

Appendix 2A

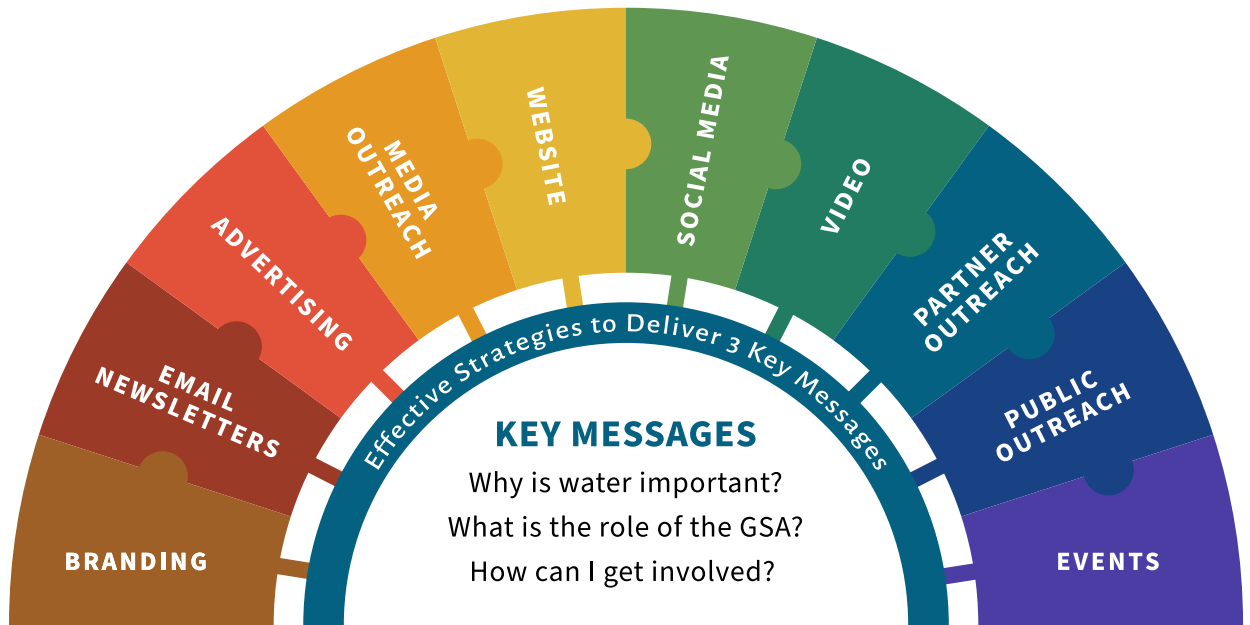
**Public Comments
(TO BE ADDED)**

Appendix 2B

Agency-Wide Marketing & Communications Plan

APPENDIX 2B. AGENCY-WIDE MARKETING & COMMUNICATIONS PLAN

Marketing & Communications Plan



Appendix 2C

Key Messages

APPENDIX 2C. KEY MESSAGES

Initially, our message points focused on: (1) getting to know your GSA; (2) an overview of groundwater sustainability planning for our community; and (3) how we got here. The key messages expanded as the work evolved to include: (4) the future of water availability and protection; (5) ongoing water efficiency efforts including Agency-supported programs; (6) methods for water demand management and regulation; (7) potential projects in support of groundwater sustainability.

Key Messages: Get to Know Your GSA

- SVBGSA is on a mission to develop a Salinas Valley Integrated Groundwater Sustainability Plan by 2023 and achieve groundwater sustainability in the Salinas Valley by 2040.
- Our groundwater basin is comprised of 6 subbasins one of which is identified as “Critically Over-Drafted” – the 180/400-Foot Aquifer.
- The rate of the community’s current water use is unsustainable. To meet our community’s ongoing water supply needs now and into the future we must balance the basin.
- The State has put us on a tight timeline to fix the problem. We ambitiously accept the challenge.
- As of 2020, we have GSP for the 180/400-Foot Aquifer Subbasin and have scoped projects and programs to bring the subbasin back into balance.
- From 2020 through 2022 we worked on GSPs for the other five basins.
- We are implementing our plans and efficiently use our GSA sustainability fee to work towards sustainability.
- Developing a sustainability plan for groundwater impacts everyone. That’s why the SVBGSA Board and our Advisory Committee are diverse and include stakeholders from every walk of life in the Salinas Valley.
- We have an unprecedented opportunity, and responsibility, to work together collaboratively and develop a science-based Groundwater Sustainability Plan.
- Join us! Visit our website, sign up for updates, attend the next meeting and follow us on Facebook.

Key Messages: Groundwater Sustainability Plan

The Subbasin Groundwater Sustainability Plans and Salinas Valley Integrated Implementation Strategy (IIS) are long term plans to ensure that the Salinas Valley Groundwater Basin (SVGB) will be managed sustainably for our current and future generations.

- Groundwater sustainability planning is not only critical to our future - it's mandatory. SGMA mandated that science-based GSPs be developed for the Salinas Valley subbasins by 2020 and 2022. These plans identify projects and management actions that must be implemented to achieve sustainability by 2040 and 2042.
- The stakes are high. Should we choose not to act, or be unable to demonstrate progress, or fail to meet the milestones set by the plans, the State can intervene with required (and potentially hefty) pumping restrictions and extraction fees.
- To meet these milestones, we have been granted the authority to develop GSPs, monitor and measure the basin and individual wells within the basin, implement projects and management actions, and assess necessary fees for planning and implementation.
- Six "Sustainability Indicators" will be evaluated in the GSPs and used to gauge what we need to do to bring our groundwater supply and demand back into balance.
- Given the hydrologic and geographic diversity of the Salinas Valley, the IIS will identify overlapping projects and programs which benefit the basins.
- Our planning process has included the involvement of subbasin committees, coordination with other GSAs and agencies, and ongoing oversight and governance by the Board and its committees, including the Advisory Committee.
- Stakeholder engagement is a key component to the development and implementation of the GSP. We encourage and invite the community to get involved. Attend our monthly Board meetings, attend a Subbasin Committee meeting, sign up for our newsletter.

Key Messages: How We Got Here

- The Salinas Valley Basin GSA is firmly rooted in stakeholder engagement.
- From 2015-2017, local agencies and stakeholders worked with the Consensus Building Institute (CBI) to facilitate the formation of the GSA.
- In 2015, CBI began with a Salinas Valley Groundwater Stakeholder Issue Assessment, which included interviews and surveys. This process resulted in recommendations for a transparent, inclusive process for the local implementation of SGMA and the formation of the GSA.

- Following the Issue Assessment, The Collaborative Work Group of stakeholders representing a broad range of interests met from March 2016 through April 2017 and developed recommendations on the governance structure, voting, and legal structure of the GSA.
- The Stakeholder Forum was simultaneously held throughout 2016 and served as a critical element for interested stakeholders and the public to learn about and provide input on the GSA.
- After nearly two years of community engagement led by the top consensus-building professionals in the nation, the Salinas Valley Basin Groundwater Sustainability Agency was formed in April 2017 with a broad and diverse foundation of support.

Key Messages: Future Water Availability and Protection

- SVBGSA is working to protect and restore the region's groundwater by balancing use with recharge, studying supplemental supply projects, improving coordination, and guiding local solutions through inclusive, science-based planning.
- SVBGSA hosted five workshops in spring 2024 to provide residents and businesses of the Salinas Valley with an opportunity to learn about water use and management in the region.
- Regulatory compliance, climate extremes, data uncertainty, and the high cost of new supply projects add to the challenge and urgency.

Key Messages: Water Efficiency Efforts

- Water is a precious resource that is essential for the Salinas Valley community. One of the most effective ways to contribute to water conservation is by being more water-conscious at home.
- Many rural areas in California rely heavily on groundwater. These communities are often more vulnerable to drought due to limited infrastructure and financial resources.
- To build awareness about water use efficiency among rural residents and empower them to contribute to sustainable groundwater management, the SVBGSA created the Water Efficiency Pilot Program (WEPP) to assist rural residential water users served by small water systems or private wells.
- We are working in our rural residential areas to provide residents with tools to improve water efficiency at home, which will assist the community with achieving sustainable groundwater management in the Salinas Valley.

- Residents who are customers of large water systems are encouraged to determine if they are eligible for rebates, conservation programs or free resources from their water agency.
- SVBGSA contracted with WaterWise Consulting, Inc. to provide free home visits to rural homes owned or rented in any of the six subbasins that fall under the jurisdiction of SVBGSA to assess how residents could improve their water use efficiency.

Key Messages: Methods for Water Demand Management and Regulation

- SVBGSA conducted an assessment to investigate how stakeholders understand and support demand management. The report is brought to the SVBGSA Board of Directors in March 2023.
- A legal white paper summarizing California law considerations for demand management was shared with the community during the SVBGSA Board meeting in March 2025.
- Also in spring 2025, the “Our Water Future in the Salinas Valley: Planning for Uncertainty” community workshops provided an opportunity for community dialogue.
- The demand management strategy was developed and discussed by subbasin committees for 18 months before the SVBGSA Board adopted the Demand Management Framework.
- Recommended initial stage classifications for each subbasin based on triggers were developed through a public process and the recommendations were received by the SVBGSA Board in February 2026.

Key Messages: Potential Projects

- In Spring 2026, SVBGSA completed a series of feasibility studies and technical investigations evaluating the projects and management actions needed to meet the Sustainable Management Criteria established in the GSPs for the six Salinas Valley subbasins.
- This technical was translated into policy through the Integrated Implementation Strategy (IIS) — a process for evaluating combinations of projects and management actions across the Salinas Valley. Rather than assessing individual projects in isolation, the IIS evaluates scenarios that reflect the hydraulic connectivity of the subbasins and the need for coordinated solutions.
- The IIS process to select the portfolio involved three key steps: (1) SVBGSA staff develops integrated implementation scenarios based on the technical studies; (2) the Advisory Committee reviews scenarios, gathers public input, and develops

recommendations; (3) the Board of Directors considers Advisory Committee recommendations before selecting the preferred implementation scenario

- The Board selected a portfolio in August 2026 as the preferred implementation pathway to guide the Salinas Valley toward long-term groundwater sustainability.

Appendix 2D

Media Policy

APPENDIX 2D. MEDIA POLICY

The press is an important partner for getting our message out to the community. To maximize our effectiveness in working with the media, a consistent protocol will be followed by staff, consultants, board members, and committee members.

Agency Spokesperson(s)

- The primary spokesperson for all media inquiries is the General Manager (GM). Media inquiries should first be directed to the GM to coordinate a response.
- Reporters may want to also interview board and community members. Some board members may enjoy media conversations, while others do not. The SVBGSA will maintain a standby list of board and community members, who will be prepared and can be called on for media inquiries.
- In preparation for the interview, the GM and communications team will work closely with the spokespeople in preparation for media interviews. Factual and coordinated talking points will be provided in advance of the interview.

Responding Quickly

- Reporters work on tight deadlines. To ensure an opportunity is not missed, all media inquiries should receive an immediate response and referred to the GM at the earliest possible opportunity.

The Back-Up Plan

- If the GM is unavailable and cannot be reached for comment, media inquiries should be directed to the Board's back-up media representative. The Board's representative will contact the communications team to determine whether a response is necessary. If the response is not urgent, offer the media an appointment time for when the GM is available. If it is a time sensitive and urgent matter, a statement will be released from the Board representative in close coordination with the communications team.

News Monitoring and Tracking

- Following the interview or statement, if published, the GM or communications team will circulate the coverage to the Board and committee members.

Appendix 2E

Disadvantaged Communities

APPENDIX 2E. DISADVANTAGED COMMUNITIES

Introduction and Purpose of Appendix

Many of the communities in the Salinas Valley Groundwater Basin are classified as Disadvantaged Communities (DACs) and Severely Disadvantaged Communities (SDACs), as well as Economically Distressed Areas (EDAs). The SVBGSA jurisdictional area has well documented DAC-designated areas including 5 Cities or Census Designated Places (CDPs), 50 Block Groups, and 18 Tracts. Additionally, work conducted by the Greater Monterey County Integrated Regional Water Management (IRWM) Program identified 25 small disadvantaged, severely disadvantaged, and suspected disadvantaged communities in unincorporated areas of the IRWMP region (Greater Monterey County Regional Water Management Group, 2018), which includes the entire SVBGSA area. As many of these communities are dependent on groundwater for drinking water, they face challenges associated with drinking water quality.

The State of California has recognized challenges in providing clean, safe, and affordable drinking water to all its citizens, especially low-income and minority communities. In 2012, California law AB 685, the Human Right to Water, declared that every person has a right to clean, safe, and affordable drinking water. In 2019, the State further made it a priority by passing SB 200, the Safe and Affordable Drinking Water Fund. In Fiscal Year 2019-2020, it dedicated \$130 million for safe drinking water solutions in DACs that do not have access to safe drinking water.

The Salinas Valley Groundwater Basin is one of the most productive agricultural regions in the world. However, over several decades seawater intrusion and intensive fertilizer use resulting in nitrate contamination have compromised drinking water quality in parts of the Salinas Valley. Nitrate contamination in groundwater can pose serious health risks to pregnant women and infants if consumed at concentrations above the maximum contaminant level (MCL) of 10 milligrams per liter (mg/L) nitrate as nitrogen (NO₃-N). Nitrate contamination not only poses health risks but also results in major costs for small rural communities. This is particularly challenging for economically disadvantaged communities in the Salinas Valley.

SGMA has limited requirements with regards to improving groundwater quality; the SGMA regulations are written in terms of avoiding degradation (CWC, §354.28 (c)(4)). However, the SVBGSA seeks to continue to engage constructively with disadvantaged communities throughout GSP implementation. SVBGSA maintains strong relationships with agencies monitoring and addressing water quality issues in the Salinas Valley. The purpose of this appendix is to provide background information on the relationship between DACs (including SDACs and EDAs) and groundwater conditions, particularly with respect to the drinking water challenges in the Salinas Valley.

Unless otherwise noted, the information in this appendix is based on and much is excerpted from the Integrated Regional Water Management (IRWM) Plan for the Greater Monterey County Region (Greater Monterey Regional Water Management Group, 2018).

Identifying DACs in the Salinas Valley

A Disadvantaged Community (DAC) is defined in the California Water Code (§79505.5(a)) as a community with an annual median household income (MHI) that is less than 80% of the statewide annual MHI, based on 5-year estimates. Further, a Severely Disadvantaged Community (SDAC) is defined as a community with an annual median household income that is less than 60% of the statewide annual MHI, based on five-year estimates. The Prop 4 Climate Bond updates this criteria to also define DACs and SDACs as communities with an MHI that is 80% and 60% of the *area* average, respectively.

For information on how these designations are determined, see the Greater Monterey County Integrated Regional Water Management Plan (Greater Monterey County Regional Water Management Group, 2018). These designations are significant because in order for a community to be eligible for State grant funds specially allocated for disadvantaged communities, or to be eligible for reduced matching fund requirements, a community must meet one of these strict definitions. Furthermore, the Prop 4 Climate Bond stipulates that at least 40 percent of grant funding be invested in programs or projects that provide meaningful direct benefits to DACs, SDACs, and vulnerable populations, which are defined as:

...a subgroup population within a region or community that faces a disproportionately heightened risk or increased sensitivity to impacts of climate change and that lacks adequate resources to cope with, adapt to, or recover from such impacts. (Note: tribes are considered vulnerable populations).

There are several areas in the Salinas Valley that contain vulnerable populations based on their combination of high climate hazard and medium social vulnerability; high climate hazard and high social vulnerability; or medium climate hazard and high social vulnerability. The state's Vulnerable Communities Platform (<https://vcp.lci.ca.gov/>) maps these populations.

At the same time, the California Department of Water Resources (DWR) also recognizes the existence of communities that are economically challenged but that are not designated as being disadvantaged according to U.S. Census data. These communities have been labeled Suspected Disadvantaged Communities until their status can be established.

In addition to disadvantaged communities, DWR recognizes Economically Distressed Areas. An economically distressed area (EDA) is defined as:

...a municipality with a population of 20,000 persons or less, a rural county, or a reasonably isolated and divisible segment of a larger municipality where the segment of the population is 20,000 persons or less, with an annual median household income that is less than 85 percent of the statewide median household income, and with one or more of the following conditions as determined by the department: (1) financial hardship, (2) unemployment rate at least 2 percent higher than the statewide average, or (3) low population density (Water Code §79702(k)).

Figure 1 shows the communities currently designated as DACs, SDACs, or EDAs in the Salinas Valley. This figure combines Census Tracts and Census Places to give a more complete representation of the communities within this area. Census block groups were not included in the figure because they are excluded from the newer Climate Bond (Proposition 4) (S)DAC Mapping Tool due to high margins of error and data privacy concerns.

For the most recent Census American Community Survey (ACS) dataset, the 5-year (2019-2023) statewide MHI is \$96,334; thus, \$77,067 and \$57,800 represent the DAC and SDAC thresholds, respectively Salinas Valley(see <https://gis.water.ca.gov/app/dacs/>). For example, Gonzales has a median household income of \$76,060 and is thus designated as a DAC, and San Lucas has a median household income of \$54,375 and is thus designated as an SDAC. The 85% MHI threshold for EDAs is \$81,884, and the statewide unemployment rate for 2023 is 4.7%. The Census Tracts, as well as Census Places with populations of less than 20,000 people, with MHIs below this threshold are shown in Figure 1. Since Monterey County has an unemployment rate of 7.3%, which is more than 2% higher than the statewide average, all of the Tracts and Places shown in Figure 1 can be considered EDAs, as they meet at least one of conditions of the second set of EDA criteria.

Table 1 shows the estimated percent of population of each subbasin that resides in DACs, SDACs, and EDAs by Census Block Group and Census Tract for each subbasin. These populations were estimated using a proportional area analysis, where the proportion of the area of the Census Block Group or Tract located in the subbasin was multiplied by the population of that Census Block Group or Tract. This analysis assumes equal distribution of population across the Census units. The same analysis was completed for Census Places; however, percentages for these units are not included in Table 1 because Places do not account for the full estimated population of each subbasin.

Table 1: Estimated Percent of Population Residing in DAC/SDAC/EDA by Subbasin in 2023

Subbasin	Census Block Group			Census Tract		
	DAC*	SDAC	EDA	DAC*	SDAC	EDA
180/400	28.1%	2.5%	34.9%	11.5%	1.5%	12.8%
Eastside	29.5%	10.3%	38.4%	44.0%	4.7%	47.5%
Forebay	31.2%	8.8%	31.4%	28.3%	0.0%	46.6%
Langley	13.4%	1.5%	13.4%	1.5%	1.5%	8.8%
Upper Valley	52.3%	38.1%	74.8%	77.7%	46.8%	85.1%
Total	30.2%	9.6%	37.7%	31.9%	4.7%	37.7%

*DACs are inclusive of SDACs

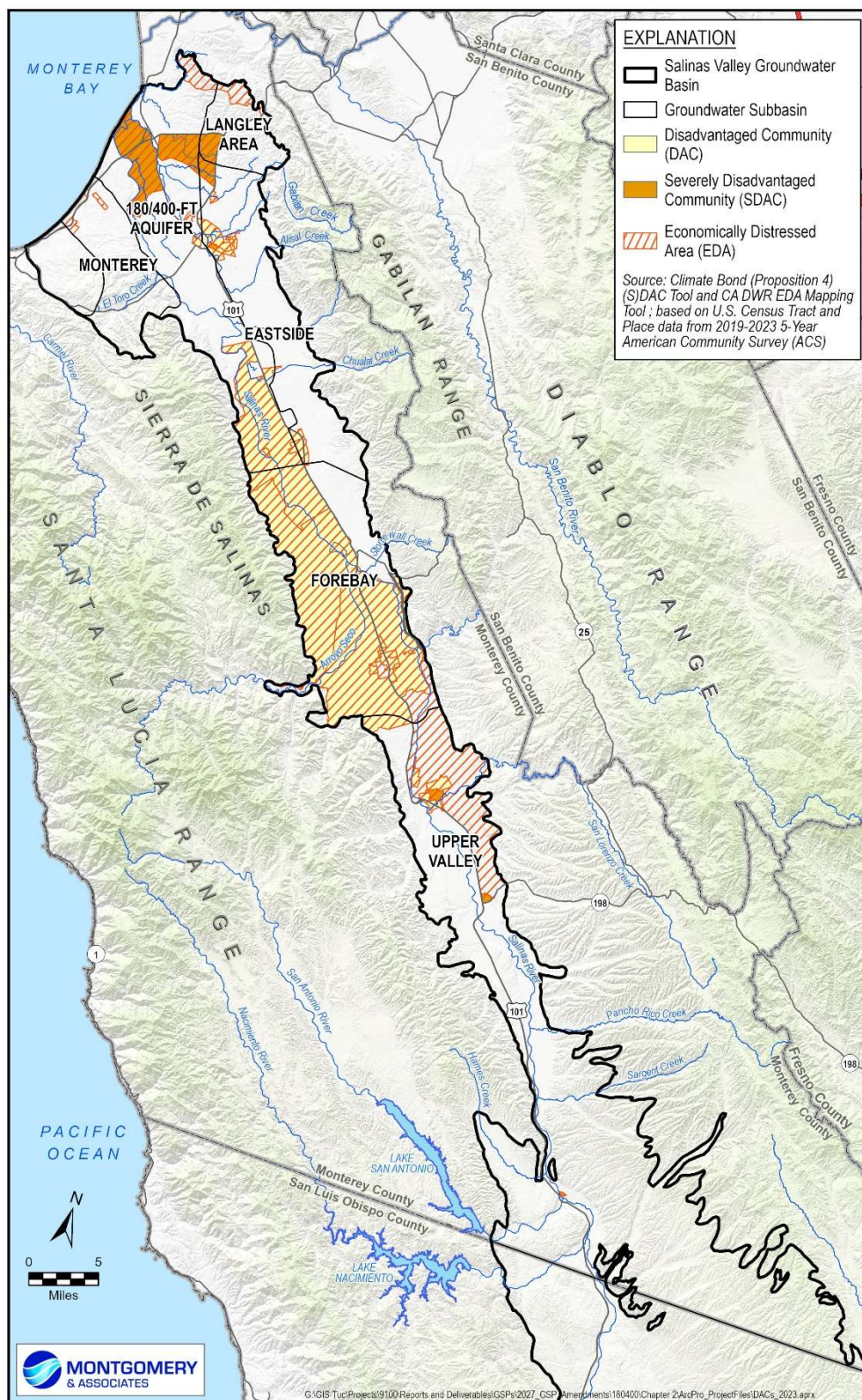


Figure 1. DAC/SDAC/EDA in the Salinas Valley Groundwater Basin

As highlighted in the IWRM Plan, small disadvantaged communities in unincorporated areas often have small public water systems that serve fewer than 200 connections. The smallest of these communities have State Small Water Systems (SSWS), which serve between 5 and 14 connections; Local Small Water Systems (LSWS), which serve between 2 and 4 connections; and/or households served by private domestic groundwater wells. There is a significant difference in capacity, water supply, and infrastructure needs between a DAC served by a large water system (e.g., a large disadvantaged community of several thousand people, or a small disadvantaged community served by a large water utility) and a small disadvantaged community served by a small water system or by private wells. The State Water Resources Control Board (SWRCB) summarized these differences in its 2015 report, Safe Drinking Water Plan for California (SWRCB, 2015):

- Small water systems have the greatest difficulty in providing safe drinking water because they are least able to address the threats to public health associated with water quality.
- Larger water systems are better equipped to deal with water quality issues because they have more customers to fund the necessary improvements, have economy of scale, more technical expertise, better management skills and knowledge, are able to solve operational problems internally, and have dedicated financial and business-related staff. They generally have more sophisticated treatment and distribution system operators who are able to react to incidents and changes in treatment conditions that may occur during operations.
- On the other hand, small systems, especially those in disadvantaged communities, have only a small number of customers, which provides them with limited fiscal assets and no economy of scale. They often lack technical expertise, the ability to address many of the issues pertinent to operating a water system, as well as qualified management and financial and business personnel. In many instances, especially for very small water systems, the system operator may be just a part-time position.

