only useful for seniors but for everybody. With a free 30 minute consultation he can evaluate your specific home accessibility needs. Good for you or your parents who may be in denial. Listed are a few typical improvements.
Handrails or Grab-bars for inside your Home.
Complete Accessibility has developed a few different handrail systems for around the house. Grab-bars can be installed in the bathrooms, showers, toilet areas and even at doorways with steps where I find many people could use some extra gripping assistance getting in and out of the door.
Lever Hardware
Lever hardware for doors eliminate the need for gripping or turning of the wrist in order to open or close doors.
Accessible Features.
These may include specialty needs such as lowering closet rods, hanging devices for laundry, lowering front door peep-holes, specialty toilet/bath assistance bars, toilet seats, lowering or raising mirrors, bath or shower fixtures, threshold ramps or whatever is specific to your comfort.
Consulting for your Accessible Home Improvement Project.
Now you can have an experienced Inspector on YOUR side. We can help you with more major accessibility home improvement projects through Home Consulting Services. These services may be accessible bathroom or kitchen remodels, doorway widening, ramps inside or outside, handrails for the front porch or getting out to the backyard. Don't wait until something happens to make these changes to your home and in your life. Take time to give Complete Accessibility a call at 925-246-3025 or go to their website at www.complete-accessibility.com. Let the experts help you with what could be a life saving decision.

RioVision Launches Website

The RioVision team preparing for the R/UDAT project has launched a website to inform Rio Vista residents of this upcoming planning and design study. The site, www.riovistavision.com invites citizens to learn about the project of revitalization for Rio Vista, and provide their input. It also explains the mission of the RioVision project, a nonprofit organization dedicated to building a "bridge to the future." It lists team members who have brought the project along in Phase I, and submitted the 30-page application to the AIA Communities by Design in Washington DC.
Now in Phase II, the RioVision project has engaged the help of Edwin Okamura, a Rio Vista resident and former VP of Marketing and COO of a leading integrated marketing agency. Under his leadership, RioVision has stepped up its outreach to the community with a new logo, a website and a Facebook page: www.facebook.com/riovistavision. We ask that citizens "like" the page and begin following the progress of the team.

RioVision is looking for sponsors to assist with expenses of bringing a team of nationally recognized architects and urban planners to Rio Vista. The R/UDAT (Regional/Urban Design Assistance Team) study will result in detailed published plans, which will be presented to the city and can be incorporated as part of our General Plan Revision. R/UDAT teams have helped over 200 communities in the U.S., including nearby cities of Santa Rosa, Healdsburg, and Sebastopol.

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RETAIL



A preliminary analysis of the feasibility of installing new water meters and related meter reading technology in the City of Rio Vista

City of Rio Vista
Water Meter Retrofit
Cost/Benefit Analysis

for the

2012 UWMP Update

Preliminary Report

Prepared by

Mark A. Carey, PE

MC Enginnering

October 1, 2012

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Introduction

MC Engineering was retained by the City of Rio Vista (City) to assist in the City's UWMP update by evaluating the feasibility of installing meters throughout the City and preparing a cost/benefit analysis to address the State required demand management measures (DMMs) associated with the City's water meters. The approach that follows takes into consideration both the monetary and ancillary benefits associated with installing meters on the existing un-metered services that are currently subjected to the flat rate as well as updating the meter reading technology throughout the City to improve reading efficiency, billing functions, and customer service. New meters and related reading technology will also allow the City to manage the water resources and future conservation programs more effectively.

Background

The City currently provides potable well water to approximately 4000 services/customers. This includes roughly 3,900 residential and multi-family and 104 commercial services with sizes ranging from ¾" to 6". Based on a review of the billing database, there are approximately 1,080 residential services that are unmetered.

To improve its water efficiency and customer billing procedures, the City, in 2010, began reading meters and improving its billing system process. Despite these measures the staff has been faced with various challenges due to the existing meter infrastructure, which includes 300 radio reads and 3,700 manual read water meters. The monthly meter reading includes 17 routes and can be very time consuming, especially when considering subsequent billing and payment processing.

A large number of the existing water meters are ¾" Sensus SRII positive displacement meters with a majority of the metered customers being within the Trilogy Subdivision. The old downtown area consists of meters that are in excess of 15 years old and many meters have reached their useful life. The 300 radios were installed on Sensus meters fitted with Itron transmitters. Most of the 104 commercial services are manual reads with the larger meters being predominately Sensus turbine meters with some assorted Neptune and Type I turbine meters. According to the meter reading staff, many of the Itron radio reads are not functioning correctly and require time consuming re-reads.

The public works meter reading staff, consisting of up to four (4) employees, spends a minimum of one (1) week per each month to read all the City meters, which accounts for approximately 160 man-hours per month. This doesn't include the office time (accounting), which has many of its own challenges including, processing various types of data inputs from manual and radio read meters, billing non-metered customers, and addressing faulty meters. These problems are magnified by numerous customer inquiries and billing discrepancies that require a response. Deadlines often require the help of volunteers for the City's monthly bill stuffing and mailing.

To better define the importance of updating and improving the City's meter reading capabilities and billing system, MC Engineering, with valuable assistance from City staff, evaluated the water demand and usage throughout the City for the 2011. The total water production from wells for 2011 was 712

million gallons (MG), or an average of 1.95 million gallons per day (MGD). Due in part to the large number of un-metered accounts, the amount of non-revenue water is difficult to ascertain with certainty. Preliminary estimates indicate that the non-revenue water is 15-17 percent of the overall water produced. These estimates are based on the assumption that all the residential flat rate accounts (non-metered) are using a hypothetical 20.2 hundred cubic feet per dwelling unit per month (HCF/DU/MO) or 495.4 gallons per day per single family connection. This non-revenue water can be attributed to a combination of factors including and not limited to:

- System leakage (real losses)
- Customer usage exceeding 20.2 HCF/MO or 495.4 gallons per day
- Meter inaccuracies (apparent losses)
- Un-read meters and billing system errors

Figure 1 below, indicates various monthly water trends and the estimated non-revenue water (NRW) for an eighteen (18) month period. Also plotted were the corresponding metered water, un-metered water, and the total water production. The un-metered water was normalized (adjusted for seasonal variation) by multiplying the number of flat rate accounts (1,080) times the 20.2 HCF times a monthly production coefficient for each month of the season. The monthly production coefficient was determined from the ratio of monthly production to the total annual production.

Figure 1, Estimated Non-Revenue Water

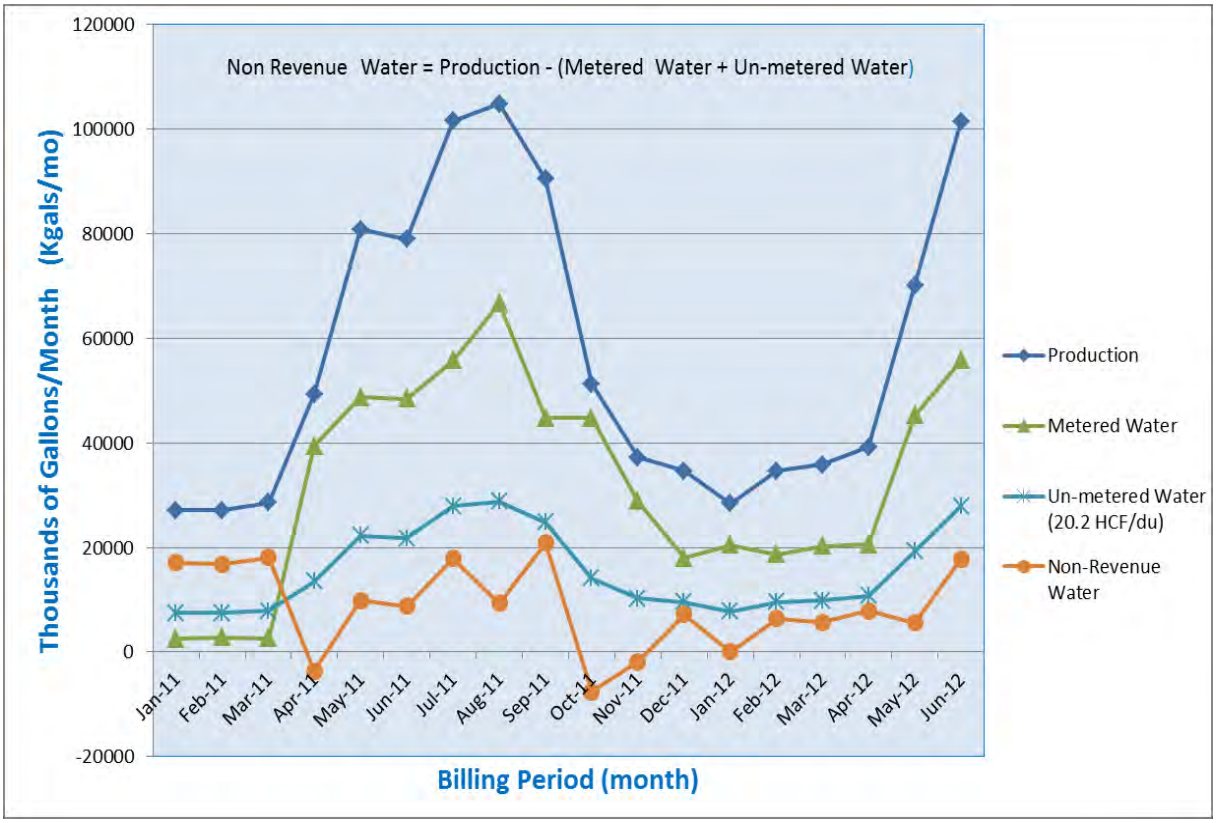

Figure 1 above, indicates various anomalies which contribute to the NRW. These apparent anomalies can include the following:

1. Flat rate account usage exceeds the calculated theoretical 20.2HCF/DU
2. Inconsistencies in meter reading
3. Inconsistencies in customer billing
4. Variations is system real losses (leakage)
5. Theft (un-authorized consumption)
6. Variations in authorized consumption (main flushing, street cleaning, etc.)

Residential, multi-family and commercial customers are billed for water on either a flat rate or a volumetric usage charge with a monthly meter charge. The flat rate is $45.02 for residential and $35.28 for multi-family accounts. The monthly meter charge for a ¾" meter is $34.28. The volumetric water charge for residential, multi-family, and commercial is $0.54/HCF. It should also be noted that the commercial sewer/wastewater customers are billed, in part, based on the volumetric usage taken from the monthly water meter reads. The residential sewer rates are based on a calculated flat rate system and are not dependent on the monthly water meter reads. The residential flat sewer rates range from $51.60/DU and $ 91.88/DU for the Northwest and Beach service areas, respectively. The commercial monthly billings, again, are based upon volumetric water usage in combination with the strength of sewer. The commercial customers monthly charges range from $ 8.09/HCF (low strength) in the Northwest service area to a high of $ 43.59/HCF (high strength) in the Beach service area. It is important to note that the commercial water usage represents roughly 6% of the overall system wide water usage, but the overall effect to the sewer revenue is significantly higher due to the volumetric water based charges.

The City is currently being faced with challenges from customers regarding the water and sewer rates. Consumer groups are demanding accountability and requesting lower utility rates, while the City staff is tasked with the duty of utilizing the current rates to provide safe and affordable drinking water and sewer service, which includes funding the current operational costs and debt service, along with necessary capital improvements. To meet the customer demands and regulatory requirements the staff must find ways to improve meter reading and billing efficiency and improve meter accuracy. A combination of water use and billing efficiencies are available to the City, including:

- Increases in meter accuracy and revenues associated with new and more accurate meters that are appropriately sized and typed for the type of use.
- Reduced accounting and administrative staff time required for billing and responding to customer inquiries through the use of new billing software and advanced meter analytics (AMA).
- Reduced labor to read meters associated with new meter technology (i.e.…touch read, automatic meter reading (AMR) and/or automatic meter infrastructure (AMI)), thus providing the City with the opportunity and flexibility to re-allocate it's meter reading staff to other

functions that will improve the City's overall infrastructure operational systems, customer response, and ultimately save costs.

- Reduced operating costs for vehicles and related overhead associated with meter reading activity.
- Minimizing the non-reads
- Eliminating the flat rate of 20.2 HCF/month while capturing the potential lost revenue.
- Other related efficiency gains and capital costs savings associated with new AMA capabilities that allow for accurate, cost effective, and cost saving programs, such as leak detection, water conservation, optimizing service and main line replacements, meter replacement, etc..).

Overview of the AWWA Water Audit and Related Industry Practices

The water industry has made great strides in recent years by developing new tools, techniques, and technologies to increase efficiencies and minimize water losses. Water losses are calculated by subtracting the Authorized Consumption (metered and un-metered water) form the System Input Volume (Production). The American Water Works Associating (AWWA) Water Balance uses a mass/balance methodology developed by the International Water Association (IWA) to account for all water entering and leaving the distribution system. A water audit was prepared for Rio Vista utilizing the IWA/AWWA standardized Water Balance methodology to identify individual components of the System Input Volume (SIV), including the Consumption, Apparent Losses (losses due to inaccurate meters), and Real Losses (losses due to leakage). A complete copy of the audit can be found in Attachment A. The key Performance Indicators from the audit are presented below in Table 1.

Table 1; Key Performance Indicators from the AWWA Audit:

PERFORMANCE INDICATORS	
Financial Indicators	
Non-revenue water as percent by volume of Water Supplied:	16.9%
Non-revenue water as percent by cost of operating system:	4.8%
Annual cost of Apparent Losses:	$21,132
Annual cost of Real Losses:	$33,199

It is important to note the limitations of the AWWA audit since such a high percentage of the consumption in Rio Vista is un-metered. Because the volumetric cost of water in Rio Vista is relatively low, the value of the apparent loss is relatively low as well. The overall average customer meter accuracy was estimated at 94% (or a 6% loss in accuracy). A reasonable recovery rate of losses due to meter inaccuracy is to assume that 70% of the apparent loss is recoverable through an aggressive testing, typing, and retrofit program. An aggressive leak detection effort can reasonably capture up to 50% of the real losses. A summary of the estimated operational efficiency indicators is presented below in Table 2.

Table 2, Operational Efficiency Indicators from the AWWA Audit:

Operational Efficiency Indicators		
Apparent Losses per service connection per day:	21.13	gallons/connection/day
Real Losses per service connection per day*:	59.50	gallons/connection/day
Real Losses per length of main per day*:	N/A	
Real Losses per service connection per day per psi pressure:	0.74	gallons/connection/day/psi
? Unavoidable Annual Real Losses (UARL):	25.80	million gallons/year
From Above, Real Losses = Current Annual Real Losses (CARL):	82.52	million gallons/year
? Infrastructure Leakage Index (ILI) [CARL/UARL]:	3.20	

* only the most applicable of these two indicators will be calculated

One of the key performance indicators above is the Infrastructure Leakage Index. This calculated based on the ratio of Current Annual Real Losses (CARL) to the Unavoidable Annual Real Losses (UARL). The UARL is determined from the miles of pipe and number of services according to the IWA statistical data and embedded formulae. An ILI value of 1 would be indicative of a system performing at the industry standard level of efficiency. The estimated value of the ILI at 3.20 indicates Rio Vista has significant room for improvement if in fact the assumptions for flat rate usage are in line with reality. If the base line estimate of 20.2 HCF/DU/month is significantly higher for flat rate customers, then the City would have a compelling case for recovering more revenue after meters are installed provided there are no large behavioral responses to the future bills. According to staff, they recently installed 30 meters on previously un-metered accounts and noted very observable drops in outdoor water usage.

Sewer Billing Related Consumption

The sewer related rates in the City are much higher than the water rates, thus special consideration should be given to the commercial meters that are used to acquire usage data for the corresponding sewer billings. From experience, the intermediate sized meters (1.5” to 3”) can typically experience accuracy losses in the range of 5%, which can have a negative effect on the commercial revenue. Higher than normal inaccuracy may exist in Rio Vista due to the following issues and factors:

- A large number of the older turbine type commercial meters are installed
- Lack of an aggressive commercial meter testing and typing program, due to the lack of manpower
- Challenges with meter reading and billing
- Water quality that can contribute to meter inaccuracy

Sewer related volumetric based charges in the City total an estimated $400,000 annually. The potential for recovering lost revenue in this area is high. For example, an average increase in meter efficiency of 10% would produce an additional $40,000 in revenue for the City from the commercial meters alone. A structured approach to capturing this potential lost revenue is included in the Recommendations section of this report.

Summary of Anticipated Meter Program Savings and Benefits

Installation of new water meters and meter reading technology in the City would have several immediate monetary and other long-term benefits that are more difficult to quantify but still important. Assumptions and values used for each category described below can be found in the footnotes along with Attachment B. The immediate monetary and long term benefits that can be used to offset costs include:

- **Labor Savings**: A significant reduction in meter reading labor could be expected if the new meter installations include the use of new meter reading technology. A summary of the technology options and impacts to labor and customer service capabilities is presented in more detail under the Meter Retrofit Options and Estimated Capital Costs section below.
- **Vehicles and Equipment Savings**: Depending upon the technology (touch read, AMR, or AMI), the need to drive around to read meters can be virtually eliminated. This is quantified in the cost/benefit analysis along with the corresponding assumptions.
- **Un-metered Non-Revenue Water Recovery**: To the extent the City's flat rate customers are collectively using more than the assumed 20.2 HCF/month, and they continue to do so after metering is in place, the City would benefit based on the incremental amount greater than the 20.2 HCF at the then current retail rate.
- **Residential Meter Accuracy Improvements (Recovery of Apparent Losses)**: The AWWA audit estimates the value of the apparent losses based on the assumed meter accuracy. The average customer meter accuracy should be verified through testing in subsequent phases and prior to embarking on the meter retrofit program in order to verify the cost benefit analysis results.
- **Commercial Meter Accuracy Improvements from Testing and Meter Typing**: Several older meters were observed during a preliminary field review. Staff has indicated that there are several potential improvements to the City's commercial metering program. Given the relatively high amount of revenue for sewer related billings all commercial meters should be surveyed and tested where warranted. Inappropriate meter types should be changed out along with older meters incapable of registering low flows and regular flows at industry standard accuracy levels established in AWWA Manual M6.
- **Recovery of Real Losses (leaks)**: Estimates of real losses are based on the calculated amount of apparent losses from the AWWA audit. Leaks can be more easily identified using acoustic devices that transmit radio signals which can be tied to an AMI system or part of a drive-by

program. For the purposes of calculating this benefit, it is assumed that only 25% of the real losses are captured. Higher amounts of recovery can be used to offset the costs for repairs.

Meter Retrofit Options and Estimated Capital Costs

It is assumed that all homes currently without a meter would receive a new water meter and move from the flat rate to volumetric billing. Various options are available for reading the new and existing meters which include:

a. Manual Reading: This would involve continuing the current practice of manually lifting lids, and inputting the reading from the new and existing registers into a handheld device for subsequent download and billing.

b. Touch Read: This reading technology involves using a wand that is touch-coupled to the register via a thru pit transmitter.

c. Drive-by Automatic Meter Reading (AMR): Under this alternative, all meters would be retrofit with radio transmitters that are read by driving by with a transceiver while the readings automatically update an electronic billing database.

d. Fixed-base Advanced Meter Infrastructure (AMI): Under this alternative, a fixed base antenna is used to pick up radio signals and transmit the reads to a central collector. Data is then backhauled either to the head-end (City Hall) or a remote server location under a hosted option. AMI systems have the advantage of reading on demand using two-way communication between the head-end and endpoint (meter).

e. Hybrid System: Hybrid systems can include a combination of any of the above although the term is most often used to refer to a system capable of drive-by (AMR) or fixed base (AMI) reading and communications.

Estimated capital costs for the systems identified above will likely range between $750,000 and $1,000,000 depending upon the final system configuration. For the purpose of preparing the initial cost/benefit analysis, a preliminary estimate of $1,000,000, which is consistent with the City's current CIP and preliminary vendor quotes received by MC Engineering, was used for analyzing the project feasibility. Detailed estimates can be prepared in subsequent phases as recommended below.

Cost Benefit Analysis

A financial analysis was prepared (see Attachment B) based on the estimated cost of the preferred metering system along with consideration of the related benefits. This analysis was prepared based on the installation of a fixed base metering system. More detailed alternatives can be analyzed in the future once the City has evaluated the preferred technology and conducted the recommended surveys and testing discussed further below.

Results indicate that the proposed installation of approximately 1,100 new meters along with the testing and retrofit of the remaining meters could likely be funded through efficiency and revenue gains. The financial results will vary depending upon the verified savings, ultimate amount financed, and customer contribution for funding non-metered residences. The analysis included in Attachment B is based on the assumption that 1,100 new meters would be installed and the cost of the meter alone reimbursed to the City from accounts that are currently without meters. All meters would presumably be retrofitted with new radios for accommodating a fixed base or drive-by metering system. The expected simple payback period is estimated at 7 years and could vary between 6 and 10 years depending upon the outcome of future meter testing and verification of the estimated input parameters included in this preliminary analysis.

Recommendations

Based on this planning level review of the City's metering options, non-revenue water, and current billing practices, installing new meters and reading capabilities in Rio Vista is financially viable. A more detailed investigation is warranted in order to verify results. The following subsequent actions are recommended:

1) **Conduct a detailed meter inventory and field survey**: It was evident that the City's existing meter database is lacking critical information. This can be leading to billing errors, un-billed accounts, and other unknown problems affecting revenues. Each account should be subject to a field survey to document existing conditions with the information cross referenced with the City's billing database. Geo-spatial maps should be prepared and linked to the billing data base.
2) **Commercial Meter Testing and Typing**: Critical information from the field surveys coupled with criteria established based on a review of the City's billing database should be used to identify commercial meters for testing. The test results should be used to update the financial business case and cost/benefit analysis.
3) **Residential Meter Testing**: Field survey data along with information from the City's billing database should be used to prioritize residential meter testing. A statistical sample set from relevant residential meter populations should be pulled and tested in order to verify the financial business case and cost/benefit analysis.
4) **Billing Services Review**: The City's billing database should be updated and various software enhancements considered based on current technologies available from the meter vendors combined with consideration of specific City software needs. Anomalies that could be leading to un-captured revenue should be identified.

5) **Detailed Business Case Analysis**: The results from the steps outlined above should be used to prepare a final business case analysis for verifying the cost effectiveness of upgrading the City's metering and meter reading capabilities. These results can potentially be used as a basis for a performance based contract whereby a vendor or service company agrees to install and help secure financing with a corresponding guarantee on results in order to minimize risk to the City.
6) **Meter Installation and Retrofit Program**: Detailed steps for the proposed meter retrofit program should be outlined further during a subsequent verification phase. It is likely that following a more detailed verification, the City could solicit final pricing and implement the proposed project over a relatively short time frame in order to maximize return on investment. Future investigations should include exploring grant funding options, alternative financing methods, and other cost effective procurement methods. Billing services and IT related functions should be reviewed in advance through a series of workshops so the City can custom tailor the proposed program to their specific needs and internal capabilities.
7) **Re-allocation of Meter Reading Staff:** A possible re-allocation of metering staff should be thoroughly analyzed if new technology is implemented that reduces meter reading manpower and time. This re-allocation of manpower will produce the necessary cost savings through the utilization and re-assignment of metering staff to various water and sewer capital improvement and operational projects and/or programs such as; meter replacement, meter testing, customer service responses, water conservation programs, water audits, and required system maintenance. Staff could also be re-allocated and assigned to implement and maintain the City's wastewater fat, oil, and grease (FAT) and required SSMP programs including and limited to; smoke testing, T.V. pipeline and lift station inspections and monitoring, and filing of necessary reports with the CRWQCB. Staff could also provide the necessary labor to develop inventory and mapping of all its infrastructure systems. Staff time would be used in place of the hiring of expensive outside consultant(s) and contractors. At the City's request, MC Engineering, in conjunction with an experienced team of water operations and management personnel, could provide the valuable training of the re-allocated field personnel to assist in managing the above programs.

AWWA WLCC Free Water Audit Software: Reporting Worksheet

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WAS v4.2

Back to Instructions

? Click to access definition

Water Audit Report for: City of Rio Vista
Reporting Year: 2010 (1/2010 - 12/2010)

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

WATER SUPPLIED

<< Enter grading in column 'E'

Volume from own sources:	712.240	Million gallons (US)/yr (MG/Yr)	
Master meter error adjustment (enter positive value):	7.122	under-registered	MG/Yr
Water imported:		MG/Yr	
Water exported:		MG/Yr	
WATER SUPPLIED:	719.362	MG/Yr	

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

			Pcnt:	Value:
Billed metered:	402.722	MG/Yr		
Billed unmetered:	195.820	MG/Yr		
Unbilled metered:		MG/Yr		
Unbilled unmetered:	8.992	MG/Yr	1.25%	

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

Use buttons to select percentage of water supplied **OR** value

AUTHORIZED CONSUMPTION: 607.535 MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption)

111.827 MG/Yr

Apparent Losses

			Pcnt:	Value:
Unauthorized consumption:	1.798	MG/Yr	0.25%	

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:	25.706	MG/Yr	6.00%	
Systematic data handling errors:	1.798	MG/Yr		

Choose this option to enter a percentage of billed metered consumption. This is NOT a default value

Apparent Losses: 29.303

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 82.525 MG/Yr

WATER LOSSES: 111.827 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 120.820 MG/Yr

= Total Water Loss + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	100.0	miles
Number of active AND inactive service connections:	3,800	
Connection density:	38	conn./mile main
Average length of customer service line:	30.0	ft
Average operating pressure:	80.0	psi

(enter length between curbstop and customer meter or property boundary)

COST DATA

Total annual cost of operating water system:	$1,200,000	$/Year
Customer retail unit cost (applied to Apparent Losses):	$0.54	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	$400.00	$/Million gallons

PERFORMANCE INDICATORS

Financial Indicators

Non-revenue water as percent by volume of Water Supplied:	16.8%
Non-revenue water as percent by cost of operating system:	4.8%
Annual cost of Apparent Losses:	$21,153
Annual cost of Real Losses:	$33,010

Operational Efficiency Indicators

Apparent Losses per service connection per day:	21.13	gallons/connection/day
Real Losses per service connection per day*:	59.50	gallons/connection/day
Real Losses per length of main per day*:	N/A	
Real Losses per service connection per day per psi pressure:	0.74	gallons/connection/day/psi
Unavoidable Annual Real Losses (UARL):	37.17	million gallons/year
From Above, Real Losses = Current Annual Real Losses (CARL):	82.52	million gallons/year
Infrastructure Leakage Index (ILI) [CARL/UARL]:	2.22	

* only the most applicable of these two indicators will be calculated

WATER AUDIT DATA VALIDITY SCORE:

Add a grading value for 13 parameter(s) to enable an audit score to be calculated

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources
2: Master meter error adjustment
3: Billed metered

For more information, click here to see the Grading Matrix worksheet

City of Rio Vista Water Meter Retrofit Project Cost Benefit Analysis

Project Start Date:	2014			
Total Project Cost:	$1,000,000	(see note 5)	Discount Rate:	4.00%
City Annual Capital Contribution:	$0		Estimated Annual Rate Increase:	2%
Customer Funded Meter Contribution:	$203,500	(see note 6)	Estimated Operational Cost Increases:	2%
Total Cost to Finance:	$796,500			
			20 year Net Present Value:	$1,318,723
Rate of Financing:	3.50%		20 year Internal Rate of Return:	22.49%
Term of Financing:	8		Simple Payback (years):	6.9

Year	Capital (1)	Water and Sewer Revenue Increase (2)	Operational Savings (3)	Leak Detection Savings (4)	Total Annual Benefits	Annual Debt Service	Consultation and Verification (5)	Total Annual Cost	Net Cash Flow	Cummulative Cash Flow	Year
1	$0	$54,886	$81,020	$8,252	$144,158	$115,872	$5,000	$120,872	$23,286	$23,286	2014
2	$0	$55,984	$82,640	$8,252	$146,876	$115,872	$5,000	$120,872	$26,004	$49,290	2015
3	$0	$57,104	$84,293	$8,252	$149,649	$115,872	$5,000	$120,872	$28,777	$78,067	2016
4	$0	$58,246	$85,979	$8,252	$152,477	$115,872	$5,000	$120,872	$31,605	$109,672	2017
5	$0	$59,411	$87,699	$8,252	$155,361	$115,872	$5,000	$120,872	$34,489	$144,161	2018
6	$0	$60,599	$89,453	$8,252	$158,304	$115,872	$5,000	$120,872	$37,431	$181,592	2019
7	$0	$61,811	$91,242	$8,252	$161,305	$115,872	$5,000	$120,872	$40,432	$222,025	2020
8	$0	$63,047	$93,067	$8,252	$164,366	$115,872	$5,000	$120,872	$43,493	$265,518	2021
9	$0	$64,308	$94,928	$8,252	$167,488	$115,872	$5,000	$120,872	$46,616	$312,134	2022
10	$0	$65,594	$96,826	$8,252	$170,673	$115,872	$5,000	$120,872	$49,800	$361,934	2023
11	$0	$66,906	$98,763	$8,252	$173,921			$0	**$173,921**	$535,855	2024
12	$0	$68,244	$100,738	$8,252	$177,234			$0	**$177,234**	$713,090	2025
13	$0	$69,609	$102,753	$8,252	$180,614			$0	**$180,614**	$893,704	2026
14	$0	$71,001	$104,808	$8,252	$184,061			$0	**$184,061**	$1,077,765	2027
15	$0	$72,421	$106,904	$8,252	$187,578			$0	**$187,578**	$1,265,343	2028
16	$0	$73,870	$109,042	$8,252	$191,164			$0	**$191,164**	$1,456,507	2029
17	$0	$75,347	$111,223	$8,252	$194,822			$0	**$194,822**	$1,651,329	2030
18	$0	$76,854	$113,448	$8,252	$198,554			$0	**$198,554**	$1,849,883	2031
19	$0	$78,391	$115,717	$8,252	$202,360			$0	**$202,360**	$2,052,242	2032
20	$0	$79,959	$118,031	$8,252	$206,242			$0	**$206,242**	$2,258,484	2033

Notes and Preliminary Savings Related Assumptions:

(1) Capital infusion can be included if the City elects to re-program current costs for meter repair and replacement into amortized payments to fund a system-wide program.

(2) Water related revenue increases are based on capturing 70% of the apparent loss from the AWWA audit by testing and repairing meters. Also included is an assumed 10% efficiency gain on commercial meters.

(3) Operational savings assume 120 hours of labor is saved each month through new meter reading technology. Savings based on labor at $35.00 per hour plus 30% fringe benefits, along with 10,000 miles of driving saved at $0.55/mile. Other misc. savings include an additional $10,00 in savings related to reducing re-reads, improving billing related services, and other related savings (reducing workman's comp claims, etc.)

(4) Leak detection related annual savings assumes 25% of the real losses identified in the AWWA water audit are identified and repaired.

(5) The total project cost is based on installing 1,100 new meters along with new radio transmitters on all meters. One antenna for reading meters and related meter data management software also included.

(6) Customer contribution assumes that 1,100 customers currently without meters contribute $185 each for a new meter through separate on-bill financing program.

DEMAND MANAGEMENT MEASURE A – WATER SURVEY PROGRAMS FOR SINGLE-FAMILY AND MULTI-FAMILY RESIDENTIAL CUSTOMERS

(California Water Code Section 10631 f(1)(A))

The City of Rio Vista has not implemented DMM A and has no plans for implementation at this time. Below is a discussion of DMM A and the analysis used to justify not implementing it.

Authority

As stated in the 2010 Urban Water Management Plan, the City owns and operates eight groundwater wells with a maximum estimated output of 7,400 gallons per minute for potable water use. The City has exclusive rights to these wells and has sole authority to operate these wells.

A Water Survey Program consists of an in-home evaluation of water-dispensing devices including:

- A check of shower heads and faucets for leaks and determination of flow rates
- Provision of low-flow shower heads and faucet aerators, if needed or requested
- A check of leaks in toilets
- Determination of toilet flush volume
- Discussion of dishwasher and washing machine use, with suggestions for optimizing
- Discussion of incentive programs for water conservation
- Inspection of water heater for leaks or damage
- Determination of water pressure at the point of use
- Instruction on how to read a water meter

Also included in Water Survey Program, the inspector performs the following tasks around the exterior of the home:

- Determination of grass type
- Review of irrigation system and strategy (schedule)
- Identification of irrigation problems or waste
- Determination of soil type, moisture depth, and root growth
- Measurement of sprinkler head output
- Consultation with homeowner on ways to efficiently utilize water for landscaping

A competent person or persons must be trained to perform the home evaluations and City resources (vehicles, literature, plumbing fixtures, etc.) must be dedicated to implement this Water Survey Program successfully. The cost of producing water must be measured against the economic and non-economic benefits of implementing such a program to determine its viability.

Table A, below, contains a summary of the Cost-Benefit analysis of implementing a Water Survey Program at the City of Rio Vista.

Table A. DMM A Cost/Benefit Evaluation

Table A - 10631(g)(2)	
Average Annual Cost Effectiveness Summary	
Total Costs	**$ 59,575**
Total Benefits	**$ 2,100**
Discount Rate	**N/A**
Time Horizon	**5 years**
Cost of Water ($ per AF)	**$ 130**
Water Savings (AF/Y)	**16.1**

A summary of the non-economic factors affecting the Water Survey Program and taken into consideration in this Cost-Benefit analysis is provided in the following paragraphs.

Environmental

The environmental effects of implementing a Water Survey Program in the City would be minimal. As stated previously, the City uses groundwater wells as its potable water source. Surface waters would not be measurably affected by implementing or not implementing the program.

There would be an environmental benefit to implementing the program in the form of reduced electrical power consumption for the production, treatment and distribution of water.

Social

There is a societal benefit in implementing the Water Survey Program. A reduction in the amount of water produced and distributed means a reduction in the amount of money spent on its production. The publicly owned system would see a reduction in power required to pump, treat, and distribute the water.

Implementing the program would also convey to the water users the message that the City is working to conserve water. The extent to which the program would be socially beneficial is not quantifiable, however.

Health

There are no measurable health benefits to either implementing or not implementing the Water Survey Program.

Customer Impact

Water customers that participate in the Water Survey Program would be educated on sources of potential leaks in their system and will know how to prevent them or fix them. They may also be better informed of irrigation practices and landscaping options to reduce their water consumption.

Participants may also talk with friends and neighbors about what they have learned, which may have an effect on how they manage water at their own homes.

Technological Factors

There are several technological advances in residential irrigation practices that are available to the average homeowner to reduce the amount of water used. Automatic sprinkling and drip irrigation systems can be equipped with timers. Soil moisture probes and rain sensors can be used to adjust irrigation schedules. Internet websites are devoted to appropriate landscaping plant choices given sun exposure, soil types, and climate. All of this information can be provided as part of a Water Survey Program. It is also available to anyone with internet access that is interested in conserving water, even without the Program.

Conclusion

While there are some non-economic benefits to implementing a Water Survey Program, the costs of the Program are too excessive to justify it at this time. A City employee (assumed ½ time) and vehicle would have to be dedicated to properly running the program. There would also be advertising and material costs associated with the Program. The sum of these costs makes implementing the Program prohibitive. Attached is an analysis of the costs and economic benefits of implementing this Program.

City of Rio Vista
2010 Urban Water Management Plan

Demand Management Measure Cost-Benefit Analysis

DMM A - Water Survey Programs for Single-Family and Multi-Family Residential Customers

Unit Cost of Water 400 $/MG[a]
130 $/AF

Cost

Employee	$	47.25	per hour[b]
(Salary and Benefits)	$	49,140	per year (half time)
Vehicle Cost	$	6,275	per year[c]
(capital depreciation, insurance, fuel, etc.)			
Materials	$	3,760	per year[d]
(faucets aerators, shower heads, etc.)			
Advertisement	$	400	per year
(flyers, web page development, etc.)			
Sub-Total of Annual Cost of Program	**$**	**59,575**	

Benefit

Single-Family Residence

Number of Single Family Residences	3,600	Units[e]
Number of Persons/Residence	2.3	Persons[f]
Per Capita Daily Water Consumption	314	gallons[g]
Estimated Water Savings per Residence	13	%[h]
Estimated Water Savings per Residence	34,300	gallons

	Predicted Participation		Water Savings	
year 1[i]	8	%	9,878,000	gallons
year 2	7	%	8,644,000	gallons
year 3	3	%	3,704,000	gallons
year 4	1	%	1,235,000	gallons
year 5	1	%	1,235,000	gallons

Sub-Total of Predicted Water Savings	24,696,000	gallons
(Water Savings expected over the 5-year horizon window)	80	acre*feet

Sub-Total of Cost Savings (5-year Horizon)	$	10,400
Average Annual Cost Savings	$	2,080

Multi-Family Residence

Number of Multi-Family Residences	160	Units
Number of Persons/Residence	2.1	Persons
Per Capita Daily Water Consumption	314	gallons
Estimated Water Savings per Residence	3	%
Estimated Water Savings per Residence	7,200	gallons

Predicted Participation		Water Savings	
year 1	8 %	92,000	gallons
year 2	7 %	81,000	gallons
year 3	3 %	35,000	gallons
year 4	1 %	12,000	gallons
year 5	1 %	12,000	gallons

Sub-Total of Predicted Water Savings		232,000	gallons
		0.7	acre*feet
Sub-Total of Cost Savings (5-year Horizon)	$	100	
Average Annual Cost Savings	$	20	
Total Predicted (5 year) Water Savings		80.7	acre*feet

Total of Cost Savings (5-year Horizon)	$	10,500
Average Annual Cost Savings	**$**	**2,100**
Annual Program Budget (Deficit)	**$**	**(57,475)**

Footnotes to DMM A Calculations Worksheet

a. Unit Cost of Water: $400/Million Gallons
See Appendix B of City of Rio Vista Water Meter Retrofit Cost/Benefit Analysis (2012) Prepared by MC Engineering.

b. City Employee Compensation: $47.27/hour
Based on an estimated $35/hour + 33% of hourly wage for fringe benefits

c. Annual Vehicle Cost: $ 6,275 per year
On-line cost-to-own calculators range from $0.20 - $0.50 per mile, not including fuel, for range of cars from compacts to pick-ups

Annual Cost Worksheet

Purchase value:	$	25,000	
Term of use:		10	years
Re-sale value		$3,000	
Annual registration cost:	$	250	
Annual insurance cost:	$	900	
Annual maintenance budget:	$	600	
Annual cost:	$	3,950	
Cost per mile:	$	0.40	
Annual mileage driven:		10,000	miles
Fuel economy:		20	mpg
Fuel cost:	$	4.65	per gallon
Annual fuel cost:	$	2,325	
Total cost per mile:	$	0.63	
Annual vehicle cost:	$	6,275	

d. Materials Cost: $ 3,760 per year
Annual budget set aside for purchasing and providing faucet aerators and low-flow shower heads to program participants.

Cost of facet aerator:	$	10	
Cost of shower head:	$	15	
No. of participating houses:		752	(total no. of houses over time horizon)
Time horizon		5	years
Annual materials cost:	$	3,760	

e. Single-family Residences: 1600
Taken from water billing records. See City of Rio Vista Water Meter Retrofit Cost/Benefit Analysis (2012) Prepared by MC Engineering.

f.	Number of Persons per residence:	2.3	Taken from population data provided in the City of Rio Vista Urban Water Management Plan and the number of metered connections.
g.	Water Consumtion:	314 gallons per capita per day	Taken from data provided in the City of Rio Vista Urban Water Management Plan.
h.	Estimated Water Savings:	13% per residence	Assumed typical value based off data provided in City of San Diego's Residential Water Survey Program. Water savings for single-family residences are expected to be larger than multi-family residences due to the large portion of water use dedicated to exterior irrigation.
i.	Program Time Horizon:	5 years	A 5-year time horizon is considered in this study, which coincides with the period between UWMP updates. It is assumed that the maximum program participation during this 5-year period is 20%. All calculations of program costs and water savings are based on a 20% participation rate.

f.	Number of Persons per residence:	2.3	Taken from population data provided in the City of Rio Vista Urban Water Management Plan and the number of metered connections.
g.	Water Consumtion:	314 gallons per capita per day	Taken from data provided in the City of Rio Vista Urban Water Management Plan.
h.	Estimated Water Savings:	13% per residence	Assumed typical value based off data provided in City of San Diego's Residential Water Survey Program. Water savings for single-family residences are expected to be larger than multi-family residences due to the large portion of water use dedicated to exterior irrigation.
i.	Program Time Horizon:	5 years	A 5-year time horizon is considered in this study, which coincides with the period between UWMP updates. It is assumed that the maximum program participation during this 5-year period is 20%. All calculations of program costs and water savings are based on a 20% participation rate.

DEMAND MANAGEMENT MEASURE F – HIGH EFFICIENCY WASHING MACHINE REBATE PROGRAM

(California Water Code Section 10631 f(1)(F))

The City of Rio Vista has not implemented DMM F and has no plans for implementation at this time. Below is a discussion of DMM F and the analysis used to justify not implementing it.

Authority

As stated in the 2010 Urban Water Management Plan, the City owns and operates eight groundwater wells with a maximum estimated output of 7,400 gallons per minute for potable water use. The City has exclusive rights to these wells and has sole authority to operate these wells.

Program Description

A high-efficiency washing machine rebate program consists of offering a cash incentive from the City to citizens willing to trade in an older, less efficient washing machine for a high-efficiency washing machine with the goal of reducing the total amount of water used in washing clothes. The cash incentive would have to be large enough to entice consumers to give up their functioning machines for new ones that would cost anywhere from $600 to over $2000. For the purpose of this evaluation, the rebate value of $100 is used.

Water Savings

A typical top-loading washing machine uses 40 – 45 gallons of water per wash cycle. The number of wash cycles per day can vary widely from home to home, depending on many factors but mostly on the number of people in the home. In study published by the American Water Works Association Research Foundation entitled *Residential End Uses of Water* (1999), the amount of water used by an average American for washing clothes is 15 gallons per day. This equates to about wash cycle every three days per person.

High-efficiency washing machines vary in the amount of water used per cycle from about 10 gallons per cycle on the low end to about 30 gallons per cycle on the high end. A typical value used for the sake of analysis is 20 gallons per cycle. Using this value of 20 gallons per cycle, a high-efficiency washing machines uses about 45% of the amount of water of a typical top-loading washing machine uses per cycle.

Participation

Predicting participation in the program is difficult. For the sake of analysis, a five-year time horizon and an expected 20% participation are considered. The annual budget for the program would be split evenly

over the five years and an estimated 4% of the household would participate in each of these five years. This equates to 150 residences participating in the program for each of the next five years.

Cost Benefit Analysis

The costs associated with implementing a rebate program include the cost of the rebate itself plus other costs including handling and disposal fees of old washing machines, advertising costs (web page development and/or pamphlets), and administrative costs. For this analysis, an assumed $100 rebate per machine was used and a $500 annual fee for the miscellaneous costs was assumed. Table F below provides a summary of the economic cost-benefit analysis.

Table F. DMM F Cost/Benefit Evaluation

Table F - 10631(g)(2)	
Cost Effectiveness Summary	
Total Costs	**$ 15,500**
Total Benefits	**$ 340**
Discount Rate	**N/A**
Time Horizon	**5 years**
Cost of Water ($ per AF)	**130**
Water Savings (AFY)	**2.6**

A summary of the non-economic factors affecting the High-Efficiency Washing Machine Rebate Program and taken into consideration in this Cost-Benefit analysis is provided in the following paragraphs.

Environmental

The environmental effects of implementing a High-Efficiency Washing Machine Rebate Program in the City would be minimal. As stated previously, the City uses groundwater wells as its potable water source. Surface waters would not be affected by implementing or not implementing the program.

There would be an environmental benefit to implementing the program in the form of reduced electrical power consumption for the production, treatment and distribution of water.

Social

There is a societal benefit in implementing the High-Efficiency Washing Machine Rebate Program. A reduction in the amount of water produced and distributed means a reduction in the amount of money spent on its production. The publicly owned system would see a minimal reduction in power required to pump, treat, and distribute the water.

Implementing the program would also convey to the water users the message that the City is working to conserve water. The extent to which the program would be socially beneficial is not quantifiable, however.

Health

There are no measurable health benefits to either implementing or not implementing the High-Efficiency Washing Machine Rebate Program.

Customer Impact

Water customers that participate in the High-Efficiency Washing Machine Rebate Program would receive a cash incentive to replace an older, less efficient washing machine with a more efficient machine. A considerable investment (from $500 and up) would also be required of the participants to purchase a new high-efficient machine. While there could potentially be a slight reduction in their water bill (depending on the tiered rate structure), the impact to the customers would come more in the knowledge they are making an effort to reduce water consumption.

Technological Factors

Technological advances in the construction of high-efficient washing machines are readily available to consumers. Advances in electronic controls and mechanical components of these machines make them more energy and water efficient than older machines.

Conclusion

While there are some non-economic benefits to implementing a High-Efficiency Washing Machine Rebate Program, the costs of the Program are too excessive to justify it at this time. With an estimated 4% of homes participating in the program in each of the next five years, the costs of distributing the rebates, administering the program, disposing of old machines, and other costs far exceed the social and economic benefits of not implementing the program. Attached is an analysis of the costs and economic benefits of implementing this Program.

City of Rio Vista
2010 Urban Water Management Plan

Demand Management Measure Cost-Benefit Analysis

DMM F - High Efficiency Washing Machine Rebate Program

Unit Cost of Water 400 $/MG[(a)]
130 $/AF

Washing machine cash rebate: $ 100

Number of residences	3760	
Number of persons per residence	2.3	
Average water use in washer	15	gallons per day per capita[(b)]
High-efficiency machine water use	6.75	gallons per day per capita[(c)]
Water savings	8.25	gallons per capita per day

Program participation

Time horizon **5 years**

Predicted Participation		Water Use (Normal)	Water Use (High Efficency)	Water Saved
Year 1	150 res.	5175 gpd	2846 gpd	2329 gpd
Year 2	150 res.	5175 gpd	2846 gpd	2329 gpd
Year 3	150 res.	5175 gpd	2846 gpd	2329 gpd
Year 4	150 res.	5175 gpd	2846 gpd	2329 gpd
Year 5	150 res.	5175 gpd	2846 gpd	2329 gpd

Total water saved: 2329 gpd
850,000 gallons per year
2.6 AF per year

Annual cost savings: **$ 340**

Cost

Time horizon **5 years**

	Predicted Participation	Rebate (Individual)	Rebate (Annual)	Other Costs (Disposal fees, advertisement, administrative, etc.)
Year 1	150 res.	$ 100	$ 15,000	$ 500
Year 2	150 res.	$ 100	$ 15,000	$ 500
Year 3	150 res.	$ 100	$ 15,000	$ 500
Year 4	150 res.	$ 100	$ 15,000	$ 500
Year 5	150 res.	$ 100	$ 15,000	$ 500

Expected annual cost: **$ 15,500**

Footnotes

a.	Unit Cost of Water	See Appendix B of City of Rio Vista Water Meter Retrofit Cost/Benefit Analysis (2012) Prepared by MC Engineering.
b.	Average Water Use	Amercian Water Works Association Research Foundation, *Residential End Uses of Water* , 1999, pp 104 -7
c.	High-efficiency machine use	Based on an average per load reduction in water use of 40%

DEMAND MANAGEMENT MEASURE H – SCHOOL EDUCATION PROGRAM

(California Water Code Section 10631 f(1)(H))

The City of Rio Vista has not implemented DMM H and has no plans for implementation at this time. Below is a discussion of DMM H and the analysis used to justify not implementing it.

Authority

As stated in the 2010 Urban Water Management Plan, the City owns and operates eight groundwater wells with a maximum estimated output of 7,400 gallons per minute for potable water use. The City has exclusive rights to these wells and has sole authority to operate these wells.

Program Description

A School Education Program would consist of publishing and distributing literature to the school-aged children of the City of Rio Vista highlighting ways to reduce water consumption and the consequences of misusing water. The program could also include visits and presentations to schools to educate the children as to where their water comes from, how it is treated, and how to protect the source for future generations. To implement this program, the City would be required to create a pamphlet or brochure template, make sufficient reproductions of the brochure, and distribute them to the local schools. The program could also require a City representative visit the schools for an annual education program.

Water Savings

The projected amount of water saved by implementing is difficult, if not impossible, to quantify. An education program will certainly make children more aware of their water consumption but water use habits are dictated more frequently by how water is used in the home. The types of fixtures in the home and the irrigation and water use habits of the adults in the home have more control over the water consumption in the home.

Education programs are valuable in “planting the seeds” of water conservation in children, but the fruits of these efforts normally won’t ripen until the children leave the home and have more control over their water use habits and decisions.

Participation

It is assumed that all students would become participants in the School Education Program, in that they all would receive printed literature (pamphlets, brochures, etc.) and most would be present for any in-school presentations from City staff covering water conservation. The total student enrollment for the 2010-2011 school year, as given by the River Delta Unified School District, was 1,118 students. This enrollment figure includes the students in the D. H. White Elementary, River View Middle, River Delta High/Elementary, and Rio Vista High schools.

Cost Benefit Analysis

The costs associated with implementing a School Education Program include the cost of developing a brochure for distribution and the cost of reproduction. Table H below provides a summary of the economic cost-benefit analysis.

Table H - 10631(g)(2)	
Cost Effectiveness Summary	
Total Costs	**$ 4,700**
Total Benefits	**Not Available**
Discount Rate	**N/A**
Time Horizon	**5 years**
Cost of Water ($ per AF)	**130**
Water Savings (AFY)	**Not Available**

A summary of the non-economic factors affecting the School Education Program and taken into consideration in this Cost-Benefit analysis is provided in the following paragraphs.

Environmental

The environmental effects of implementing a School Education Program in the City would be minimal. As stated previously, the City uses groundwater wells as its culinary water source. Surface waters would not be affected by implementing or not implementing the program.

The actual amount of water savings, which would affect the power consumption for treatment and distribution, is not quantifiable.

Social

There is a societal benefit in implementing the School Education Program. A reduction in the amount of water produced and distributed means a reduction in the amount of money spent on its production. The publicly owned system would see a minimal reduction in power required to pump, treat, and distribute the water.

Implementing the program would also convey to the water users the message that the City is working to conserve water. The extent to which the program would be socially beneficial is not quantifiable, however it is assumed that the message of water conservation would be a lasting one.

Health

There are no measurable health benefits to either implementing or not implementing the School Education Program.

Customer Impact

The School Education Program would have as much of an impact on the water customers as the customers themselves would allow. If they make individual decisions to use less water in their daily proceedings, they would benefit in a reduced water bill.

Technological Factors

Technological factors affecting the implementation of a School Education Program could include multi-media presentation to school-aged children outlining the water cycle, where their water comes from, why it is important to be aware of how water is used, and what they can do to reduce consumption.

Conclusion

While a School Education Program for reducing water consumption may have an impact on the water use habits of the children as they reach adulthood, the immediate effects are not quantifiable and do not justify implementation of the Program at this time. There are several state-sponsored advertisements on television and radio that reach the school-aged children with more efficacy than a local program would be able to do and the message of conservation is already reaching the public through these campaigns.

City of Rio Vista
2010 Urban Water Management Plan

Demand Management Measure Cost-Benefit Analysis

DMM H - School Education Programs

Unit Cost of Water 400 $/MG[(a)]
130 $/AF

Program Participation

School	**Enrollment**
D. H. White Elementary	465
River View Middle	263
River Delta High/Elementary	10
Rio Vista High	380
Total	1118

Cost

Brochure creation	$	2,500	
Reproduction/distribution	$	2	per pamphlet
	$	2,200	total distribution
Total Annual Cost	**$**	**4,700**	

Benefit

There is no quantifiable benefit to the program

Footnotes

a. Unit Cost of Water — See Appendix B of City of Rio Vista Water Meter Retrofit Cost/Benefit Analysis (2012) Prepared by MC Engineering.

DEMAND MANAGEMENT MEASURE N – RESIDENTIAL ULTRA-LOW-FLUSH TOILET REPLACEMENT PROGRAM

(California Water Code Section 10631 f(1)(N))

The City of Rio Vista has not implemented DMM N and has no plans for implementation at this time. Below is a discussion of DMM N and the analysis used to justify not implementing it.

Authority

As stated in the 2010 Urban Water Management Plan, the City owns and operates eight groundwater wells with a maximum estimated output of 7,400 gallons per minute for potable water use. The City has exclusive rights to these wells and has sole authority to operate these wells.

Program Description

A Residential Ultra-Low-Flush Toilet Replacement Program would consist of offering a rebate to residential water customers toward replacing an old toilet fixture (5 – 6 gallons per flush) with a new, ultra-low-flush fixture (1.6 gpf). The intent of this program is to phase out the older toilets that use much more water per flush to reduce the overall water consumption without changing the daily activities of the water customers.

Toilet Replacement Programs typically include either a cash rebate towards replacing toilet fixtures or offering a free replacement fixture to participants. As part of the program, the program sponsor will collect and dispose of the old fixtures. New ultra-low-flush toilets range in price from about $120 to over $300 per fixture. The program would only be open to customers that were changing out a fixture that used more than five gallons per flush.

Water Savings

As stated above, the typical toilet placed in homes and businesses prior to 1993 used between five and 6 gallons per flush. The ultra-low-flush toilets use 1.6 gallons per flush. This equates to a water savings of between 3.4 and 4.4 gallons for each time the toilet is flushed. In the publication "Residential End Uses of Water" published by the American Water Works Association Research Foundation (1999), which presents the results of an extensive study of residential water use habits of Americans, the mean amount of toilet flushes per capita per day is 5.0. This means that switching from a standard toilet to an ultra-low-flush toilet could reduce the water use by an individual by as much as 22 gallons per day, assuming the amount of flushes remains the same with the new fixture. On average, there are 2.3 residents per home in Rio Vista. This equates to a potential water savings of 50.6 gallons per day for each home that would participate in the Program by changing out all of the standard toilets for ultra-low-flush toilets.

Participation

Participation in the program would be limited to those homes that do not already have ultra-low-flush toilet fixtures in their homes. This would exclude homes that have been constructed since 1993 (when regulations were implemented to require ultra-low-flush toilets) as well as older homes that have already replaced the old toilets.

Construction permit records are only available back to June 1, 1999. Since this date, 1,916 new single family building permits have been approved and homes have been constructed. There are a total of 3,600 single-family in the City, meaning over half of them would have been constructed after the 1993 date and would not be eligible for the Program. For this evaluation, we assume a total of 1,600 residences are eligible for the Program. The participation in the program would be related to the incentive the citizens would receive through participation. For evaluation purposes, we assumed the Program would provide a $100 incentive for participation and 20% of the eligible homes (4% per year for each of the five years in the horizon period) would participate. Participation in the Program would include changing out all of the toilet fixtures in the home with ultra-low-flow toilets.

Cost Benefit Analysis

The costs associated with implementing am Ultra-Low-Flush Toilet Rebate Program include the cost of providing a cash incentive award for participation as well as administrative costs for advertising, implementing and running the program. Table N below provides a summary of the economic cost-benefit analysis.