Following the Greater Monterey County IWRM Plan, this Appendix includes DACs, SDACs, and EDAs and places an emphasis on small disadvantaged communities for the reasons highlighted by the SWRCB.

Jurisdictional Responsibilities

A number of agencies and groups have existing jurisdictional responsibility over groundwater quality. The SVBGSA will collaborate with these agencies and groups so as to not duplicate efforts or overstep its institutional authority. The following agencies and groups have responsibility over various aspects of groundwater (Greater Monterey County Regional Water Management Group, 2018):

- **Greater Monterey County IRWM Regional Water Management Group** – AB1630 appropriated State grant funds to enable this Group to develop solutions for DACs to be integrated into the broader IRWM planning effort. IRWM is a voluntary, collaborative effort to identify and implement water management solutions on a regional scale to increase regional self-reliance, reduce conflict, and manage water resources. The IRWM planning process brings together water and natural resource managers along with other community stakeholders to collaboratively plan for and ensure the region’s continued water supply reliability, improved water quality, flood management, and healthy functioning ecosystems. The Department of Water Resources manages grant programs specifically designated for adopted IRWM Plans including funding for water quality improvement projects.
- **State Water Resources Control Board (SWRCB)** – The SWRCB administers the state’s Drinking Water Program as the federally-designated Primary Agency responsible for the administration and enforcement of the Safe Drinking Water Act requirements in California. Prior to July 1, 2014, the California Department of Public Health was designated as the Primary Agency. These requirements are defined in the California Health and Safety Code and Titles 17 and 22, California Code of Regulations. The CDPH continues to maintain the State’s Drinking Water and Radiation Laboratory, which serves as the state’s principal laboratory as required for primacy under the Safe Drinking Water Act. The SWRCB is responsible for the regulatory oversight of over 7,600 public water systems in California. It may delegate oversight responsibility of public water systems with less than 200 service connections to local county health departments, which it has done in Monterey County.
- **Monterey County Department of Environmental Health (MCDEH)** – Delegated oversight responsibility by the SWRCB, MCDEH is the Local Primary Agency and its Drinking Water Protection Services regulates domestic water systems in the County that serve between two and 199 connections. MCDEH also regulates all well construction in Monterey County.
- **SWRCB and Central Coast Regional Water Quality Control Board** – State policy on water quality control falls under the SWRCB, which is the state water pollution control agency for all purposes under the Clean Water Act (CWC §13160), including drinking water sources from both surface water and groundwater. The SWRCB has nine regional boards, including the Central Coast Regional Water Quality Control Board (CCRWQCB), which is responsible for the day-to-day implementation of the federal Clean Water Act and California’s Porter-Cologne Water Quality Control Act in the Central Coast. Together, the State Water Board and Regional Boards are responsible for the protection of the quality of ambient surface and groundwater up to the point where the water enters a drinking water well or surface water intake. The Regional Boards are

responsible for developing and enforcing water quality objectives and implementation plans to protect the beneficial uses of the State's waters. The Regional Boards enforce water quality regulations through the following means.

- **Basin Plan** – Each Regional Board is directed to formulate a water quality control plan, called a Basin Plan, that includes water quality standards under the Clean Water Act. The CCRWQCB implements the Basin Plan in the Central Coast Region, in part by issuing and enforcing waste discharge requirements to individuals, communities, or businesses whose waste discharges can affect water quality, including surface water, groundwater, or wetlands.
- **Waste Discharge Requirements (WDRs)** – WDRs, sometimes simply known as Orders, for discharges to waters of the United States also serve as National Pollutant Discharge Elimination System (NPDES) permits. The SWRCB and CCRWQCB regulate discharges from wastewater treatment and disposal systems under general WDRs. Small, domestic wastewater treatment systems having a maximum daily flow of 100,000 gallons per day (gpd) or less that discharge to land are covered under a statewide general WDR permit for small systems (Order WQ 2014-0153-DWQ). The State and Regional Boards are also responsible for plans and permits related to other uses, such as farming, septic tanks, and larger scale sewage treatment that can also impact the quality of surface and ground waters.
- **Irrigated Lands Program (ILP)** – The SWRCB initiated the ILP in 2003 to control agricultural runoff's impairment of surface waters. In 2012, groundwater regulations were added to the program. Waste discharge requirements, which protect both surface water and groundwater, address agricultural discharges throughout the Central Coast. Anyone who irrigates land to produce crops or pasture commercially must seek ILP permit coverage and maintain in good standing with their coalitions. This regulatory program has since been updated with Agricultural Order 4.0.
- **Department of Pesticide Regulation** – The California Department of Pesticide Regulation is responsible for ensure that pesticides do not contaminate the groundwater.
- **Office of Environmental Health Hazard Assessment** – The California Office of Environmental Health Hazard Assessment is responsible for providing the SWRCB with health-based risk assessments for contaminants. These assessments are used to develop primary drinking water standards.
- **California Public Utilities Commission (CPUC)** – The CPUC is responsible for ensuring that California's investor-owned water utilities deliver clean, safe, and reliable

water to their customers at reasonable rates. The Water Division regulates over 100 investor-owned water and sewer utilities under the CPUC's jurisdiction; providing water service to about 16 percent of California's residents.

- **Local Agency Formation Commissions (LAFCOs)** – These commissions oversee the expansion of service areas of public agencies, including cities that own or operate public water systems. They can review public agencies to determine if the agency is providing municipal services in a satisfactory manner, including the delivery of safe drinking water.
- **Central Coast Groundwater Coalition (CCGC)** – The CCGC is a non-profit 501(c)5 mutual benefit organization that represents landowners and growers who operate in Monterey, San Benito, Santa Clara, Santa Cruz, San Luis Obispo, and Santa Barbara counties, as well as the northern portion of Ventura County in the Central Coast Region. The CCGC is not a governmental organization like the other jurisdictional agencies, and therefore does not have legal jurisdictional authority. However, the CCGC is the primary organization tasked with fulfilling the groundwater quality regulatory requirements in the Irrigated Lands Regulatory Program (ILRP) of the Central Coast Regional Water Quality Control Board. The organization combines the resources of its members to achieve economies of scale to comply with the regulatory requirements of the CCRWQCB. Between 2013 and 2015, the CCGC characterized the rural drinking water supply and shallow groundwater aquifer in the CCGC region which includes the previously noted six counties. In addition to using data from member wells, CCGC gathered publicly available data generated by the counties and data submitted by landowners and growers who perform individual monitoring as part of the current ILRP. Information collected on tested wells included depth to groundwater and well perforation levels where available. For many wells, quality parameters were collected, such as nitrates and total dissolved solids (TDS). In the groundwater characterization report, the information from the six counties was compiled and analyzed to produce maps showing areas where groundwater quality exceeds drinking water limits for nitrates. This information enabled CCGC to develop an accurate groundwater characterization in 2015 which provides growers, regulators and the public with a better understanding of local aquifers and geology in the six-county region.

DAC Drinking Water Challenges

Drinking water systems are categorized according to the number of service connections:

- Public water systems, which are referred to as municipal public water systems in this GSP for clarity, are water systems that provide drinking water to at least 15 service connections or serve an average of at least 25 people for at least 60 days a year,

- State small water systems are water systems that provide piped drinking water to between five and 14 service connections, and do not regularly serve drinking water to more than an average of 25 individuals daily for more than 60 days out of the year,
- Local small water systems are water systems that provide drinking water to between two and four service connections, and
- Private domestic wells usually provide water to only one or two connections.

Since state small water systems, local small water systems, and private domestic wells face more severe drinking water challenges than public water systems, they are the focus for the following discussion.

Private domestic wells are not regulated by the State. MCDEH requires one-time nitrate testing of newly installed private domestic wells, but there are no additional requirements. The SWRCB's Groundwater Ambient Monitoring and Assessment (GAMA) Domestic Well Project was developed in order to address the lack of domestic well water quality data. The GAMA Groundwater Information System includes numerous datasets that can be downloaded by users. The CCRWQCB also collects domestic well data per Irrigated Lands Regulatory Program (ILRP) groundwater monitoring requirements.

Between October 2013 and August 2014, the CCGC compiled water quality data from 229 samples from domestic and irrigation wells in the Salinas Valley. Data were collected from the GeoTracker GAMA database that includes data from the California Department of Public Health, GAMA-SWRCB data collection efforts and Regulated Sites. Additional data were collected from the USGS National Water Information System data, and data were extracted from the GAMA special study carried out by Lawrence Livermore National Laboratory. In its 2015 *Groundwater Characterization Report* (CCGC, 2015), CCGC made the following conclusions regarding nitrate in the Salinas Valley:

- 41% of wells with nitrate concentrations (or 309 of 758 total wells sampled) had maximum concentrations over the MCL.
- 34% of the land area within the Salinas Valley has nitrate concentrations over the MCL.
- 55% of domestic wells or 121 of 221 total sampled on CCGC-member properties had concentrations exceeding the MCL.

Domestic wells and wells associated with local small and state small water systems are generally more susceptible to nitrate contamination since they are typically shallow and are more likely to be located in rural areas within or adjacent to agricultural areas. They are also more susceptible to potential nitrate contamination from nearby septic systems. Public water systems, on the other

hand, tend to access deeper groundwater and are more likely to be located in areas that are less susceptible nitrate contamination. Public water system operators implement regular water quality testing and treatment as necessary, and wells are usually taken out of service once they become contaminated. Funding programs are often available for public water systems, and costs are spread out over a large number of ratepayers over time. When contamination is detected in private domestic wells, treatment options are limited and the individual homeowner will typically have to bear the full cost of addressing the problem (CCGC, 2015).

According to the IRWM Plan, only a very small percentage of domestic wells in Monterey County have been tested through the Central Coast Regional Water Quality Board's groundwater monitoring programs. MCDEH has adopted a policy to begin requiring well testing when an application for repair or replacement of a septic system is proposed, which will provide new additional data.

MCDEH Drinking Water Protection Services regulates state small and local small water systems through their Small Water System Program. There are currently 694 local small and 276 state small water systems in Monterey County, which serve about 4,232 connections (Greater Monterey County Regional Water Management Group, 2018).

DACs in the Salinas Valley rely primarily on groundwater for their drinking water supply, except for those who have to rely on bottled water due to unsafe or poor water quality conditions. The primary drinking water problems experienced by small DACs in Monterey County are related to nitrate contamination, seawater intrusion, or other contaminants of concern. Numerous studies over the decades have documented these challenges.

Although several of the subbasins in the Salinas Valley are in overdraft, poor or unsafe drinking water quality in some locations is a persistent challenge. During the recent prolonged drought, while Monterey County was classified as experiencing "exceptional" drought, very few water users in the Greater Monterey County IRWM region actually suffered from a lack of water availability. While the drought had immediate impacts on surface water supplies throughout the State, it tended to have a more gradual impact on groundwater supplies. Groundwater quality, rather than quantity, is of primary concern for drinking water supplies in the Salinas Valley, particularly nitrate contamination and seawater intrusion.

Nitrate Contamination

Nitrate contamination is particularly problematic in the Salinas Valley Groundwater Basin, where agriculture dominates the landscape. Nitrate is currently extensively monitored and evaluated by the CCGC and is documented in a report submitted to the CCRWQCB (CCGC, 2015). Nitrate contamination in the Salinas Valley was first documented in a report published by the Association of Monterey Bay Area Governments (AMBAG) in 1978. In 1988, a report by the State Water Board documented that nitrate levels in the Salinas Valley groundwater had

impaired its beneficial use as a drinking water supply. In a July 1995 staff report, the SWRCB ranked the Salinas Valley as their number one water quality concern due to the severity of nitrate contamination. All of the Salinas Valley cities have had to replace domestic water wells due to high nitrate levels that exceed the drinking water MCL. Maps prepared by the MCWRA indicate that elevated nitrate concentrations in groundwater were locally present through the 1960s, but significantly increased in the 1970s and 1980s.

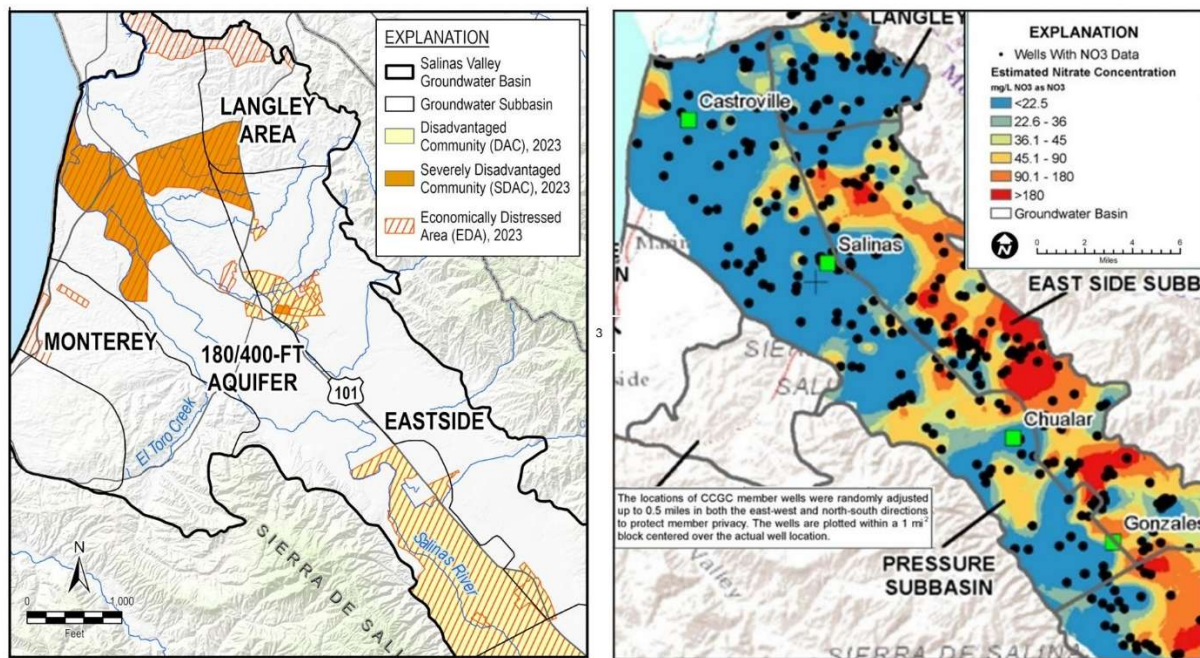


Figure 2. DACs, SDACs, and EDAs in the 180/400-Foot Aquifer Subbasin and Nitrate Concentration Map developed by CCGC (2015)

Seawater Intrusion

Seawater Intrusion is another significant water quality concern for DACs and SDACs, primarily impacting coastal communities in the northern part of the Salinas Valley Groundwater Basin. Seawater intrusion has been observed in the 180-Foot and 400-Foot Aquifer Subbasin for over 70 years, and was documented in DWR Bulletin 52 in 1946. By the 1940s, many agricultural wells in the Castroville area had become so salty that they had to be abandoned (Greater Monterey County Regional Water Management Group, 2018). Seawater is high in chlorides. EPA defines the 1000 mg/L threshold as an Upper Limit Secondary Maximum Contaminant Level (SMCL). Locally 500 mg/L is the threshold for seawater intrusion, with impacts to agriculture at lower levels than the drinking water standard. Seawater intrusion is the primary threat to drinking water supplies for many DACs located in the northern coastal portion of the Salinas Valley.

Seawater has intruded inland in the 180-Foot and 400-Foot Aquifers, as shown on Figure 3 and Figure 4. Seawater intrusion in the 180-Foot Aquifer covered approximately 20,000 acres in 1995 and had expanded to approximately 28,000 acres by 2010. Since then, the rate of expansion has decreased, with an overlying area of 28,300 acres in 2017. The area overlying intrusion into the 400-Foot Aquifer is not as extensive, with an overlying area of approximately 12,000 acres in 2010. However, between 2013 and 2015, the 400-Foot Aquifer experienced a significant increase in the area of seawater intrusion, from approximately 12,500 acres to approximately 18,000 acres, likely resulting from localized downward migration between aquifers.

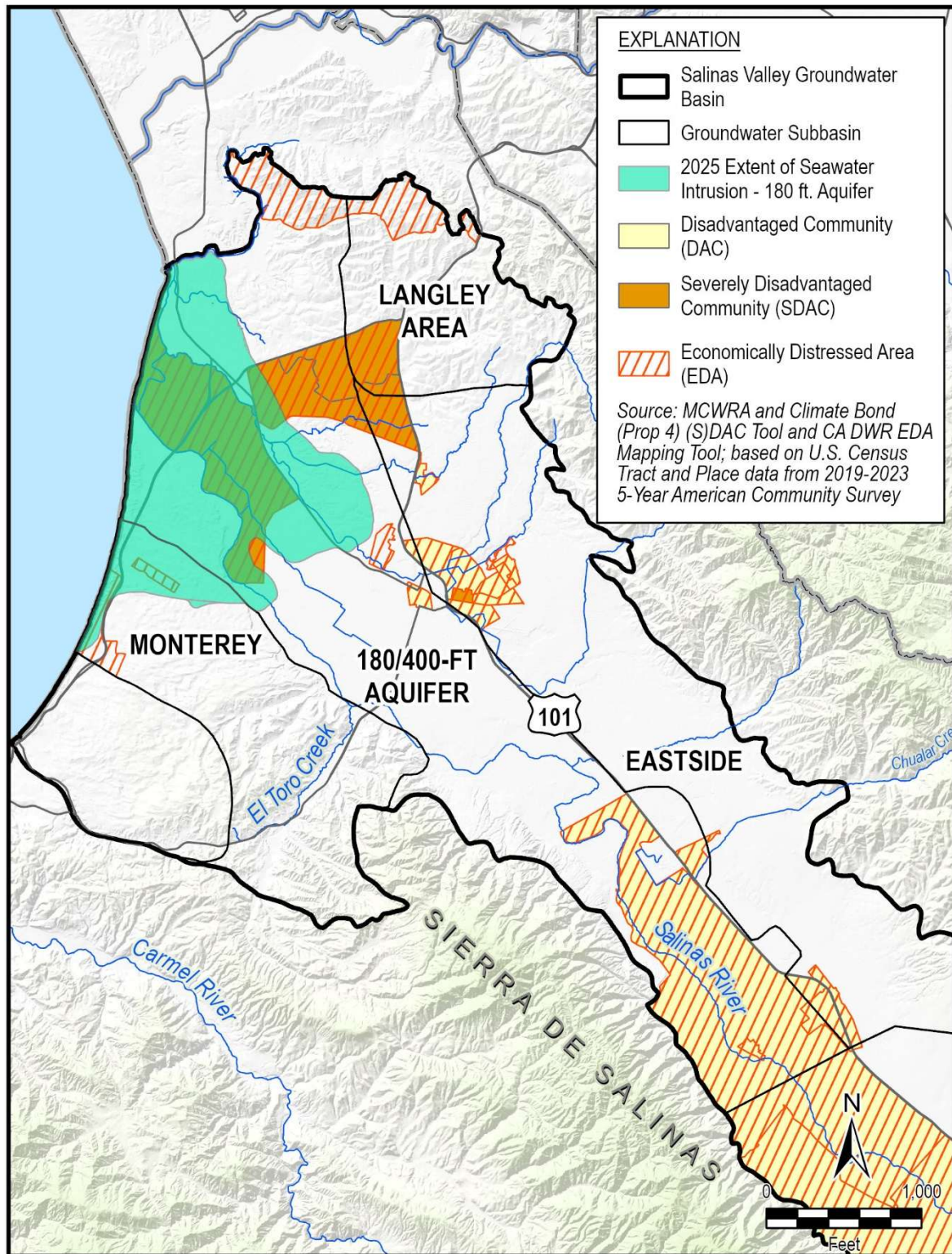


Figure 3. 2025 Extent of Seawater Intrusion in the 180-Foot Aquifer

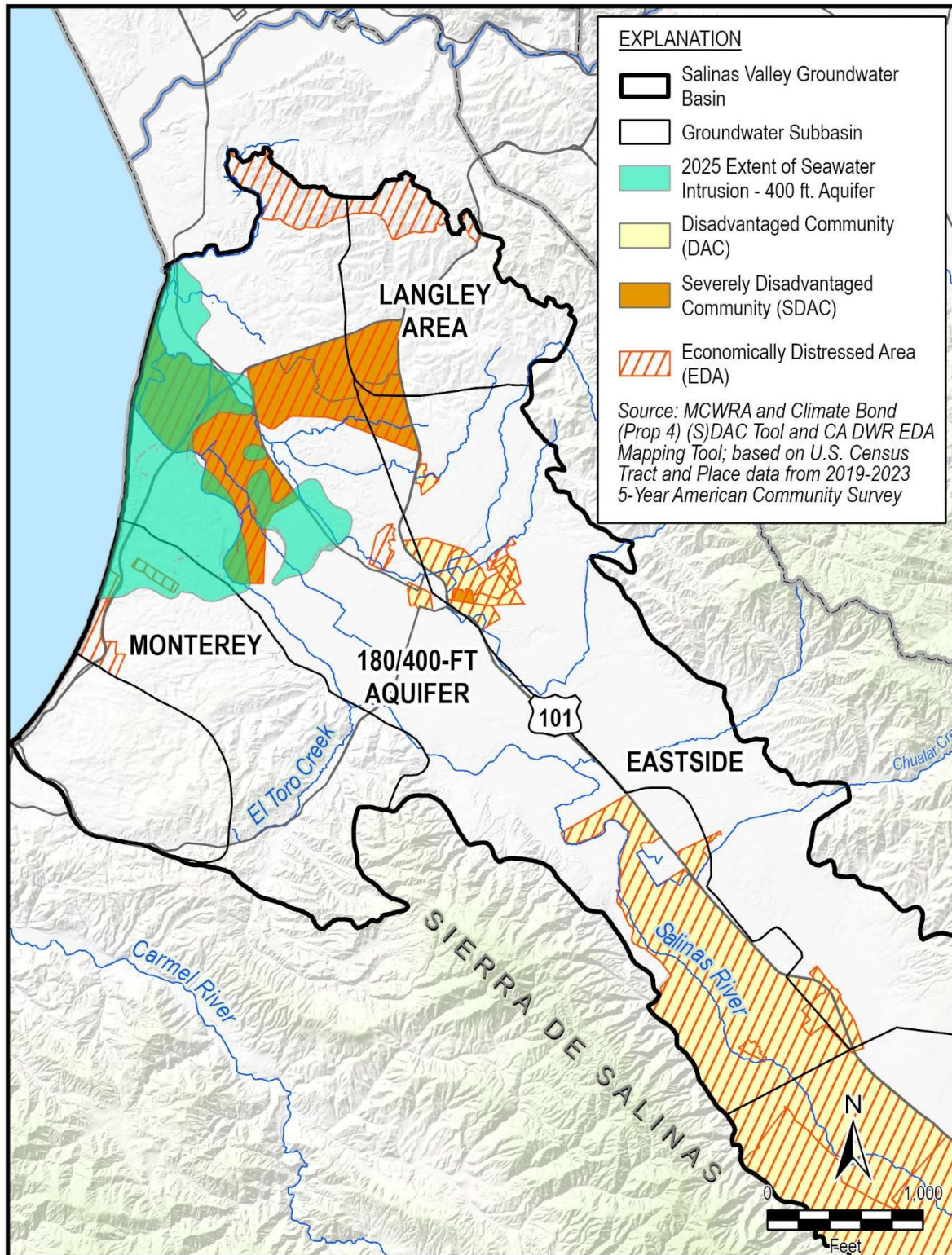


Figure 4. 2025 Extent of Seawater Intrusion in the 400-Foot Aquifer

Other Contaminants of Concern

In addition to nitrates and seawater intrusion, there are a few other contaminants of concern. With the recent passage of Assembly Bill (AB) 1249 (Salas, Chapter 717, Statutes of 2014), the State has recognized the prevalence, and urgency to address, the contamination of drinking water supplies in California by not only nitrate, but specifically by arsenic, perchlorate, and hexavalent chromium. The Greater Monterey County IRWM Regional Water Management Group convened a Technical Advisory Committee with MCDEH and the Central Coast Regional Water Quality Control Board to identify the extent of nitrate, arsenic, perchlorate, and hexavalent chromium contamination in communities throughout the region.