Table N - 10631(g)(2)	
Cost Effectiveness Summary	
Total Costs	**$ 6,500**
Total Benefits	**$ 393**
Discount Rate	**N/A**
Time Horizon	**5 years**
Cost of Water ($ per AF)	**130**
Water Savings (AFY)	**3.0**

A summary of the non-economic factors affecting the Residential Ultra-Low-Flush Toilet Replacement Program and taken into consideration in this Cost-Benefit analysis is provided in the following paragraphs.

Environmental

The environmental effects of implementing a Residential Ultra-Low-Flush Toilet Replacement Program in the City would be minimal. As stated previously, the City uses groundwater wells as its culinary water source. Surface waters would not be affected by implementing or not implementing the program.

There would be an environmental benefit to implementing the program in the form of reduced electrical power consumption for the production, treatment and distribution of water.

Social

There is a societal benefit in implementing the Residential Ultra-Low-Flush Toilet Replacement Program. A reduction in the amount of water produced and distributed means a reduction in the amount of money spent on its production. The publicly owned system would see a minimal reduction in power required to pump, treat, and distribute the water.

Implementing the program would also convey to the water users the message that the City is working to conserve water. The extent to which the program would be socially beneficial is not quantifiable, however.

Health

There are no measurable health benefits to either implementing or not implementing the Residential Ultra-Low-Flush Toilet Replacement Program.

Customer Impact

Water customers that participate in the Residential Ultra-Low-Flush Toilet Replacement Program would receive a cash incentive to replace older, high volume toilets with new low volume toilets. A cash investment would also be required of the participants to cover the balance of the cost of the replacement toilet, as well as any additional toilets in the house that need to be replaced to qualify for the rebate. While there could potentially be a slight reduction in their water bill (depending on the tiered rate structure), the impact to the customers would come more in the knowledge they are making an effort to reduce water consumption.

Technological Factors

There are no measureable technological factors that affect this program.

Conclusion

While there are some non-economic benefits to implementing a Residential Ultra-Low-Flush Toilet Replacement Program, the costs of the Program are too excessive to justify it at this time. With an estimated 4% of qualifying homes participating in the program in each of the next five years, the costs of distributing the rebates, administering the program, disposing of old toilets, and other costs far exceed the social and economic benefits of not implementing the program. Attached is an analysis of the costs and economic benefits of implementing this Program.

City of Rio Vista
2010 Urban Water Management Plan

Demand Management Measure Cost-Benefit Analysis

DMM N - Residential Ultra-Low-Flush Toilet Replacement Program

Unit Cost of Water	400	$/MG[(a)]
	130	$/AF
Ultra-Low-Flush Toilet Rebate	$ 100	
Number of eligible residences	1600	
Number of persons per residence	2.3	
Average number of flushes per person	5	per day[(b)]
Volumer per flush, standard toilet	5.5	gallons
Volumer per flush, ULF toilet	1.6	gallons
Water savings	3.9	gallons per flush

Program participation

Time horizon **5 years**

Predicted Participation		Water Use (Normal)	Water Use (High Efficency)	Water Saved
Year 1	60 res.	3795 gpd	1104 gpd	2691 gpd
Year 2	60 res.	3795 gpd	1104 gpd	2691 gpd
Year 3	60 res.	3795 gpd	1104 gpd	2691 gpd
Year 4	60 res.	3795 gpd	1104 gpd	2691 gpd
Year 5	60 res.	3795 gpd	1104 gpd	2691 gpd

Total water saved: 2691 gpd
982,000 gallons per year
3.0 AF per year

Annual cost savings: **$ 393**

Cost

Time horizon **5 years**

Predicted Participation		Rebate (Individual)	Rebate (Annual)	Other Costs (Disposal fees, advertisement, administrative, etc.)
Year 1	60 res.	$ 100	$ 6,000	$ 500
Year 2	60 res.	$ 100	$ 6,000	$ 500
Year 3	60 res.	$ 100	$ 6,000	$ 500
Year 4	60 res.	$ 100	$ 6,000	$ 500
Year 5	60 res.	$ 100	$ 6,000	$ 500

Expected annual cost: **$ 6,500**

Footnotes

a. Unit Cost of Water — See Appendix B of City of Rio Vista Water Meter Retrofit Cost/Benefit Analysis (2012) Prepared by MC Engineering.

b. Average Water Use — Amercian Water Works Association Research Foundation, *Residential End Uses of Water* , 1999, pp 96 -7

PUBLIC NOTICE
ADOPTED URGENCY ORDINANCE SUMMARY

NOTICE IS HEREBY GIVEN that the **City Council of the City of Rio Vista adopted Urgency Ordinance No. 006-2015** at its meeting on **July 21, 2015** by roll call vote. In summary, the Urgency Ordinance amends:

> **Section 17.68 of the Rio Vista Municipal Code related to water conservation and landscaping to comply with the California State Water Resources Control Board's adopted mandatory water conservation regulations, and includes, but is not limited to, no lawn/garden watering or other outdoor water use between 9 a.m. and 7 p.m. on any day. Users with odd-numbered street addresses using outdoor water only on Sundays & Wednesdays, and users with even-numbered street addresses using outdoor water only on Saturdays and Tuesdays.**

This ordinance goes into effect immediately upon its adoption.

CEQA: The City Council determined Urgency Ordinance 006-2015 is exempt from review under the California Environmental Quality Act (CEQA). Pursuant to State CEQA Guidelines Section 15307, this Ordinance is covered by the CEQA Categorical Exemption for actions taken to assure the maintenance, restoration, enhancement or protection of a natural resource where the regulatory process involves procedures for protection of the environment. The adoption of this Ordinance will result in the enhancement and protection of water resources and will not result in cumulative adverse environment impacts or any other potentially significant impact described in State CEQA Guidelines Section 15300.2. It is, therefore, exempt from the provisions of CEQA.

AYES:	**Council Members Boulware, Kott McCracken, Vice Mayor Hampton & Mayor Richardson**
NOES:	**None**
ABSTAIN:	**None**
ABSENT:	**None**

Submitted for publication by:
Anna Olea-Moger, CMC, City Clerk
July 22, 2015

[Publish one time in the Daily Republic & the Beacon on Wednesday, July 29, 2015]

ORDINANCE NO. 643

ORDINANCE OF THE CITY OF RIO VISTA ADOPTING A WATER CONSERVATION AND LANDSCAPE ORDINANCE TO BE INCORPORATED AS PART OF TITLE 17 OF THE RIO VISTA MUNICIPAL CODE (ZONING)

WHEREAS, water is a limited and precious resource which is subject to ever-increasing demands; and

WHEREAS, the continuation of Rio Vista's economic well-being and natural character is dependant upon adequate supplies of water being available for future uses; and

WHEREAS, it is the policy of the City of Rio Vista to promote the conservation and efficient use of water and to prevent the waste of this valuable resource; and

WHEREAS, landscapes are essential to the quality of life in Rio Vista by providing areas for active and passive recreation and as an enhancement to the environment by cleaning air and water, preventing erosion, offering fire protection, and replacing vegetation lost to development; and

WHEREAS, as more than half of the water used by local residents is typically used outdoors, landscape design installation and maintenance can and should be water efficient; and

WHEREAS, at its regularly scheduled meetings of December 12, 2007, October 8, 2008, November 12, 2008, and December 10, 2008, the Planning Commission of the City of Rio Vista, after reviewing various alternatives and examples, undertook the preparation of a comprehensive set of regulations and guidelines regarding water-conserving landscaping; and

WHEREAS, at its meeting of December 10, 2008, after hearing staff's report, reviewing the submitted draft ordinance and holding a public hearing, the Planning Commission voted 5-0 (with two members absent) to recommend the adoption of a water-conserving landscaping ordinance; and

WHEREAS, the City Council of the City of Rio Vista reviewed this water conservation and landscape ordinance at its regular meeting of March 19, 2009.

NOW, THEREFORE, the City Council of the City of Rio Vista hereby ordains as follows:

Section 1. The ordinance, attached hereto as Exhibit A, is enacted pursuant to Article 10.8 of Chapter 3 of Division 1 of Title 7 of the Government Code of the State of California and is a local "water efficient landscape ordinance," as specified by said article and may be updated, as needed, to respond to State mandate or local necessity.

Section 2. Chapter 17.68 of the Rio Vista Municipal Code is hereby adopted to read as set forth in **Exhibit A**, attached hereto and incorporated herein by this reference.

Section 3. Findings. The City Council hereby makes the following Findings:

1. The Water Conservation and Landscaping Ordinance was determined to be exempt from CEQA pursuant to CEQA Guideline 15308; and
2. The Ordinance was found to be consistent with the Rio Vista General Plan; and
3. The proposed addition of Chapter 17.68 to Title 17 of the Rio Vista Municipal Code is consistent with the State of California requirements for municipalities to adopt Water Efficient Landscape standards pursuant to Government Code Section 65591 *et seq.*

Section4. Severability. If any section, subsection, sentence, clause, or phrase of the Ordinance is, for any reason, found to be invalid or unconstitutional, such finding shall not affect the remaining portions of this Ordinance. The City Council hereby declares that it would have passed this Ordinance by section, subsection, sentence, clause, or phrase irrespective of the fact that any one or more sections, subsections, sentences, clauses, or phrases are declared unconstitutional.

Section 5. Inconsistency. To the extent that the terms or provisions of this Ordinance may be inconsistent or in conflict with the terms or conditions of any prior City ordinance(s), motion, resolution, rule, or regulation governing the same subject matter thereof, such inconsistent and conflicting provisions of prior ordinances, motions, resolutions, rules, and regulations are hereby repealed. Regulations set forth in the new section and subsections are intended to augment regulations set forth in subsections 17.44.120 and 17.44.130, *Parking facilities and landscaping* and *Landscaping, fences and hedges*, respectively.

Section 6. Effective Date. This Ordinance shall go into effect and be in full force and effect at 12:01 a.m. on the 31st day after its passage.

Introduced at a regular meeting of the City Council held on March 19, 2009, and passed and adopted by the City Council of the City of Rio Vista on April 16, 2009 by the following roll call vote:

AYES: COUNCILMEMBERS Jones, Krebs, Richards, and Mayor Vick
NOES: COUNCILMEMBERS None
ABSENT: COUNCILMEMBERS Norman
ABSTAIN: COUNCILMEMBERS None

Jan Vick, Mayor

ATTEST:

City Clerk

EXHIBIT A

Chapter 17.68

WATER CONSERVATION AND LANDSCAPING

Sections:

17.68.010. Purpose
17.68.020. Applicability
17.68.030. Landscape Plans Required
17.68.040. Landscaping Design Standards and Guidelines
17.68.050. Plant Material and Installation Standards and Guidelines
17.68.060. Irrigation Design Standards and Guidelines
17.68.070. Building Permit and Inspection Requirements
17.68.080. Maintenance Standards and Guidelines for Cultivated Landscape Areas
17.68.090. Requirement for Separate Water Meters
17.68.100. Conflicts
17.68.110. Definitions

17.68.010. Purpose

Water is a limited and precious resource. The purpose of this chapter is to assist the City of Rio Vista in achieving water conservation through proper plant selection, installation, and maintenance practices. The benefits of water conservation and landscape standards are many and diverse. For example, these standards are intended to maintain and improve the quality of development currently being established in the City of Rio Vista and to upgrade the appearance and function of existing developments; to buffer incompatible land uses; and to provide an attractive streetscape to pedestrians, bicyclists, and motorists.

These standards are intended to minimize or soften the visual impact of buildings and parking lots, reduce or eliminate heat and glare, prevent soil erosion, minimize impacts to native wildlife and vegetation, minimize surface runoff and water conservation standards, serve to preserve the City's water resources, and protect water quality. The following xeriscape principles serve as the primary means of achieving water conservation:

A. Appropriate planning and design for local conditions;

B. Limiting turf to locations where it provides functional benefits;

C. Efficient irrigation systems;

D. The use of soil amendments to improve the structural characteristics of the soil;

E. The use of mulches, where appropriate;

F. The use of drought-tolerant plants; and

G. Appropriate and timely maintenance.

17.68.020. Applicability

The provisions of this chapter apply as follows:

A. ***Applicable projects.*** This chapter applies to all new projects for which landscaping is proposed that are subject to use permit or site plan and architectural review, except as exempted under subsections B, C, and D, below. Such projects include: landscaping associated with new commercial, institutional, and mixed-use development; common areas and developer-installed landscaping associated with new multi-family development; front yards and common areas associated with new residential planned unit developments; and common areas and developer-installed, front-yard landscaping associated with single-family development of five or more units. This chapter also applies to replacement landscaping proposed for existing commercial, mixed-use, and multi-family development and to replacement landscaping associated with single-family residences previously subject to the requirements of this chapter.

B. ***Residential exemptions.*** This chapter does not apply to private yard areas within single-family and multi-family developments. While the chapter applies to all requests for building permits for new single-family homes, it does not apply to new single-family homes already completed or under permitted construction on single-family lots created prior to the effective date of the adopting ordinance. Remodel projects for existing, legally conforming, single-family homes and duplexes that entail less than 50% of the structure to be remodeled, as determined by the Community Development Director or his/her designee, are also exempt from the provisions of this chapter. The City encourages landscape designers to follow the provisions of this chapter, regardless of this exemption.

C. ***Discretionary exemptions.*** Schools, parks, playgrounds, common-use areas in multi-family residential developments (e.g., play areas and turf areas intended for passive or active recreational use), sports fields, registered historical sites, and cemeteries may be exempted from the water budget requirements set forth in Sections 17.68.030 and 17.68.060, subject to approval of the Planning Commission.

D. ***Agricultural exemption.*** This chapter does not apply to areas devoted to agricultural cultivation.

E. ***No exemption for wells.*** The presence of a well on-site shall not be considered grounds for exempting a project that is subject to the provisions of this chapter from any of its requirements.

F. ***Exceptions to standard criteria***. If the Zoning Administrator finds a proposed landscape

plan is not in conformance with any of the criteria specified in Sections 17.68.030 through 17.68.090, the permit application shall be disapproved. The Zoning Administrator may elect, instead, to refer the application to the Planning Commission for consideration of an Exception and/or due to the potential controversial nature of the proposal. In order to grant an Exception, the Commission must be able to make all of the following findings:

1. The proposed landscape plan would complement the character of surrounding development, the size of the subject property, and the scale of development on site; and

2. The proposed landscaping would not be injurious to the public health, safety or welfare; and

3. The applicant has successfully demonstrated that the majority of improvements to the site are in conformance with the intent of the code and the exception is necessary due to a hardship unique to the location. Hardship, for the purpose of this finding, shall not be based on economic considerations.

G. ***Appeal by Applicant.*** In the event that the applicant disagrees with an administrative determination on an application, including water budget requirements, the applicant may appeal to the Planning Commission in accordance with Chapter 17.60. of this (the Zoning) Code. The Findings for an Exception stated in subsection F. 1. 2. and 3., above, must also be made for any such appeal(s) to be granted. The applicant may follow the same appeal procedures for application and fees to appeal a decision of the Planning Commission to the City Council.

17.68.030. Landscape Plans Required

A. ***General.*** Prior to the issuance of any building permit for projects subject to this chapter, the necessary landscape plans shall be submitted to, reviewed by, and approved by the Community Development Director or his/her designee. The project applicant shall be required to reimburse the City for staff costs associated with the review and processing of a landscape plan, pursuant to rates set forth in the City Fee Schedule at the time the application is submitted. The landscape plan may be referred to the Planning Commission for Site Plan and Architectural Review.

B. ***Nature of required plans.*** Landscape plans for one existing single-family home or duplex, or for one existing commercial/industrial property developed with a facility less than 10,000 square feet in building footprint, may be prepared by the property or business owner as long as they meet the basic requirement of subsection C, set forth below. For landscape projects associated with larger projects, the plans shall be prepared by a landscape architect, a certified irrigation consultant, or a licensed contractor.

C. ***Contents of landscape plans.*** Landscape plans shall include the following items:

1. A written summary statement addressing compliance with applicable provisions of this chapter.

2. A planting plan, drawn to scale and showing geographic North, setting forth the following items, as applicable to the project:

   a. All landscape features, including areas of vegetation to be preserved, in context with property lines and street names.

   b. The location and outline of existing and proposed buildings, and other improvements (fences, utilities, paved areas, etc.) on the site, if any.

   c. Existing and proposed parking spaces, other vehicular areas, access aisles, driveways, and similar features;

   d. All plant materials, designated by name and location, to be installed, preserved, or removed.

   e. The boundaries of each hydrozone.

   f. A legend including the botanical name, common name, container size, spacing if applicable, and quantities of all plant material to be installed.

   g. Existing trees to be preserved or removed, labeled by name and size.

   h. The location and characteristics of all other landscape materials to be used.

3. A tabulation clearly displaying the relevant statistical information necessary for the Community Development Director or Planning Commission to evaluate compliance with the provisions of this chapter, which at a minimum shall include the following:

   a. The gross landscape area in square feet, square footage of paved areas, and the number of trees to be planted and/or preserved,

   b. The Annual Water Budget allowed for the project area, calculated in accordance with Section 17.68.060 (Irrigation Design Standards and Guidelines), and a tabulated estimate of the amount of water use per year (in CCF units) necessary for long-term maintenance based on estimated water needs following the establishment of the landscaping. This estimate shall be prepared in accordance with the Landscape Coefficient Method described in the most recent edition of the Water Use Classification of Landscape Species (WUCOLS) guide (available from the California Department of Water Resources) and shall document estimated water use for each hydrozone based on water use by plant type, planting density, and microclimate.

c. Other such information that may be required by the Community Development Director or Planning Commission that is reasonable and necessary to determine that the landscape plan meets the requirements of this chapter.

17.68.040. Landscaping Design Standards and Guidelines

A. ***Site development concepts for water conservation.*** The following site development concepts shall be applied to applicable projects in order to promote water conservation:

1. The preservation of existing plant communities.
2. The reestablishment of native plant communities.
3. Limited amount of lawn grass areas.
4. The use of site-specific and drought-tolerant plant materials.
5. Site development that retains storm water runoff on site.
6. The use of pervious paving materials.

B. ***Use of site-specific and adapted planting materials.*** Plants used in the landscape design shall to the greatest extent feasible:

1. Be appropriate to the conditions in which they are to be planted.
2. Encourage low maintenance, high-quality design.
3. Be otherwise consistent with the intent of this chapter.

Additionally, the use of plant materials adapted to the local microclimate is encouraged in order to reduce water consumption, general maintenance, and dependence on fertilizers and insecticides.

C. ***Lawn grass (turf) areas.***

1. *General.* A major portion of water demand used for landscape purposes is required for the irrigation of lawn areas. Properly managed non-grass landscape developments of site-specific plantings will typically be able to survive on a reduced water requirement and survive drought conditions better than lawn areas. For that reason, portions of landscaped areas that have been customarily designed as lawns shall be:

   a. Preserved as native plant communities;
   b. Planted as redeveloped native or locally-adapted drought tolerant areas; and/or
   c. Planted in mixes of trees, shrubs, and ground covers at a low density.

2. *Selection of grass species.* Only drought-tolerant turf varieties suitable to the local climate shall be used.

3. *Slope limitation.* Lawn grass shall not be planted on slopes that exceed 10%, unless otherwise authorized by the Community Development Director or the Planning Commission to address special situations (e.g., berms and erosion control).

4. *Windy conditions.* Winds in the Rio Vista area can bend, break, and/or disfigure plants and trees. The following standards will help to reduce damage and waste of landscaping investments:

a. A survey shall be performed by a landscaper to determine the prevailing wind directions in the area and plant vegetative barriers, where possible, to reduce wind effect.
b. Larger shrubs can and should be used to reduce effect on ground cover and small, flowering shrubs. Gardening publications such as the *Sunset Western Garden Book* shall be consulted to identify planting materials that thrive despite windy conditions.
c. Trees shall be staked with flexible material to allow root development to respond to windy conditions while training the young tree to grow upright.
d. The specifications in Section 17.68.060 (D)(2) for required irrigation methods shall be followed.
e. Turf shall not be placed immediately adjacent to hardscape areas (such as sidewalks and roadways) as water will spread onto non-vegetated areas during windy conditions. Typical turf design for windy areas will be curved with a drought tolerant vegetative or non-vegetative ground cover located immediately adjacent to hardscape areas.
f. Drought tolerant ground cover shall be utilized to replace large landscaped areas that would historically have been landscaped with high water demand turf. Living (drought tolerant) ground cover is able to retain soils better and is more attractive in the long-term because non-living mulch is more likely to be wind borne away for landscaped areas.

5. *Riverfront conditions.* The stormwater drains throughout the City lead to the Sacramento River, and the City obtains its primary source of potable water from its ground water aquifer. In addition, pollution impacts local plant and wildlife species, which help to promote the local economy (an example being the bass population) and the aesthetics of the City. Consequently, pollution prevention measures are necessary to protect contamination of these resources. The following standards shall help to prevent pollution:

a. Design for on-site rainwater graywater use. Where possible, projects shall be designed so that rainwater shed from rooflines flows to landscaping rather than the storm drain sewer. This is especially important near driveway and parking aisles as the oils and pollutants from motorized vehicles will be carried by the rainwater into the storm drain system and then to the Sacramento River.

b. Mulch plantings, and continue to maintain mulching as this not only protects plants from drought conditions but reduces the impact of pests and the need for pesticides, which are carried by watering and rainfall to the River and may infiltrate the City's ground water.

6. *Trees.* Trees conserve energy by shading and provide pollution filtering, oxygen and a pleasant appearance to the streetscape. Tree planting shall comply with the following standards:

   a. Existing trees shall be retained and preserved whenever feasible.
   b. Trees located in landscape planters or within 10 feet of a permanent structure or twenty feet of a sidewalk or roadway shall be installed with root barriers.
   c. Number of trees:
      (1) Parking areas: Trees shall be provided and maintained or replaced upon failure to thrive, within parking areas at a minimum ratio of one tree for each five parking spaces.
      (2) Street trees: One tree per 200 square feet of landscaped area with a minimum of one every 20 feet of commercial frontage and one per 30 feet of residential frontage (which every is more stringent). Street tree type must be approved by the Public Works Director.

17.68.050. Plant Material and Installation Standards and Guidelines

A. ***Amendment of planting soil.*** Urban soils that do not contain organic matter, are compacted, or eroded are often lifeless or do not contain needed nutrients for the proposed landscaping and have lost their ability to absorb water or filter pollutants out of the water. Prior to the installation of plant materials, a soils report shall be prepared, and soils within areas to be landscaped shall be amended in accordance with findings for all new development within the City; this requirement may be required for remodel projects as set forth in subsection 17.68.020(B), above.

B. ***Use of organic mulches.*** The use of organic mulches reduces the growth of weeds and adds nutrients to the soil as well as retains moisture over the root zones of plant materials. The following minimum standard may be modified subject to the approval of the Planning Commission in the course of its review of a landscaping plan:

1. *Application Specifications.* A minimum of two inches of organic mulch shall be placed over all newly installed tree, shrub and ground cover planting areas, unless otherwise approved by the Planning Commission. No impervious materials shall be used under the mulch.

17.68.060. Irrigation Design Standards and Guidelines

A. ***Irrigation systems required.*** Landscaped areas shall be irrigated by the use of an automatic irrigation system with controllers set to apply water as noted in this Section. High-water and low-water use areas shall be separately circuited as noted below. Rainfall sensing devices shall be required in order to avoid operation of the system during periods of increased rainfall.

B. ***Annual water budget.*** The irrigation system shall use an amount of water less than or equal to the allowable Annual Water Budget for each applicable project area. The allowable Annual Water Budget shall be determined by multiplying the total square footage of planting area by 0.257. This results in the number of units of 100 cubic feet water allowed per year within the planting area. The above multiplier was arrived by the following formula:

AWB = 55 x .75 x PA x .00623, where:

AWB = Annual Water Budget, also known as maximum water allowance;
55 = ETo, Average of Annual Reference Evapotranspiration in inches per month for the Sacramento River Delta region;
.75 = Local ETo adjustment factor;
PA = Total Planting Area in square feet; and,
.00623 = Conversion factor into 100 cubic feet.

C. ***Hydrozoning and scheduling of irrigation systems.*** Water-efficient landscaping is best accomplished by the use of hydrozones in planting and irrigation design. Therefore, the following standards shall be considered the minimum requirements for landscape irrigation design within the City of Rio Vista.

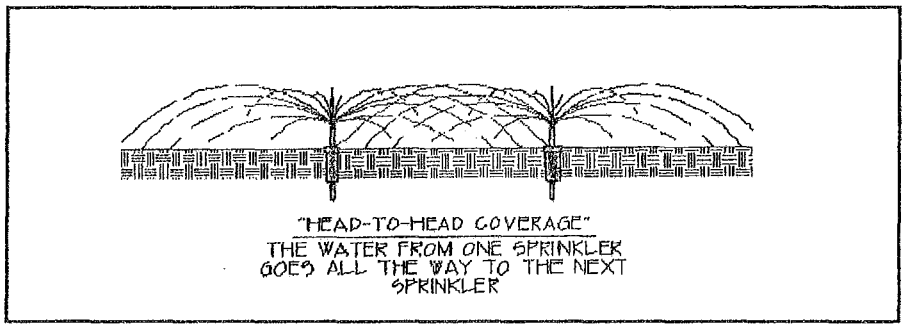
1. *Sprinkler Zoning.* Irrigation fixtures shall be separately circuited in conformance with the hydrozones defined on the landscaping plan.

2. *Control Systems.* Automatically controlled irrigation systems shall be operated by an irrigation controller that is able to irrigate high-water-requirement areas, such as turf, on a different schedule from low-water-requirement areas. The controller shall be rescheduled as necessary and required to respond to a change of seasons and water demand, as well as the change from an establishment period for a newly-installed landscape to a long-term maintenance schedule.

D. ***Irrigation system design guidelines.*** Landscape irrigation systems shall incorporate the following design principles in order to maximize efficiency and reduce maintenance needs:

1. *Impervious Areas.* Sprinkler heads shall be selected and located to avoid direct overthrow onto impervious areas such as concrete sidewalks, patio pad areas, asphalt parking areas or roadway surfaces.

2. *Wind Control.* The use of low-trajectory spray nozzles and drip irrigation systems will reduce the effect of wind velocity on the irrigation system. The spacing of sprinklers on the upwind edge of irrigated areas shall be tightened. For spray type sprinklers, a maximum distance of 12 feet is recommended. Rotor type sprinklers require closer spacing and generally require overlap of the spray line. On an upwind edge, more sprinkler heads are preferable to fewer.



3. *Matched precipitation sprinklers.* Sprinklers with matched precipitation rates will help ensure uniformity in water application.

4. *Low precipitation sprinklers.* The use of low-precipitation sprinklers will help match water application to soil infiltration rates and reduce run-off.

5. *Check valves.* The use of check valves prevents the problem of water drainage from low elevation sprinkler heads and helps avoid problems caused by the introduction of air into the irrigation lines.

6. *Master valve and excess flow sensing devices.* These features help prevent water loss from malfunctioning valves or broken irrigation lines.

7. *Slopes.* Irrigation design should take slopes into consideration in order to avoid run-off.

17.68.070. Building Permit and Inspection Requirements

A. ***Building Permit Required.*** A building permit shall be required for landscaping plans developed pursuant and subject to this chapter. The building permit plans shall include the landscaping plan as approved by the Community Development Director or the Planning Commission and an irrigation plan that includes the following:

1. The location, types, and sizes of all components of the irrigation system, including electronic controllers, main lateral lines, valves, application devices, rain shut off and moisture sensors, backflow preventers, etc.
2. The plan shall distinguish each irrigation circuit (or zone), and show valve size, flow rate in gallons per minute, and sprinkler precipitation rates.
3. Where possible, the landscape plan shall utilize drip irrigation systems.

B. Permit Requirements. Once landscaping subject to the provisions of this chapter has been installed, approval of the building permit and/or issuance of an occupancy permit shall be contingent upon the following:

1. An inspection performed by planning staff to review the landscaping for conformance with the approved plans; and

2. The submittal of a letter, signed by the property owner, verifying compliance with the provisions of this chapter and agreeing to provide ongoing maintenance of the landscaping and associated irrigation system.

17.68.080. Maintenance Standards and Guidelines for Cultivated Landscape Areas

A. ***General.*** The owner or assignee of land subject to this chapter shall be responsible for the maintenance of said land in good condition so as to present a healthy, neat, and orderly landscape area.

B. ***Replacement requirements.*** Vegetation that is required to be planted or preserved by this chapter shall be replaced with equivalent vegetation if it is not living within one year of issuance of a certificate of occupancy.

C. ***Requirement for on-going maintenance.*** The required mulch layer shall be maintained on all landscape projects. Landscaped areas subject to the provisions of this chapter shall be maintained in a healthy, pest-free condition.

D. ***Watering.***

1. *General.* All watering of planted areas shall be managed so as to conserve water and maintain healthy flora.

2. *Operation of Irrigation Systems.* Following the establishment of a landscape area, overhead irrigation systems shall be operated between the hours of 7:00 p.m. and 7:00 a.m. or as required by the City of Rio Vista Engineer, whichever is more stringent.

3. *Maintenance of Irrigation Systems.* Irrigation systems shall be maintained as necessary to eliminate waste of water due to loss of heads, broken pipes, or misadjusted nozzles.

17.68.090. Requirement for Separate Water Meters

In all new commercial development subject to the provisions of this chapter, a separate water meter shall be required for the purpose of landscaping. A separate water meter shall also be required for common areas associated with new residential condominiums and planned unit developments.

17.68.100. Conflicts

If the provisions of this chapter conflict with other ordinances or regulations, the more stringent limitation or requirement shall govern or prevail to the extent of the conflict.

17.68.110. Definitions

The following definitions apply to chapter 17.68:

Annual Water Budget. (AWB) The maximum amount of water per year permitted to be used to irrigate the applicable portion of a project site. The AWB is determined by a calculation outlined in subsection 17.68.060 of this chapter.

Cultivated landscape area. Planted areas that are frequently maintained by mowing, irrigating, pruning, fertilizing, etc.

Development. Any proposed material change in the use or character or the land, including, but not limited to, land clearing or the placement of any structure or site improvements on the land.

Ground cover. Plants, other than turf grass, normally reaching an average maximum height of not more than 24 inches at maturity.

Hydrozone: An area of landscaping having a consistent water use requirement and served with a single irrigation valve zone.

Irrigation system. A permanent, artificial watering system designed to transport and distribute water to plants.

Landscaping. Any combination of living plants (such as grass, ground cover, shrubs, vines, hedges, or trees) and nonliving hardscape materials or elements (such as rocks, pebbles, sand, mulch, walls, fences decks, patios, or decorative paving materials).

Mulch. Nonliving organic and synthetic materials customarily used in landscape design to retard erosion, retain moisture, and reduce weed growth.

Open space. Open space shall be interpreted to mean:

A. All areas of natural plant communities or area replanted with vegetation after construction, such as re-vegetated natural areas; tree, shrub, hedge or ground cover planting areas, and lawns; and
B. Other areas allowed to be counted as open space as per the City of Rio Vista Zoning Ordinance.

Replacement Landscaping. Replacement landscaping means the replacement of 50% or more of an existing landscaped area (or combination of areas on a single parcel) having a minimum

size of 1,000 square feet with new landscape materials that substantially differ in type, size, or water consumption.

Shrub. A self-supporting woody perennial plant of low to medium height characterized by multiple stems and branches continuous from the base, usually not more than 10 feet in height at its maturity.

Site-specific planting. The selection of plant material that is particularly well suited to withstand the physical growing conditions that are normal for that location.

Tree. Any self-supporting woody perennial plant which has a DBH (diameter at breast height) of two inches or more and which normally attains an overall height of at least 15 feet at maturity, usually with one main stem or trunk and many branches. It may appear to have several stems or trunks as in several varieties of oak.

Vegetation, native. Any plant species with a geographic distribution indigenous to all or part of Solano County. (Plant species which have been introduced by man are not native vegetation.)

Yard, front. A front or street-side yard as defined in Title 17 of the Rio Vista Municipal Code.

Yard, private. A yard area, not otherwise defined as a front or street-side yard, associated with a single residential unit and intended for the private use of a household.

Xeriscape. Landscaping methods that conserve water through the use of drought-tolerant plants and planting techniques, as well as the design of irrigation systems.

I, CAROLYN PARKINSON, INTERIM CITY CLERK OF THE CITY OF RIO VISTA, do attest the above and foregoing to be a true copy of Ordinance 643 of the City Council of the City of Rio Vista. That said ordinance was passed, approved and adopted at a regular meeting of the City Council on April 16, 2009 by the following roll-call vote:

AYES:	COUNCILMEMBERS	Jones, Krebs, Richards, and Mayor Vick
NOES:	COUNCILMEMBERS	None
ABSENT:	COUNCILMEMBERS	Norman

WITNESS my hand and seal of said City this 16th day of April, 2009

ATTEST:

Carolyn Parkinson

Carolyn Parkinson, MMC
Interim City Clerk

CITY OF RIO VISTA

WATER CONSERVATION URGENCY ORDINANCE

REVISION

Adopted by the Rio Vista City Council on JULY 21, 2015

PLEASE KEEP FOR FUTURE REFERENCE

Section 3. Section 17.68.025 Water and Resource Conservation is hereby amended to read as follows:

A. The penalties for the waste of water and the procedures to impose such penalties are specified in Chapter 13.04.190. Acts constituting a waste of water are as follows:

1. Failure to comply with the following schedule when watering lawns, plants, or garden, or using outdoor water for other irrigation purposes.

   a. No lawn/garden watering, or other outdoor water use, will be allowed between **nine o'clock (9:00 A.M.) and seven o'clock (7:00 P.M.) on any day.**

   b. Subject to the limitations set forth in Section 17.68.025(A)(1)(a), users with odd-numbered street addresses shall use outdoor water only on Sundays and Wednesdays.

   c. Subject to the limitations set forth in Section 17.68.025(A)(1)(a), users with even-numbered street addresses shall use outdoor water only on Saturdays and Tuesdays.

   d. The Director of Public Works or his or her designee may waive the requirements of Sections 17.68.025(A)(1)(a)-(c) if such waiver is necessary for health or safety reasons, as evidenced by the water user, and to the Director's satisfaction. In no case shall any user water more than two (2) days a week.

2. Watering lawns or gardens such that excess water leaves the property or area being watered.

3. Watering outdoor landscaping while raining, or within forty-eight (48) hours after measurable rainfall.

4. Washing vehicles, equipment or boats on days that do not coincide with irrigation times and days for the address where the vehicle is being

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washed, or using an open hose which is not equipped with a shut-off nozzle.

5. Hosing down driveways, streets, parking lots, and building exteriors without the consent of the Director of Public Works or his or her designee except for valid health or safety reasons.

6. Having leaky faucets or plumbing fixtures on the premises.

7. Having improper connections to the City water system or on site faucets or hose bibs without a properly installed and maintained reduced pressure backflow device to prevent contamination of the potable water supply (i.e.: a RV may not connect to a residential faucet without a certified reduced pressure backflow device that is properly installed, maintained and annually inspected).

8. Operating evaporated coolers which are not equipped with a re-circulating pump.

9. The use of potable water in a fountain or other decorative water feature, except where the water is part of a re-circulating system.

10. The irrigation with potable water of ornamental turf on public street medians.

11. The irrigation with potable water of landscapes outside of newly constructed homes and buildings in a manner inconsistent with regulations or other requirements established by the California Building Standards Commission and the Department of Housing and Community Development.

12. The washing of a car, boat, trailer, or other mobile equipment except at a commercial car wash, using only reclaimed water, or by using a bucket or a water-hose equipped with an automatic shutoff nozzle.

ORDINANCE NO. 02-2014

AN ORDINANCE OF THE CITY OF RIO VISTA AMENDING CHAPTER 17.68 OF THE RIO VISTA MUNICIPAL CODE RELATED TO WATER CONSERVATION AND LANDSCAPING

WHEREAS, water is a limited and precious resource which is subject to ever-increasing demands; and

WHEREAS, based on on-going drought conditions, the Rio Vista City Council declares that a water shortage exists and that water use within the City should be reduced by at least twenty percent; and

WHEREAS, the continuation of Rio Vista's economic well-being and natural character is dependent upon adequate supplies of water being available for future uses; and

WHEREAS, it is the policy of the City to promote the conservation and efficient use of water, and to prevent the waste of this valuable resource; and

WHEREAS, while the City has a water waste ordinance that specifies penalties for wasting water, the ordinance does not specifically define actions that are considered a waste of water.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF RIO VISTA DOES ORDAIN AS FOLLOWS:

Section 1. Section 17.68.025 Water and Resource Conservation is hereby added to read as follows:

A. The penalties for the waste of water and the procedures to impose such penalties are specified in Chapter 13.04.190. Acts constituting a waste of water are as follows:

1. Except when performed with a bucket or watering can, or by use of a drip irrigation system or similar low volume, non-spray irrigation equipment, or for very short periods of time for the express purpose of allowing landscape contractors to adjust or repair an irrigation system; failure to comply with the following schedule when watering lawns, plants, or garden, or using outdoor water for other purposes.

a. No lawn/garden watering, or other outdoor water use, will be allowed between twelve o'clock (12:00 P.M.) noon and seven o'clock (7:00 P.M.) on any day.

b. Subject to the limitations set forth in Section 17.68.025(A)(1)(a), users with odd-numbered street addresses shall use outdoor water only on Sundays, Wednesdays, and Fridays.

c. Subject to the limitations set forth in Section 17.68.025(A)(1)(a), users with even-numbered street addresses shall use outdoor water only on Tuesday, Thursdays and Saturdays.

d. No user may water outdoors on Mondays unless the Director of Public Works or his or her designee determines that health and safety reasons necessitate such water use. In no case shall any facility water more than three (3) days a week.

2. Watering lawns or gardens such that excess water leaves the property or area being watered.

3. Watering outdoor landscaping while raining.

4. Washing vehicles, equipment or boats on days that do not coincide with irrigation times and days for the address where the vehicle is being washed, or using an open hose which is not equipped with a shut-off nozzle.

5. Hosing down driveways, streets, parking lots, and building exteriors without the consent of the Director of Public Works or his or her designee except for valid health or safety reasons.

6. Having leaky faucets or plumbing fixtures on the premises.

7. Having improper connections to the City water system or on site faucets or hose bibs without a properly installed and maintained reduced pressure backflow device to prevent contamination of the potable water supply (i.e.: a RV may not connect to a residential faucet without a certified reduced pressure backflow device that is properly installed, maintained and annually inspected).

8. Operating evaporated coolers which are not equipped with a recirculating pump.

B. To ensure all water use is paid for by the user in a timely manner, and is therefore, not wasted, the City may hold the property owner of record liable for all unpaid water fees. This requirement is in addition to the joint and several liability requirements outlined in Section 13.04.135. In a form provided by the City, the property owner of record may provide that it is the tenant's responsibility to pay for water use. However, the property owner of record would remain liable for any unpaid water fees in the event that the tenant fails to pay for water use.

Section 2. Publication. The City Clerk shall certify the passage of this ordinance and cause a summary of this ordinance to be published after its passage, with the names of those members of the City Council voting for and against the ordinance, in a newspaper of general circulation, published and circulated in the City in accordance with Section 36933 of the Government Code. The full text of this ordinance will be available for viewing in the City Clerk's Office.

Section 3. Severability. If any section, subsection, sentence, clause, or phrase of this ordinance is, for any reason, found to be invalid or unconstitutional, such finding shall not affect the remaining portions of this ordinance. The City Council hereby declares that it would have passed this ordinance by section, subsection, sentence, clause, or phrase irrespective of the fact that any one or more sections, subsections, sentences, clauses, or phrases are declared unconstitutional.

Section 4. Effective Date. This ordinance shall go into effect and be in full force and effect at 12:01 a.m. on the 31st day after its passage.

Section 5. This ordinance was introduced at a meeting of the City Council held on June 17, 2014, and **PASSED** and **ADOPTED** by the City Council of the City of Rio Vista on the **1st** day of **July**, 2014.

AYES: **Council Members Hampton, Kubli, McCracken, Vice Mayor Boulware & Mayor RIchardson**
NOES: **None**
ABSENT: **None**
ABSTAIN: **None**

Norman Richardson, Mayor

ATTEST:

Anna Olea-Moger, CMC, City Clerk

City of Rio Vista
Northwest Wastewater Treatment Facility

Recycled Water Use Feasibility Study

Prepared By: Joseph DiGiorgio, P.E.

Reviewed By: Robert Emerick, Ph.D., P.E.

Date: January 21, 2013

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.



1.1 Introduction

This feasibility Study provides an update to the 2004 City of Rio Vista evaluation of the economic feasibility of reclaiming Northwest Wastewater Treatment Facility (NWTF) effluent on the Trilogy Golf Course, and for other possible uses. This Study is prepared to comply with Regional Board Order No. R5-2010-0081 (VI. PROVISIONS.C.1.g, and 2.b) and is only intended to provide an indication of potential economic feasibility for recycled water use project(s), or to rule them out with the least expenditures of City funds. Therefore, much of this analysis is cursory to avoid spending resources on more in-depth analysis if easily identifiable costs clearly exceed the value to the local ratepayers. However, if any NWTF recycled water projects are later pursued, a much more detailed project report and facilities plan must be performed to further refine the specific project(s) costs presented in this feasibility study.

Even with likely understated cost assumptions this study finds the existing Rio Vista ratepayers would have to shoulder millions of dollars in up front and operational costs above the value of the recycled water to irrigate the Trilogy golf course. In addition, the salinity of water necessarily percolating to groundwater beneath the golf course (or any other irrigated landscape or agricultural use) would be approximately 30%, or more, saline with the use of recycled water compared to using the existing well water. As the State develops new salinity management regulations (i.e. via the SWRCB Recycled Water Policy and the CV-SALTS stakeholder program) this added salinity may require significant mitigation efforts by Rio Vista citizens (ie,

water softener removal programs, or expensive salt removal processes such as reverse osmosis treatment). Therefore this study concludes NWTF recycled water use projects are not feasible in the near future, and at the current wastewater flows, without significant funding from outside sources (i.e. grants, or large industrial user funds); and, furthermore the evolving State regulations concerning salinity management must be further defined so that full salinity mitigation costs can be known before such a significant investment is made.

At this time there are no known other credibly feasible effluent reclamation uses in the vicinity of the NWTF. As an example, there are no credible uses for significant volumes of reclaimed water at the nearby Rio Vista airport. Therefore, this report focuses only on the most potentially feasible effluent use, irrigation of the Trilogy Golf Course, which historically used effluent from the now defunct Trilogy Wastewater Treatment Plant. Although effluent was used historically on the Trilogy Golf Course, that use was troubled by persistent effluent runoff problems. These runoff problems would have to be corrected before effluent reclamation could again occur at this golf course.

A “Purple Pipe” mainline suitable for conveying recycled water was installed in Airport Road, along the frontage to the NWTF, to facilitate later recycled water use if an interested user is identified along that corridor. However, there are no purple pipe installations for landscape and median usage beyond the main pipe installed in Airport Road, so significant irrigation of landscapes and medians with recycled water is not generally feasible throughout the City.

1.2 Value of the Recycled Water

Regional Water Board Order No. R5-2010-0081 is very specific as to what is to be evaluated in this Study, “the Study shall complete the evaluation based on the observed maximum discharge of 0.2 mgd.” Therefore, based on a roughly 6-month dry weather irrigation season, the approximate volume of effluent available for reclamation (without the expense of winter storage and stored effluent retreatment prior to use) is less than 36 Mgal. The total amount of groundwater pumped by Trilogy to irrigate the golf course (and maintain the water features) is typically around 130 Mgal/year. A monthly breakdown of this groundwater use and the amount of dry season effluent potentially available to reduce this use is presented in Attachment A.

As shown in Attachment A, reclaiming dry season effluent could reduce groundwater pumping by about 30 percent in a typical year. The incremental annual cost savings resulting from this reduction in annual groundwater production is estimated to be $14,400/year, based primarily on the cost of delivered potable water cited by the most recent City of Rio Vista UWMP DMM Analyses. The 20-year present worth of the true “time value” of this annual savings (at a net 2 percent rate of interest, an estimate of the difference between interest and inflation) is estimated to be $250,000. Therefore, if the 20-year present worth of the cost of permitting, production, and delivery of the recycled water is less than or equal to $250,000, the value of the water provided could cover the cost of the recycled water program, without funding from other sources. Alternatively, if the cost of construction of facilities and permitting necessary for delivery of recycled water alone significantly exceed $250,000, the program would require either

grant or ratepayer funds to be sustainable. Added operational costs (i.e., additional power usage for unrestricted Title 22 reuse disinfection) would also require ratepayer funds to be sustained.

1.3 Potential Costs and Savings

Reclaiming effluent for 6 months of the year would appear to have the potential to reduce City NPDES-specific monitoring costs by about 50 percent. This would be the case if 1) the dry season six months covered two calendar quarters rather than three, and 2) if effluent was never discharged to the river during the dry season six months, e.g., the effluent was stored on rain days and other days when the golf course could not use effluent for irrigation purposes. To assure no river discharge during the dry season would require a roughly one million gallon storage tank with a total present worth cost of more than $1 million. This cost far exceeds any monitoring cost savings. Therefore no firm material savings in monitoring costs can be assumed when the effluent discharge to the river will continue to occur in the dry season on a stop and start basis, which requires additional intermittent specific monitoring efforts. Additionally any NPDES-specific monitoring costs savings are offset to some extent by Title 22 tertiary recycled water use monitoring requirements (e.g., daily coliform tests rather than weekly). Thus, the total savings resulting from six months of effluent reclamation that is available to plan, design, permit, build, and operate for 20 years an effluent reclamation project at Trilogy is estimated to be the $250,000 in reduced water production costs at Trilogy Golf Course.

Considering the current recession and City financial matters, there are no additional City funds available to subsidize effluent reclamation at this time. To be feasible for the City, an effluent reclamation project must be self-funding, i.e., truly cost-effective, unless grant funds are available to make up the difference in capital costs and any additional operational costs to the City. The City has not identified any available grant funds for this small effluent reclamation project.

Reconnaissance estimates of costs to plan, design, permit, and build a seasonal 0.2 Mgal/d ADWF effluent reclamation system for Trilogy Golf Course are presented in Attachment B. As shown, the costs to design and build the reclamation pump station at NWTF and approximately 3,000-feet of additional piping to convey recycled water to the Trilogy Golf Course irrigation pump station (two major costs relatively easy to estimate accurately) exceeds $2.3 million, which taken alone far exceeds the value of the groundwater saved over 20 years. Furthermore, the substantial additional costs of 1) modifying and permitting NWTF for Title 22 reclamation, 2) modifying and permitting the Trilogy Golf Course for effluent, 3) meeting Title 22 Engineering Report Transmission and Use Area maintenance and staff training requirements (including cross-connection control), 4) operating the system (including increased power for UV disinfection), etc. only further supports the City's conclusion that reclamation of NWTF effluent on the Trilogy Golf Course is not cost effective at this time.

1.4 Salinity Assessment

In addition to the above cost analysis, a cursory salinity analysis similar to that required by the current State Recycled Water Policy shows that the quality of water that must necessarily percolate to groundwater beneath the golf course would become much more saline if recycled water is used. Current potable water salinity data, and NWWTF effluent water quality, as well as estimated percolate water quality are presented in Attachment C. For the measured constituents Total Dissolved Solids (TDS), Chloride, and Boron the evapo-transpirative concentration of irrigation water produces percolate water quality above currently cited water quality objectives. If recycled water is used, the salinity concentration percolating to groundwater in a typical year is increased an additional 30%. If salinity must be removed from wastewater to comply with future salinity discharge limitations, the costs to mitigate this additional salinity alone may well exceed all costs identified in this evaluation, making the project even less feasible under current regulations.

Attachment A

Attachment A

Evaluation of the Value of Local Recycled Water Resources

Month	Calculated Typical Water Production by Trilogy Golf Course [a], Mgal	Typical NWTF Dry Season Effluent Production [b], Mgal	Effluent as a % of Trilogy Water Use
January	0	----	----
February	0	----	----
March	9	----	----
April	15	----	----
May	20	6	30
June	21	6	29
July	22	6	27
August	18	6	33
September	15	6	40
October	8	6	75
November	0	----	----
December	0	----	----
Total	128	36	28

Value of 36 Mgal at $400 per Mgal [c] = $14,400 (per year)

Present worth value, financed by Value of Water over 20 years [d] = $250,000

(a) Based on 100 acres irrigated, ETc Table for Irrigation Scheduling and Design, Zone 14 Monthly Evapotranspiration, Sprinkler Irrigation Typical Year, Turf Grass Reference, IRRIGATION TRAINING AND RESEARCH CENTER, California Polytechnic State University, San Luis Obispo.

(b) Based on 0.2 Mgal per day

(c) Based on City of Rio Vista 2010 UWMP DMM analysis, $130 per Acre-Foot, cost of potable water production

(d) 2% net interest rate

Attachment B

Attachment B
Estimated Cost of Effluent Reclamation Projects

Preliminary Planning:

Cost Elements	Reconnaissance Cost Estimate, $
Planning Phase (to refine assumptions and costs of this feasibility study):	
• Determine needed monitoring, alarm, and other upgrades to the NWTF to meet full Title 22 tertiary standards.	5,000
• Layout 1) the reclamation pump station, day tank, force main size, and alignment, and 2) the connection to the Trilogy Golf Course irrigation system and Airport Road piping.	10,000
• Determine the improvements needed to bring the Trilogy Golf Course up to current effluent reclamation standards.	5,000
• Develop a preliminary estimate of the design, permitting, construction, and operation costs and savings of implementing an effluent reclamation project.	5,000
• Present the project to the Rio Vista City Council and Trilogy Golf Course for consideration.	5,000
Reconnaissance Estimate of Preliminary Planning Costs	***$30,000***

Permitting Phase:

Cost Elements	Reconnaissance Cost Estimate, $
• Trilogy groundwater quality and effluent reclamation impact assessment (assume no new monitoring wells)	20,000
• Division of Water Rights application to remove effluent from the Sacramento River, including CEQA document	5,000
• Anti-Degradation Analysis, including Salt and Nutrient Management Plans.	20,000
• Title 22 Engineering Report covering production, distribution, and use of recycled water, including on-going training of use area staff, cross-connection, control program, maintenance of distribution piping records, etc.	40,000
• Incremental increase in costs to file a Report of Waste Discharge to permit effluent reclamation on Trilogy Golf Course, including all permit related negotiations and hearings.	15,000
• Present worth value of Cross Connection Control Program, Use Area staff training and safely programs, maintenance of distribution piping records, etc.	100,000
• Title 22 effluent monitoring (assumed to be covered by savings in the NPDES effluent monitoring).	0
Reconnaissance Estimate of Permitting Phase Costs	***$200,000***

Design Phase:

Cost Elements	Reconnaissance Cost Estimate, $
• Upgrades to NWTF to produce full Title 22 tertiary effluent.	50,000
• Pump station and force main from NWTF to Trilogy Golf Course including all ancillary facilities.	100,000
• Modifications to the Trilogy Golf Course irrigation pump station.	30,000
• Place holder guess at costs to design modifications to the Trilogy Golf Course irrigation system and runoff control facilities to prevent effluent runoff and meet all other Title 22 Engineering Report and Regional water Board requirements.	30,000
• Bid related costs	20,000
Reconnaissance Estimate of Design Phase Costs	***$230,000***

Construction Phase:

Cost Elements	Reconnaissance Cost Estimate, $
• Upgrades to NWTF to full Title 22 tertiary effluent standards	500,000
• 0.5 Mgal/d effluent pump station	100,000
• 0.2 Mgal day tank	250,000
• 2,000 feet of 8-inch force main	300,000
• Modification of the Trilogy Golf Course irrigation pump station to receive effluent with the effluent being discharged to the existing pump station, not the forebay water hazard pond (which over flows in storm events)	50,000
• Place holder guess at golf course irrigation system and/or runoff control modifications.	250,000
• Construction management, inspection, surveys, engineering services during construction, etc. (30%)	435,000
Reconnaissance Estimate of Construction Phase Costs Exceed	***$1,900,000***

Total Estimated Planning, Permitting, Design and Construction Costs Exceed $2,300,000.

Ongoing increased operational costs not evaluated for this feasibility study as above costs alone show the projects are not feasible at the present time.

Attachment C

Attachment C
Reconnaissance Recycled Water Salinity Assessment

		January inches	February inches	March inches	April inches	May inches	June inches	July inches	August inches	September inches	October inches	November inches	December inches	**Annual inches**
Precipitation	*a*	8.2	0.3	0.8	0.3	0.4	0.4	0.1	0.3	0.3	0.8	4.9	2.7	**19.6**
Run-off	*b*	2.5										1.5	0.8	**4.8**
Percolated Precipitation	*c*	5.8										3.4	1.9	**11.1**
Total Applied Irrigation Water				3.3	5.5	7.2	7.7	8.3	6.8	5.5	3.0			**47.3**
Applied Recycled Water	*d*			2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2			**17.6**
Applied Potable Makeup Wat	*d*			1.1	3.3	5.0	5.5	6.1	4.6	3.3	0.8			**29.7**

		Chloride (mg/l)	**TDS (mg/l)**	**Boron (mg/L)**
Potable Water		60	410	0.8
Recycled Water		150	730	1.2
Potable Water Irrigation Only				
Estimated Percolate Qualit	*e*	120	850	1.6
Potable and Recyceld Water Irrigation				
Estimated Percolate Quali	*e*	**190**	**1100**	**2.0**
Water Quality Objective	*f*	106	500	0.7

a *1997 (Typical Year)*
b *0.7 run-off in wet months*
c *Precipitation less run-off and ET in wet months, assumed zero salinity*
d *For recycled water scenario potable water and recycled water blended*
e *Irrigation efficiency 0.75, higher efficiency implys higher salinity*
f *Agricultural Objective based on most sensitive crop, Ayers and Wescott*

J3

Water Supply Assessment,
November 2023

WATER SUPPLY ASSESSMENT
FOR
THE BRANN RANCH PROJECT
RIO VISTA, CA

NOVEMBER 2023



PREPARED FOR:
THE CITY OF RIO VISTA
PUBLIC WORKS DEPARTMENT

PREPARED BY:

DILLON & MURPHY
ENGINEERING

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Brann Ranch Preliminary Site Plan

1. INTRODUCTION

This Water Supply Assessment (WSA) was prepared for the proposed Brann Ranch Project (Project) located in Rio Vista, CA. This WSA contains the data and analysis required by California State Senate Bill 610 (SB 610). The intent of SB 610 is to ensure that information on water supply availability is considered in connection with certain land use decisions made by cities and counties.

The proposed Project satisfies the statutory definition of a “project” for the purpose of determining SB 610 applicability because it is “a proposed residential development of more than 500 dwelling units” (as defined in Water Code Section 10912 (a)(1)).

Under SB 610, a WSA must be furnished to local governments for inclusion in the environmental documentation for certain projects that are subject to the California Environmental Quality Act (CEQA). The proposed Project has been determined to be subject to CEQA by the lead agency, The City of Rio Vista. This report provides technical support to the City of Rio Vista in complying with CEQA and developing an Environmental Impact Report (EIR) for this project.

1.1 PROJECT LOCATION AND DESCRIPTION

The City of Rio Vista has a population of approximately 10,500 with 5,600 water service connections. The City is the operator of the public water system that will provide water to the proposed Project.