Conclusion

The State of California has recognized the severity of drinking water challenges for DACs with the passage of the 2012 Human Right to Water Act (AB 685), which declared that every person has a right to clean, safe, and affordable drinking water. Further, it emphasized this state-wide focus with the Safe and Affordable Drinking Water Fund in 2019, which is intended to provide funding specifically for safe drinking water solutions in DACs that do not have access to safe drinking water.

This appendix highlights the relationship between DACs and groundwater in the Salinas Valley Groundwater Basin, particularly with respect to drinking water. It provides a base for the SVBGSA to engage DACs in groundwater management activities and support state and local efforts related to drinking water.

References

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- Greater Monterey County Regional Water Management Group. 2018. "Integrated Regional Water Management Plan for the Greater Monterey County Region." Accessed December 20, 2019. <http://www.greatermontereyirwmp.org/documents/plan/>.
- Rural Community Assistance Corporation. 2017. "Castroville Community Services District Median Household Income Survey Results Prop 1 Agreement No. D1612801/TA Work Plan No. 5077-A." March 30, 2017.

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https://www.waterboards.ca.gov/publications_forms/publications/legislative/docs/2015/sdwp.pdf.

Appendix 3A

Water Systems

Table 1. Small Water Systems (2-14 connections)

Water System Name	ID	Connections	Population Served	Subbasin
ALISAL RD WS #01	2702233	N/A	N/A	EASTSIDE AQUIFER
ALISAL RD WS #02	2702497	N/A	N/A	EASTSIDE AQUIFER
ALISAL RD WS #03	2702519	N/A	N/A	EASTSIDE AQUIFER
BORONDA RD WS #07	2702557	N/A	N/A	EASTSIDE AQUIFER
CHUALAR CANYON WS #01	2701188	N/A	N/A	EASTSIDE AQUIFER
CHUALAR CANYON WS #03	2701523	N/A	N/A	EASTSIDE AQUIFER
CHUALAR CANYON WS #04	2701775	N/A	N/A	EASTSIDE AQUIFER
CHUALAR CANYON WS #05	2701810	N/A	N/A	EASTSIDE AQUIFER
CHUALAR CANYON WS #07	2701478	N/A	N/A	EASTSIDE AQUIFER
CHUALAR CANYON WS #09	2702136	N/A	N/A	EASTSIDE AQUIFER
CHUALAR CANYON WS #11	2702386	N/A	N/A	EASTSIDE AQUIFER
CORONA RD WS 3	2702505	N/A	N/A	EASTSIDE AQUIFER
EL CAMINO REAL WS #01	2700560	N/A	N/A	EASTSIDE AQUIFER
EL CAMINO REAL WS #28	2701758	N/A	N/A	EASTSIDE AQUIFER
EL CAMINO REAL WS #33	2701108	N/A	N/A	EASTSIDE AQUIFER
EL CAMINO REAL WS #34	2700508	N/A	N/A	EASTSIDE AQUIFER
EL CAMINO REAL WS #35	2701218	N/A	N/A	EASTSIDE AQUIFER
EL CAMINO REAL WS #37	2701920	N/A	N/A	EASTSIDE AQUIFER
EL CAMINO REAL WS #43	2702282	N/A	N/A	EASTSIDE AQUIFER
ESPINOSA RD WS #08	2702012	N/A	N/A	EASTSIDE AQUIFER
ESPINOSA RD WS #09	2702298	N/A	N/A	EASTSIDE AQUIFER
GLORIA RD WS #01	2701678	N/A	N/A	EASTSIDE AQUIFER
GOULD RD WS #01	2701064	N/A	N/A	EASTSIDE AQUIFER
HARRISON RD WS #02	2701433	N/A	N/A	EASTSIDE AQUIFER
HARRISON RD WS #03	2701746	N/A	N/A	EASTSIDE AQUIFER
HARRISON RD WS #04	2701994	N/A	N/A	EASTSIDE AQUIFER
HARRISON RD WS #06	2702128	N/A	N/A	EASTSIDE AQUIFER
HARRISON RD WS #07	2702297	N/A	N/A	EASTSIDE AQUIFER
HARRISON RD WS #08	2702401	N/A	N/A	EASTSIDE AQUIFER
HARRISON RD WS #09	2702549	N/A	N/A	EASTSIDE AQUIFER
HARTNELL RD WS #01	2702681	N/A	N/A	EASTSIDE AQUIFER
HWY 101 WS #05	2702436	N/A	N/A	EASTSIDE AQUIFER
IVERSON RD WS #01	2701846	N/A	N/A	EASTSIDE AQUIFER
KOHARA NURSERY WS	2702161	N/A	N/A	EASTSIDE AQUIFER
MARTINES RD WS #03	2702119	N/A	N/A	EASTSIDE AQUIFER
MIDDLEFIELD RD WS #02	2700651	N/A	N/A	EASTSIDE AQUIFER
MIDDLEFIELD RD WS #03	2700652	N/A	N/A	EASTSIDE AQUIFER
MIDDLEFIELD RD WS #04	2700653	N/A	N/A	EASTSIDE AQUIFER
MIDDLEFIELD RD WS #09	2702515	N/A	N/A	EASTSIDE AQUIFER

Water System Name	ID	Connections	Population Served	Subbasin
MONTEREY ROSES WS	2700851	N/A	N/A	EASTSIDE AQUIFER
NATIVIDAD RD WS #03	2701456	N/A	N/A	EASTSIDE AQUIFER
OLD STAGE RD WS #06	2702107	N/A	N/A	EASTSIDE AQUIFER
OLD STAGE RD WS #07	2701993	N/A	N/A	EASTSIDE AQUIFER
OLD STAGE RD WS #08	2702366	N/A	N/A	EASTSIDE AQUIFER
OLD STAGE RD WS #13	2701780	N/A	N/A	EASTSIDE AQUIFER
OLD STAGE RD WS #14	2702017	N/A	N/A	EASTSIDE AQUIFER
OLD STAGE RD WS #15	2702191	N/A	N/A	EASTSIDE AQUIFER
OLD STAGE RD WS #16	2702310	N/A	N/A	EASTSIDE AQUIFER
OLD STAGE RD WS #17	2702443	N/A	N/A	EASTSIDE AQUIFER
OLD STAGE RD WS #19	2702548	N/A	N/A	EASTSIDE AQUIFER
RANCHO SALINAS PACKING WS	2702067	N/A	N/A	EASTSIDE AQUIFER
SAN JUAN GRADE WS #01	2701521	N/A	N/A	EASTSIDE AQUIFER
SAN JUAN GRADE WS #02	2700737	N/A	N/A	EASTSIDE AQUIFER
SPENCE RD WS #04	2701964	N/A	N/A	EASTSIDE AQUIFER
SPENCE RD WS #08	2701729	N/A	N/A	EASTSIDE AQUIFER
UTO GREENHOUSE WS	2701716	N/A	N/A	EASTSIDE AQUIFER
WHITE RD WS #01	2700805	N/A	N/A	EASTSIDE AQUIFER
ZABALA RD WS #01	2700860	N/A	N/A	EASTSIDE AQUIFER
ZABALA RD WS #02	2702518	N/A	N/A	EASTSIDE AQUIFER
APPLE AVE WS #01	2701580	N/A	N/A	FOREBAY AQUIFER
APPLE AVE WS #04	2705021	N/A	N/A	FOREBAY AQUIFER
AROYO SECO RD WS #04	2701831	N/A	N/A	FOREBAY AQUIFER
ARROYO SECO RD WS #08	2701045	N/A	N/A	FOREBAY AQUIFER
ARROYO SECO RD WS #13	2702352	N/A	N/A	FOREBAY AQUIFER
ARROYO SECO RD WS #14	2702376	N/A	N/A	FOREBAY AQUIFER
BOEKENOOGAN WINERY WS	2702744	N/A	N/A	FOREBAY AQUIFER
BRYAN EQUIP/VALLEY ELECT WS	2702359	N/A	N/A	FOREBAY AQUIFER
CENTRAL AVE WS	2701419	N/A	N/A	FOREBAY AQUIFER
DOUD RD WS #01	2701790	N/A	N/A	FOREBAY AQUIFER
DOUD RD WS #02	2702062	N/A	N/A	FOREBAY AQUIFER
EL CAMINO REAL WS #32	2701794	N/A	N/A	FOREBAY AQUIFER
ELM AVE WS #01	2701845	N/A	N/A	FOREBAY AQUIFER
FAIRVIEW RD WS #01	2702181	N/A	N/A	FOREBAY AQUIFER
FORT ROMIE RD WS #01	2700562	N/A	N/A	FOREBAY AQUIFER
FORT ROMIE RD WS #02	2701830	N/A	N/A	FOREBAY AQUIFER
KITZMILLER RD WS #01	2701574	N/A	N/A	FOREBAY AQUIFER
LUCERNE RD WS	2701900	N/A	N/A	FOREBAY AQUIFER
MAESTRI RANCH WS	2701110	N/A	N/A	FOREBAY AQUIFER
METZ RD WS #01	2701713	N/A	N/A	FOREBAY AQUIFER

Water System Name	ID	Connections	Population Served	Subbasin
METZ RD WS #02	2701209	N/A	N/A	FOREBAY AQUIFER
METZ RD WS #04	2701147	N/A	N/A	FOREBAY AQUIFER
METZ RD WS #06	2702016	N/A	N/A	FOREBAY AQUIFER
METZ RD WS #09	2701180	N/A	N/A	FOREBAY AQUIFER
MILE END RD WS #01	2700603	N/A	N/A	FOREBAY AQUIFER
MILE END RD WS #02	2702367	N/A	N/A	FOREBAY AQUIFER
MISSION RD WS #02	2702170	N/A	N/A	FOREBAY AQUIFER
MISSION RD WS #03	2702543	N/A	N/A	FOREBAY AQUIFER
MISSION RD WS #04	2702619	N/A	N/A	FOREBAY AQUIFER
MORISOLI RD WS	2701038	N/A	N/A	FOREBAY AQUIFER
PINE ST WS #03	2701916	N/A	N/A	FOREBAY AQUIFER
PRYOR FARMS INC WS	2702911	N/A	N/A	FOREBAY AQUIFER
RIVER RD WS #27	2702419	N/A	N/A	FOREBAY AQUIFER
RIVER RD WS #33	2702754	N/A	N/A	FOREBAY AQUIFER
SAN VICENTE RD WS #01	2700774	N/A	N/A	FOREBAY AQUIFER
THIRD ST WS #01	2701730	N/A	N/A	FOREBAY AQUIFER
UNDERWOOD RD WS #01	2702340	N/A	N/A	FOREBAY AQUIFER
VIDA RD WS #01	2702603	N/A	N/A	FOREBAY AQUIFER
WALNUT AVE WS #01	2701999	N/A	N/A	FOREBAY AQUIFER
WALNUT AVE WS #02	2702099	N/A	N/A	FOREBAY AQUIFER
AVERY LN WS #01	2701620	N/A	N/A	LANGLEY AREA
AVERY LN WS #02	2701834	N/A	N/A	LANGLEY AREA
AVERY LN WS #03	2702159	N/A	N/A	LANGLEY AREA
AVERY LN WS #04	2702580	N/A	N/A	LANGLEY AREA
BERTA CANYON WS #03	2700513	N/A	N/A	LANGLEY AREA
BERTA CANYON WS #04	2702570	N/A	N/A	LANGLEY AREA
BERTA CANYON WS #06	2700985	N/A	N/A	LANGLEY AREA
BERTA CANYON WS #07	2702167	N/A	N/A	LANGLEY AREA
BLACKIE RD WS #04	2700517	N/A	N/A	LANGLEY AREA
BLACKIE RD WS #06	2700843	N/A	N/A	LANGLEY AREA
BLACKIE RD WS #07	2701524	N/A	N/A	LANGLEY AREA
BLACKIE RD WS #08	2701555	N/A	N/A	LANGLEY AREA
BLACKIE RD WS #09	2701594	N/A	N/A	LANGLEY AREA
BLACKIE RD WS #10	2701607	N/A	N/A	LANGLEY AREA
BLACKIE RD WS #11	2701651	N/A	N/A	LANGLEY AREA
BLACKIE RD WS #15	2702218	N/A	N/A	LANGLEY AREA
BLACKIE RD WS #16	2702139	N/A	N/A	LANGLEY AREA
BLACKIE RD WS #17	2702142	N/A	N/A	LANGLEY AREA
BLACKIE RD WS #19	2702341	N/A	N/A	LANGLEY AREA
BLACKIE RD WS #20	2701602	N/A	N/A	LANGLEY AREA
CASTROVILLE BLVD WS #01	2700524	N/A	N/A	LANGLEY AREA

Water System Name	ID	Connections	Population Served	Subbasin
CASTROVILLE BLVD WS #03	2700526	N/A	N/A	LANGLEY AREA
CASTROVILLE BLVD WS #04	2700527	N/A	N/A	LANGLEY AREA
CASTROVILLE BLVD WS #06	2700529	N/A	N/A	LANGLEY AREA
CASTROVILLE BLVD WS #09	2702385	N/A	N/A	LANGLEY AREA
CASTROVILLE BLVD WS #10	2702423	N/A	N/A	LANGLEY AREA
CASTROVILLE BLVD WS #11	2702463	N/A	N/A	LANGLEY AREA
CASTROVILLE BLVD WS #14	2702632	N/A	N/A	LANGLEY AREA
COKER RD WS #01	2700533	N/A	N/A	LANGLEY AREA
COKER RD WS #02	2701148	N/A	N/A	LANGLEY AREA
COKER RD WS #03	2702228	N/A	N/A	LANGLEY AREA
CRAZY HORSE WS #01	2700537	N/A	N/A	LANGLEY AREA
CRAZY HORSE WS #05	2702124	N/A	N/A	LANGLEY AREA
CRAZY HORSE WS #06	2701720	N/A	N/A	LANGLEY AREA
CRAZY HORSE WS #07	2702278	N/A	N/A	LANGLEY AREA
CRAZY HORSE WS #08	2702582	N/A	N/A	LANGLEY AREA
CROSS RD WS #01	2701509	N/A	N/A	LANGLEY AREA
CROSS RD WS #02	2701585	N/A	N/A	LANGLEY AREA
CROSS RD WS #03	2701771	N/A	N/A	LANGLEY AREA
CROSS RD WS #04	2701807	N/A	N/A	LANGLEY AREA
CROSS RD WS #05	2701818	N/A	N/A	LANGLEY AREA
CROSS RD WS #06	2701817	N/A	N/A	LANGLEY AREA
CROSS RD WS #08	2700951	N/A	N/A	LANGLEY AREA
CROSS RD WS #09	2701921	N/A	N/A	LANGLEY AREA
CROSS RD WS #10	2702095	N/A	N/A	LANGLEY AREA
CUNHA LN WS #01	2702126	N/A	N/A	LANGLEY AREA
DEL MONTE FARMS RD WS #09	2702054	N/A	N/A	LANGLEY AREA
DESMOND RD WS #01	2700545	N/A	N/A	LANGLEY AREA
DESMOND RD WS #02	2700546	N/A	N/A	LANGLEY AREA
DESMOND RD WS #05	2701571	N/A	N/A	LANGLEY AREA
DESMOND RD WS #06	2701644	N/A	N/A	LANGLEY AREA
DESMOND RD WS #08	2702109	N/A	N/A	LANGLEY AREA
DESMOND RD WS #09	2702117	N/A	N/A	LANGLEY AREA
DESMOND RD WS #10	2702207	N/A	N/A	LANGLEY AREA
DESMOND RD WS #11	2702536	N/A	N/A	LANGLEY AREA
DYER RD WS #02	2700550	N/A	N/A	LANGLEY AREA
DYER RD WS #03	2701559	N/A	N/A	LANGLEY AREA
DYER RD WS #04	2701610	N/A	N/A	LANGLEY AREA
DYER RD WS #05	2701646	N/A	N/A	LANGLEY AREA
DYER RD WS #06	2702618	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #01	2700553	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #02	2700554	N/A	N/A	LANGLEY AREA

Water System Name	ID	Connections	Population Served	Subbasin
ECHO VALLEY RD WS #03	2700555	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #04	2700556	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #06	2701893	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #07	2701210	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #08	2701424	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #09	2701235	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #10	2701425	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #11	2701556	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #12	2701640	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #13	2701642	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #14	2701662	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #15	2701749	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #18	2701808	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #19	2701914	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #22	2702234	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #25	2702400	N/A	N/A	LANGLEY AREA
ECHO VALLEY RD WS #26	2702417	N/A	N/A	LANGLEY AREA
EDEN LN WS #01	2701650	N/A	N/A	LANGLEY AREA
EL CAMINO REAL WS #02	2700561	N/A	N/A	LANGLEY AREA
EL CAMINO REAL WS #07	2700566	N/A	N/A	LANGLEY AREA
EL CAMINO REAL WS #08	2700567	N/A	N/A	LANGLEY AREA
EL CAMINO REAL WS #15	2700574	N/A	N/A	LANGLEY AREA
EL CAMINO REAL WS #19	2701426	N/A	N/A	LANGLEY AREA
EL CAMINO REAL WS #23	2701427	N/A	N/A	LANGLEY AREA
EL CAMINO REAL WS #25	2702362	N/A	N/A	LANGLEY AREA
EL CAMINO REAL WS #26	2701536	N/A	N/A	LANGLEY AREA
EL CAMINO REAL WS #29	2701785	N/A	N/A	LANGLEY AREA
EL CAMINO REAL WS #31	2701429	N/A	N/A	LANGLEY AREA
EL CAMINO REAL WS #36	2701934	N/A	N/A	LANGLEY AREA
EL CAMINO REAL WS #38	2702201	N/A	N/A	LANGLEY AREA
EL CAMINO REAL WS #39	2702106	N/A	N/A	LANGLEY AREA
EL CAMINO REAL WS #40	2702127	N/A	N/A	LANGLEY AREA
EL CAMINO REAL WS #42	2702158	N/A	N/A	LANGLEY AREA
EL CAMINO REAL WS #48	2702808	N/A	N/A	LANGLEY AREA
EL DORO WS #01	2700576	N/A	N/A	LANGLEY AREA
ERMCO WATER SYSTEM	2702721	N/A	N/A	LANGLEY AREA
EXECUTIVE DR WS #01	2700583	N/A	N/A	LANGLEY AREA
FRISCH RD WS #01	2700584	N/A	N/A	LANGLEY AREA
FRISCH RD WS #02	2700588	N/A	N/A	LANGLEY AREA
HIDDEN VALLEY RD WS #13	2701534	N/A	N/A	LANGLEY AREA
HOLLY HILLS MOTEL WS #01	2700582	N/A	N/A	LANGLEY AREA

Water System Name	ID	Connections	Population Served	Subbasin
HOLLY HILLS MOTEL WS #02	2700604	N/A	N/A	LANGLEY AREA
HOLLY HILLS WS #01	2701141	N/A	N/A	LANGLEY AREA
HOLLY HILLS WS #02	2701979	N/A	N/A	LANGLEY AREA
HOLLY HILLS WS #03	2702424	N/A	N/A	LANGLEY AREA
HWY 156 WS #01	2701844	N/A	N/A	LANGLEY AREA
HWY 156 WS #02	2705582	N/A	N/A	LANGLEY AREA
JOSHUA LN WS	2701007	N/A	N/A	LANGLEY AREA
KING RD WS #01	2702288	N/A	N/A	LANGLEY AREA
KING RD WS #02	2702307	N/A	N/A	LANGLEY AREA
KING RD WS #03	2702313	N/A	N/A	LANGLEY AREA
LANGLEY CANYON WS #01	2700617	N/A	N/A	LANGLEY AREA
LANGLEY CANYON WS #02	2700618	N/A	N/A	LANGLEY AREA
LANGLEY CANYON WS #03	2700619	N/A	N/A	LANGLEY AREA
LANGLEY CANYON WS #04	2700620	N/A	N/A	LANGLEY AREA
LANGLEY CANYON WS #05	2700621	N/A	N/A	LANGLEY AREA
LANGLEY CANYON WS #06	2701440	N/A	N/A	LANGLEY AREA
LANGLEY CANYON WS #08	2701243	N/A	N/A	LANGLEY AREA
LANGLEY CANYON WS #09	2701244	N/A	N/A	LANGLEY AREA
LANGLEY CANYON WS #10	2701762	N/A	N/A	LANGLEY AREA
LANGLEY CANYON WS #12	2701437	N/A	N/A	LANGLEY AREA
LANGLEY CANYON WS #13	2701908	N/A	N/A	LANGLEY AREA
LANGLEY CANYON WS #15	2701441	N/A	N/A	LANGLEY AREA
LANGLEY CANYON WS #16	2702346	N/A	N/A	LANGLEY AREA
LANGLEY CANYON WS #17	2702232	N/A	N/A	LANGLEY AREA
LANGLEY CANYON WS #18	2702309	N/A	N/A	LANGLEY AREA
LAVENDER LN WS #01	2700623	N/A	N/A	LANGLEY AREA
LAVENDER LN WS #02	2701548	N/A	N/A	LANGLEY AREA
LINDA VISTA MWC	2701400	N/A	N/A	LANGLEY AREA
MAHER RD WS #04	2700637	N/A	N/A	LANGLEY AREA
MAHER RD WS #07	2701395	N/A	N/A	LANGLEY AREA
MAHER RD WS #09	2701883	N/A	N/A	LANGLEY AREA
MAHER RD WS #11	2702162	N/A	N/A	LANGLEY AREA
MAHER RD WS #14	2702281	N/A	N/A	LANGLEY AREA
MAHER RD WS #18	2701781	N/A	N/A	LANGLEY AREA
MAHER RD WS #21	2702301	N/A	N/A	LANGLEY AREA
MAHER RD WS #22	2702433	N/A	N/A	LANGLEY AREA
MAHER RD WS #23	2702447	N/A	N/A	LANGLEY AREA
MAHER RD WS #24	2702589	N/A	N/A	LANGLEY AREA
MAHER RD WS #25	2702683	N/A	N/A	LANGLEY AREA
MALLORY CANYON WS #01	2701917	N/A	N/A	LANGLEY AREA
MALLORY CANYON WS #02	2700640	N/A	N/A	LANGLEY AREA