The Brann Ranch Project is approximately 321 acres located in Rio Vista, CA. The project site is located north of Highway 12, west of Liberty Island Road/Providence Path, and south of McCormack Road. The Projects Assessor’s Parcel Numbers (APN) are: 0048-110-060, 0048-110-460, 0048-110-470, 0048-110-480, 0048-110-490, and 0048-110-100. See Figure 2 – Project Location Map.

The Project proposes approximately 1,200 single family residential units, 11.8 acres of commercial/retail/mixed uses, 85.3 acres of open space, and 18.6 acres of parks. See Table 1 for land use totals. The Project is estimated to increase the City population by 3,600 over the next 20 years.

At buildout total potable water demand for this Project is estimated to be 452 acre-feet per year and 45 acre-feet per year of recycled water for irrigation.

1.2 OBJECTIVE

The objective of the Brann Ranch WSA is to verify that the planned water supplies of the City of Rio Vista are sufficient to meet the demands of the Project plus other existing and planned future uses of the identified water supply. In compliance with SB 610, this WSA examines the availability of the identified water supply under normal-year, single-dry-year, and multiple-dry-year conditions over a 20-year projection.

A foundational document for preparation of the WSA is the City of Rio Vista 2020 Urban Water Management Plan (UWMP). The 2020 UWMP provided an update to the 2015 UWMP. The water demand for the Project is accounted for in the UWMP because it is consistent with the

existing general plan designation and zoning of the site, Planned Unit Development (PUD). The 2020 UWMP used the City of Rio Vista Water System Evaluation Final Draft 2019 (Water System Evaluation) for demand estimates and projections. The UWMP projects the future water use and supply in 5-year increments by scaling existing metered water use within its service area with population growth trends.

2. PROJECT WATER DEMAND AND SUPPLY

This section addresses water demands for the proposed land uses of the Project. Both potable and recycled water will meet the water demands for this Project. The primary water use will be for domestic water supplied with potable water and irrigation supplied by recycled water.

2.1 EXISTING WATER USE

The Project site is zoned for planned unit development. Historically it was used as residential and agricultural land and was not served by the City of Rio Vista water system. Existing water use is 0 acre feet per year.

2.2 ESTIMATED FUTURE DEMAND

Using the information from the UWMP and Water System Evaluation an estimated calculation of the proposed water demands based on the proposed land use is presented in Table 1 below.

Table 1 – Brann Ranch Estimated Water Demand

LAND USE TABLE							
LAND USE TABLE	**ACRES (AC)**	**DWELLING UNITS (DU)**	**GPD/ DU (1)**	**GPD/ AC (2)**	**TOTAL GPD**	**TOTAL GPY**	**TOTAL AFY**
RESIDENTIAL	114.9	1,200	330		396,000	144,540,000	444
ROADS	90.5			0	0	0	0
OPEN SPACE	85.3			0	0	0	0
COMMERCIAL-NEIGHBORHOOD SERVICE/MIXED USE	2 .4			600	1,440	525,600	2
COMMERCIAL	9.4			600	5,640	2,058,600	6
LIFT STATION/WATER WELL SITES	0.3			0	0	0	0
PARKS (3)	18.6			0	0	0	45
TOTALS	**321.4**	**1,200**			**403,080**	**147,124,200**	**497**

NOTES:

(1) CALCULATED GPD/DU FROM 2019 WATER SYSTEM EVALUATION

(2) CALCULATED GPD/AC FROM 2019 WATER SYSTEM EVALUATION

(3) PARK IRRIGATION TO BE SUPPLIED BY RECYCLED WATER, CALCULATED BY SWRCB OUTDOOR WATER OBJECTIVES

GPD = GALLONS PER DAY, GPY = GALLONS PER YEAR, AFY = ACRE FEET PER YEAR

AF = ACRE FEET, 1 ACRE-FOOT = 325,851 GALLONS

Based on the above calculations, the estimated projected annual water demand for the proposed Brann Ranch Project is 452 AF per year of potable water and 45 AF per year of recycled water.

2.3 ESTIMATED FUTURE RECYCLED WATER USE

The proposed Project intends to use reclaimed/recycled water for park irrigation. The annual recycled water demand for park irrigation is 45 AF and was estimated using the SWRCB Outdoor Water Use Objective (0.55 X square footage X Net reference evapotranspiration X .62 conversion factor).

The City of Rio Vista is currently planning on upgrading the UV system at the Northwest Wastewater Treatment Plant (NWWWTP) to meet Title 22 requirements. Once the NWWWTP is upgraded, the City will supply recycled water to be used for park irrigation. There is existing infrastructure in place to convey recycled water to the proposed Project boundary.

The Project development will install the required infrastructure for recycled water and will be responsible to connect to the existing recycled water infrastructure. If recycled water is not available by the time the project is completed the City can supply the irrigation demand of 45 acre-feet per year with potable water.

3. CITY OF RIO VISTA WATER SYSTEM DEMAND

This section summarizes water demands for the City of Rio Vista service area. The section describes the factors affecting total water demand, including climate, population, and customer types such as residential, commercial, and industrial. The water demands are documented for normal climate conditions in this section and dry year conditions in section 4.

3.1 CLIMATE

Climate has a considerable influence on water demand on a seasonal and annual basis, especially outdoor water use for landscape irrigation. Table 2 below summarizes the 2010-2022 monthly average climate data for the City from the California irrigation Management Information System (CIMIS) station 140 – Twitchell Island.

Table 2 – City of Rio Vista Climate Data

MONTHS	Average Total ET0 (in) (2010-2022)	Average Total Precipitation (in) (2010-2022)	Average Max Temp (F) (2010-2022)	Average Min Temp (F) (2010-2022)	Average Temp (F) (2010-2022)
JANUARY	1.4	1.9	57.8	38.0	47.0
FEBRUARY	2.4	1.6	63.5	40.3	51.3
MARCH	3.8	2.2	67.1	44.1	55.3
APRIL	5.7	1.0	71.9	48.3	59.5
MAY	7.6	0.3	77.2	52.4	64.1
JUNE	8.7	0.1	85.6	57.9	71.0
JULY	8.9	0.0	88.3	59.1	72.5
AUGUST	7.8	0.0	88.2	59.3	72.2
SEPTEMBER	5.9	0.1	86.9	57.2	71.0
OCTOBER	4.0	0.9	79.5	50.2	63.9
NOVEMBER	2.0	1.5	66.3	41.0	52.8
DECEMBER	1.3	3.4	57.6	38.0	46.9
ANNUAL	**59.6**	**13.1**			

Source: California Irrigation Management Information Systems from Station 140, Twitchell Island (https://cimis.water.ca.gov/)
Notes:
ET0 = evapotranspiration

3.2 POPULATION

The City of Rio Vista analyzed current and future population projections in its 2020 UWMP. Population projections were provided by Solano County Water Agency – Partner Agency 2020-2045 Population Projections Memorandum. Table 3 below reproduces the UWMP Table 3-1: Retail Population – Current and Projected for the City's water service area with projections to 2045. The proposed project is estimated to add 3,600 to the City's population over the next 20 years, which is consistent with the population projection from the UWMP.

Table 3 – City of Rio Vista Population

	ACTUAL POPULATION				PROJECTED POPULATION				
YEAR	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
POPULATION	6,797	7,360	8,245	9,987	10,987	12,088	13,298	14,630	14,830

Source: 2020 UWMP Table 3-1, SCWA 2020-2045 Population Projections

3.3 CURRENT AND PROJECTED WATER USE SECTORS AND WATER DEMAND

Table 4 below documents the historical water demand for the City's service area by water use type for 2005 – 2020 and its projected use from 2025 – 2045. This table combines the following tables from the 2020 UWMP: Table 4-1: Demands for Potable, Table 4-2: Use for Potable Water – Projected, and Table 4-3: Total Water Use (Potable and Non-Potable).

Table 4 – Historical and Projected Water Demand by Water Use Type

WATER USE TYPE	DEMAND VOLUME (AF)								
	ACTUAL				PROJECTED				
	2005 [(1)]	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
SINGLE-FAMILY RESIDENTIAL	1,509	2,217	1,384	1,417	1,671	1,839	2,023	2,225	2,256
MULTI-FAMILY RESIDENTIAL	84	123	87	80	103	113	124	137	139
COMMERCIAL & INSTITUTIONAL	48	71	80	405	478	525	578	636	645
INDUSTRIAL	1	2	2	4	5	5	6	6	6
LANDSCAPE			25	41	48	53	58	64	64
LOSSES			215	78	83	92	101	111	113
RECYCLED WATER					62	142	236	330	424
OTHER	4	6							
TOTAL	**1,647**	**2,419**	**1,793**	**2,025**	**2,450**	**2,769**	**3,126**	**3,509**	**3,647**

Source: 2010, 2015, 2020 UWMP Table 4-1,4-2, AND 4-3

[(1)] Use breakdown estimated for 2005

The projected water demand is primarily based on population growth and land use projections. It is assumed that the water demand would increase in proportion to population. The potable and recycled water demand for this project are within the increases projected by the UWMP. Recycled water demand is included in these projected growth estimates.

4. CITY OF RIO VISTA WATER SYSTEM SUPPLY

This section summarizes the City of Rio Vista's water supply. The City water distribution system consists of pipes, groundwater wells, storage tanks (reservoirs), and booster pumps stations. The pipes range from 4-inch to 16-inch in diameter. The system includes a total of 6 groundwater wells with capacities ranging from 400 gpm to 1,400 gpm that are actively producing high quality water for the City. A total of 2 above ground storage tanks (Reservoir #1 and Reservoir #2) with a total capacity of 4 million gallons (MG) serve the system. A condition of Project approval will be the installation of a 1,000 gpm domestic water supply well at the project site to meet the demands of the project.

The City relies on groundwater from the Solano Subbasin as its sole source of water. The Project will be supplied by groundwater. Figure 3 shows the Solano subbasin.

4.1 GROUNDWATER SUPPLY

The City draws its water supply from the Solano Subbasin (5-021.66) at the southeastern limit of the Sacramento Valley Groundwater Basin (5-021). This groundwater basin is a medium priority subbasin and is not adjudicated per the 2020 DWR Bulletin 118.

4.1.1 SOLANO SUBBASIN

The Solano Subbasin is bounded by the Sacramento River to the east, Putah Creek on the north, and the North Mokelumne and San Joaquin rivers on the south and southeast. The western edge of the basin is defined by the hydrologic divide between the Sacramento River and the San Francisco Bay drainages. The Suisun-Fairfield groundwater basin lies immediately to the west of the Solano Subbasin. The Solano Subbasin also contains at least two distinct freshwater- bearing zones: an upper alluvial layer, ranging from 60-130 feet thick; and the thicker Tehama formation, which provides most of the groundwater used in the area. Additional saline water- bearing formations underlie the Tehama formation. Primary waterways in and bordering the basin include the Sacramento, Mokelumne, and San Joaquin Rivers, the Sacramento River Deep Water Ship Channel, and Putah Creek.

Wells in the upper alluvium can provide substantial yields when situated near the Sacramento River; otherwise, these shallower wells can be relatively low yielding. Most wells in the Solano Subbasin tap the Tehama formation, which ranges from 1,500-2,500 feet thick, and can also provide very high yields of several thousand gallons per minute per well.

4.1.2 GROUNDWATER MANAGEMENT

The Solano Subbasin is comprised of five Groundwater Sustainability Agencies (GSA): City of Vacaville GSA, Northern Delta GSA, Sacramento County GSA, Solano Irrigation District GSA, and the Solano Subbasin GSA. The City of Rio Vista is a member of the Solano Subbasin GSA. The City is engaged in groundwater monitoring and study efforts as a participant of the GSA. The Solano Subbasin has implemented the Groundwater Sustainability Plan (GSP) in 2022. The Solano Subbasin GSA provides annual water reports in compliance with the GSP.

The Annual Report – Water year 2022 contains detailed information about groundwater management including groundwater monitoring, groundwater conditions, water budgets, change in groundwater storage, and assessment of sustainability.

4.1.3 AVAILABLE GROUNDWATER

The City commissioned ENGEO Incorporated to prepare a 2002 report titled Groundwater Evaluation for Rio Vista. The report reevaluated the groundwater basin in and around the City limits to help determine the future capability of providing water for existing and planned developments. The report concludes that the groundwater basin will likely meet the future groundwater demands established by the projected population growth for the next 20 years. An updated groundwater report was developed in 2016 that concluded that groundwater levels are stable and not declining, consistent with previous investigations. Since February 2005, the City has contracted with ENGEO to collect and analyze well monitoring data. This monitoring indicates that groundwater levels at various wells may fluctuate during particular months or seasonally according to the City's operational use of its array of wells, but that overall, well levels and trends remain stable. ENGEO provides annual Water Well Elevation Data Reports to the City.

4.2 WATER SUPPLY IN NORMAL AND DRY YEARS

Table 5 below documents the historical water supply for the City's service area by supply type for 2005 – 2020 and its projected supply from 2025 – 2045. This table reproduces the 2020 UWMP: Table 6-9: Water Supplies.

Table 5 – Historical and Projected Water Supply

SUPPLY TYPE	WATER SUPPLY VOLUME (AF)								
	ACTUAL				PROJECTED				
	2005	2010	2015	2020	2025	2030	2035	2040	2045
GROUNDWATER	1,647	2,419	1,793	2,025	3,052	3,358	3,694	4,064	4,120
RECYCLED WATER	0	0	0	0	62	142	236	330	424
TOTAL	**1,647**	**2,419**	**1,793**	**2,025**	**3,114**	**3,500**	**3,930**	**4,394**	**4,544**

Source: 2010, 2015 2020 UWMP Table 6-9

Table 6 below compares the amount of water supply and demand during normal conditions projected from 2025-2045. This table reproduces the 2020 UWMP: Table 7-2: Normal Year Supply and Demand Comparison.

Table 6 – Normal Year Supply and Demand Comparison

NORMAL YEAR SUPPLY AND DEMAND COMPARISON (AF)					
	2025	**2030**	**2035**	**2040**	**2045**
SUPPLY TOTALS	3,114	3,500	3,930	4,394	4,544
DEMAND TOTALS	2,450	2,769	3,126	3,509	3,647
DIFFERENCE	**664**	**731**	**804**	**885**	**897**

Source: 2020 UWMP Table 7-2

Table 7 below compares the amount of water supply and demand during a single dry year projected from 2025-2045. This table reproduces the 2020 UWMP: Table 7-3: Dry Year Supply and Demand Comparison.

Table 7 – Single Dry Year Supply and Demand Comparison

DRY YEAR SUPPLY AND DEMAND COMPARISON (AF)					
	2025	**2030**	**2035**	**2040**	**2045**
SUPPLY TOTALS	2,228	2,451	2,696	2,966	3,007
DEMAND TOTALS	2,228	2,451	2,696	2,966	3,007
DIFFERENCE	**0**	**0**	**0**	**0**	**0**

Source: 2020 UWMP Table 7-3

Table 8 below compares the amount of water supply and demand during multiple dry years projected from 2025-2045. This table reproduces the 2020 UWMP: Table 7-4: Multiple Dry Years Supply and Demand Comparison.

Table 8 – Multiple Dry Years Supply and Demand Comparison

MULTIPLE DRY YEARS SUPPLY AND DEMAND COMPARISON (AF)						
		2025	**2030**	**2035**	**2040**	**2045**
FIRST YEAR	SUPPLY TOTALS	2,388	2,627	2,890	3,179	3,223
	DEMAND TOTALS	2,388	2,627	2,890	3,179	3,223
	DIFFERENCE	**0**	**0**	**0**	**0**	**0**
SECOND YEAR	SUPPLY TOTALS	2,301	2,532	2,785	3,064	3,106
	DEMAND TOTALS	2,301	2,532	2,785	3,064	3,106
	DIFFERENCE	**0**	**0**	**0**	**0**	**0**
THIRD YEAR	SUPPLY TOTALS	2,228	2,451	2,696	2,966	3,007
	DEMAND TOTALS	2,228	2,451	2,696	2,966	3,007
	DIFFERENCE	**0**	**0**	**0**	**0**	**0**
FOURTH YEAR	SUPPLY TOTALS	2,166	2,383	2,622	2,884	2,924
	DEMAND TOTALS	2,166	2,383	2,622	2,884	2,924
	DIFFERENCE	**0**	**0**	**0**	**0**	**0**
FIFTH YEAR	SUPPLY TOTALS	2,092	2,302	2,535	3,786	2,824
	DEMAND TOTALS	2,092	2,302	2,535	3,786	2,824
	DIFFERENCE	**0**	**0**	**0**	**0**	**0**

Source: 2020 UWMP Table 7-4

5. SUPPLY AND DEMAND COMPARISON

The WSA compares water supply and demand for the City of Rio Vista over the next 20 years. Tables 7, 8, and 9 show water supply and demand projections for the City of Rio Vista service area in five-year increments from 2025 – 2045 for normal, dry, and multiple dry years. These tables are based on the assumptions outlined in the 2020 UWMP. The projected Project demands are consistent with the projected future demands per the 2020 UWMP.

The City has sufficient potable water supply to meet the proposed Project demand of 497 acre-feet per year. If recycled water is not available by the time the project is completed the City can supply the irrigation demand of 45 acre-feet per year with potable water. There is sufficient supply for irrigation demand until recycled water is available.

6. CONCLUSION

Based on the analysis in the WSA, the City of Rio Vista's water supply will meet the proposed Project water demands in combination with the existing and other planned uses within the City's service area. The WSA findings are consistent with the 2020 UWMP and other documents referenced.

7. REFERENCES

Among other reports, data, and City files, the City relied on the following sources for preparation of the Water Supply Assessment:

California Department of Water Resources. *California's Groundwater: Bulletin 118-80*. https://water.ca.gov/Programs/Groundwater-Management/Bulletin-118

California Irrigation Management Information System. Station 140, Twitchell Island. Accessed October 2023. https://cimis.water.ca.gov/Default.aspx

City of Rio Vista. 2001. *City of Rio Vista General Plan 2001*.

City of Rio Vista. May 2022. 2020 Urban Water Management Plan. Completed by Dillon & Murphy Engineering

NV5. City of Rio Vista Water System Evaluation Final Draft. February 2019.

ENGEO. Hydrologic Progress Reports and Evaluations. 2005-present.

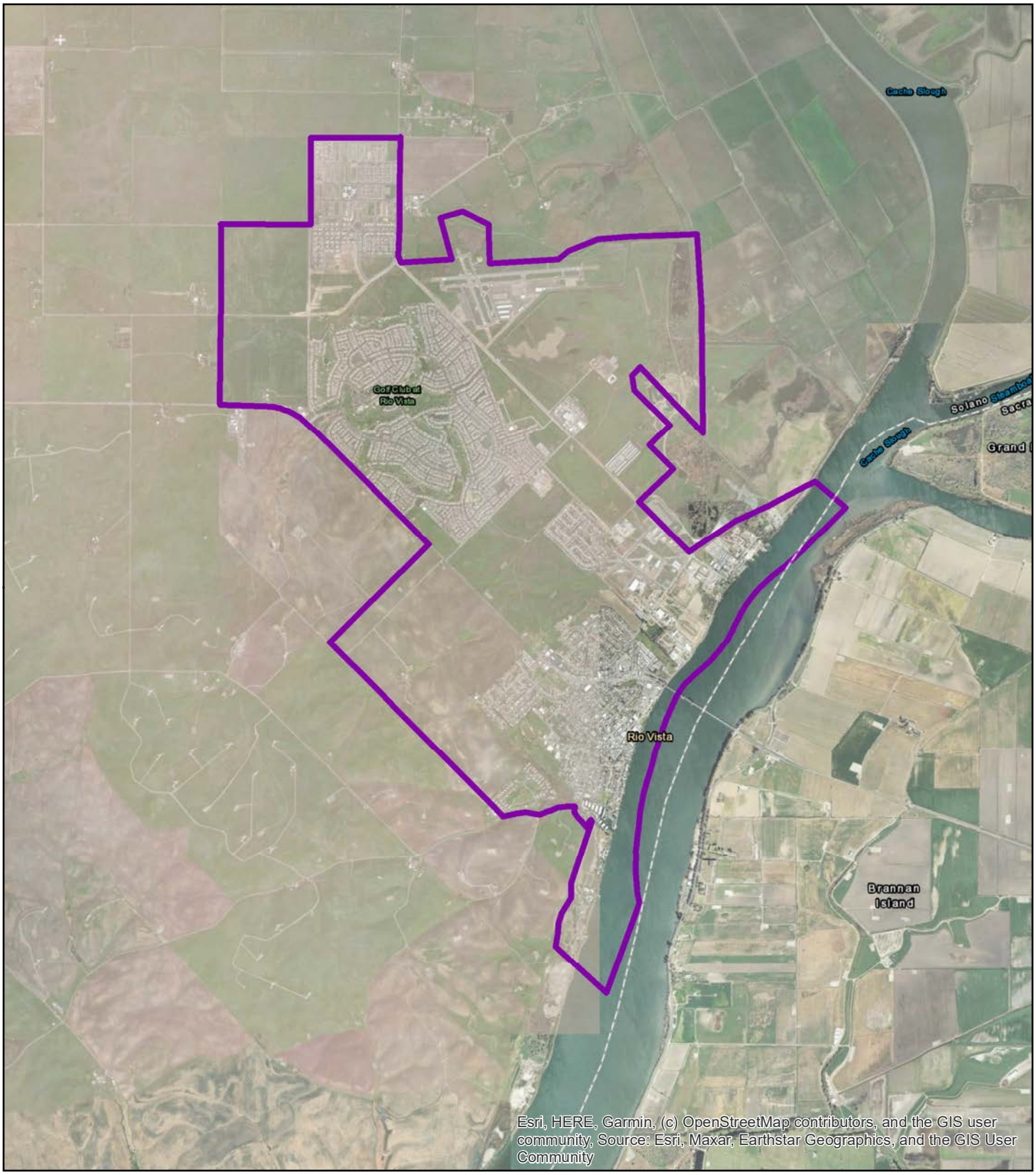
ENGEO. Groundwater Instrumentation Analysis, City of Rio Vista. May 10, 2016 - present.

ENGEO. Groundwater Evaluation, City of Rio Vista. May 6, 2016.

Solano County Water Agency. 2021. SCWA – Partner Agency 2020-2045 Population Projections. Prepared by Kennedy Jenks Consultants Inc.

Solano County Water Agency. November 2021. Solano Subbasin Groundwater Sustainability Plan Prepared by Luhdorff & Scalmanini Consulting Engineers, Inc.

Solano County Water Agency. March 2023. Solano County and Solano Subbasin Groundwater Sustainability Annual Report – Water Year 2022. Prepared by Luhdorff & Scalmanini Consulting Engineers, Inc.



DOCUMENT PATH: S:\D&M_GIS_Projects\Rio Vista\R21232023 SERVICE AREA BOUNDARY MAP.mxd

FIGURE 1 – CITY OF RIO VISTA WATER SERVICE AREA

Legend

SERVICE AREA

CITY OF RIO VISTA
PUBLIC WATER SYSTEM 4810004
SERVICE AREA

N

0 950 1,900 3,800
Feet

DILLON & MURPHY ENGINEERING

NOVEMBER 2023

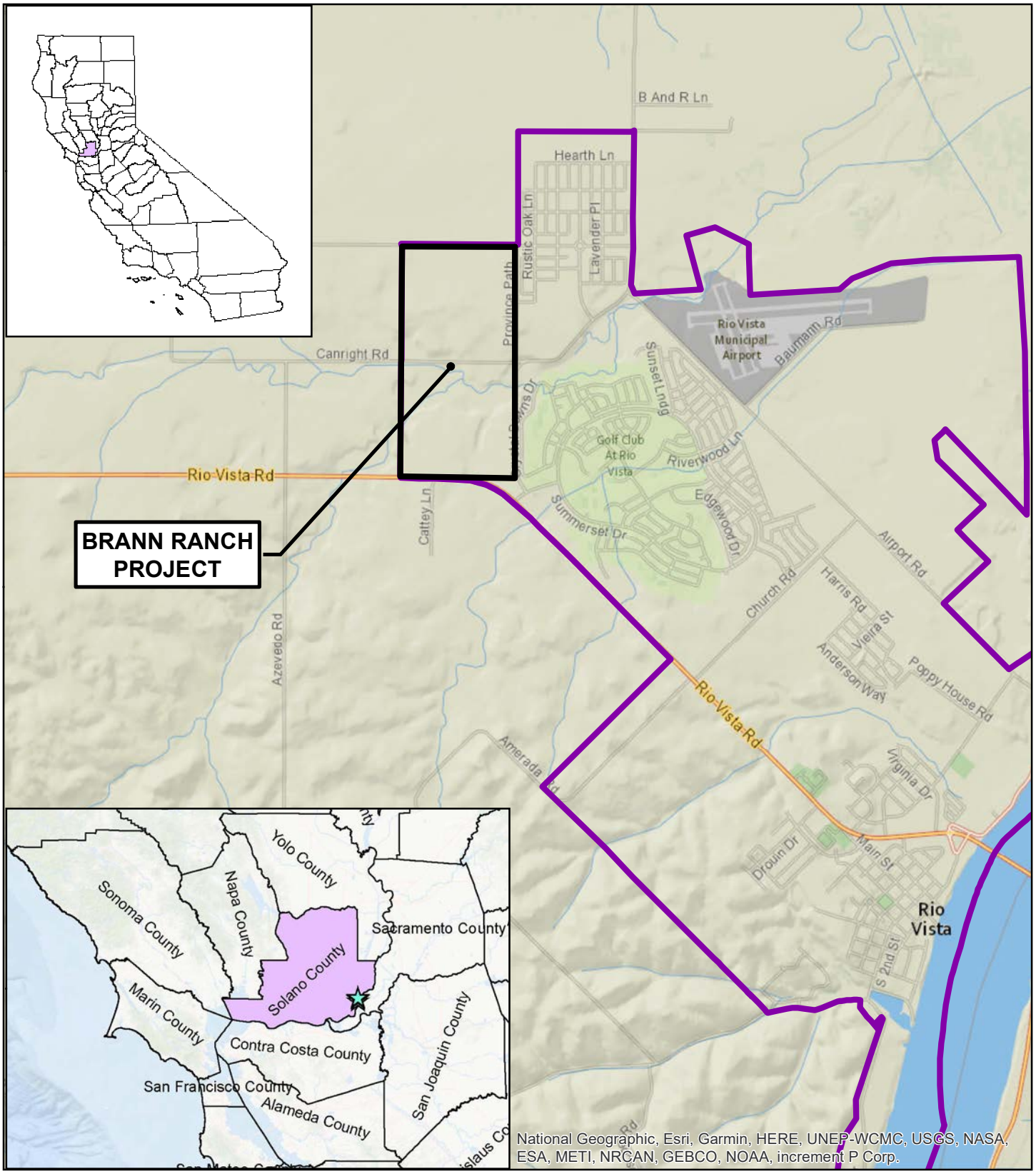


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FIGURE 2 - BRANN RANCH PROJECT LOCATION MAP

Legend

BRANN RANCH PROJECT

SERVICE AREA

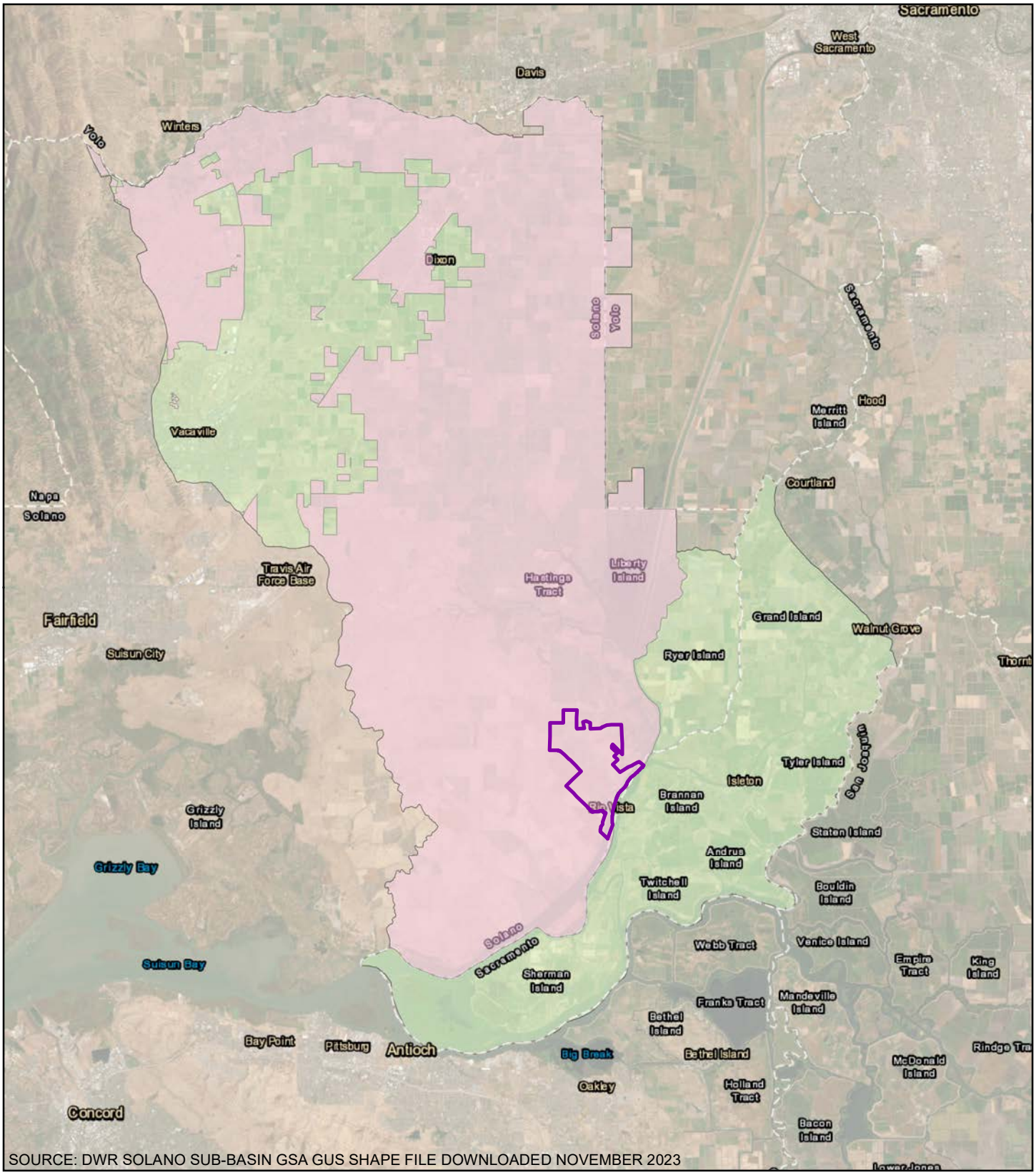
NOVEMBER 2023

CITY OF RIO VISTA
BRANN RANCH PROJECT

N

0 750 1,500 3,000
Feet

DILLON & MURPHY ENGINEERING



SOURCE: DWR SOLANO SUB-BASIN GSA GUS SHAPE FILE DOWNLOADED NOVEMBER 2023

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Legend

- RIO VISTA SERVICE AREA
- GSA SERVICE AREA
- SOLANO SUB-BASIN

NOVMEBER 2023

FIGURE 3 - SOLANO SUB-BASIN

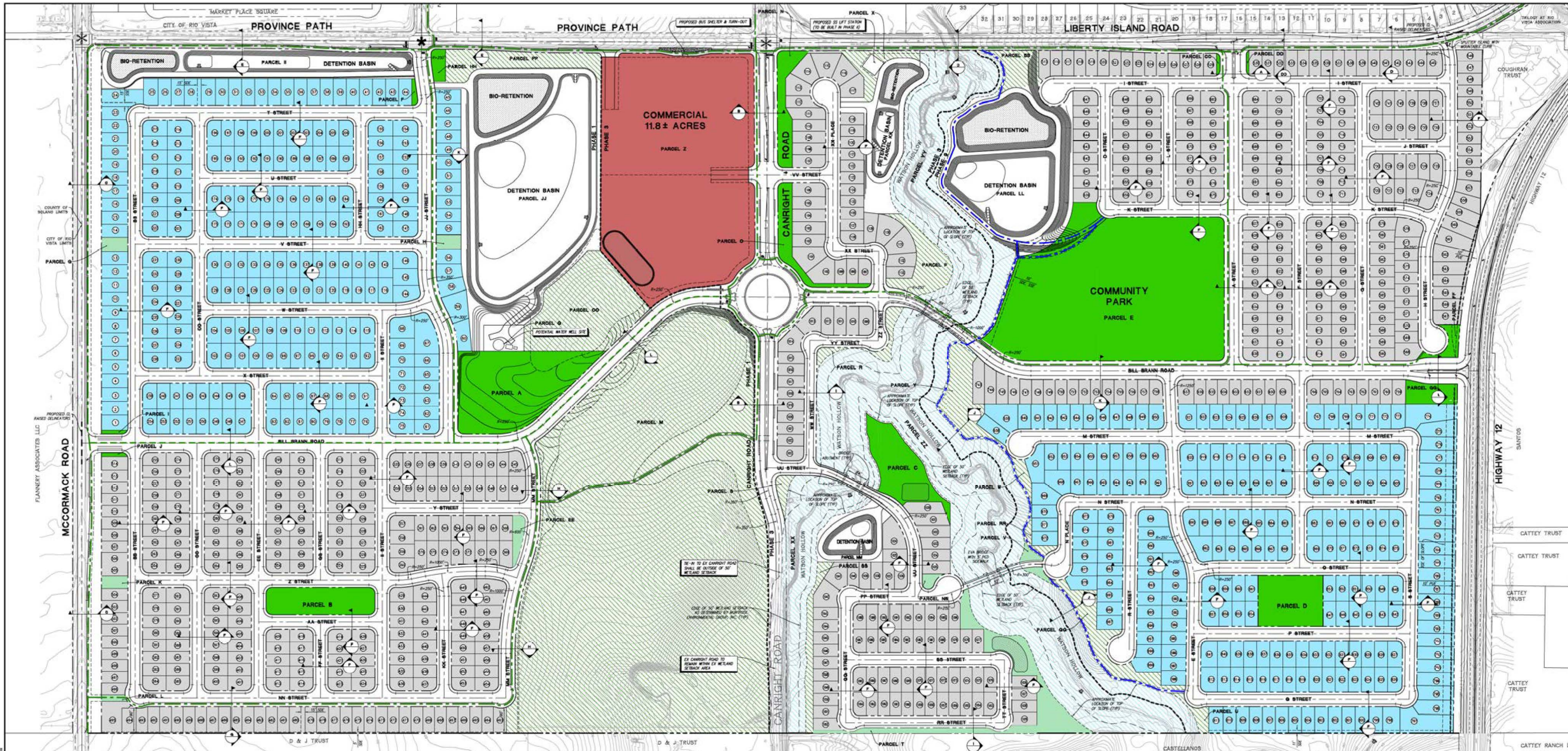
CITY OF RIO VISTA
PUBLIC WATER SYSTEM 4810004
SERVICE AREA

DILLON & MURPHY ENGINEERING

N

0 6,500 13,000 26,000

Feet



LEGEND

- EXISTING RED LIGHT FLASHERS AT ALL-WAY STOP INTERSECTION
- PROPOSED RED LIGHT FLASHERS AT ALL-WAY STOP INTERSECTION
- BIKE PATH/ PEDESTRIAN TRAIL
- CLASS 2 BIKE PATH/ PEDESTRIAN TRAIL
- WATSON HOLLOW PEDESTRIAN TRAIL
- PHASE LINE

LOT BREAKDOWN

	LOT SIZE	PHASE 1	PHASE 2	PHASE 3	TOTAL
(grey)	45' X 90'	260	261	125	646
(blue)	50' X 95'	254	233	0	487
	TOTAL	514	494	125	1,133

DEDICATION OF PARCELS

PARCEL(S)	LAND USE	AGENCY
A, B, C, D, E, F, I, J, N, O, CC, DD, FF, GG, HH	PUBLIC PARK	CITY OF RIO VISTA
G, H, K, L, M, P, R, S, T, U, V, W, Y, BB, EE, II, JJ, KK, LL, MM, NN, OO, PP, QQ, RR, SS	OPEN SPACE (INCLUDES DRAINAGE PARCELS, LANDSCAPE PARCELS, DETENTION BASINS, AND RIGHT-OF-WAY DEDICATION	CITY OF RIO VISTA
Q	WATER WELL SITES	CITY OF RIO VISTA
X	SANITARY SEWER PUMP STATION SITE	CITY OF RIO VISTA
Z	COMMERCIAL	ENCORE LIBERTY II, LLC
XX, YY, ZZ	WATSON HOLLOW	CITY OF RIO VISTA

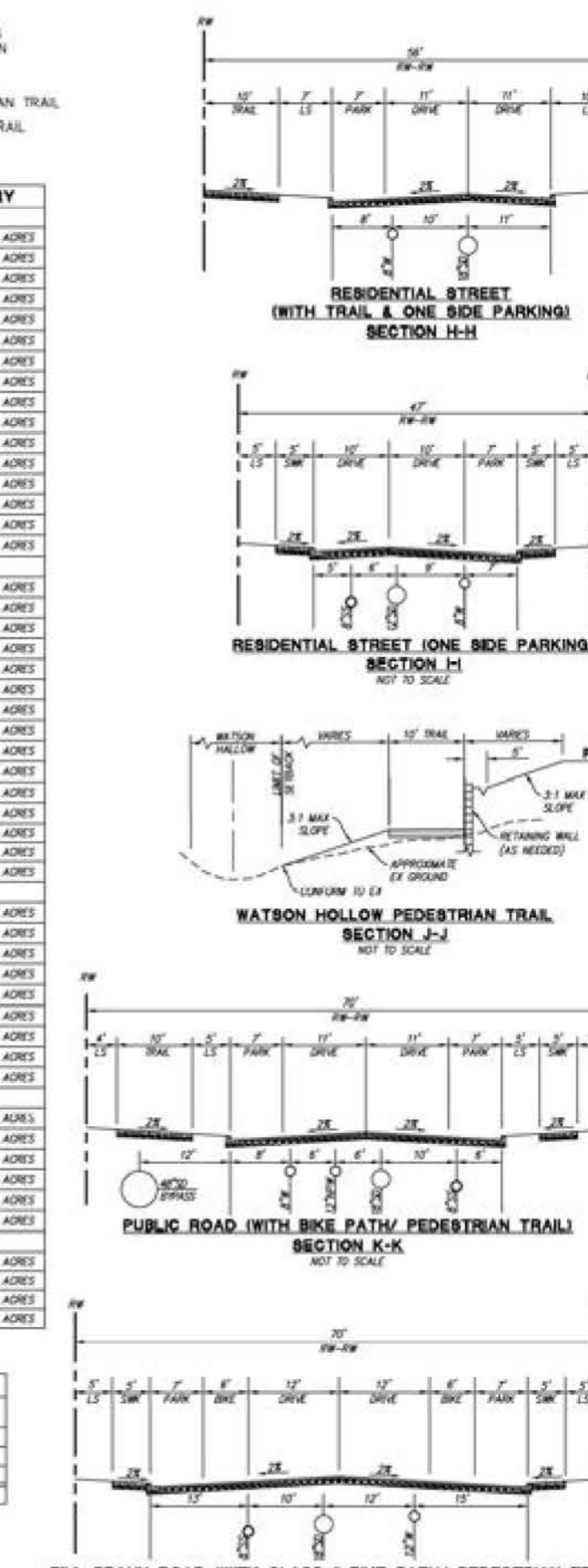
PARKS & OPEN SPACE SUMMARY

PARKS		
	PARCEL A (PARK A)	2.90 ACRES
	PARCEL B (PARK B)	0.97 ACRES
	PARCEL C (PARK C)	1.20 ACRES
	PARCEL D (PARK D)	1.11 ACRES
	COMMUNITY PARK	10.10 ACRES
	PARCEL F (ENTRY PARK)	0.04 ACRES
	PARCEL I (ENTRY PARK)	0.03 ACRES
	PARCEL J (ENTRY PARK)	0.03 ACRES
	PARCEL N (LINEAR PARK)	0.96 ACRES
	PARCEL O (LINEAR PARK)	0.53 ACRES
	PARCEL CC (ENTRY PARK)	0.02 ACRES
	PARCEL DD (ENTRY PARK)	0.02 ACRES
	PARCEL FF (ENTRY PARK)	0.18 ACRES
	PARCEL GG (ENTRY PARK)	0.37 ACRES
	PARCEL HH (ENTRY PARK)	0.15 ACRES
	TOTAL AREA	18.61 ACRES
OPEN SPACE		
	PARCEL M	29.77 ACRES
	PARCEL P	0.67 ACRES
	PARCEL R	0.28 ACRES
	PARCEL S	0.26 ACRES
	PARCEL U	0.15 ACRES
	PARCEL W	0.13 ACRES
	PARCEL Y	0.85 ACRES
	PARCEL BB	0.46 ACRES
	PARCEL NN	0.07 ACRES
	PARCEL OO	2.71 ACRES
	PARCEL PP	1.05 ACRES
	PARCEL QQ	0.77 ACRES
	PARCEL RR	0.09 ACRES
	PARCEL SS	0.43 ACRES
	TOTAL AREA	37.69 ACRES
TRANSITIONAL OPEN SPACE		
	PARCEL G	0.12 ACRES
	PARCEL H	0.12 ACRES
	PARCEL K	0.11 ACRES
	PARCEL L	0.05 ACRES
	PARCEL T	1.49 ACRES
	PARCEL V	0.14 ACRES
	PARCEL EE	0.15 ACRES
	PARCEL NN	0.07 ACRES
	TOTAL AREA	2.26 ACRES
DETENTION BASINS & BIO-RETENTION		
	PARCEL II	3.23 ACRES
	PARCEL JJ	10.84 ACRES
	PARCEL KK	1.93 ACRES
	PARCEL LL	5.86 ACRES
	PARCEL MM	1.10 ACRES
	TOTAL AREA	22.96 ACRES
WATSON HOLLOW CREEK AND TRAIL		
	PARCEL XX	3.01 ACRES
	PARCEL YY	13.80 ACRES
	PARCEL ZZ	5.66 ACRES
	TOTAL AREA	22.47 ACRES

DENSITY SUMMARY

PHASE	GROSS AREA (AC)	NO. OF LOTS	DENSITY (DU/AC)
1	137.8	514	3.7
2	106.8	494	4.6
3	40.2	125	3.1
TOTAL	284.8	1,133	4.0

NOTE:
GROSS AREA EXCLUDES COMMERCIAL, WATSON HOLLOW AND ASSOCIATED 50' SETBACK, PROPOSED FRONTAGE STREET RIGHT-OF-WAY DEDICATION, AND HIGHWAY 12



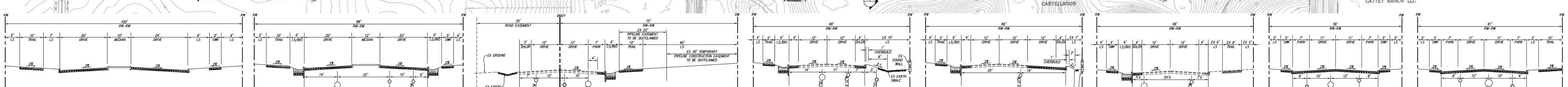
RESIDENTIAL STREET (WITH TRAIL & ONE SIDE PARKING)
SECTION H-H

RESIDENTIAL STREET (ONE SIDE PARKING)
SECTION I-I
NOT TO SCALE

WATSON HOLLOW PEDESTRIAN TRAIL
SECTION J-J
NOT TO SCALE

PUBLIC ROAD (WITH BIKE PATH/ PEDESTRIAN TRAIL)
SECTION K-K
NOT TO SCALE

BILL BRANN ROAD (WITH CLASS II BIKE PATH/ PEDESTRIAN TRAIL)
SECTION L-L
NOT TO SCALE



100' RW ● PROJECT ENTRY
SECTION A-A
NOT TO SCALE

CANRIGHT ROAD
SECTION B-B
NOT TO SCALE

MCCORMACK ROAD
SECTION C-C
NOT TO SCALE

LIBERTY ISLAND ROAD
SECTION D-D
NOT TO SCALE

LIBERTY ISLAND ROAD
SECTION DD-DD
NOT TO SCALE

PROVINCE PATH
SECTION E-E
NOT TO SCALE

RESIDENTIAL STREET (WITH PARKING)
SECTION F-F
NOT TO SCALE

RESIDENTIAL STREET (WITH TRAIL)
SECTION G-G
NOT TO SCALE

PRELIMINARY SITE PLAN
BRANN PROPERTY
VESTING TENTATIVE MAP

CITY OF RIO VISTA, SOLANO COUNTY, CALIFORNIA

RJA
RUGGERI-JENSEN-AZAR
ENGINEERS ▪ PLANNERS ▪ SURVEYORS
4690 CHABOT DRIVE, SUITE 200 PLEASANTON, CA 94588
PHONE: (925) 227-9100 FAX: (925) 227-9300

NO.	DATE	DESCRIPTION	BY

DATE: APRIL 2023
SHEET NO. C-2
JOB NO.: 211098

J4

Groundwater Elevation Data Report

Project No.
5462.000.006

April 4, 2024

Ms. Kristina Miller
City Manager
City of Rio Vista
One Main Street
Rio Vista, CA 94571

Subject: Groundwater Elevation Data
Rio Vista, California

GROUNDWATER ELEVATION DATA REPORT THROUGH DECEMBER 2023

Dear Ms. Miller:

DRAFT

We are pleased to present this progress report for the evaluation of groundwater elevation data through December 2023, collected from the active municipal water supply wells in Rio Vista, California. The groundwater level data are measured by pressure transducers installed in each well and recorded by the Supervisory Control and Data Acquisition (SCADA) system. The SCADA system was installed in February 2005 by the instrument contractor, Sierra Controls. The purpose of this report is to provide an update for the continued analysis of groundwater withdrawal and sustainability of the aquifer under the City of Rio Vista (City).

This report provides data and analysis intended to aid in the ongoing evaluation of the City's groundwater supply. It does not provide conclusions or opinions regarding long-term characterization of the aquifer. This report merely updates the aggregation of the groundwater level and pumping data provided by the City of Rio Vista.

This report summarizes the reported SCADA groundwater elevation data from the transducers in City Wells 10, 11, 13, 14, and 15. Recent groundwater elevation data, from 2015 to 2023, are presented in Appendix A and Figures 1A through 5A. Historical static and pumping level elevation data for these locations are presented in Appendix B, Figures 1B through 5B. The historical data dates to as early as 2005. This report also summarizes the reported SCADA pumping totals from Wells 7, 8, 9, 10, 11, 12, 13, 14, and 15. Well pumping data are presented in Figures 6A and 6B. The approximate locations of the wells are shown in Figures 7A and 7B. We note that pumping data for Well 9 are included, but the groundwater elevation data are not available and not included in this report. Wells 7, 8, and 12 are no longer in service, though their historical pumping data are included in this report.

This report provides an update of the data in addition to a brief summary of observed trends in individual water supply wells with respect to production. This update report provides a review of the most recent data collected between June 2023 and December 2023. We have condensed the groundwater elevation (GWE) data into monthly pumping level (lowest) and static level (highest) elevations, along with the estimated monthly total production volume, displayed in a chart format. Manual readings collected by City staff are used to verify the transducer elevation readings.

TABLE 1: Well Summary

WELL NUMBER	CURRENT STATUS	MANUAL READINGS CURRENTLY TAKEN	TRANSDUCER READINGS CURRENTLY TAKEN
7	Out of Service	No	No
8	Out of Service	No	No
9	Active	No	No
10	Active	Yes	Yes
11	Active	Yes	Yes
12	Out of Service	No	No
13	Active	Yes	Yes
14	Active	Yes	Yes
15	Active	Yes	Yes

COLLECTED DATA

This report summarizes the reported data from May 2005 to the present, including an update of the groundwater supply data recorded between June 2023 and December 2023. We have identified several data gaps that hamper confidence in our analysis. In addition, it is not always possible to identify when data are not accurate, so it is possible that some of the trends will not be correct. These large data gaps may be a result of faulty or inaccurate transducers. Periodic maintenance and recalibration can prevent future data gaps associated with faulty transducers.

For this progress report, we plotted the available GWE data to identify water level trends for individual well locations. We specifically compared how the monthly production of each well affects the local GWE by aggregating the GWE data into monthly minimum and maximum values. The manual water level data provided by the City are designated ’60 min static’ and ‘60 min dynamic drawdown;’ these data are interpreted to be static water level measured 60 minutes after pumping was stopped, and pumping level measured 60 minutes after the start of pumping. The upper GWE line (Figures 1A through 5A) represents an estimate of static groundwater elevation in the aquifer where the wells are reportedly screened (depth 140 to 540 feet). The pumping GWE represents the lowest level measured at each well.

It should be emphasized that most of the water supply wells had transducers that have historically experienced periods of inoperability, which are indicated with a gray background on the charts. In July 2014, a policy was instituted by the City’s Department of Public Works to manually measure the static GWE with an electric sounder for each well once a month to confirm that the transducers are working properly to obtain accurate data. The plotted GWEs represent an estimate of the long-term elevation trend recorded at each well.

Well 10 (Figures 1A and 1B)

The transducer in Well 10 was inoperable from July 2009 to August 2014 and from April 2015 to June 2016. During these periods, the transducer did not record the groundwater elevations. However, manual water level depth measurements began in July 2014 and approximately each month thereafter. The manual readings measure the ambient water table elevation and the drawdown elevation.

DRAFT

In February and March 2015, the transducer recorded a static GWE between 15 feet and 18 feet, which was significantly greater than the manual readings reported during the same time period. It is likely that the GWE readings logged by the transducer were incorrect.

Following the repair of the transducer in June 2016, the static groundwater elevation readings have been consistently lower than the data recorded prior to March 2015. This may be an indication that the replacement transducer was calibrated incorrectly in June 2016. However, the manual groundwater elevation readings appear to be relatively consistent with the replacement transducer's readings. Therefore, it is more likely that the transducer was incorrectly calibrated prior to July 2009. The GWE trendline in Figures 1A and 1B has been adjusted from Elevation -15 feet to Elevation -20 feet to reflect the estimated groundwater elevation assuming that the 2016 replacement transducer is calibrated correctly.

Since June 2016, relatively consistent pumping water level of Elevations -40 to -70 feet are recorded by the transducer. Static water levels since June 2016 are generally Elevation -10 to -30 feet. However, as noted above, it cannot be assumed that the transducers were accurately calibrated prior to July 2009 and the data collected during this period may not be reliable to assess an overall lowering of the groundwater table. Since the installation of the replacement transducer in June 2016, static water levels are consistent and do not indicate unusual basin level conditions are occurring.

Based on the recent static and pumping water level elevations since June 2023, Well 10 pumping water level elevation recovers to static groundwater elevations consistent with the revised groundwater elevation datum. During this period, monthly production at Well 10 has increased compared to the first half of 2023; a total of approximately 9.3 million gallons was pumped between July 2023 and December 2023. Based on the recent readings, it appears the static GWE at this well is generally stable, with about 10 to 30 feet of seasonal fluctuation.

We recommend continuing the routine manual water level measurements to check and adjust the transducer data as needed or determine if recalibration by the supplier is necessary. Manual GWE readings are necessary to confidently determine the long-term performance of the aquifer at Well 10.

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Well 11 (Figures 2A and 2B)

The Well 11 transducer was inoperable from June 2009 to August 2014. During this period, the transducer recorded much lower elevations than the actual GWE, based on estimates from nearby wells, and ultimately failed in April 2011. Furthermore, the recorded GWE continually decreased throughout this period. A manual reading recorded in July 2014 demonstrated that the reported water level from the SCADA system was significantly lower and inaccurate. We understand that the transducer was repaired and was recording reliable water levels until it again became inoperable in June 2015. Transducer operation was restored again in September 2015.

From December 2019 to April 2020, the transducer static water elevation and manual readings remained relatively consistent. Over the same period, the recorded production increased, with a total of approximately 29 million gallons. The increase in production coincided with a rise in the recorded pumping level GWE. Based on this information, the pumping water level readings are inconsistent with the pumping records.

Between May 2020 and August 2022, manual water level readings were temporarily suspended for Well 11 due to an obstruction in the well. From April 2021 to September 2021 and February 2022 to August 2022, the recorded production increased. The increase in production appeared to have no impact on the recorded pumping level GWE.

Based on information provided by Greg Malcolm, City of Rio Vista Public Works Superintendent, we understand that the well rehabilitation activities were completed in July 2022. Manual readings resumed in August 2022. Since September 2022, the static water level and pumping level elevations are relatively consistent with the manual readings, although the static water level manual readings are consistently 5 to 25 feet lower than the static transducer readings.

Possible reasons for the decrease in static GWE include: (1) increased production at nearby Wells 13 and 14 contributing to increased well interference at Well 11, or (2) the transducer is failing and providing faulty data.

Well 11 is located approximately 1,000 feet northeast of Well 14. Groundwater readings at Well 14 are relatively consistent with data collected in 2022. As such, it is unlikely that these readings are indicative of a decrease in the local groundwater elevation at Well 11. The transducer readings appear relatively consistent with the manual readings. However, the transducer may have been recalibrated incorrectly following the well rehabilitation activities.

We recommend calibration of the transducer against the manual water level measurements and continued routine manual level monitoring of Well 11. Manual GWE readings are necessary to verify transducer accuracy and confidently determine the long-term performance of the aquifer in the vicinity of Well 11.

Well 13 (Figures 3A and 3B)

The transducer installed in Well 13 was inoperable several times, beginning in March 2006 to June 2007, again from June 2010 to August 2014, and from September 2016 to October 2017. During the first approximately 16-month-long period, the recorded elevations were much lower than the actual GWE in the well. During the second period of inoperability, the transducer did not record the GWE.

During an interim period from August 2008 to June 2010, multiple readings were above the estimated static GWE. A manual reading was recorded in July 2014 and each month thereafter. The transducer was repaired and appeared to be correctly reporting the pumping and static water elevations after July 2014, although there were some anomalous readings in December 2015, January 2016, April 2018, and December 2018.

Static groundwater elevation readings from September 2016 to October 2017 indicate a decreasing trend. In comparison, manual readings over the same period indicate a generally increasing trend with elevations reported above the static GWE readings provided by the transducer. This may indicate that the transducer was providing faulty readings during this time period. Furthermore, between July 2016 and December 2016, the total production of the well decreased from 20 million gallons to almost no production. Over the same period, there is no increase in the pumping level elevation of the well. However, Well 11, which is approximately 2,000 feet from Well 13, showed an increase in the pumping water level elevation over the same period. These discrepancies appear to indicate that the transducer was calibrated incorrectly during this from July 2016 to December 2016.

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Since October 2017, there appears to be relatively consistent data recorded by the transducer with respect to well production, apart from recorded data from December 2018 to February 2019. Between December 2018 and February 2019, the recorded well recovery elevations were the same as the pumping water level elevations as is expected during a period of no pumping. However, these elevations were 15 feet greater than the manual readings recorded over the same period. This may be indicative of faulty transducer readings over this period.