Water System Name	ID	Connections	Population Served	Subbasin
MALLORY CANYON WS #03	2700641	N/A	N/A	LANGLEY AREA
MALLORY CANYON WS #04	2701637	N/A	N/A	LANGLEY AREA
MALLORY CANYON WS #05	2701448	N/A	N/A	LANGLEY AREA
MALLORY CANYON WS #07	2701840	N/A	N/A	LANGLEY AREA
MALLORY CANYON WS #08	2701546	N/A	N/A	LANGLEY AREA
MALLORY CANYON WS #09	2701723	N/A	N/A	LANGLEY AREA
MALLORY CANYON WS #10	2702114	N/A	N/A	LANGLEY AREA
MALLORY CANYON WS #11	2702435	N/A	N/A	LANGLEY AREA
MALLORY CANYON WS #12	2705586	N/A	N/A	LANGLEY AREA
MALLORY CANYON WS #20	2701137	N/A	N/A	LANGLEY AREA
MARJORIE RD WS	2700921	N/A	N/A	LANGLEY AREA
MCGUFFIE RD WS #01	2700644	N/A	N/A	LANGLEY AREA
MCGUFFIE RD WS #03	2701409	N/A	N/A	LANGLEY AREA
MCGUFFIE RD WS #05	2701596	N/A	N/A	LANGLEY AREA
MCGUFFIE RD WS #06	2702355	N/A	N/A	LANGLEY AREA
MCGUFFIE RD WS #07	2702096	N/A	N/A	LANGLEY AREA
MCGUFFIE RD WS #08	2701449	N/A	N/A	LANGLEY AREA
MCGUFFIE RD WS #09	2701632	N/A	N/A	LANGLEY AREA
MCGUFFIE RD WS #10	2702236	N/A	N/A	LANGLEY AREA
MCGUFFIE RD WS #11	2701643	N/A	N/A	LANGLEY AREA
MCGUFFIE RD WS #12	2702160	N/A	N/A	LANGLEY AREA
MERIDIAN RD WS #02	2700646	N/A	N/A	LANGLEY AREA
MERIDIAN RD WS #03	2700647	N/A	N/A	LANGLEY AREA
MERIDIAN RD WS #04	2701091	N/A	N/A	LANGLEY AREA
MERIDIAN RD WS #06	2701451	N/A	N/A	LANGLEY AREA
MERIDIAN RD WS #07	2701494	N/A	N/A	LANGLEY AREA
MERIDIAN RD WS #08	2701502	N/A	N/A	LANGLEY AREA
MERIDIAN RD WS #10	2701875	N/A	N/A	LANGLEY AREA
MERIDIAN RD WS #11	2701135	N/A	N/A	LANGLEY AREA
MERIDIAN RD WS #12	2701664	N/A	N/A	LANGLEY AREA
MERIDIAN RD WS #13	2701919	N/A	N/A	LANGLEY AREA
MERIDIAN RD WS #14	2702092	N/A	N/A	LANGLEY AREA
MESSICK RD WS #01	2700649	N/A	N/A	LANGLEY AREA
MESSICK RD WS #02	2701953	N/A	N/A	LANGLEY AREA
MESSICK RD WS #03	2702112	N/A	N/A	LANGLEY AREA
MESSICK RD WS #04	2702459	N/A	N/A	LANGLEY AREA
MORO RD WS #01	2700657	N/A	N/A	LANGLEY AREA
MORO RD WS #02	2700658	N/A	N/A	LANGLEY AREA
MORO RD WS #03	2700659	N/A	N/A	LANGLEY AREA
MORO RD WS #04	2701925	N/A	N/A	LANGLEY AREA
MORO RD WS #06	2701238	N/A	N/A	LANGLEY AREA

Water System Name	ID	Connections	Population Served	Subbasin
MORO RD WS #07	2701454	N/A	N/A	LANGLEY AREA
MORO RD WS #08	2701453	N/A	N/A	LANGLEY AREA
MORO RD WS #10	2702357	N/A	N/A	LANGLEY AREA
MORO RD WS #13	2701528	N/A	N/A	LANGLEY AREA
MORO RD WS #15	2701764	N/A	N/A	LANGLEY AREA
MORO RD WS #16	2700744	N/A	N/A	LANGLEY AREA
MORO RD WS #17	2702725	N/A	N/A	LANGLEY AREA
MUSTANG WA	2701801	N/A	N/A	LANGLEY AREA
OAK ESTATES DR WS #01	2700661	N/A	N/A	LANGLEY AREA
OAK RD WS #01	2700666	N/A	N/A	LANGLEY AREA
OAKRIDGE DR WS #02	2702272	N/A	N/A	LANGLEY AREA
OLD STAGE RD WS #18	2702446	N/A	N/A	LANGLEY AREA
ORCHARD LN WS #01	2700668	N/A	N/A	LANGLEY AREA
ORCHARD LN WS #03	2700670	N/A	N/A	LANGLEY AREA
ORCHARD LN WS #04	2701387	N/A	N/A	LANGLEY AREA
ORCHARD LN WS #06	2701514	N/A	N/A	LANGLEY AREA
PARADISE RD WS #02	2700675	N/A	N/A	LANGLEY AREA
PARADISE RD WS #03	2700676	N/A	N/A	LANGLEY AREA
PARADISE RD WS #04	2700677	N/A	N/A	LANGLEY AREA
PARADISE RD WS #06	2700679	N/A	N/A	LANGLEY AREA
PARADISE RD WS #07	2700680	N/A	N/A	LANGLEY AREA
PARADISE RD WS #11	2701134	N/A	N/A	LANGLEY AREA
PARADISE RD WS #12	2701460	N/A	N/A	LANGLEY AREA
PARADISE RD WS #13	2701461	N/A	N/A	LANGLEY AREA
PARADISE RD WS #22	2701634	N/A	N/A	LANGLEY AREA
PARADISE RD WS #23	2701638	N/A	N/A	LANGLEY AREA
PARADISE RD WS #28	2701462	N/A	N/A	LANGLEY AREA
PARADISE RD WS #29	2701696	N/A	N/A	LANGLEY AREA
PARADISE RD WS #31	2702263	N/A	N/A	LANGLEY AREA
PARADISE RD WS #33	2702337	N/A	N/A	LANGLEY AREA
PESANTE RD WS #01	2701021	N/A	N/A	LANGLEY AREA
PESANTE RD WS #03	2700688	N/A	N/A	LANGLEY AREA
PESANTE RD WS #04	2700689	N/A	N/A	LANGLEY AREA
PESANTE RD WS #07	2700692	N/A	N/A	LANGLEY AREA
PESANTE RD WS #08	2701083	N/A	N/A	LANGLEY AREA
PESANTE RD WS #12	2700734	N/A	N/A	LANGLEY AREA
PESANTE RD WS #13	2701399	N/A	N/A	LANGLEY AREA
PESANTE RD WS #14	2700616	N/A	N/A	LANGLEY AREA
PESANTE RD WS #15	2701923	N/A	N/A	LANGLEY AREA
PESANTE RD WS #16	2701990	N/A	N/A	LANGLEY AREA
PESANTE RD WS #17	2702006	N/A	N/A	LANGLEY AREA

Water System Name	ID	Connections	Population Served	Subbasin
PESANTE RD WS #18	2701983	N/A	N/A	LANGLEY AREA
PESANTE RD WS #19	2702111	N/A	N/A	LANGLEY AREA
PESANTE RD WS #21	2701788	N/A	N/A	LANGLEY AREA
PESANTE RD WS #22	2702131	N/A	N/A	LANGLEY AREA
PESANTE RD WS #24	2707025	N/A	N/A	LANGLEY AREA
PESANTE RD WS #25	2702333	N/A	N/A	LANGLEY AREA
PESANTE RD WS #27	2702648	N/A	N/A	LANGLEY AREA
PESANTE RD WS #29	2702794	N/A	N/A	LANGLEY AREA
PEZZINI LN WS #01	2701392	N/A	N/A	LANGLEY AREA
PINE TREE WAY WS #01	2700695	N/A	N/A	LANGLEY AREA
PINE TREE WAY WS #02	2700696	N/A	N/A	LANGLEY AREA
PLAZA SERENA WS	2701636	N/A	N/A	LANGLEY AREA
POLLOCK LN WS #01	2700697	N/A	N/A	LANGLEY AREA
POLLOCK LN WS #02	2701129	N/A	N/A	LANGLEY AREA
POLLOCK LN WS #03	2700699	N/A	N/A	LANGLEY AREA
POLLOCK LN WS #04	2701088	N/A	N/A	LANGLEY AREA
POLLOCK LN WS #05	2702005	N/A	N/A	LANGLEY AREA
POLLOCK LN WS #06	2702051	N/A	N/A	LANGLEY AREA
POLLOCK LN WS #07	2702051	N/A	N/A	LANGLEY AREA
PRUNEDALE RD WS #02	2700704	N/A	N/A	LANGLEY AREA
PRUNEDALE RD WS #03	2701469	N/A	N/A	LANGLEY AREA
PRUNEDALE RD WS #04	2702360	N/A	N/A	LANGLEY AREA
PRUNEDALE RD WS #06	2702425	N/A	N/A	LANGLEY AREA
REESE CIR WS #01	2700712	N/A	N/A	LANGLEY AREA
REESE CIR WS #03	2702222	N/A	N/A	LANGLEY AREA
REESE CIR WS #04	2702591	N/A	N/A	LANGLEY AREA
SAN JUAN GRADE WS #03	2702775	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #02	2700739	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #06	2700743	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #08	2700745	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #13	2700750	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #18	2701680	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #20	2700767	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #26	2701474	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #29	2701501	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #30	2701506	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #31	2701530	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #37	2701988	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #38	2701567	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #39	2701962	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #43	2701674	N/A	N/A	LANGLEY AREA

Water System Name	ID	Connections	Population Served	Subbasin
SAN MIGUEL WS #44	2701715	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #45	2701748	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #49	2702120	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #54	2702420	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #59	2702599	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #62	2702690	N/A	N/A	LANGLEY AREA
SAN MIGUEL WS #64	2702731	N/A	N/A	LANGLEY AREA
SANDY HILL DR WS #01	2701787	N/A	N/A	LANGLEY AREA
STRAWBERRY RD WS #01	2700761	N/A	N/A	LANGLEY AREA
STRAWBERRY RD WS #03	2700763	N/A	N/A	LANGLEY AREA
STRAWBERRY RD WS #10	2700770	N/A	N/A	LANGLEY AREA
STRAWBERRY RD WS #22	2702389	N/A	N/A	LANGLEY AREA
STRONG CIR WS	2702264	N/A	N/A	LANGLEY AREA
TARAWILD CT WS #01	2701657	N/A	N/A	LANGLEY AREA
TIMEVIEW WAY WS #01	2702504	N/A	N/A	LANGLEY AREA
TUCKER RD WS #01	2701554	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #01	2700776	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #02	2700777	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #03	2700778	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #04	2701484	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #05	2701380	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #07	2702380	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #08	2700569	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #09	2701366	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #10	2701485	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #14	2701591	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #15	2701724	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #16	2701767	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #17	2701728	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #18	2701970	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #19	2701992	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #20	2702177	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #21	2702178	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #22	2702260	N/A	N/A	LANGLEY AREA
TUSTIN RD WS #23	2702415	N/A	N/A	LANGLEY AREA
VALLE PACIFICO WS #01	2700780	N/A	N/A	LANGLEY AREA
VALLE PACIFICO WS #02	2700781	N/A	N/A	LANGLEY AREA
VALLE PACIFICO WS #03	2700782	N/A	N/A	LANGLEY AREA
VALLE PACIFICO WS #04	2700783	N/A	N/A	LANGLEY AREA
VALLE PACIFICO WS #05	2700784	N/A	N/A	LANGLEY AREA
VALLE PACIFICO WS #09	2702168	N/A	N/A	LANGLEY AREA

Water System Name	ID	Connections	Population Served	Subbasin
VALLE PACIFICO WS #11	2702379	N/A	N/A	LANGLEY AREA
VALLE PACIFICO WS #12	2702025	N/A	N/A	LANGLEY AREA
VALLE PACIFICO WS #14	2702152	N/A	N/A	LANGLEY AREA
VALLE PACIFICO WS #15	2702470	N/A	N/A	LANGLEY AREA
VALLE PACIFICO WS #16	2702695	N/A	N/A	LANGLEY AREA
VIA DEL SOL WS #01	2701652	N/A	N/A	LANGLEY AREA
VIA DEL SOL WS #02	2700814	N/A	N/A	LANGLEY AREA
VIA DEL SOL WS #03	2702153	N/A	N/A	LANGLEY AREA
VIA DEL SOL WS #04	2702499	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #01	2701719	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #02	2700791	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #04	2700793	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #05	2700794	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #06	2700795	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #07	2700796	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #08	2701119	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #09	2701488	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #10	2701512	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #11	2701531	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #12	2701532	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #13	2701533	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #14	2700667	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #15	2701565	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #16	2701601	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #17	2701611	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #18	2701617	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #20	2701660	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #21	2701895	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #23	2701725	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #24	2701747	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #27	2701401	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #28	2700722	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #32	2702129	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #33	2702169	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #34	2702249	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #35	2702402	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #36	2702489	N/A	N/A	LANGLEY AREA
VIERRA CANYON WS #37	2702429	N/A	N/A	LANGLEY AREA
WILD HORSE WS #01	2701933	N/A	N/A	LANGLEY AREA
WILD PINTO WS #01	2701795	N/A	N/A	LANGLEY AREA
WILD PINTO WS #02	2701913	N/A	N/A	LANGLEY AREA

Water System Name	ID	Connections	Population Served	Subbasin
WILDER CT WS #01	2702287	N/A	N/A	LANGLEY AREA
CATTLEMEN RD WS #01	2701677	N/A	N/A	UPPER VALLEY AQUIFER
DELICATO VINEYARD WS	2702538	N/A	N/A	UPPER VALLEY AQUIFER
INDIAN VALLEY RD WS #01	2702547	N/A	N/A	UPPER VALLEY AQUIFER
LOS LOBOS RD WS	2701693	N/A	N/A	UPPER VALLEY AQUIFER
MESA VERDE RD WS #01	2701741	N/A	N/A	UPPER VALLEY AQUIFER
MONTEREY-DIXIE WS	2701960	N/A	N/A	UPPER VALLEY AQUIFER
NACIMIENTO LAKE DR WS #01	2701936	N/A	N/A	UPPER VALLEY AQUIFER
RANCHITA CANYON RD WS #01	2705555	N/A	N/A	UPPER VALLEY AQUIFER
SARGENTS RD WS #01	2701710	N/A	N/A	UPPER VALLEY AQUIFER
SARGENTS RD WS #03	2701710	N/A	N/A	UPPER VALLEY AQUIFER
SPRECKELS RD WS - KING CITY	2702075	N/A	N/A	UPPER VALLEY AQUIFER
TEAGUE AVE WS #04	2702465	N/A	N/A	UPPER VALLEY AQUIFER
TOPO RANCH WS	2701162	N/A	N/A	UPPER VALLEY AQUIFER
VINEYARD CANYON WS	2701930	N/A	N/A	UPPER VALLEY AQUIFER

Table 2. Public Water Systems (15 < connections or serving more than 25 people for at least 60 days out of the year)

Water System Name	PWSID	Connections	Population Served	Subbasin	State Water System Classification
ALBA WS	CA2702572	4	40	EASTSIDE AQUIFER	NC
ALCO WATER SERVICE	CA2710001	9,272	29,179	EASTSIDE AQUIFER	C
ALTMAN PLANTS WS #01	CA2700856	5	45	EASTSIDE AQUIFER	NTNC
ALTMAN PLANTS WS #02	CA2702616	3	25	EASTSIDE AQUIFER	NTNC
ASSISI MWC	CA2700503	42	126	EASTSIDE AQUIFER	C
CAL AM WATER COMPANY - RALPH LANE WS	CA2702004	30	66	EASTSIDE AQUIFER	C
COLOR SPOT NURSERY WS #01	CA2700853	4	200	EASTSIDE AQUIFER	NTNC
COLOR SPOT NURSERY WS #02	CA2702482	1	25	EASTSIDE AQUIFER	NTNC
CWSC FOOTHILL ESTATES	CA2702198	45	183	EASTSIDE AQUIFER	C
CWSC SALINAS	CA2710010	24,036	106,858	EASTSIDE AQUIFER	C
EL CAMINO WC INC	CA2702409	31	90	EASTSIDE AQUIFER	C
ENCINAL RD WS #01	CA2701241	18	41	EASTSIDE AQUIFER	C
ESPERANZA RD WS	CA2702615	1	160	EASTSIDE AQUIFER	NTNC
FOOTHILL ESTATES WS	CA2702198	61	183	EASTSIDE AQUIFER	C
FREE WILL BAPTIST CHURCH WS	CA2702475	2	80	EASTSIDE AQUIFER	NC
GABILAN WC	CA2700586	162	454	EASTSIDE AQUIFER	C

Water System Name	PWSID	Connections	Population Served	Subbasin	State Water System Classification
GREEN VALLEY FLORAL WS	CA2701151	1	25	EASTSIDE AQUIFER	NTNC
GROWERS COMPANY INC WS	CA2702202	6	200	EASTSIDE AQUIFER	NTNC
HARRISON RD WS #01	CA2700592	4	40	EASTSIDE AQUIFER	NTNC
IVERSON & JACKS APTS WS	CA2701068	31	150	EASTSIDE AQUIFER	C
IVERSON RD WS #03	CA2702621	1	40	EASTSIDE AQUIFER	NTNC
JOHNSON CYN WS #01	CA2702626	8	28	EASTSIDE AQUIFER	NTNC
LHOIST NORTH AMERICA WS	CA2702259	1	100	EASTSIDE AQUIFER	NTNC
MATSUI NURSERY WS	CA2701931	2	75	EASTSIDE AQUIFER	NTNC
MISIONERO VEGETABLES WS	CA2701946	3	60	EASTSIDE AQUIFER	NTNC
NATIVIDAD RD WS #02	CA2701922	3	35	EASTSIDE AQUIFER	NTNC
OLD NATIVIDAD RD WS #01	CA2701232	3	25	EASTSIDE AQUIFER	NC
PENTECOSTAL WS	CA2700558	1	25	EASTSIDE AQUIFER	NTNC
PREMIUM PACKING WS	CA2702537	1	5	EASTSIDE AQUIFER	NC
ROSEHART INDUSTRIAL PARK WS	CA2702121	13	28	EASTSIDE AQUIFER	NTNC
SAN JERARDO COOP WS	CA2701904	67	249	EASTSIDE AQUIFER	C
SPENCE RD WS #05	CA2701726	4	25	EASTSIDE AQUIFER	NTNC
SUNNY ACRES MWS	CA2701589	15	45	EASTSIDE AQUIFER	C
APPLE AVE WS #02	CA2701034	18	75	FOREBAY AQUIFER	C
APPLE AVE WS #03	CA2701036	20	60	FOREBAY AQUIFER	C
ARROYO SECO ESTATES MWS	CA2702520	20	70	FOREBAY AQUIFER	C
CAMPORA APARTMENTS	CA2701046	42	126	FOREBAY AQUIFER	C
CAMPORA STATION WS	CA2701579	5	25	FOREBAY AQUIFER	NTNC
CAMPORA-GLORIA RD WS #01	CA2702642	2	25	FOREBAY AQUIFER	NC
CORRECTIONAL TRAINING FACILITY - SOLEDAD	CA2710850	2,769	5,500	FOREBAY AQUIFER	C
DOLE FRESH VEGETABLES WS	CA2702412	1	80	FOREBAY AQUIFER	NTNC
ESTANCIA WINERY WS	CA2702613	1	70	FOREBAY AQUIFER	NTNC
FOOTHILL RD WS #01	CA2702431	4	25	FOREBAY AQUIFER	NTNC
GOLDEN STATE VINTNERS WS	CA2701550	1	30	FOREBAY AQUIFER	NTNC
GONZALES, CITY OF	CA2710007	1,930	8,383	FOREBAY AQUIFER	C
GREENFIELD, CITY OF	CA2710008	3,720	17,517	FOREBAY AQUIFER	C
KENDALL-JACKSON WINERY WS	CA2702496	2	45	FOREBAY AQUIFER	NTNC
MCCOY RD WS #05	CA2701040	24	72	FOREBAY AQUIFER	C
MISSION SCHOOL WS	CA2702317	1	100	FOREBAY AQUIFER	NTNC
OAK PARK WS	CA2700999	1	29	FOREBAY AQUIFER	NC
OASIS CAFE WS	CA2701000	5	31	FOREBAY AQUIFER	NC