Since June 2019, there appears to be relatively consistent data recorded by the transducer with respect to well production, apart from recorded data from December 2019 to March 2020. Between December 2019 and March 2020, the recorded static water elevations were approximately the same as the pumping water level elevations during this period of no pumping. However, these elevations were 20 feet higher than the manual readings recorded over the same period. They may be indicative of faulty transducer readings or improper calibration.

Since June 2023, the static groundwater elevation readings from the transducer and manual measurements have been relatively consistent. Although the static groundwater elevation is lower than the plotted trendline, both the static water level and pumping level are generally consistent with the well production. Water levels show recovery beginning in July 2023 despite high production continuing through October 2023. Possible reasons for the well recovery include: (1) the transducer is failing and providing faulty data, or (2) reduced production at nearby Wells 11 and 14 contributed to recovery at Well 13.

We recommend calibration of the transducer and continued routine manual monitoring of Well 13. Manual GWE readings are necessary to verify transducer accuracy and determine the long-term performance of the water table in the vicinity of Well 13.

Well 14 (Figures 4A and 4B)

The Well 14 transducer was inoperable from September 2010 to August 2014. During that period, it appears to have recorded lower elevations than the actual GWE in the well. When a manual reading was recorded in July 2014, it demonstrated that the reported water level on the SCADA system was 30 feet lower than what was measured manually. The transducer was repaired in July 2014 and appears to be correctly recording the water elevation.

Following the repair of the transducer in July 2014, the static groundwater elevation readings have been consistent with the manual readings and recording the seasonal fluctuations. Therefore, it is likely that the transducer was incorrectly calibrated prior to July 2014. The GWE trendline in Figures 4A and 4B has been adjusted from Elevation -20 feet to Elevation -25 feet to reflect the estimated groundwater elevation assuming that the repaired transducer is calibrated correctly.

Since July 2014, there appears to be relatively consistent data recorded by the Well 14 transducer with respect to well production, apart from anomalous production data recorded from August and September 2018. There are data gaps within a portion of the December 2016 and February 2017 readings with no data from January 2017. This data gap does not affect our current findings regarding the performance of the well and the local groundwater table.

Since June 2023, there appears to be relatively consistent data recorded at Well 14 by the transducer with respect to well production, apart from anomalous static level data recorded for July 2023 and August 2023. The anomalies observed in July and August 2023 are similar to

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anomalous readings made in January 2022, October 2022, and May 2023. This may be indicative of a faulty transducer.

Based on the recent readings, it appears the static GWE of this well is stable, but slightly below the adjusted GWE trendline. Possible reasons for the well recovery GWE decrease include: (1) the transducer is failing and providing faulty data, or (2) increased production at nearby Wells 11 and 13 may have contributed to increased well interface at Well 14.

We recommend calibration of the transducer and continued routine manual monitoring of Well 14. Manual GWE readings are necessary to determine the long-term performance of the water table in the vicinity of Well 14.

Well 15 (Figures 5A and 5B)

Well 15 became active in July 2013. Based on the transducer data, the GWE lowers in the summer months and increases in the winter months. This continued trend is indicative of the large volumes of water pumped during the summer months.

There is a discrepancy between the manual readings and the transducer readings from June 2015 to October 2015, May 2017 to November 2017, and September 2018 to October 2018. During these periods, the well's transducer shows a lower static water elevation than the manual readings. This may be indicative of a faulty transducer. It may also be evidence of inaccurate manual GWE elevation measurements. In addition, the pumping water level elevation between December 2016 and March 2017 does not appear to correspond to the production of the well during the same timeframe. The pumping water level elevations appear to be corrected after March 2017, but we recommend that the transducer be routinely recalibrated to confirm these readings are accurate.

Since June 2023, there appears to be relatively consistent data recorded by the transducer with respect to well production. During this period, monthly well production at Well 15 has increased compared to the first half of 2023; a total of approximately 166.3 million gallons between July 2023 and December 2023. Since April 2020, relatively consistent pumping water level elevations of -55 to -75 feet are recorded by the transducer. Static water levels since June 2016 are generally Elevation -25 to -45 feet. Based on the recent readings, the static GWE of this well follows typical seasonal fluctuations and is generally stable.

We recommend routine calibration of the transducer and continued routine manual monitoring of Well 15. Manual GWE readings are necessary to determine the long-term performance of the water table in the vicinity of Well 15.

DISCUSSION

Our evaluation of the data collected through December 2023 from the Rio Vista municipal water supply wells continues to show fluctuation in the groundwater levels. Transducers level data, along with the monthly manual measurement of the GWE from each well, generally confirm stable groundwater elevations in the City's wells. The current plotted trends do not indicate a significant change to the overall static GWE in the individual wells and the local groundwater basin as a whole.

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To provide reliable groundwater performance data, it is important that the City continue to maintain the well monitoring equipment, evaluate the transducer performance and data, and perform annual surveying of the reference point elevations at each well. The following recommendations should be considered by the City regarding the ongoing monitoring of the water supply wells.

- Continue routine manual static GWE measurements to verify the accuracy of the transducer measurements
- Survey the reference point elevation at Wells 10, 11, 13, 14, and 15
- Factory recalibration of the transducers in Wells 11, 13, and 14
- Monthly critical review of the SCADA data to identify transducers that may be incorrectly recording data

We look forward to continuing to monitor and update the GWEs and flow reports while providing groundwater data and well performance analysis services to the City of Rio Vista.

We are available at your convenience to discuss any questions or comments you may have.

Sincerely,

ENGEO Incorporated

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Victoria Drake, PE James Thurber, CHG

vkd/jt/ca

cc: Mr. Greg Malcolm, Public Works Superintendent

Attachments: Selected References
Appendix A – Recent Groundwater Elevation Data, 2015 – 2023
Appendix B – Historical Groundwater Elevation Data, 2005 – 2023

SELECTED REFERENCES

1. ENGEO. 2002. Groundwater Evaluation, Rio Vista, California. June 21, 2002. Project No. 5462.5.001.01.

2. ENGEO. 2006. Hydrogeologic and Available Water Supply Trend Analysis, Rio Vista, California. October 6, 2006. Project No. 5462.6.001.01.

3. ENGEO. 2015. Preliminary Report of Groundwater Elevation, Groundwater Supply Study, Rio Vista, California. February 12, 2015; Revised February 13, 2015. Project No. 5462.000.002.

4. ENGEO. 2016. Progress Report for Evaluation of Water Well Supply Data through June 2016. July 25, 2016. Project No. 5462.000.002.

5. ENGEO. 2017. Water Well Elevation Data Report, December 2016, Groundwater Supply Study, Rio Vista, California. April 12, 2017. Project No. 5462.000.005.

6. ENGEO. 2017. Water Well Elevation Data Report, June 2017, Groundwater Supply Study, Rio Vista, California. September 5, 2017. Project No. 5462.000.005.

7. ENGEO. 2018. Water Well Elevation Data Report, December 2017, Groundwater Supply Study, Rio Vista, California. April 17, 2018. Project No. 5462.000.005.

8. ENGEO. 2018. Draft Water Well Elevation Data Report through June 2018, Groundwater Supply Study, Rio Vista, California. February 27, 2019. Project No. 5462.000.006.

9. ENGEO. 2019. Draft Water Well Elevation Data Report through December 2018, Groundwater Supply Study, Rio Vista, California. March 5, 2019. Project No. 5462.000.006.

10. ENGEO. 2019. Draft Water Well Elevation Data Report through June 2019, Groundwater Supply Study, Rio Vista, California. November 12, 2019. Project No. 5462.000.006.

11. ENGEO. 2019. Draft Water Well Elevation Data Report through December 2019, Groundwater Supply Study, Rio Vista, California. June 5, 2020. Project No. 5462.000.006.

12. ENGEO. 2022. Draft Water Well Elevation Data Report through December 2021, Groundwater Supply Study, Rio Vista, California. March 15, 2022. Project No. 5462.000.006.

13. ENGEO. 2023. Draft Water Well Elevation Data Report through December 2022, Groundwater Supply Study, Rio Vista, California. July 14, 2023. Project No. 5462.000.006.

14. ENGEO. 2023. Draft Water Well Elevation Data Report through June 2023, Groundwater Supply Study, Rio Vista, California. December 21, 2023. Project No. 5462.000.006.

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APPENDIX A

Recent Groundwater Elevation Data, 2015 – 2023

Figure 1A – Well 10 Data
Figure 2A – Well 11 Data
Figure 3A – Well 13 Data
Figure 4A – Well 14 Data
Figure 5A – Well 15 Data
Figure 6A – Well Production by Month
Figure 7A – Well Locations

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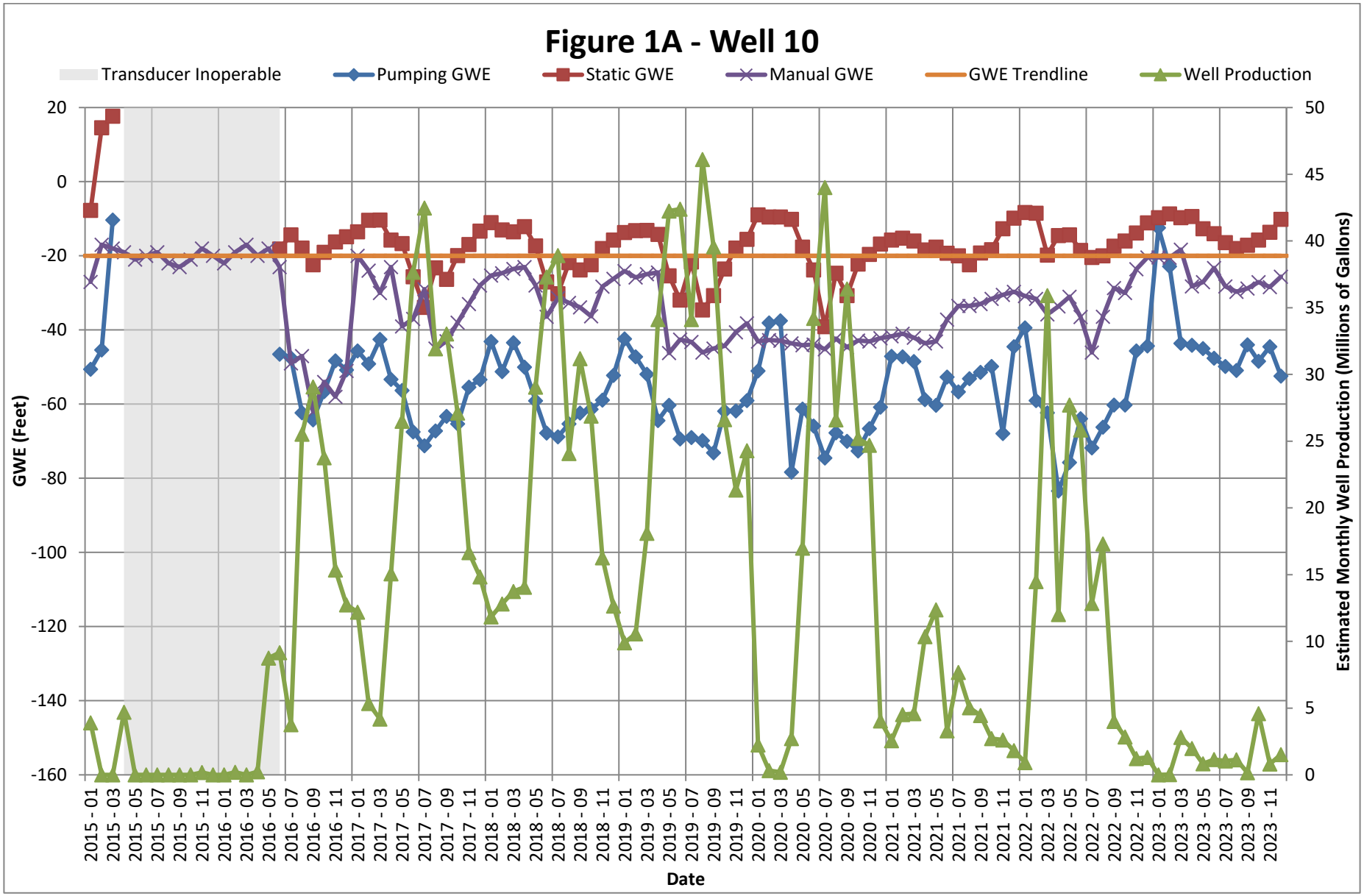
Figure 1A - Well 10



5462.000.006
April 4, 2024

Figure 2A - Well 11

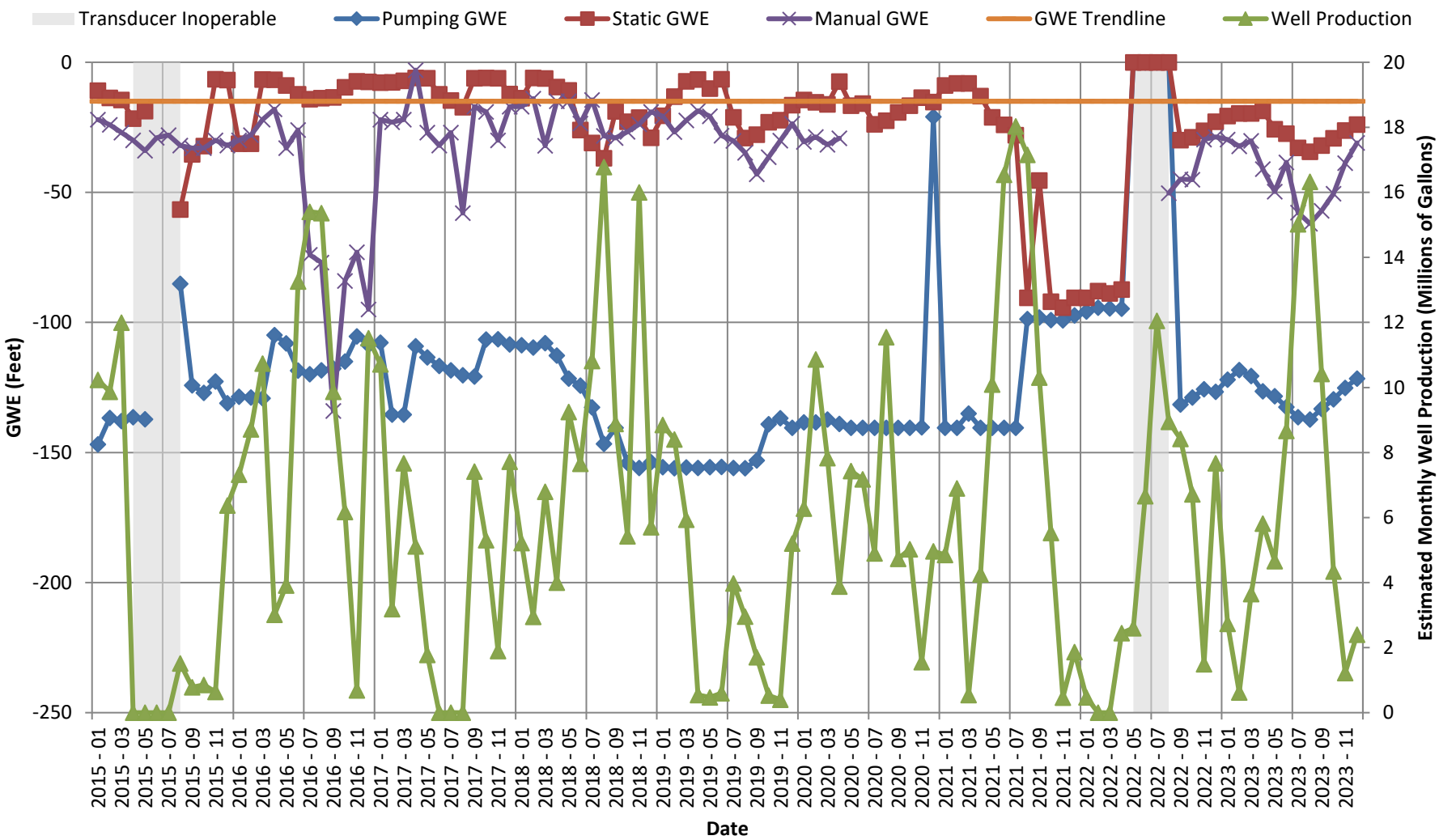


Figure 3A - Well 13

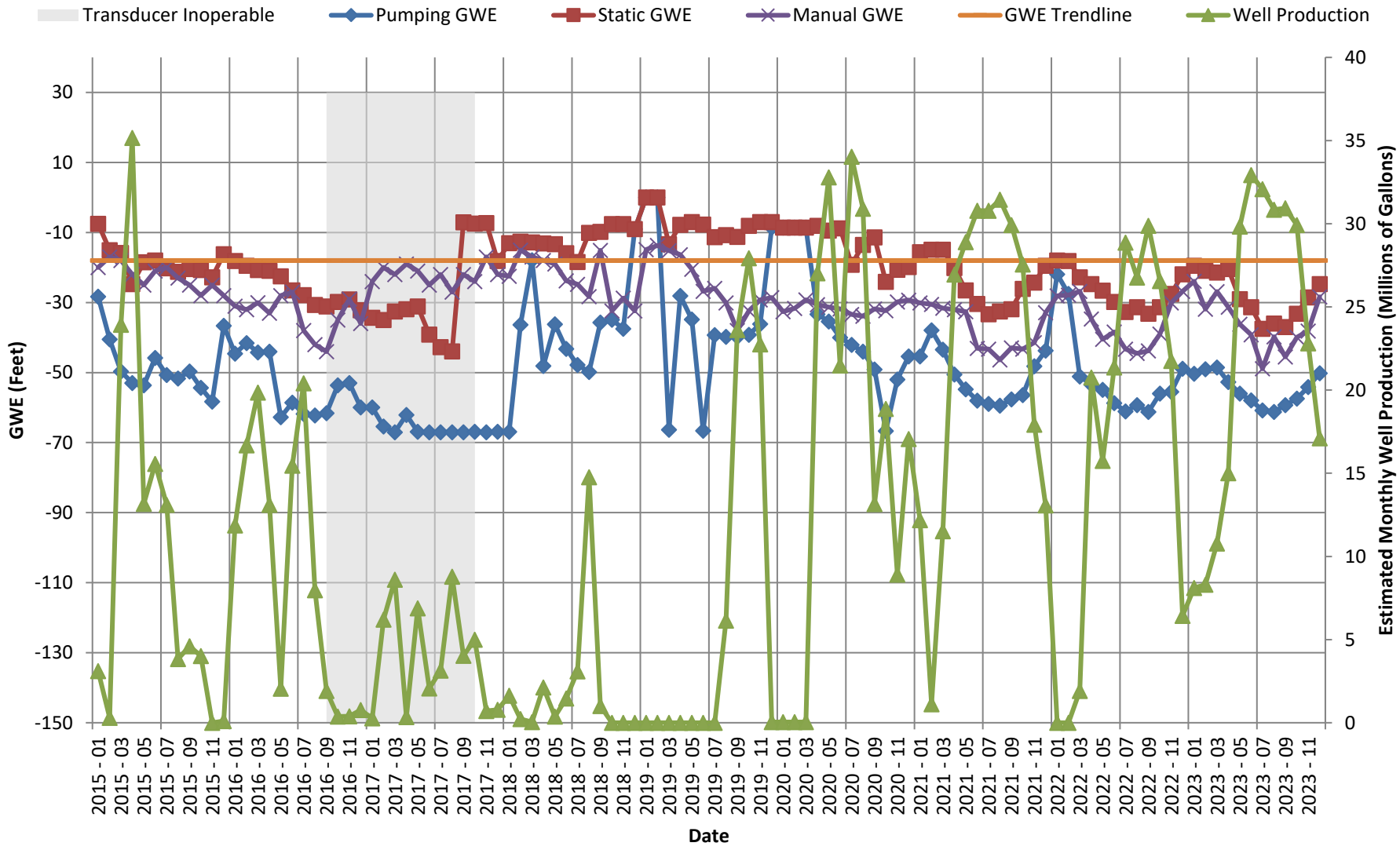


Figure 4A - Well 14

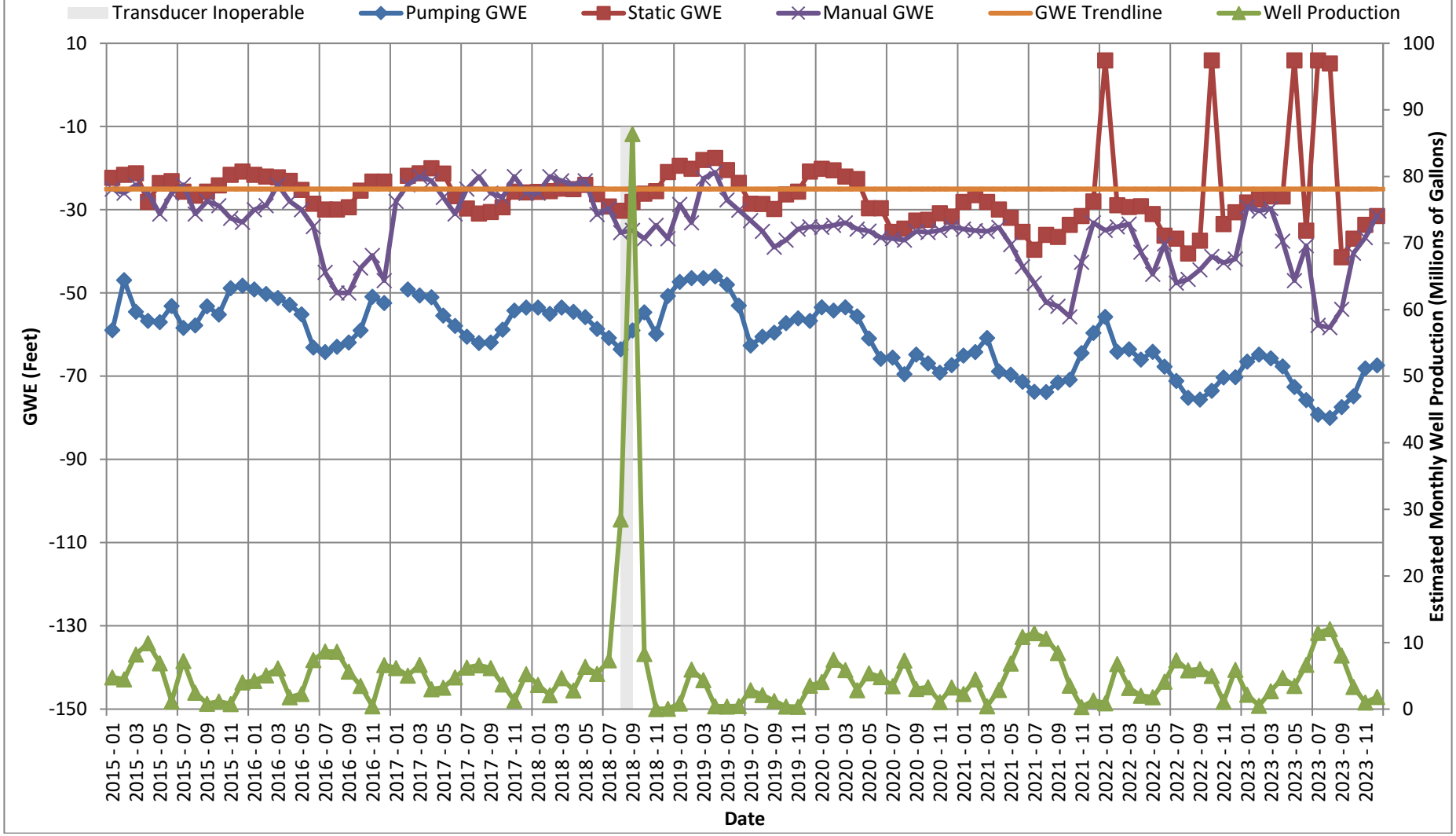


Figure 5A - Well 15

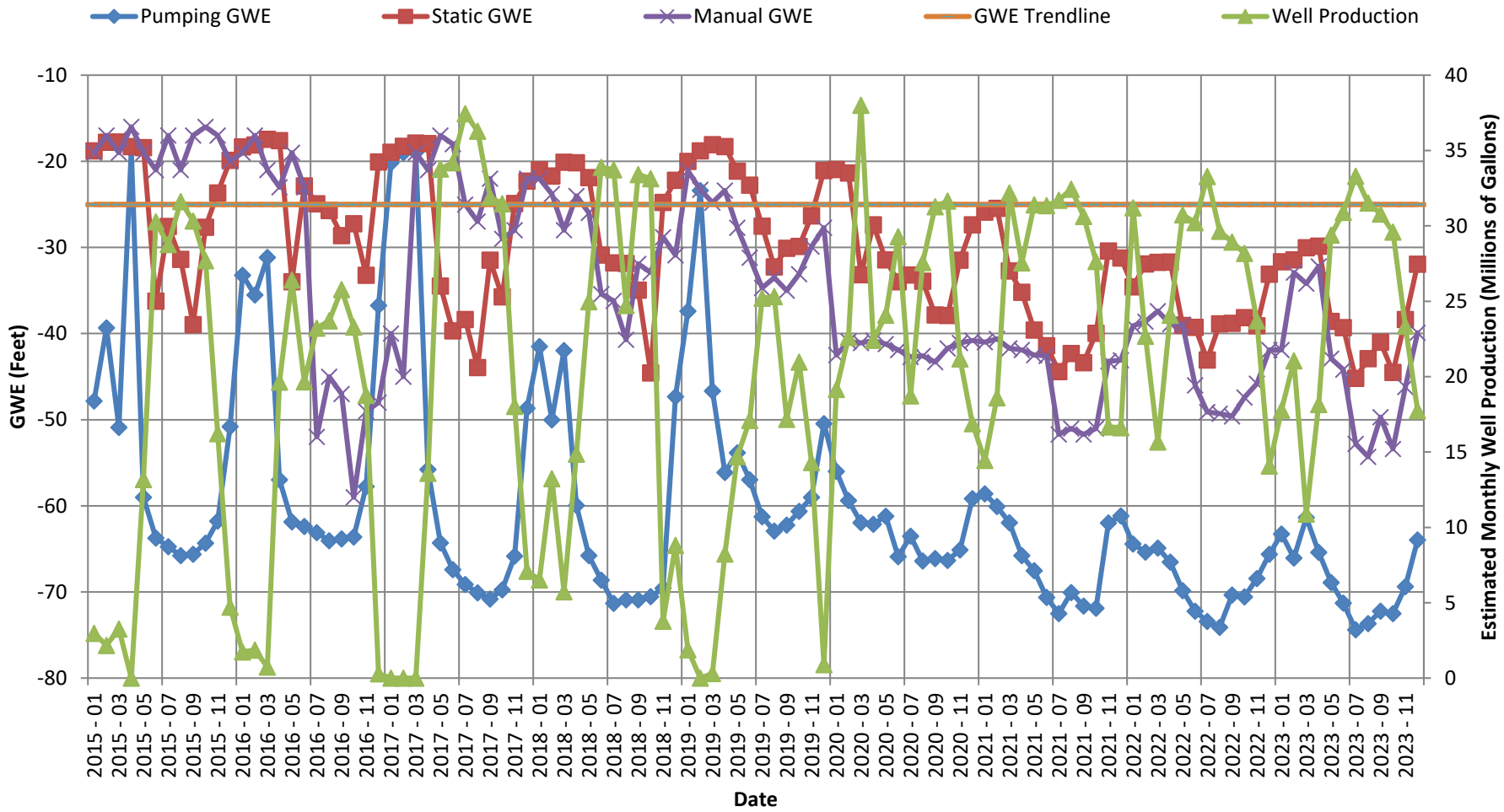


Figure 6A - Well Production by Month

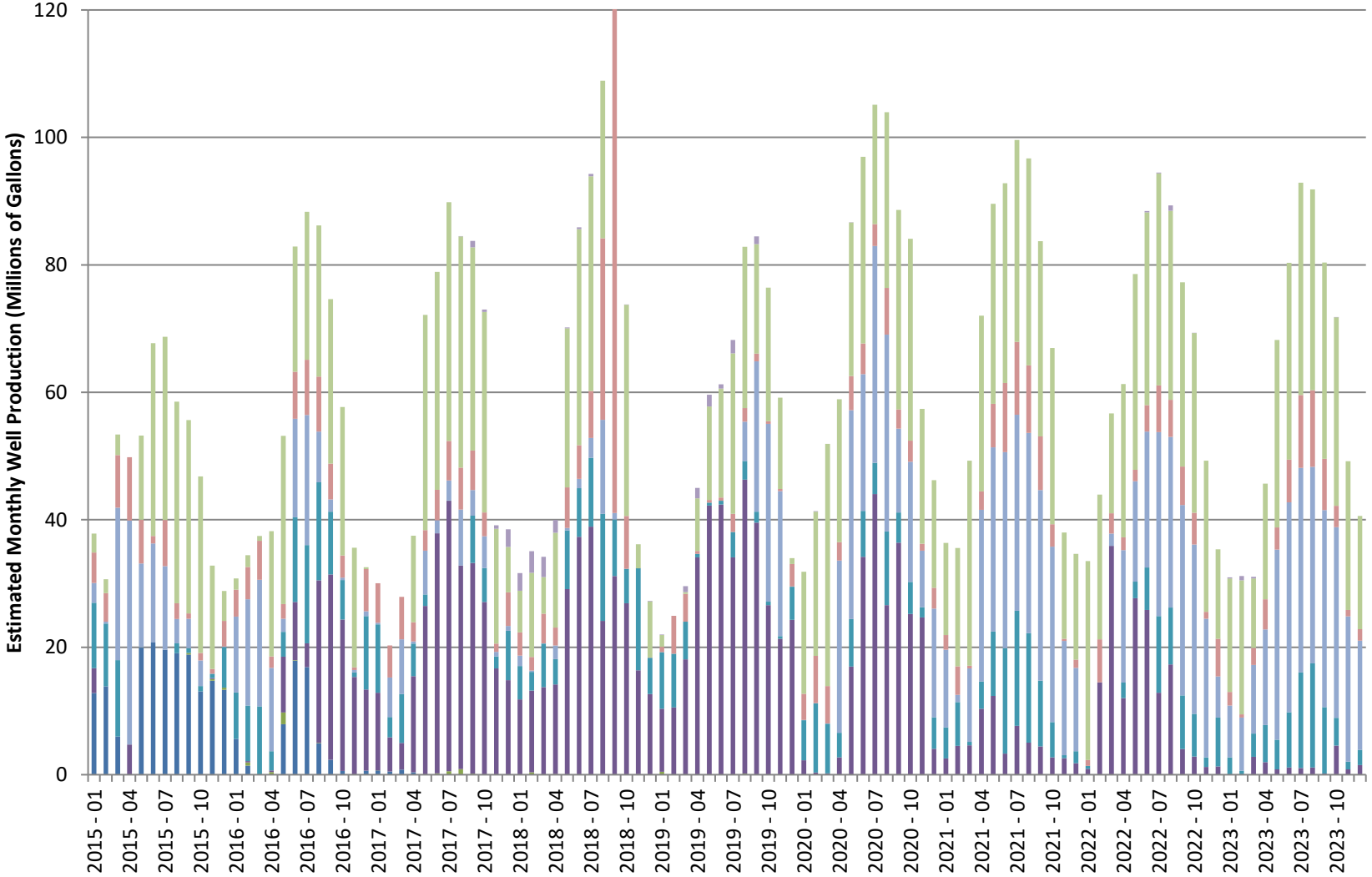


Figure 7A - Well Locations



APPENDIX B

Historical Groundwater Elevation Data, 2005 – 2023

Figure 1B – Well 10 Data
Figure 2B – Well 11 Data
Figure 3B – Well 13 Data
Figure 4B – Well 14 Data
Figure 5B – Well 15 Data
Figure 6B – Well Production by Month
Figure 7B – Well Locations