Water System Name	PWSID	Connections	Population Served	Subbasin	State Water System Classification
PARADISE RD WS #21	CA2701633	16	48	FOREBAY AQUIFER	C
PARAISO HOT SPRINGS WS	CA2701001	5	25	FOREBAY AQUIFER	NC
PINE ST WS #01	CA2701403	17	65	FOREBAY AQUIFER	C
SALINAS VALLEY STATE PRISON	CA2710851	2,208	3,386	FOREBAY AQUIFER	C
SAN SABA WINERY WS	CA2702609	2	29	FOREBAY AQUIFER	NC
SAN VICENTE MWC	CA2702466	21	90	FOREBAY AQUIFER	C
SOLEDAD MISSION WS	CA2701176	2	25	FOREBAY AQUIFER	NC
SOLEDAD, CITY OF	CA2710011	3,669	16,729	FOREBAY AQUIFER	C
AMERICAN LEGION #593 WS	CA2702679	2	25	LANGLEY AREA	NC
BLACKIE RD WS #05	CA2700837	18	54	LANGLEY AREA	C
BLACKIE RD WS #18	CA2702094	21	60	LANGLEY AREA	C
CABANA HOLIDAY WS	CA2700522	146	400	LANGLEY AREA	C
CALVARY CHURCH INC WS	CA2700703	5	150	LANGLEY AREA	NTNC
CENTRAL BAY HIGH SCHOOL WS	CA2702490	1	250	LANGLEY AREA	NTNC
CHETMOORE ACRES WA	CA2700634	24	50	LANGLEY AREA	C
COLONIAL OAK WC INC	CA2700534	66	198	LANGLEY AREA	C
COUNTRY MEADOWS MWC	CA2701929	107	621	LANGLEY AREA	C
COUNTRYSIDE ESTATES MWC	CA2702374	18	73	LANGLEY AREA	C
CWSC COUNTRY MEADOWS	CA2701929	107	294	LANGLEY AREA	C
CWSC OAK HILLS	CA2710019	894	3,904	LANGLEY AREA	C
ECHO VALLEY RD WS #05	CA2701423	16	48	LANGLEY AREA	C
ECHO VALLEY SCHOOL WS	CA2700552	1	579	LANGLEY AREA	NTNC
GARLEN COURT WS	CA2700686	23	69	LANGLEY AREA	C
GLENN AVE WS #01	CA2700589	26	78	LANGLEY AREA	C
HIDDEN CANYON RANCH MWC	CA2702554	27	102	LANGLEY AREA	C
HIDDEN VALLEY WA	CA2700594	31	51	LANGLEY AREA	C
HOLLY HILLS MWC	CA2701789	27	108	LANGLEY AREA	C
LA TAPATIA TAQUERIA WS	CA2702382	1	25	LANGLEY AREA	NC
LANGLEY/VALLE PACIFICO WS	CA2701670	31	81	LANGLEY AREA	C
MAHER RD WS #05	CA2700638	17	51	LANGLEY AREA	C
MANZANITA PARK WS	CA2702229	1	300	LANGLEY AREA	NC
MERIDIAN RD WS #09	CA2701837	2	35	LANGLEY AREA	NTNC
MONTEREY BAY NURSERY WS	CA2702336	3	25	LANGLEY AREA	NTNC
MONTEREY DUNES MWA	CA2701452	137	280	LANGLEY AREA	C
MONTEREY MUSHROOMS WS	CA2701940	1	450	LANGLEY AREA	NTNC
MORO COJO MWA	CA2700656	19	67	LANGLEY AREA	C

Water System Name	PWSID	Connections	Population Served	Subbasin	State Water System Classification
MORO RD WS #09	CA2701926	65	210	LANGLEY AREA	C
NORMCO	CA2700511	267	928	LANGLEY AREA	C
OAK HEIGHTS W & R CO INC	CA2700665	35	105	LANGLEY AREA	C
OAK MANOR WS	CA2700509	28	71	LANGLEY AREA	C
ORCHARD LN WS #02	CA2700669	16	32	LANGLEY AREA	C
ORCHARD LN WS #09	CA2702165	5	25	LANGLEY AREA	NC
PAJARO/SUNNY MESA COMMUNITY SERVICES DISTRICT	CA2710020	457	6,500	LANGLEY AREA	C
PARADISE RD WS #05	CA2700678	15	42	LANGLEY AREA	C
PARADISE RD WS #09	CA2700682	18	250	LANGLEY AREA	C
PESANTE RD WS #02	CA2700687	40	120	LANGLEY AREA	C
PESANTE RD WS #06	CA2700691	16	48	LANGLEY AREA	C
POND-DEROSA OAKS WC	CA2701553	72	216	LANGLEY AREA	C
PRUNEDALE CHEVRON WS	CA2701630	1	25	LANGLEY AREA	NC
PRUNEDALE MWC	CA2700702	84	252	LANGLEY AREA	C
PRUNEDALE PLAZA WS	CA2701814	11	90	LANGLEY AREA	NC
PRUNEDALE SCHOOL WS	CA2700705	1	400	LANGLEY AREA	NTNC
PRUNEDALE SHOPPING CENTER WS	CA2701231	1	150	LANGLEY AREA	NTNC
PRUNETREE SHOPPING CENTER WS	CA2702368	38	200	LANGLEY AREA	NTNC
RANCHO BORROMEO MWS	CA2700709	36	100	LANGLEY AREA	C
ROLLING HILLS RANCHO WA	CA2700713	59	177	LANGLEY AREA	C
ROYAL OAK PLACE WS	CA2702388	20	60	LANGLEY AREA	C
ROYAL OAKS PARK WS	CA2700636	1	25	LANGLEY AREA	NC
SALINAS TRANSPLANT WS	CA2702021	1	58	LANGLEY AREA	NC
SAN MIGUEL WS #01	CA2700738	34	100	LANGLEY AREA	C
SAN MIGUEL WS #03	CA2700740	16	48	LANGLEY AREA	C
SAN MIGUEL WS #22	CA2702073	31	93	LANGLEY AREA	C
SPRING CANYON WA	CA2700838	33	99	LANGLEY AREA	C
SUMMERHILL MHP WS	CA2700792	34	102	LANGLEY AREA	C
THIMIO MWC	CA2702608	21	60	LANGLEY AREA	C
VIERRA CANYON WS #29	CA2701942	2	25	LANGLEY AREA	NC
VIERRA ESTATES WS	CA2702007	53	164	LANGLEY AREA	C
VIERRA KNOLLS MWC	CA2702055	22	66	LANGLEY AREA	C
VIERRA MEADOWS MWC	CA2702003	25	75	LANGLEY AREA	C
WOODLAND HEIGHTS MWC	CA2702439	19	57	LANGLEY AREA	C
AERA ENERGY LLC WS	CA2701187	1	75	UPPER VALLEY AQUIFER	NTNC

Water System Name	PWSID	Connections	Population Served	Subbasin	State Water System Classification
BERNARDO RD WS #02	CA2702486	3	25	UPPER VALLEY AQUIFER	NC
BRADLEY UNION SCHOOL WS	CA2700964	1	100	UPPER VALLEY AQUIFER	NTNC
CALIFORNIA ORCHARD WS	CA2701742	50	150	UPPER VALLEY AQUIFER	C
CAMP ROBERTS - CALIFORNIA NATIONAL GUARD	CA2710705	342	385	UPPER VALLEY AQUIFER	NTNC
CHEVRON OIL FIELD WS	CA2701171	1	75	UPPER VALLEY AQUIFER	NTNC
CWSC KING CITY	CA2710009	2,778	14,441	UPPER VALLEY AQUIFER	C
LITTLE BEAR WATER COMPANY	CA2710016	705	2,303	UPPER VALLEY AQUIFER	C
SAN ARDO WD	CA2700728	162	550	UPPER VALLEY AQUIFER	C
SAN LUCAS WD	CA2701676	96	500	UPPER VALLEY AQUIFER	C
SCHEID VINEYARD WS	CA2702539	1	45	UPPER VALLEY AQUIFER	NTNC
WILDHORSE CAFE WS	CA2701172	6	50	UPPER VALLEY AQUIFER	NTNC

Appendix 3B

Land Use Plans

APPENDIX 3B. LAND USE PLANS IN THE SUBBASIN

Land use planning is an important factor in water management. California state law requires each city and county to adopt “a comprehensive, long-term general plan for the physical development of the county or city, and any land outside its boundaries which bears relation to its planning” (Government Code section 65300). However, existing land uses identified in the GSPs are based on the County of Monterey Assessor’s Parcel Number land use codes, which may differ from land uses identified in general plans or other land use planning documents.

To better understand the general plans of the County and cities, in the first phase of GSP implementation the SVBGSA requested land use planning information, including:

- Existing land use maps illustrating urban, suburban and rural areas, including residential industrial or commercial designations, farmland, grazing land and other open space uses.
- Land use plan and spheres of influence maps to understand the locations of planned growth, potential conversion of agricultural lands to urban uses, and anticipated growth rates.
- Housing element site maps identify where near term residential development is planned to meet state housing obligations.
- Williamson Act maps to identify which farmlands have this type of contractual protection that may limit development.
- Water supply assessments (WSAs) for planned developments, where available.
- Identification of any water and wastewater infrastructure constraints on new development.

In addition to land use jurisdiction information, SVBGSA has reviewed additional materials related to land use plans.

Although not specifically requested by SVBGSA, Urban Water Management Plans (UWMPs) require urban water suppliers to project long-term water demands, including demands associated with anticipated growth, and assess the reliability of available water supplies to meet those demands under normal, dry, and multiple-dry-year conditions. UWMPs are updated every 5 years. Some cities provided or referenced their UWMPs in response to SVBGSA’s information request.

The Association of Monterey Bay Area Governments (AMBAG) prepares and periodically updates the regional growth forecast that projects the region's population, housing and employment. The growth forecast is used to support regional planning efforts such as the Regional Travel Demand Model and the Metropolitan Transportation Plan as well as local

planning such as the development of General Plans and project review. SVBGSA uses the AMBAG regional growth forecast for its predictive groundwater modeling. However, use of the forecast by local land-use planning agencies is elective.

The Local Agency Formation Commission of Monterey County (LAFCO) is mandated to encourage the orderly formation of local governmental agencies, preserve agricultural land resources, discourage urban sprawl, and encourage the efficient delivery of local government services in Monterey County. LAFCO is responsible for regulating the boundaries of cities and special districts and establishing Spheres of Influence, among other responsibilities. Service reviews, maps, and Memoranda of Understanding or Agreement between LAFCO, the County and the cities can be found here: <https://www.countyofmonterey.gov/government/government-links/lafco/studies-maps>

SVBGSA will continue to consider the County and cities' general plans in the next phase of PMA development. SVBGSA will coordinate with the County and cities on activities necessary to achieve groundwater sustainability and to ensure long term water supply reliability for planned land uses.

The County of Monterey is the land use authority within the Langley Subbasin. This appendix provides information on the County General Plan and related land use documents.

County of Monterey

The County of Monterey (County) relies on AMBAG growth projections for its planning. In 2023, unincorporated Monterey County's population was 104,236, and it is expected to decrease to 102,537 people by 2040 (AMBAG, 2026). The County of Monterey adopted its General Plan in 2010, with amendments in 2013, 2016, and 2020. It applies to the inland areas of unincorporated Monterey County and can be found here:

<https://www.countyofmonterey.gov/government/departments-a-h/housing-community-development/planning-services/current-planning/general-info/2010-monterey-county-general-plan-adopted-october-26-2010>

In addition to the General Plan, the County of Monterey has adopted Area Plans and Master Plans. In the Langley Subbasin, the applicable area plan is the North County Inland Area Plan. This documents can be found here:

<https://www.countyofmonterey.gov/government/departments-a-h/housing-community-development/planning-services/current-planning/land-use-regulations-11559>

In addition, the County of Monterey holds Williamson Act contracts and open space and conservation easements that limit development on some agricultural and other lands. The County has adopted ordinances related to stormwater management and water conservation with potential benefits to groundwater management.

Table 1 summarizes relevant elements of the Monterey County General Plan (Monterey County, 2010) and water related policies. The County of Monterey has well permitting authority and the General Plan includes policies related to these responsibilities. Based on a basin investigation prepared as part of a General Plan settlement agreement in 2013, the County has stated that intends to review and amend one or more of the policies under Goal 3.

Table 1. Monterey County General Plan Summary

Element	Goal / Policy	
Land Use	LU-1.4	Growth areas shall be designated only where an adequate level of services and facilities such as water, sewerage, fire and police protection, transportation, and schools exist or can be assured concurrent with growth and development. Phasing of development shall be required as necessary in growth areas in order to provide a basis for long-range services and facilities planning.
Open Space	OS-3.8	The County shall cooperate with appropriate regional, state, and federal agencies to provide public education/outreach and technical assistance programs on erosion and sediment control, efficient water use, water conservation and re-use, and groundwater management. This cooperative effort shall be centered through the Monterey County Water Resources Agency.
et seq. Public Services	GOAL PS-2	Assure an adequate and safe water supply to meet the county's current and long-term needs.
	PS-2.1	Coordination among, and consolidation with, those public water service providers drawing from a common water table to prevent overdrawing the water table is encouraged.
	PS-2.2	The County of Monterey shall assure adequate monitoring of wells in those areas experiencing rapid growth provided adequate funding mechanisms for monitoring are established in the CIFP.
	PS-2.3	New development shall be required to connect to existing water service providers where feasible. Connection to public utilities is preferable to other providers.
	PS-2.4	Regulations for installing any new domestic well located in consolidated materials (e.g., hard rock areas) shall be enacted by the County.
	PS-2.5	Regulations shall be developed for water quality testing for new individual domestic wells on a single lot of record to identify: a) Water quality testing parameters for a one-time required water quality test for individual wells at the time of well construction. b) A process that allows the required one-time water quality test results to be available to future owners of the well. Regulations pursuant to this policy shall not establish criteria that will prevent the use of the well in the development of the property. Agricultural wells shall be exempt from the regulation.
	GOAL PS-3	Ensure that new development is assured a long-term sustainable water supply.
	PS-3.1	Except as specifically set forth below, new development for which a discretionary permit is required, and that will use or require the use of water, shall be prohibited without

		proof, based on specific findings and supported by evidence, that there is a long-term, sustainable water supply, both in quality and quantity to serve the development [see Plan for list].
	PS-3.2	Specific criteria for proof of a Long-Term Sustainable Water Supply and an Adequate Water Supply System for new development requiring a discretionary permit, including but not limited to residential or commercial subdivisions, shall be developed by ordinance with the advice of the General Manager of the Water Resources Agency and the Director of the Environmental Health Bureau. A determination of a Long-Term Sustainable Water Supply shall be made upon the advice of the General Manager of the Water Resources Agency. The following factors shall be used in developing the criteria for proof of a long-term sustainable water supply and an adequate water supply system: [see Plan for list]
	PS-3.3	Specific criteria shall be developed by ordinance for use in the evaluation and approval of adequacy of all domestic wells. The following factors shall be used in developing criteria for both water quality and quantity including, but not limited to: [see Plan for list]
	PS-3.4	The County shall request an assessment of impacts on adjacent wells and instream flows for new high-capacity wells, including high-capacity urban and agricultural production wells, where there may be a potential to affect existing adjacent domestic or water system wells adversely or in-stream flows, as determined by the Monterey County Water Resources Agency. In the case of new high-capacity wells for which an assessment shows the potential for significant adverse well interference, the County shall require that the proposed well site be relocated or otherwise mitigated to avoid significant interference. The following factors shall be used in developing criteria by ordinance for use in the evaluation and approval of adequacy of all such high-capacity wells, including but not limited to: a) Effect on wells in the immediate vicinity as required by the Monterey County Water Resources Agency or Environmental Health Bureau. b) Effects of additional extractions or diversion of water on in-stream flows necessary to support riparian vegetation, wetlands, fish, and other aquatic life including migration potential for steelhead, for the purpose of minimizing impacts to those resources and species. This policy is not intended to apply to replacement wells.
	PS-3.5	The Monterey County Health Department shall not allow construction of any new wells in known areas of saltwater intrusion as identified by Monterey County Water Resources Agency or other applicable water management agencies: a) Until such time as a program has been approved and funded that will minimize or avoid expansion of saltwater intrusion into useable groundwater supplies in that area; or b) Unless approved by the applicable water resource agency. This policy shall not apply to deepening or replacement of existing wells, or wells used in conjunction with a desalination project.
	PS-3.6	The County shall coordinate and collaborate with all agencies responsible for the management of existing and new water resources.
	PS-3.7	A program to eliminate overdraft of water basins shall be developed as part of the Capital Improvement and Financing Plan (CIFP) for this Plan using a variety of strategies, which may include but are not limited to: a) Water banking

		b) Groundwater and aquifer recharge and recovery c) Desalination d) Pipelines to new supplies e) A variety of conjunctive use techniques The CIFP shall be reviewed every five years in order to evaluate the effectiveness of meeting the strategies noted in this policy. Areas identified to be at or near overdraft shall be a high priority for funding.
	PS-3.8	Developments that use gray water and cisterns for multi-family residential and commercial landscaping shall be encouraged, subject to a discretionary permit.
	PS-3.9	A tentative subdivision map and/or vesting tentative subdivision map application for either a standard or minor subdivision shall not be approved until the applicant provides evidence of a long-term sustainable water supply in terms of yield and quality for all lots that are to be created through subdivision.
	PS-3.10	In order to maximize agricultural water conservation measures to improve water use efficiency and reduce overall water demand, the County shall establish an ordinance identifying conservation measures that reduce agricultural water demand.
	PS-3.11	In order to maximize urban water conservation measures to improve water use efficiency and reduce overall water demand, the County shall establish an ordinance identifying conservation measures that reduce potable water demand
	PS-3.12	The County shall maximize the use of recycled water as a potable water offset to manage water demands and meet regulatory requirements for wastewater discharge, by employing strategies including, but not limited to, the following: a) Increase the use of treated water where the quality of recycled water is maintained, meets all applicable regulatory standards, is appropriate for the intended use, and re-use will not significantly impact beneficial uses of other water resources. b) Work with the agricultural community to develop new uses for tertiary recycled water and increase the use of tertiary recycled water for irrigation of lands currently being irrigated by groundwater pumping. c) Work with urban water providers to emphasize use of tertiary recycled water for irrigation of parks, playfields, schools, golf courses, and other landscape areas to reduce potable water demand. d) d. Work with urban water providers to convert existing potable water customers to tertiary recycled water as infrastructure and water supply become available.
	PS-3.13	To ensure accuracy and consistency in the evaluation of water supply availability, the Monterey County Health Department, in coordination with the MCWRA, shall develop guidelines and procedures for conducting water supply assessments and determining water availability. Adequate availability and provision of water supply, treatment, and conveyance facilities shall be assured to the satisfaction of the County prior to approval of final subdivision maps or any changes in the General Plan Land Use or Zoning designations.
	PS-3.14	The County will participate in regional coalitions for the purpose of identifying and supporting a variety of new water supply projects, water management programs, and multiple agency agreements that will provide additional domestic water supplies for the Monterey Peninsula and Seaside basin, while continuing to protect the Salinas and Pajaro River groundwater basins from saltwater intrusion. The County will also

		participate in regional groups including representatives of the Pajaro Valley Water Management Agency and the County of Santa Cruz to identify and support a variety of new water supply, water management and multiple agency agreement that will provide additional domestic water supplies for the Pajaro Groundwater Basin. The County's general objective, while recognizing that timeframes will be dependent on the dynamics of each of the regional groups, will be to complete the cooperative planning of these water supply alternatives within five years of the adoption of the General Plan and to implement the selected alternatives within five years after that time.
	PS-3.15	The County will pursue expansion of the Salinas Valley Water Project (SVWP) by investigating expansion of the capacity for the Salinas River water storage and distribution system. This shall also include, but not be limited to, investigations of expanded conjunctive use, use of recycled water for groundwater recharge and seawater intrusion barrier, and changes in operations of the reservoirs. The County's overall objective is to have an expansion planned and in service by the date that the extractions from the Salinas Valley groundwater basin are predicted to reach the levels estimated for 2030 in the EIR for the Salinas Valley Water Project. The County shall review these extraction data trends at five-year intervals. The County shall also assess the degree to which the Salinas Valley Groundwater Basin (Zone 2C) has responded with respect to water supply and the reversal of seawater intrusion based upon the modeling protocol utilized in the Salinas Valley Water Project EIR. If the examination indicates that the growth in extractions predicted for 2030 are likely to be attained within ten years of the date of the review, or the groundwater basin has not responded with respect to water supply and reversal of seawater intrusion as predicted by the model, then the County shall convene and coordinate a working group made up of the Salinas Valley cities, the MCWRA, and other affected entities. The purpose will be to identify new water supply projects, water management programs, and multiple agency agreements that will provide additional domestic water supplies for the Salinas Valley. These may include, but not be limited to, expanded conjunctive use programs, further improvements to the upriver reservoirs, additional pipelines to provide more efficient distribution, and expanded use of recycled water to reinforce the hydraulic barrier against seawater intrusion. The county's objective will be to complete the cooperative planning of these water supply alternatives within five years and to have the projects on-line five years following identification of water supply alternatives.

References

- AMBAG (Association of Monterey Bay Area Governments). 2026. 2026 Regional Growth Forecast Technical Documentation. Adopted June 2026. https://www.ambag.org/sites/default/files/2026-05/11.%202050%20AMBAG%20MTP-SCS%20Appendix%20A_PDF%200.pdf
- Monterey County. 2010. "2010 Monterey County General Plan." <https://www.co.monterey.ca.us/government/departments-i-z/resource-management-agency-rma-/planning/resources-documents/2010-general-plan>.
- County of Monterey. 2025. Communications to SVBGSA September 18, 2025.

Appendix 4A

ISW Seasonality Analysis

APPENDIX 4A. ISW SEASONALITY ANALYSIS

Surface water and groundwater can be hydrologically connected along a stream reach during some months of the year and not others. These temporal variations of interconnected surface water (ISW) during a given year are the result of variations in recharge, precipitation, groundwater pumping, and riparian evapotranspiration. Hydrologic connectivity in the Salinas Valley is estimated using results from the SVIHM (version 1, Montgomery & Associates, 2025), which is calibrated to historical groundwater levels and stream flows. For this analysis, stream reaches were considered to have ISW when simulated historical groundwater levels under the surface water were at or above the bottom of the channel (i.e. a simulated gaining reach), based on the DWR definition of interconnection as a continuous saturated zone under the surface water body as described in Section 4.4.5.1.

The ISW locations described in section 4.4.5.1 of the GSP represent reaches that are connected more than 10% of time over the SVIHM simulation period from WY 1980 to WY 2022. The number of interconnected reaches is similar regardless of whether a threshold of 10% or 50% time-connected is used; therefore, 10% was selected as a conservative assumption. Streams overlying the Salinas Valley Aquitard are not included in this analysis because the aquitard prevents recharge of surface water to the principal aquifer in the subbasin. In addition, in line with the groundwater-dependent ecosystem analysis completed by the Central Coast Wetlands Group included in GSP Amendment 1, areas where groundwater elevations were more than 30 feet below ground surface were excluded as it was assumed that groundwater and surface water are not interconnected. The identified ISW locations are the best estimates of where persistent hydrologic connections potentially occur along streams in the Salinas Valley. However, the lateral extents (lengths) of these reaches vary from month to month during the year, as well as from year to year.

ISW was analyzed on a monthly basis to understand temporal variations throughout the year. Figure 4A-1 presents the average distribution of the percentage of modeled stream cells in the Langley Subbasin with comparison to the entire Salinas Valley. A box plot for each month shows the distribution for that month. For example, the January box summarizes the percentage of modeled stream cells connected during the month of January across the SVIHM simulation period from WY 1980 to WY 2022. The box extends from the 25th to the 75th percentile, the horizontal line represents the median, and the whiskers extend to the lowest and highest values within 1.5 times the interquartile range. Outliers beyond the whiskers are not shown.

The monthly analysis shows the average temporal connectivity along the entire length of a stream; however, some reaches of the stream have much lower or higher connectivity than indicated by the average values. Model results demonstrate that the Langley Area Subbasin consistently exhibits a lower percentage of hydrologic connection throughout the entire water year compared to the Valley-wide average.

In addition to seasonal variability, interannual climatic conditions significantly influence the extent and duration of ISW. Figure 4A-2 shows estimated average annual percent connection for the SVIHM model period. ISW extents in other subbasins decrease substantially during drought periods, such as around 1990, 2015, and 2022. This reduction in interconnection is the result of little or no water released from the upstream reservoirs, compounded by increased pumping during droughts. This relationship does not occur in the Langley Subbasin, mainly because the groundwater system is not connected to the Salinas River. The relatively high connectivity estimates shown for the Subbasin during the 1980s could be more reflective of uncertainty in the model results than actual conditions. Calibrating the SVIHM to measured groundwater levels was challenging due to the complexities of groundwater movement through fractured bedrock and areas with consolidated clay lenses. Figure 4A-3 demonstrates the percentage of streams hydrologically connected across varying water year types, categorized from dry to wet classifications based on historical hydrology. Expectedly, connectivity exhibits a positive correlation with water year wetness. Consistent with the monthly findings, the Langley Subbasin demonstrates a lower connectivity across all climatic conditions relative to all subbasins in aggregate.

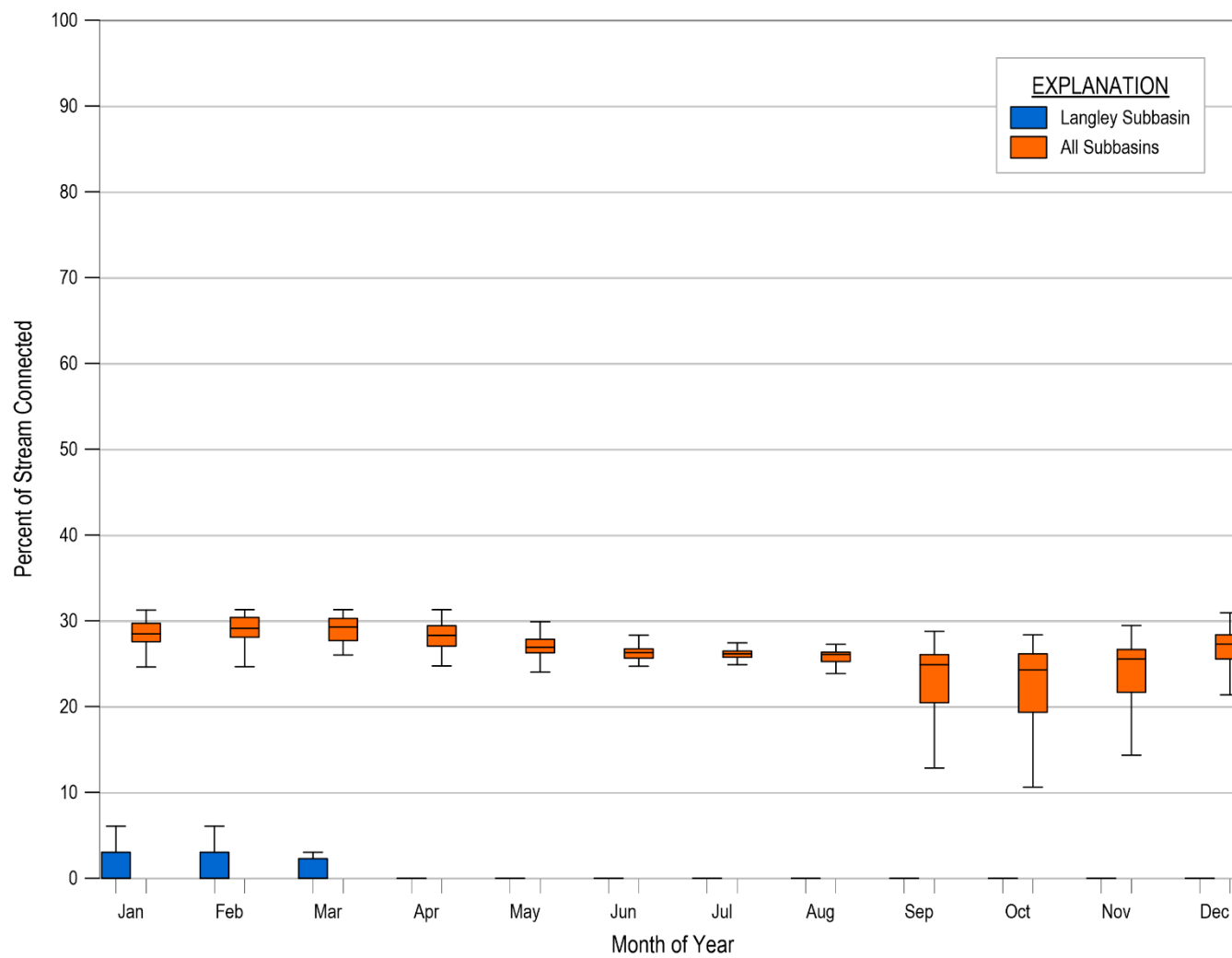


Figure 4A-1. Monthly Distribution of Percent of Streams Connected

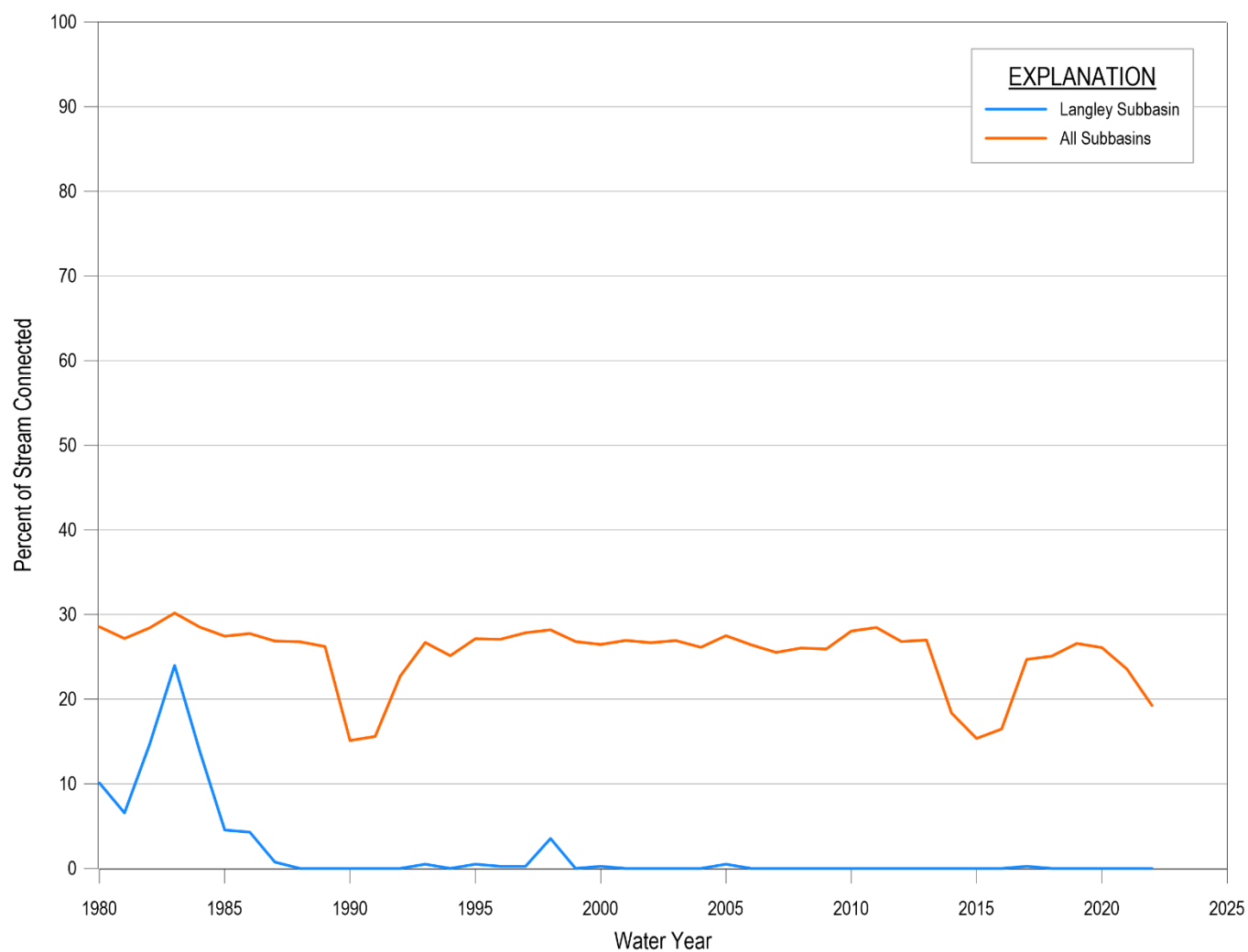


Figure 4A-2. Average Annual Percent of Streams Connected

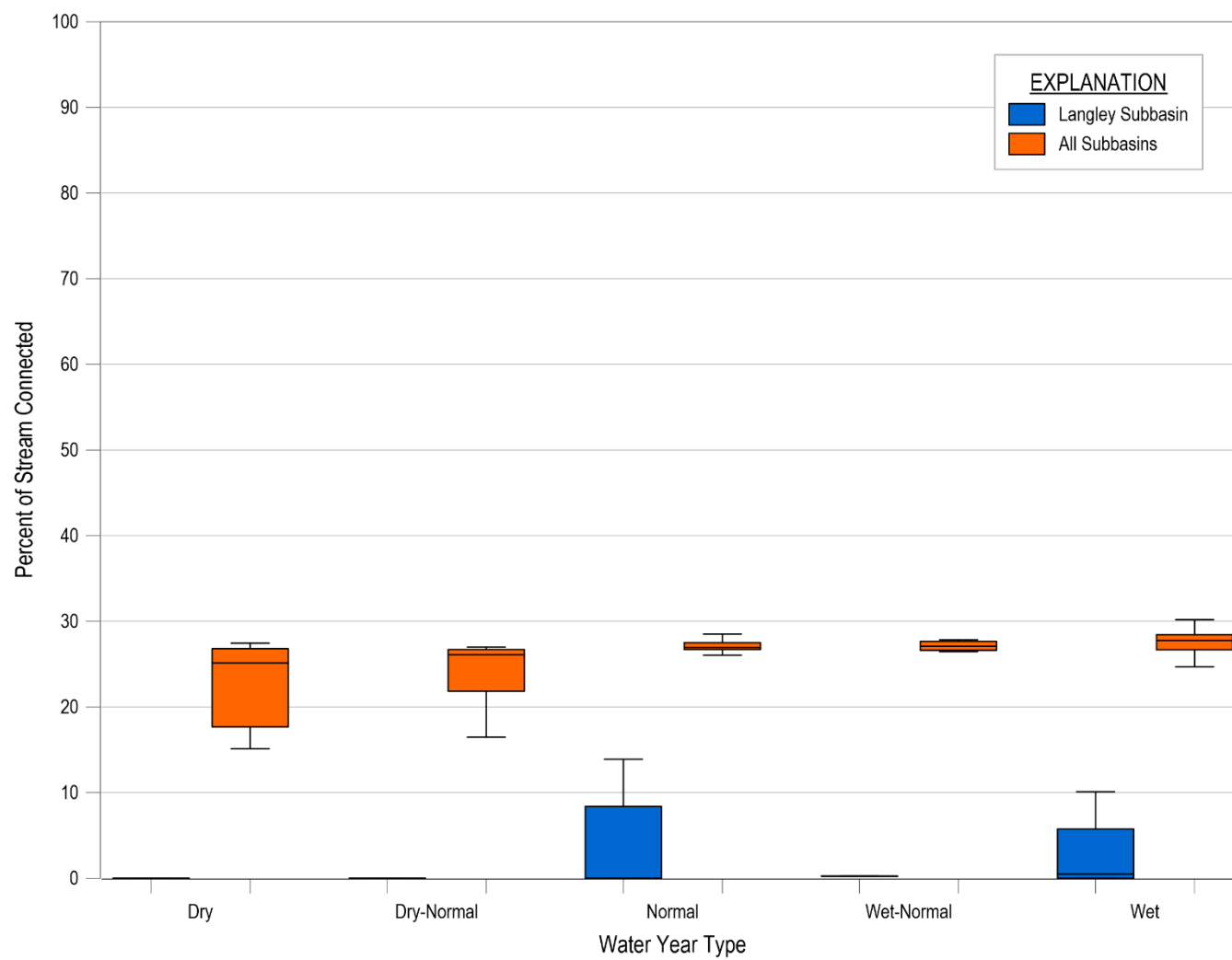


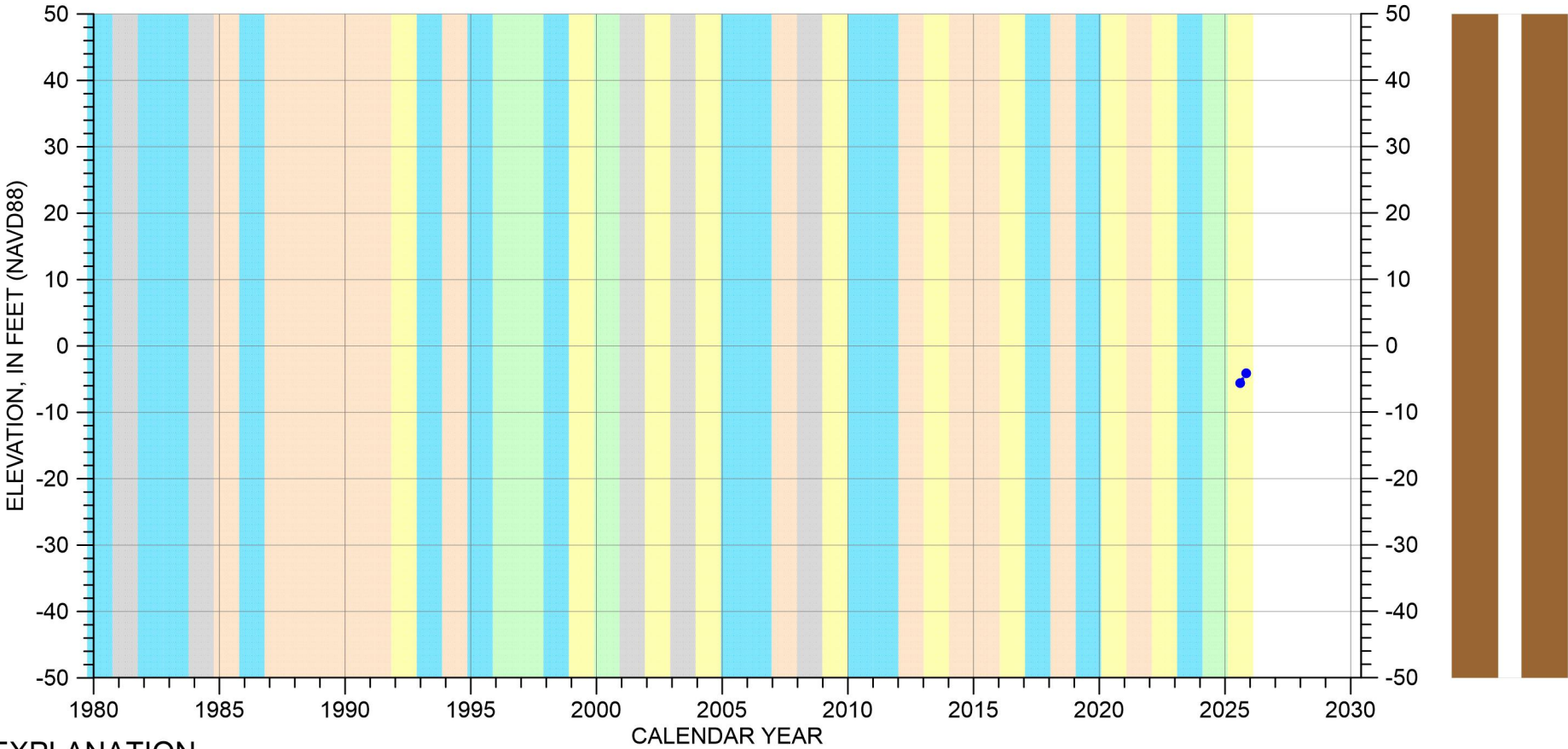
Figure 4A-3. Distribution of Percent of Streams Connected Across Water Year Types (Dry to Wet)

Appendix 5A

RMS Hydrographs

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 12S/03E-31R02

Langley Area Subbasin

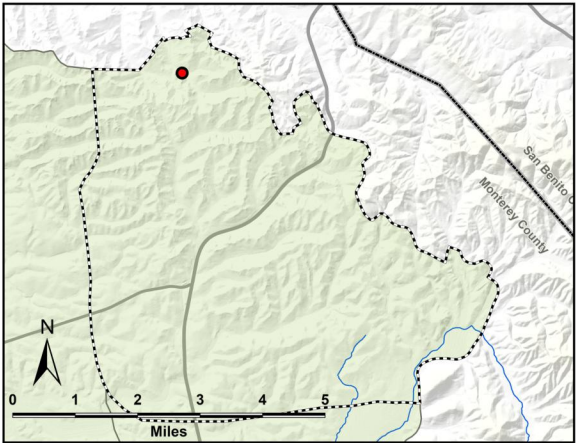


EXPLANATION

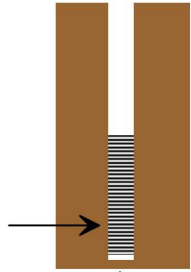
- - - Groundwater Elevation
- Suspect Measurement
- Land Surface (205 FT MSL)
- Measurable Objective
- Minimum Threshold

WATER YEAR TYPE DESIGNATION

- | | |
|--------------|--------------|
| DRY | WET - NORMAL |
| DRY - NORMAL | WET |
| NORMAL | |



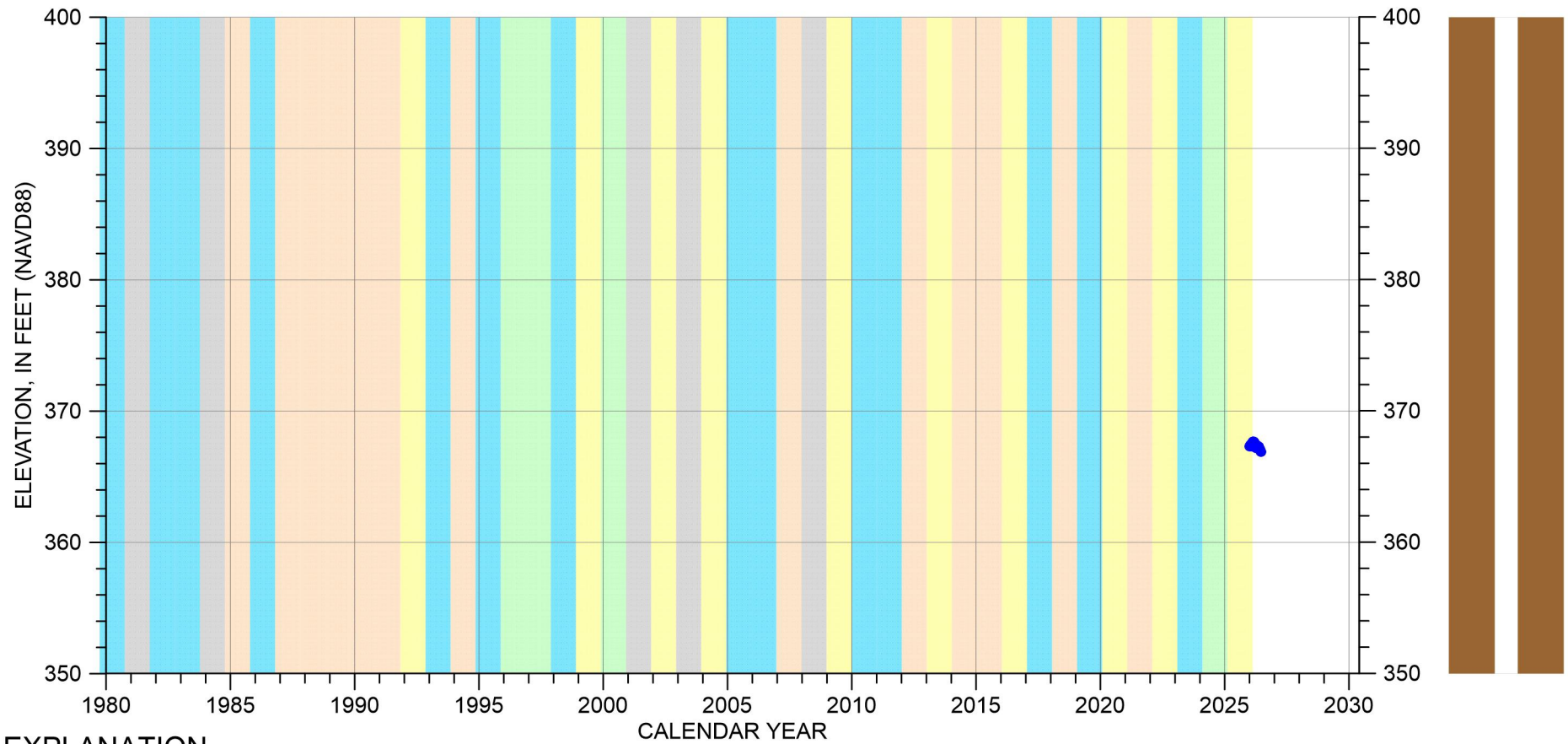
Perforated from
-65 to -145 feet msl



Well bottom
-145 feet msl

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 13S/03E-10D02

Langley Area Subbasin

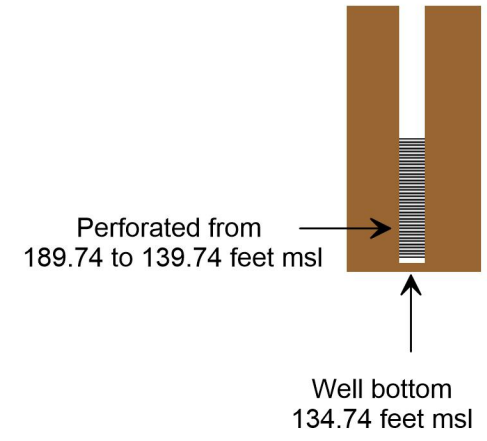
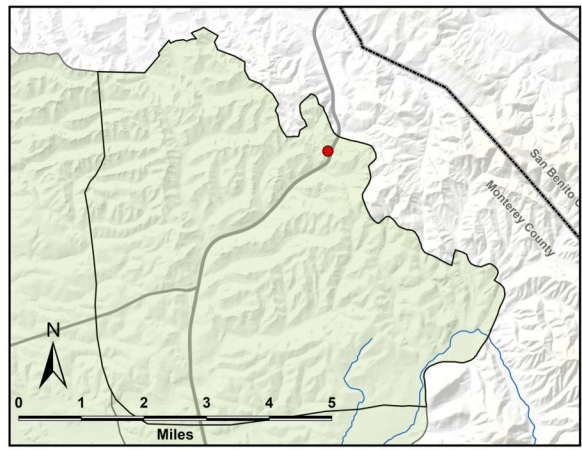