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Figure 1B - Well 10

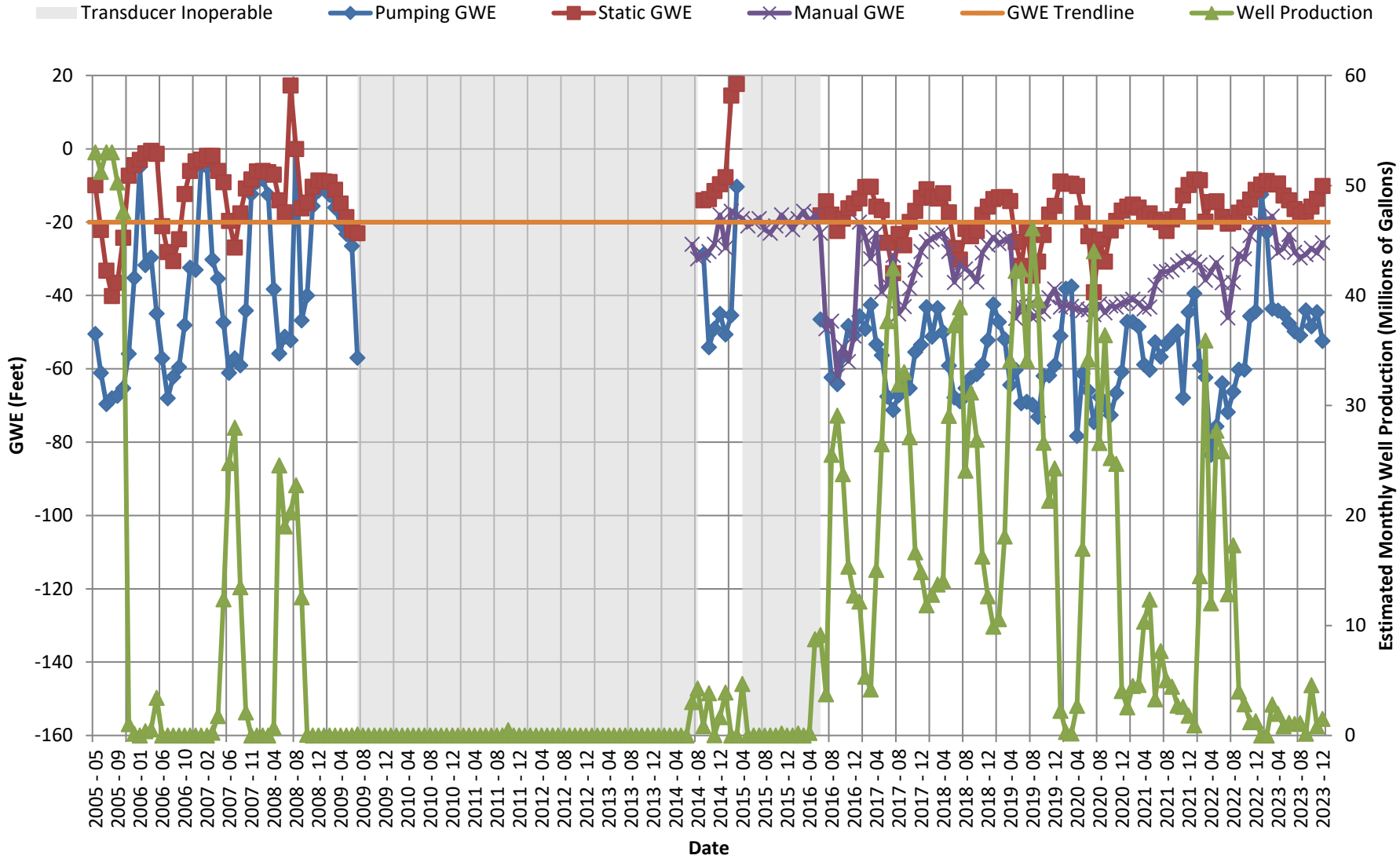


Figure 2B - Well 11

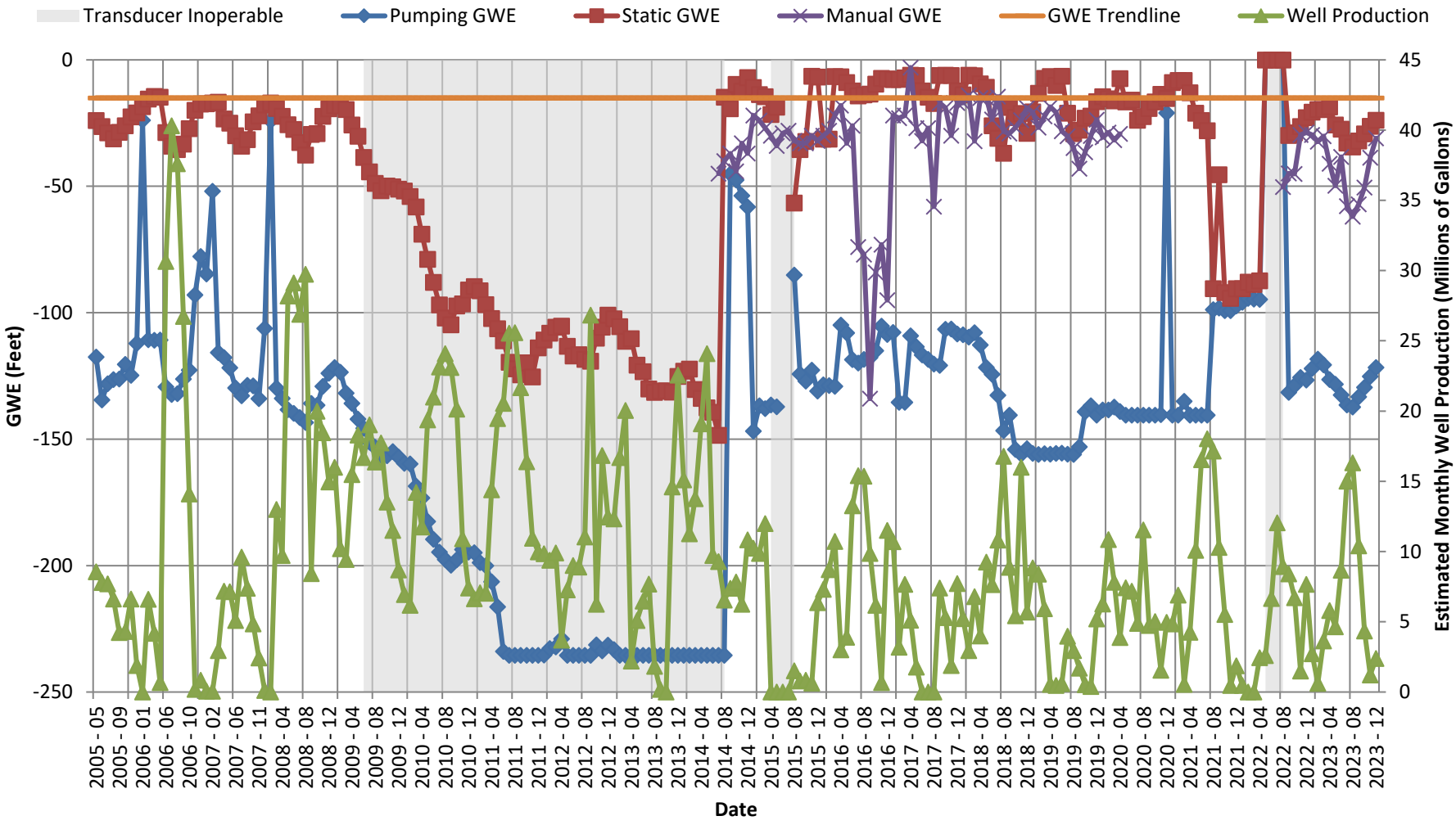


Figure 3B - Well 13

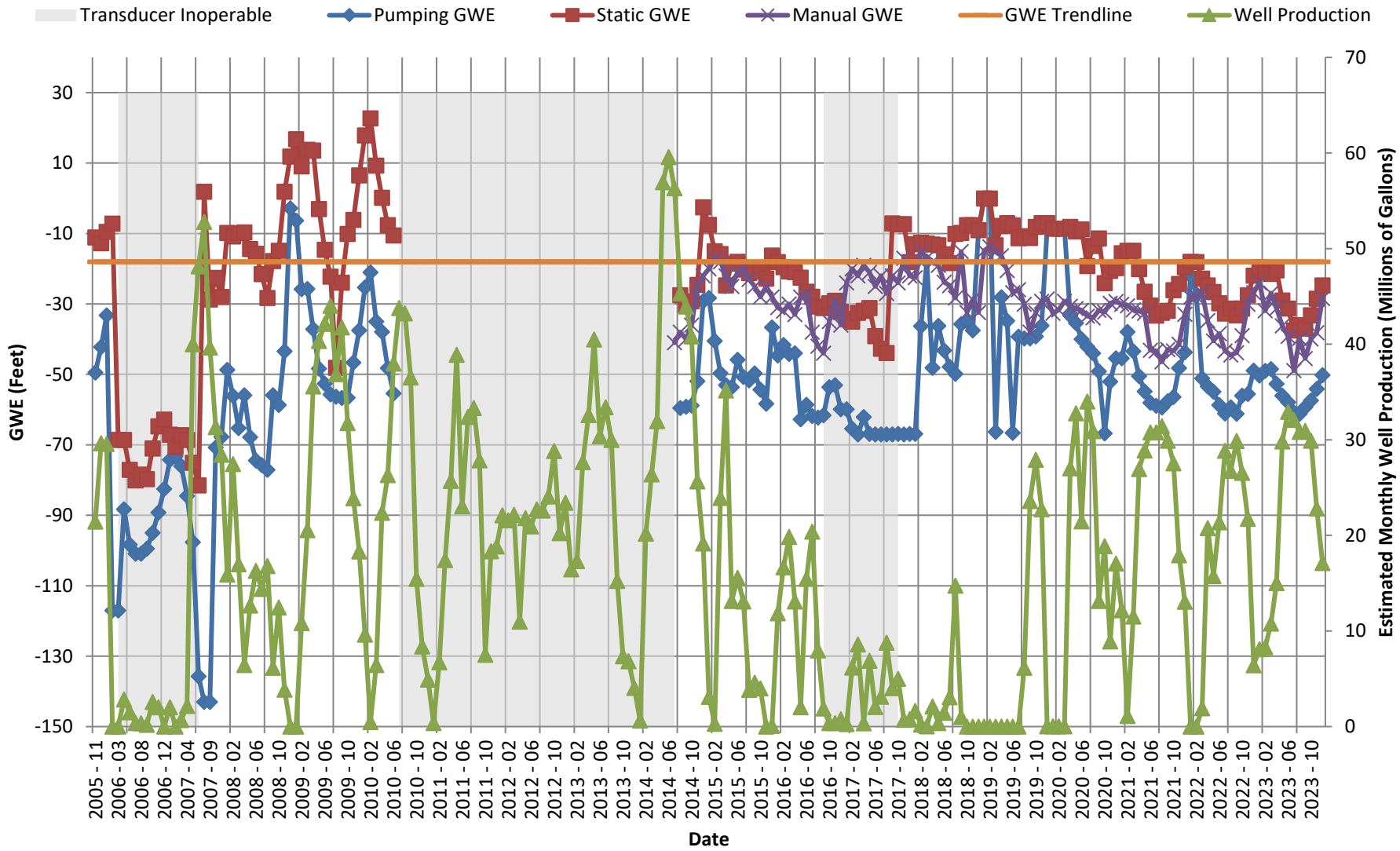


Figure 4B - Well 14

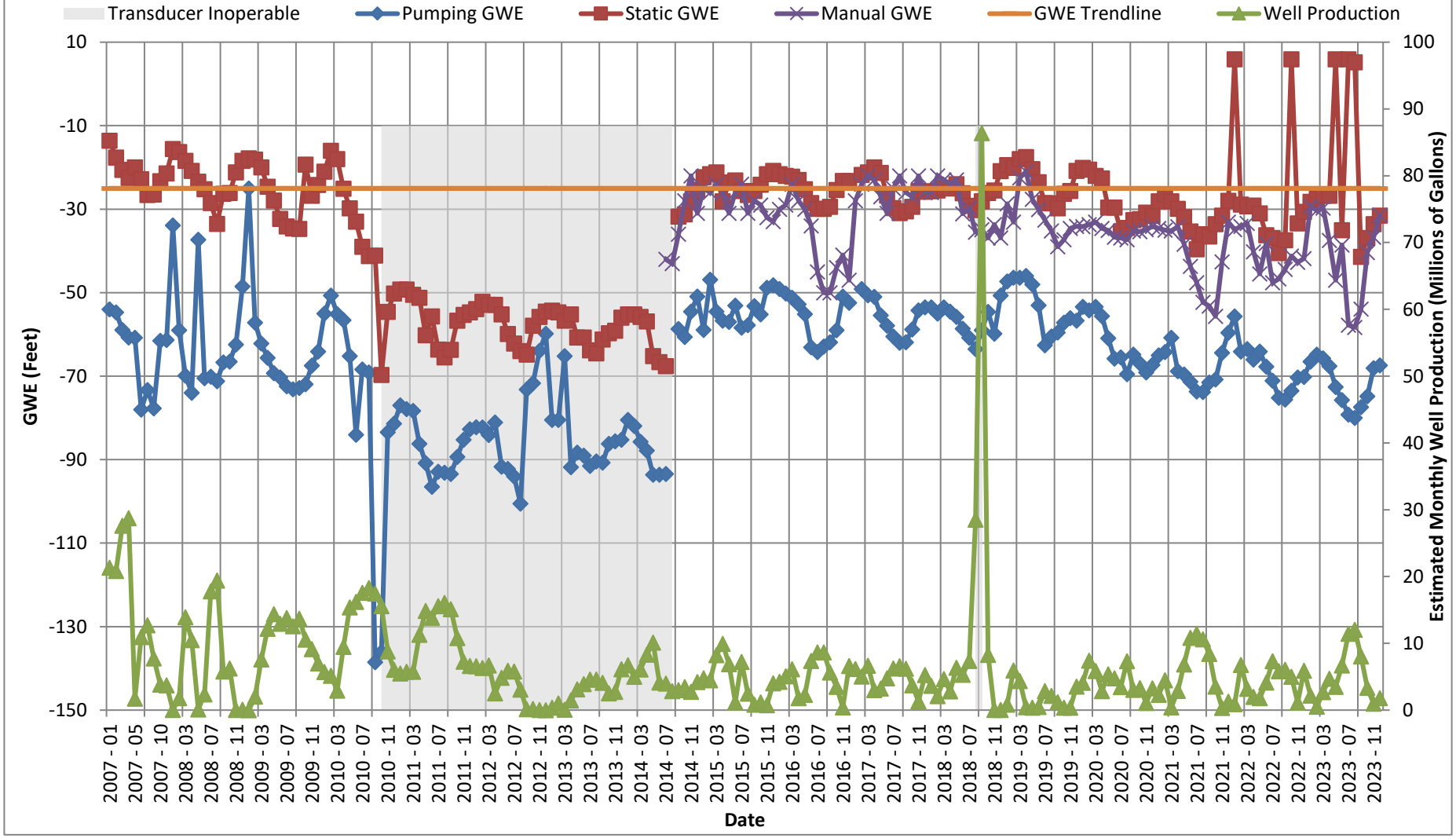
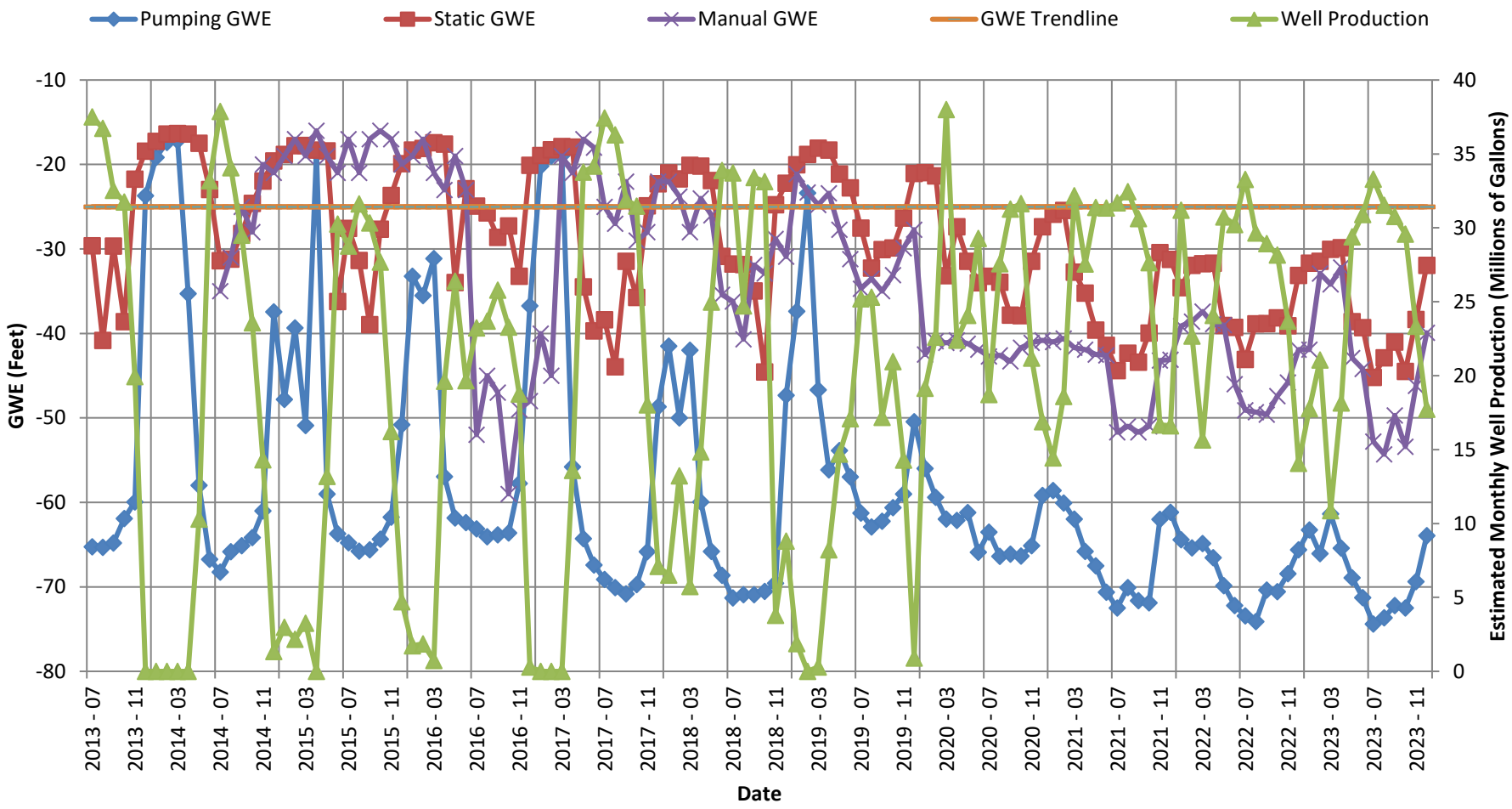


Figure 5B - Well 15



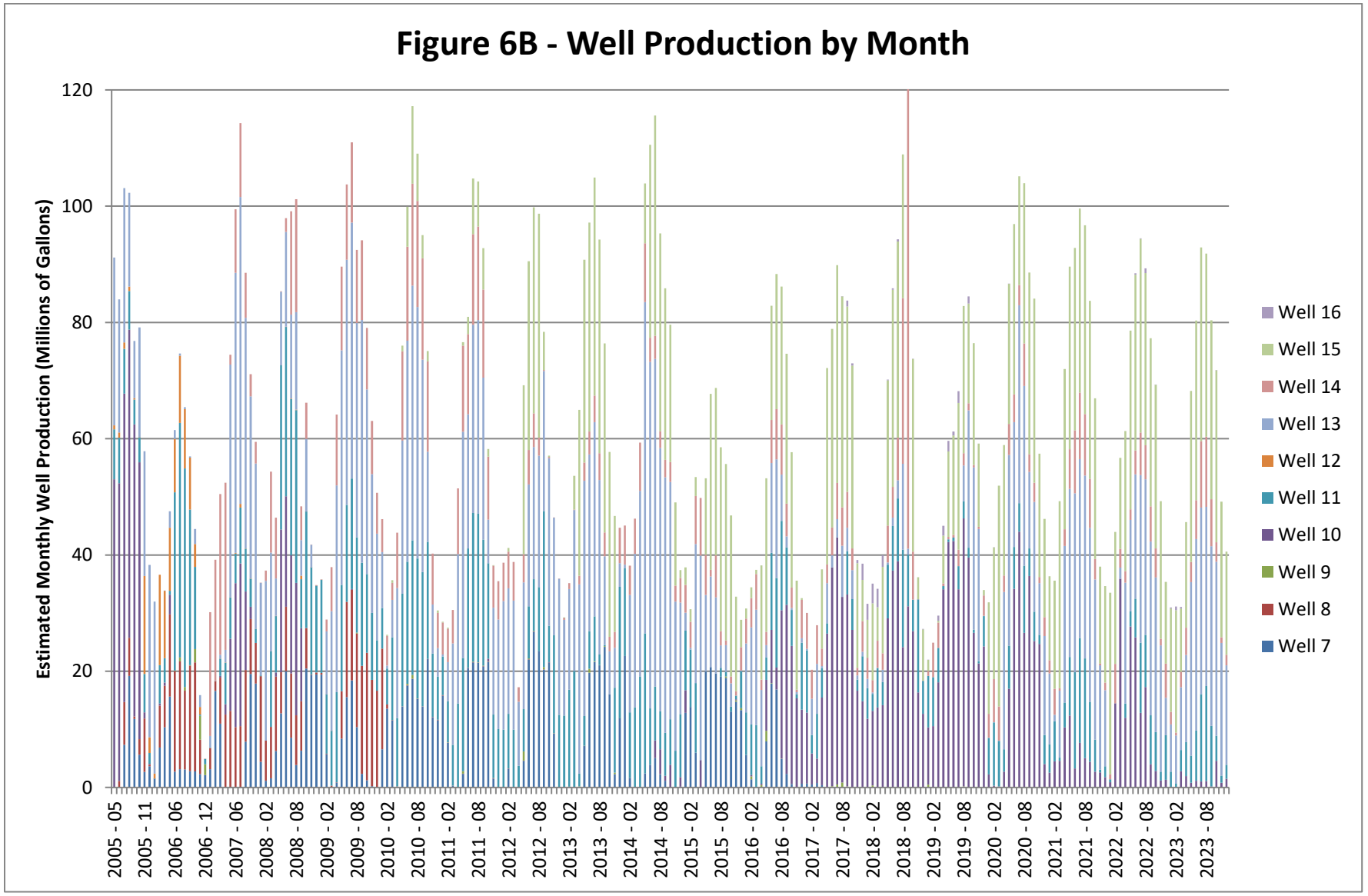


Figure 6B - Well Production by Month
Estimated Monthly Well Production (Millions of Gallons)
120
100
80
60
40
20
0
2005 - 05
2005 - 11
2006 - 06
2006 - 12
2007 - 06
2008 - 02
2008 - 08
2009 - 02
2009 - 08
2010 - 02
2010 - 08
2011 - 02
2011 - 08
2012 - 02
2012 - 08
2013 - 02
2013 - 08
2014 - 02
2014 - 08
2015 - 02
2015 - 08
2016 - 02
2016 - 08
2017 - 02
2017 - 08
2018 - 02
2018 - 08
2019 - 02
2019 - 08
2020 - 02
2020 - 08
2021 - 02
2021 - 08
2022 - 02
2022 - 08
2023 - 02
2023 - 08
Well 16
Well 15
Well 14
Well 13
Well 12
Well 11
Well 10
Well 9
Well 8
Well 7

FIGURE 7B - Well Locations