EXPLANATION

- - - Groundwater Elevation
- Suspect Measurement
- Land Surface (469.74 FT MSL)
- Measurable Objective
- Minimum Threshold

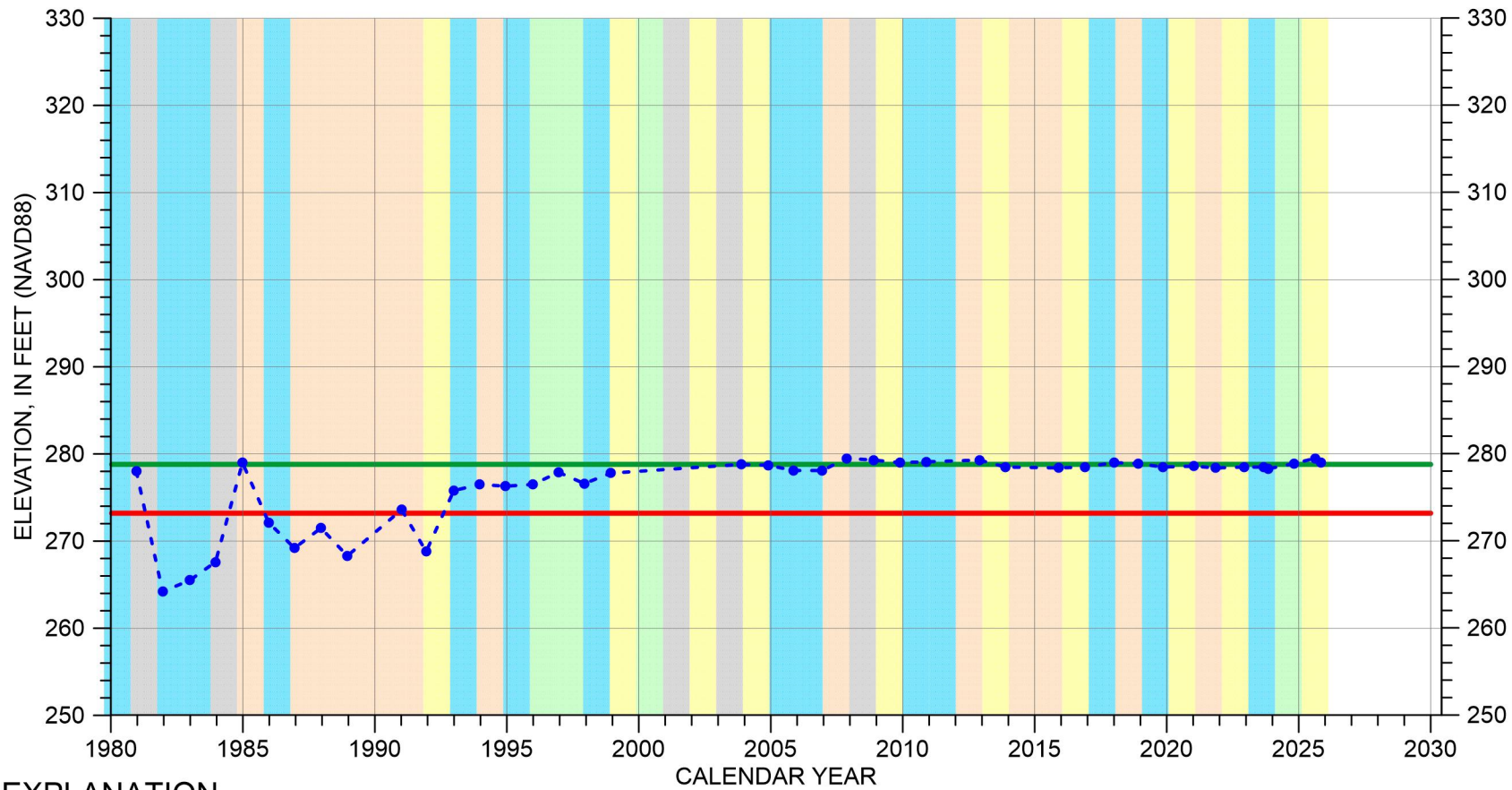
WATER YEAR TYPE DESIGNATION

- | | |
|--------------|--------------|
| DRY | WET - NORMAL |
| DRY - NORMAL | WET |
| NORMAL | |



HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 13S/03E-10N01

Langley Area Subbasin

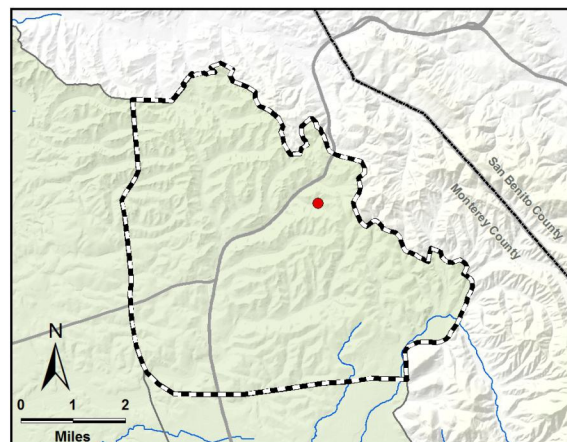


EXPLANATION

- - - Groundwater Elevation
- Suspect Measurement
- Land Surface (383 FT MSL)
- Measurable Objective
- Minimum Threshold

WATER YEAR TYPE DESIGNATION

- | | |
|--------------|--------------|
| DRY | WET - NORMAL |
| DRY - NORMAL | WET |
| NORMAL | |

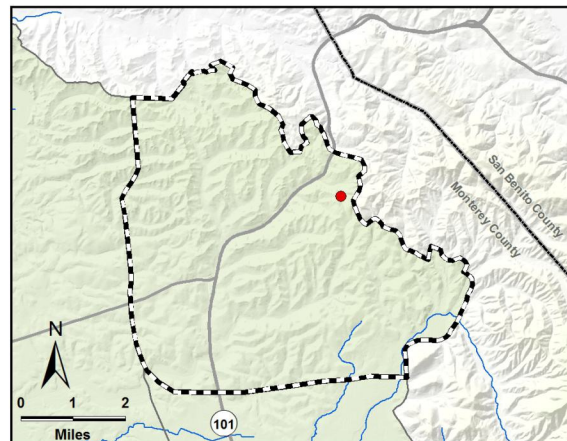
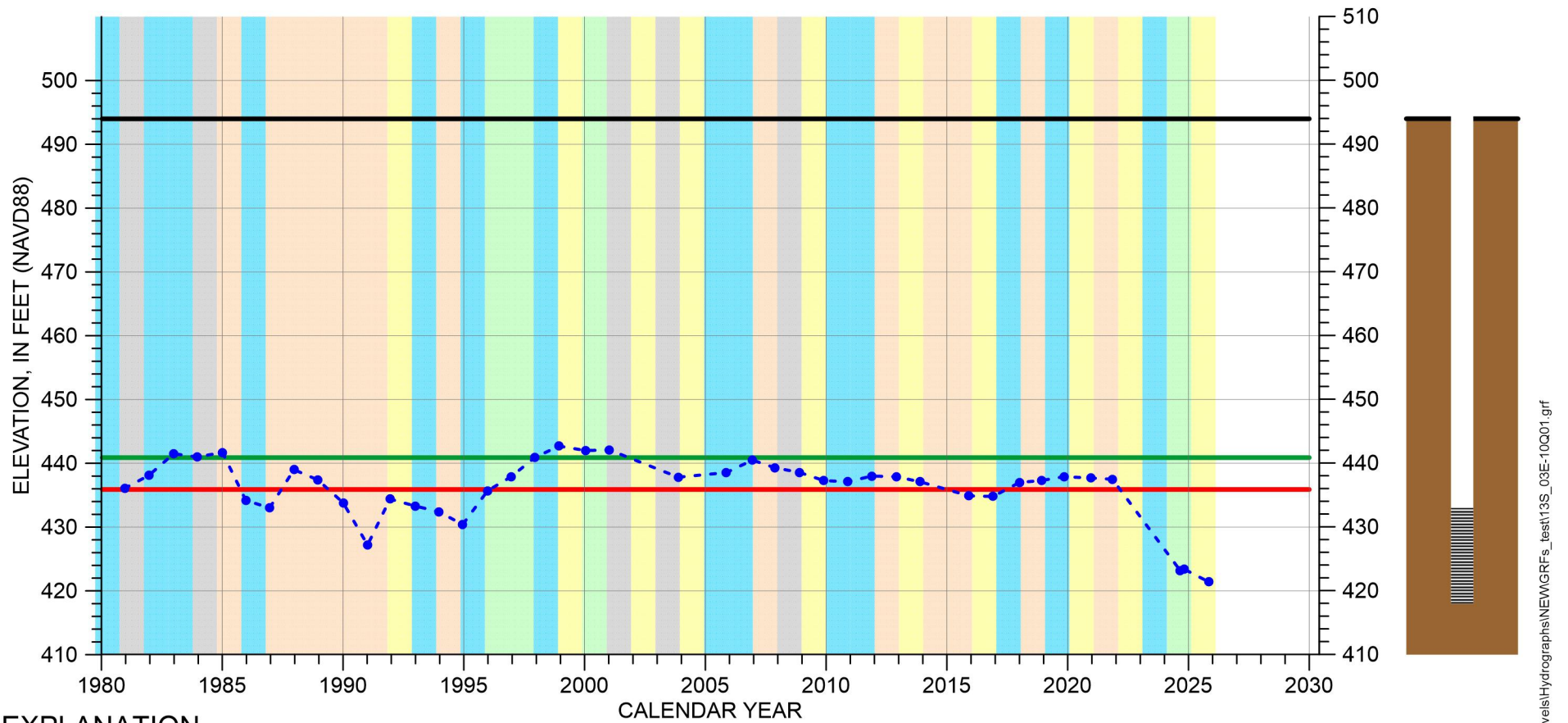


Perforated interval
unknown

Well bottom
238 feet msl

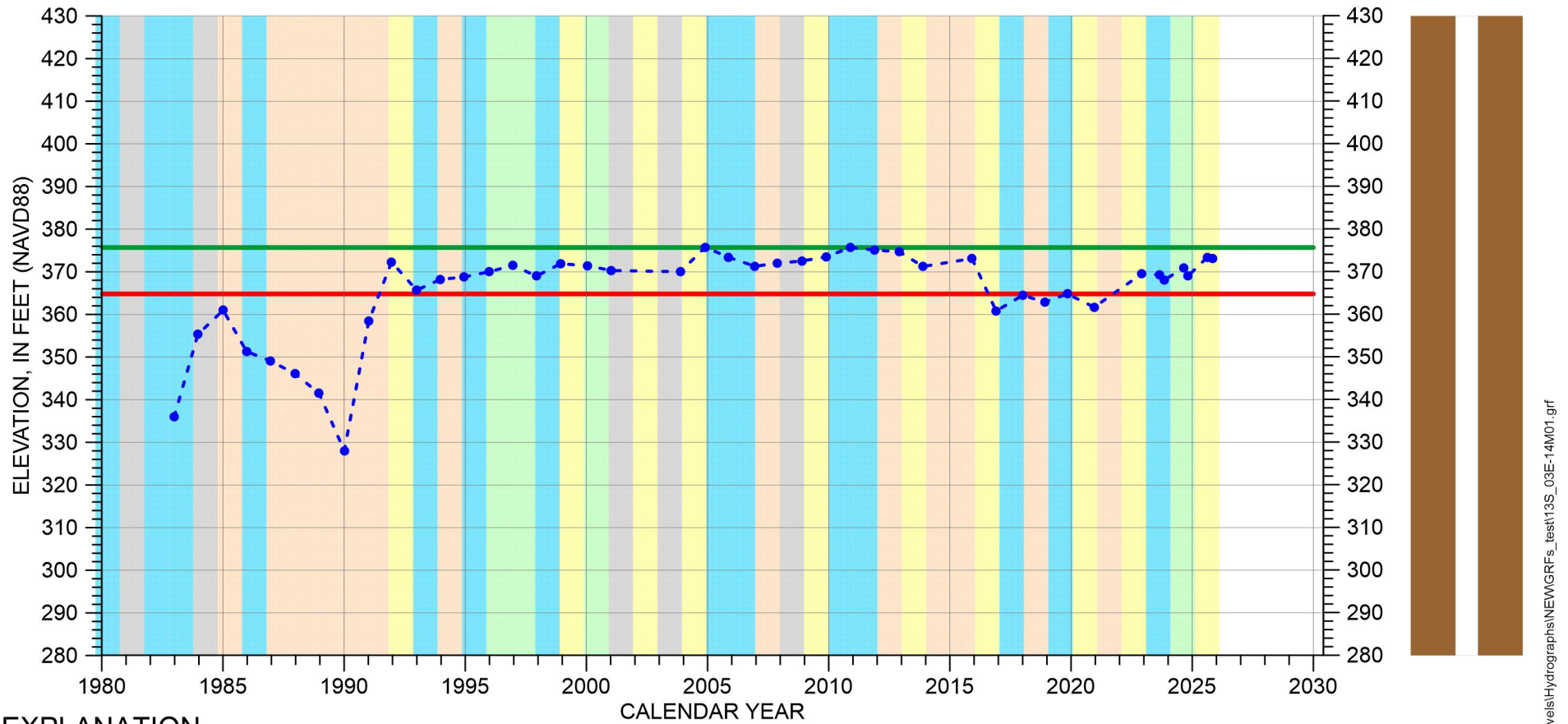
HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 13S/03E-10Q01

Langley Area Subbasin



HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 13S/03E-14M01

Langley Area Subbasin

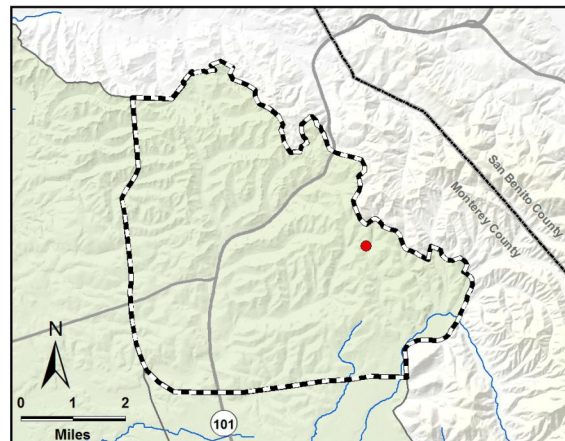


EXPLANATION

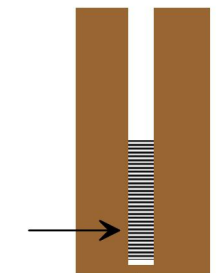
- - - Groundwater Elevation
- Suspect Measurement
- Land Surface (461 FT MSL)
- Measurable Objective
- Minimum Threshold

WATER YEAR TYPE DESIGNATION

- | | |
|--------------|--------------|
| DRY | WET - NORMAL |
| DRY - NORMAL | WET |
| NORMAL | |



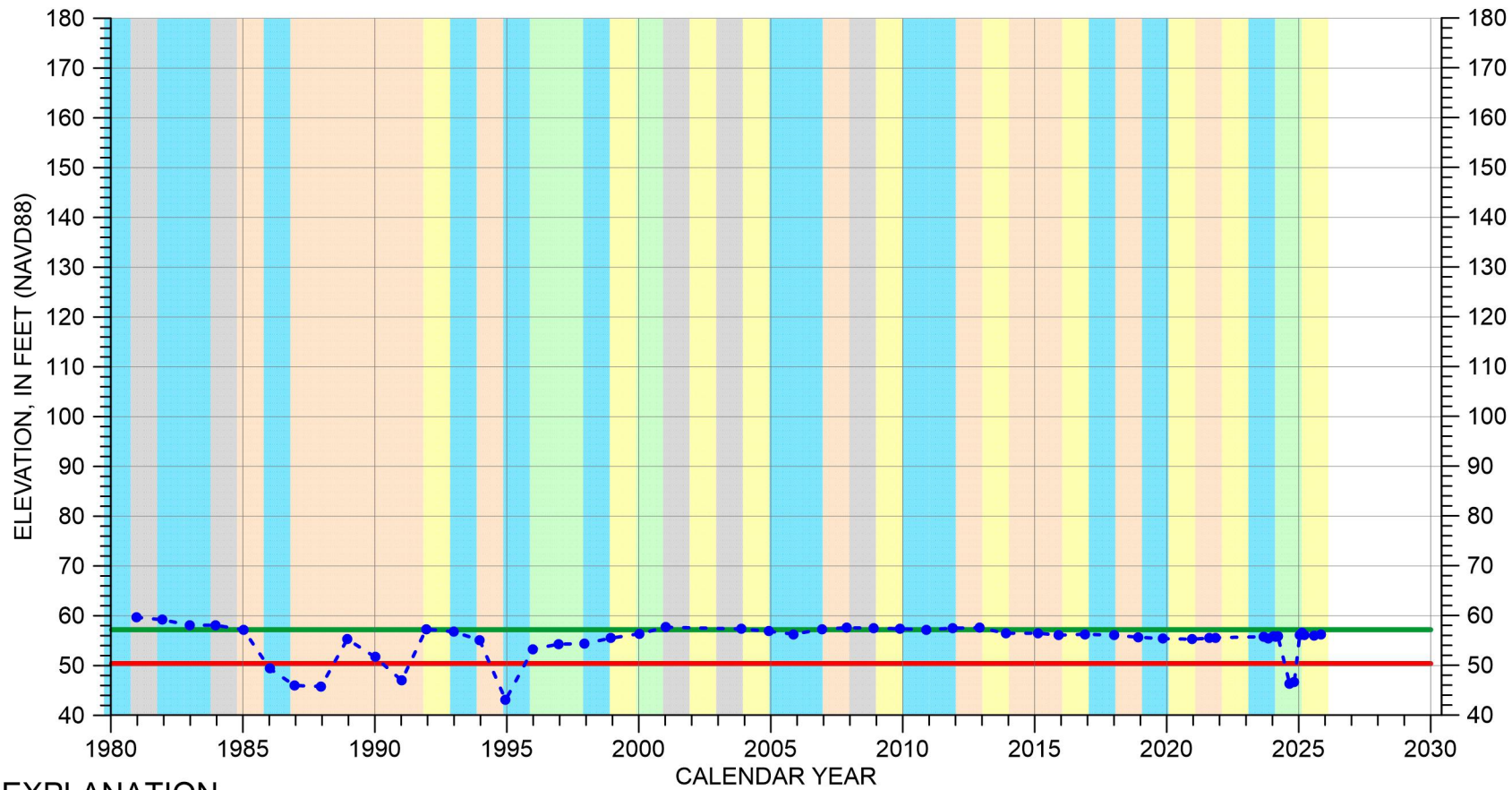
Perforated from
141 to 59 feet msl



Well bottom
11 feet msl

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 13S/03E-16J01

Langley Area Subbasin

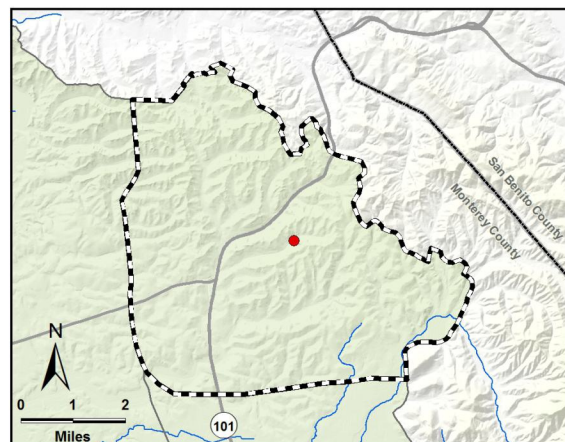


EXPLANATION

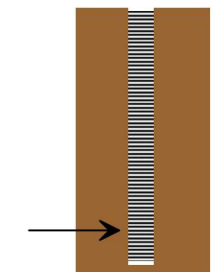
- - - Groundwater Elevation
- Suspect Measurement
- Land Surface (279 FT MSL)
- Measurable Objective
- Minimum Threshold

WATER YEAR TYPE DESIGNATION

- | | |
|--------------|--------------|
| DRY | WET - NORMAL |
| DRY - NORMAL | WET |
| NORMAL | |



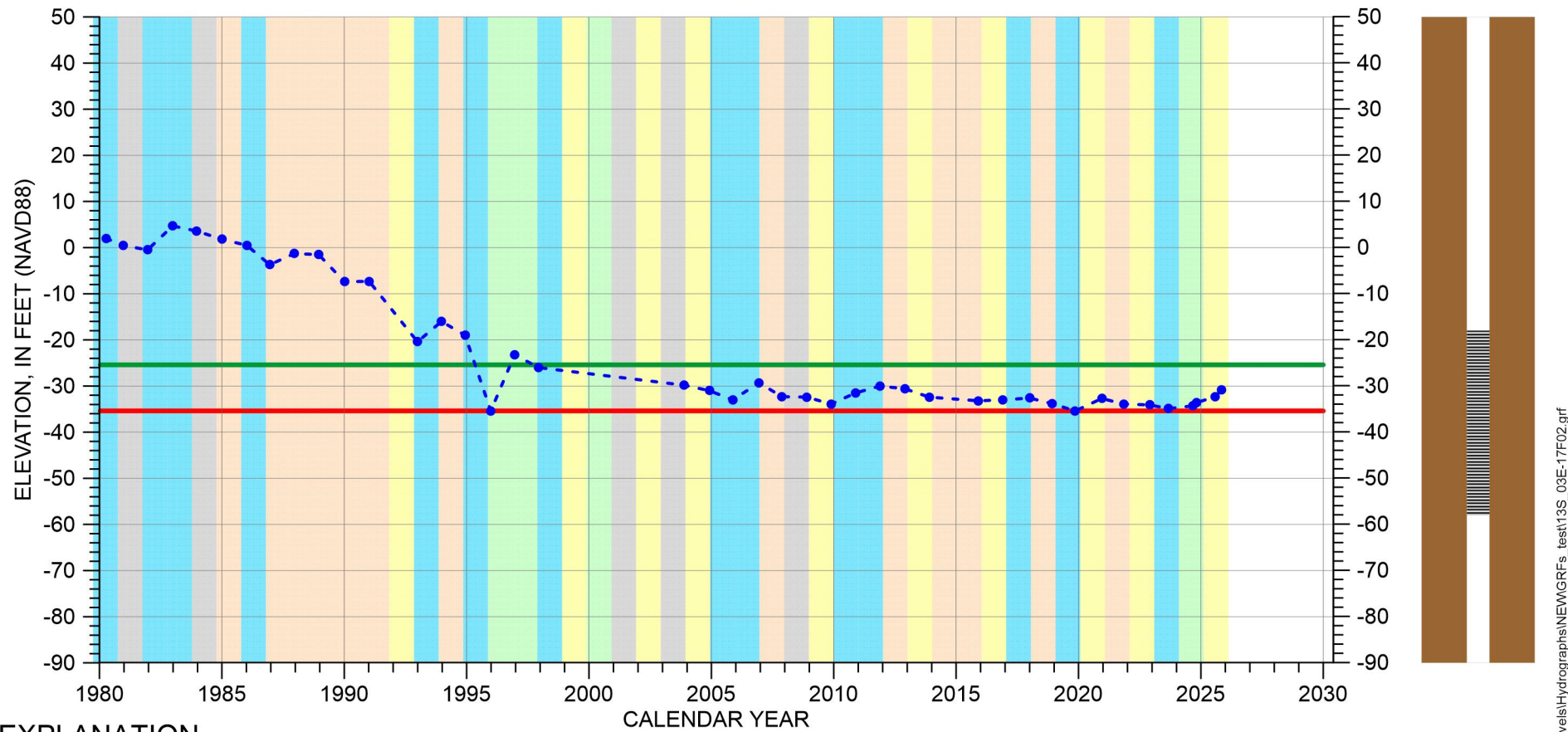
Perforated from
175 to 35 feet msl



Well bottom
27 feet msl

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 13S/03E-17F02

Langley Area Subbasin

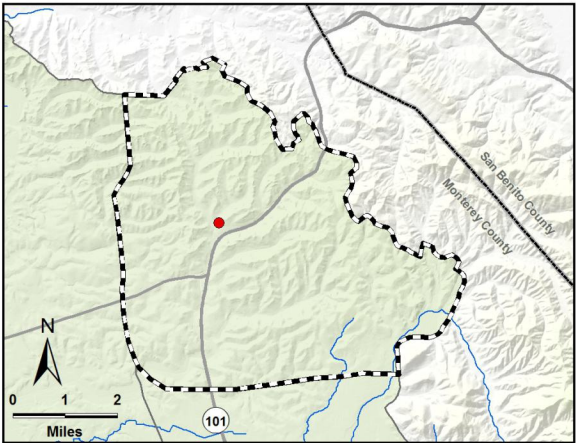


EXPLANATION

- Groundwater Elevation
- Suspect Measurement
- Land Surface (226 FT MSL)
- Measurable Objective
- Minimum Threshold

WATER YEAR TYPE DESIGNATION

- | | |
|--------------|--------------|
| DRY | WET - NORMAL |
| DRY - NORMAL | WET |
| NORMAL | |

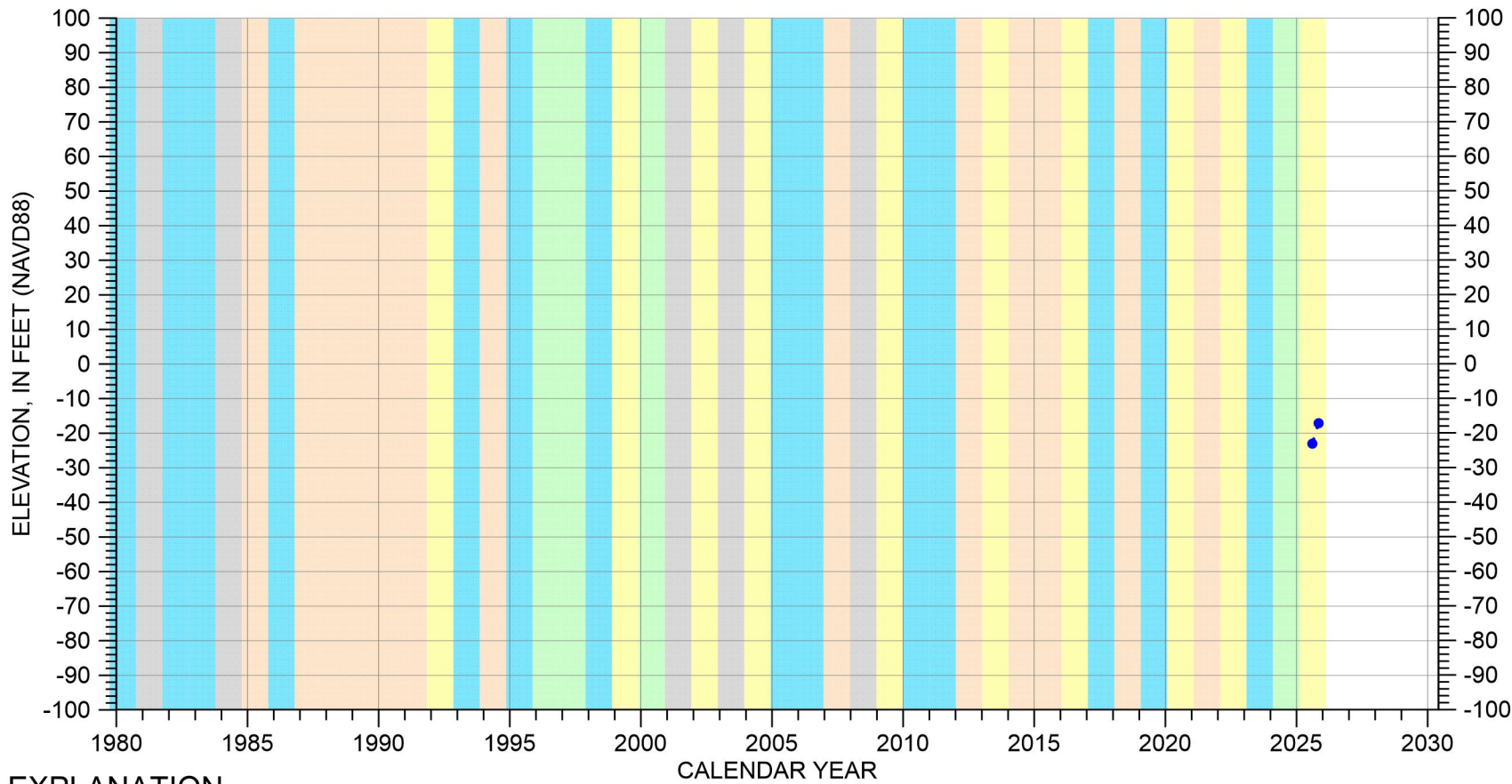


Perforated from
-18 to -58 feet msl

Well bottom
-166 feet msl

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 13S/03E-18H03

Langley Area Subbasin

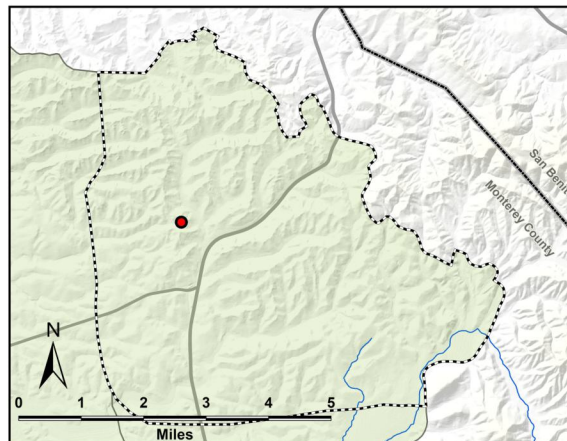


EXPLANATION

- - - Groundwater Elevation
- Suspect Measurement
- Land Surface (376 FT MSL)
- Measurable Objective
- Minimum Threshold

WATER YEAR TYPE DESIGNATION

- | | |
|--------------|--------------|
| DRY | WET - NORMAL |
| DRY - NORMAL | WET |
| NORMAL | |

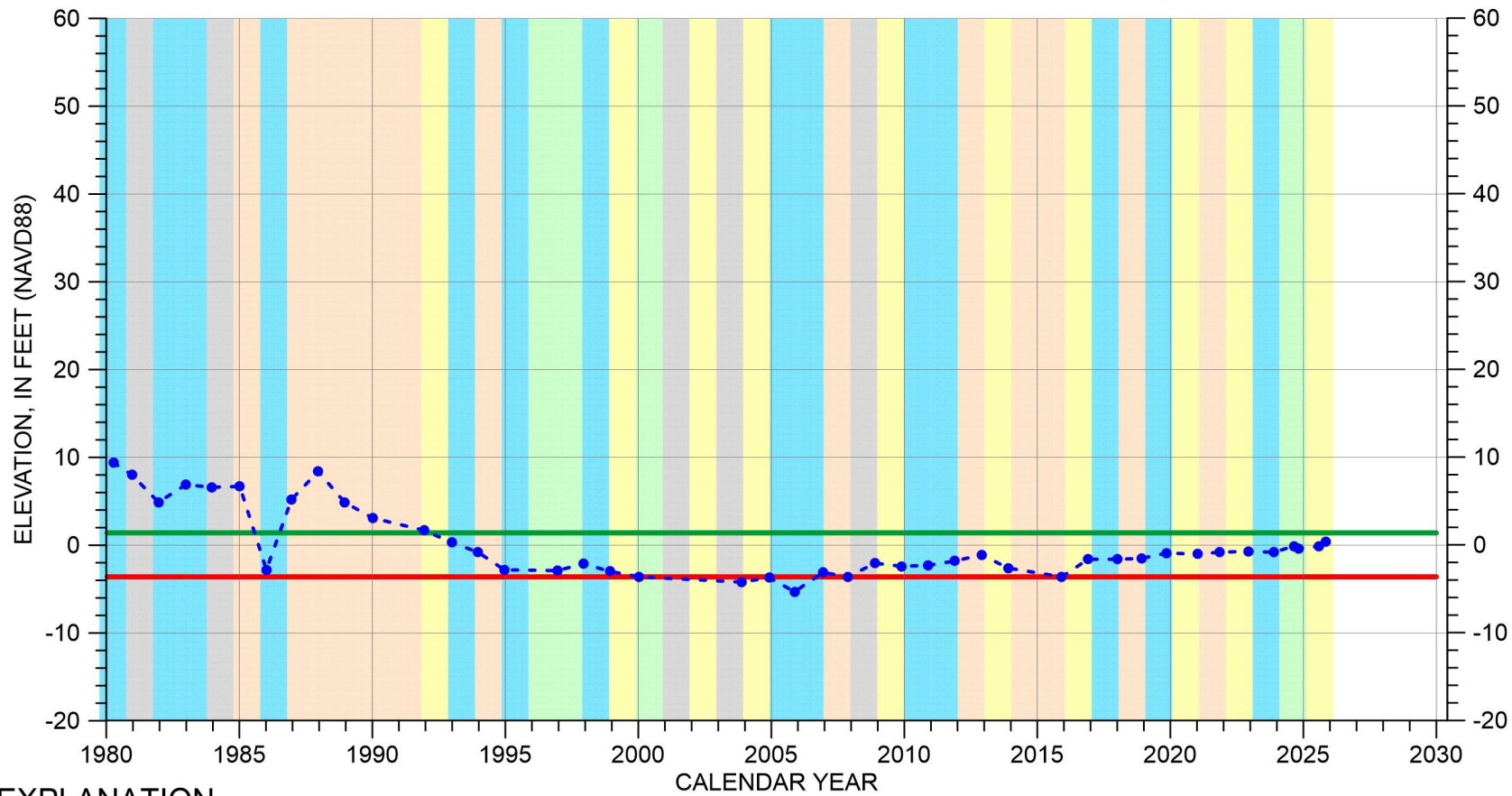


Perforated interval
unknown

Well bottom
elevation unknown

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 13S/03E-19H01

Langley Area Subbasin

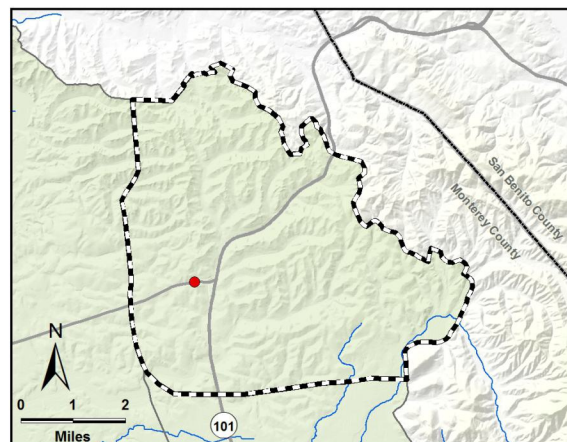


EXPLANATION

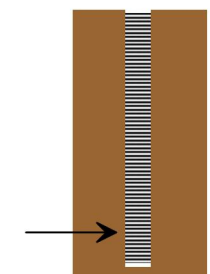
- - - Groundwater Elevation
- Suspect Measurement
- Land Surface (137 FT MSL)
- Measurable Objective
- Minimum Threshold

WATER YEAR TYPE DESIGNATION

- | | |
|--------------|--------------|
| DRY | WET - NORMAL |
| DRY - NORMAL | WET |
| NORMAL | |



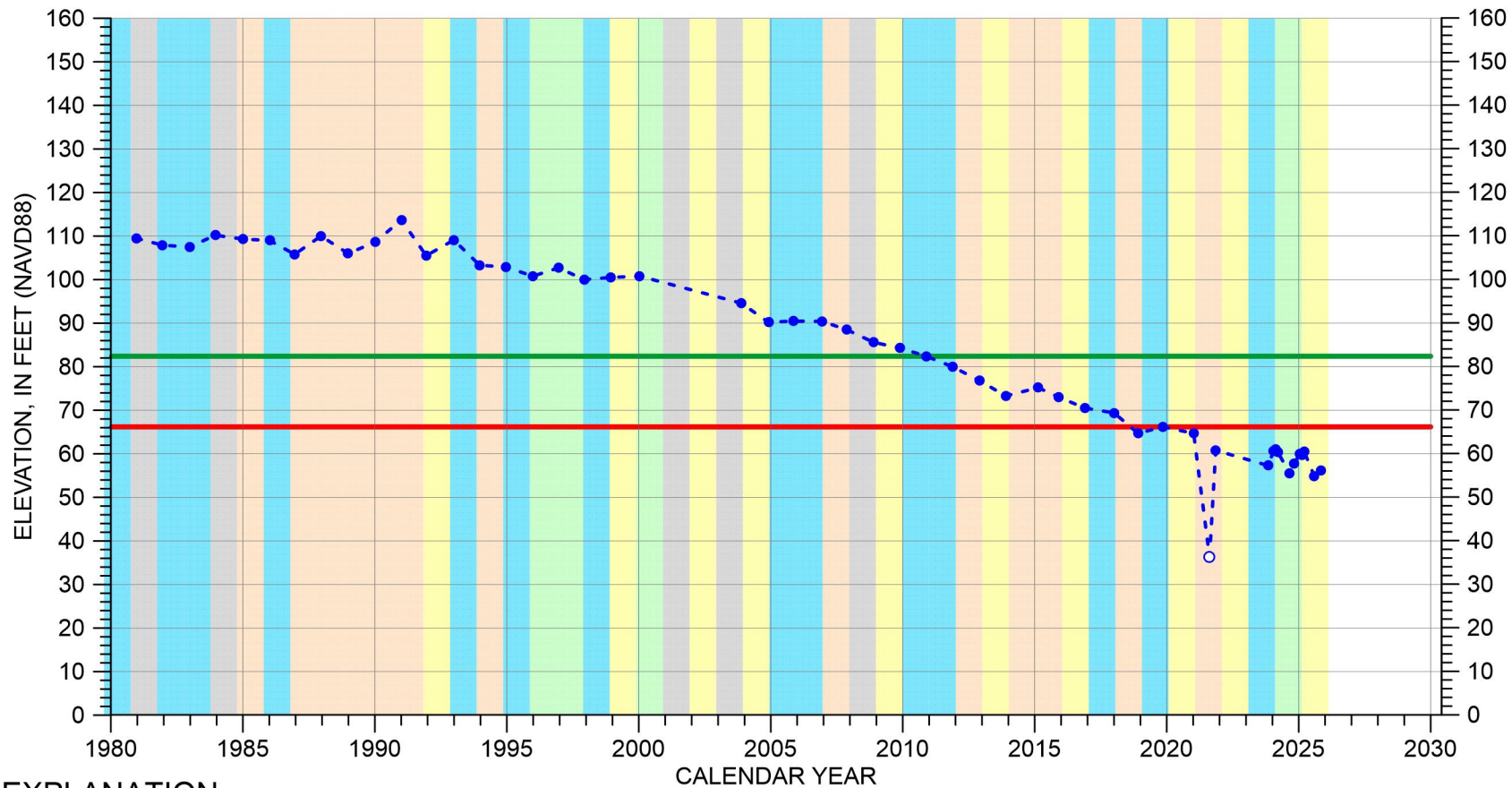
Perforated from
5 to -51 feet msl



Well bottom
-55 feet msl

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 13S/03E-22F01

Langley Area Subbasin

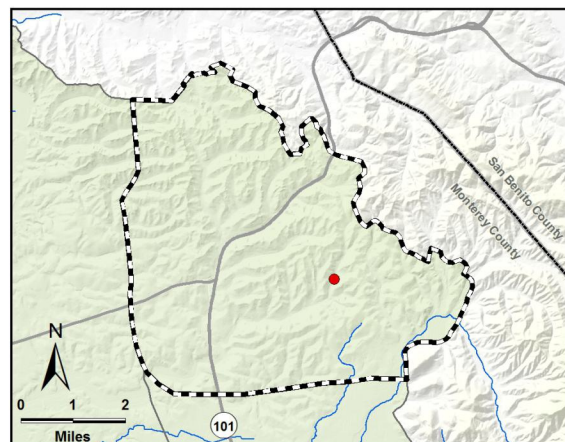


EXPLANATION

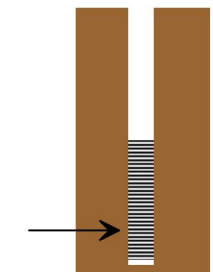
- - - Groundwater Elevation
- Suspect Measurement
- Land Surface (217 FT MSL)
- Measurable Objective
- Minimum Threshold

WATER YEAR TYPE DESIGNATION

- | | |
|--------------|--------------|
| DRY | WET - NORMAL |
| DRY - NORMAL | WET |
| NORMAL | |



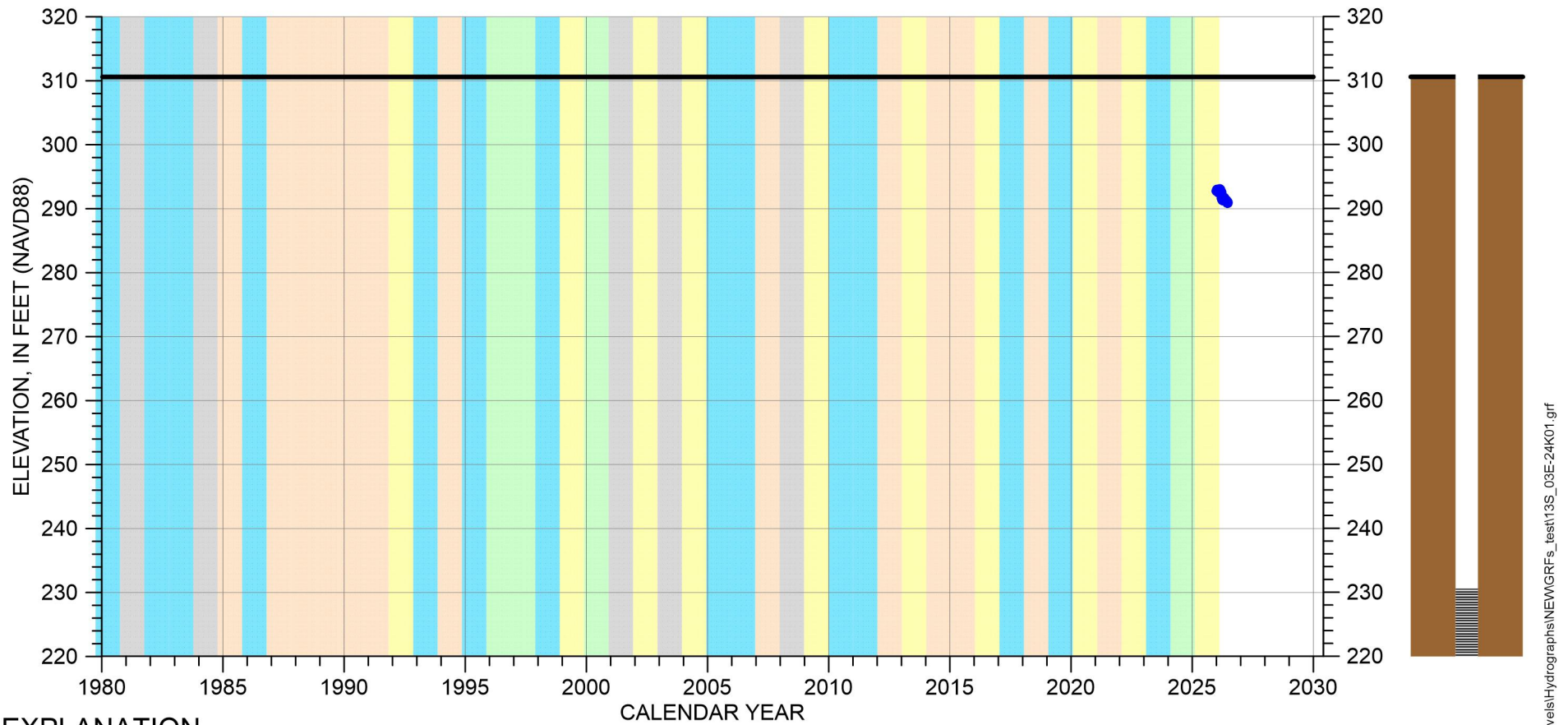
Perforated from
-43 to -103 feet msl



Well bottom
-117 feet msl

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 13S/03E-24K01

Langley Area Subbasin

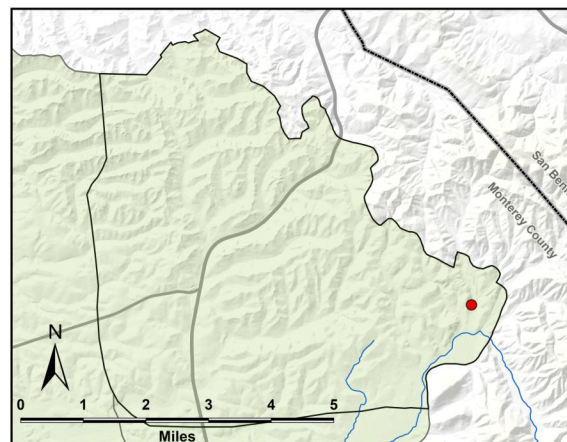


EXPLANATION

- - - Groundwater Elevation
- Suspect Measurement
- Land Surface
- Measurable Objective
- Minimum Threshold

WATER YEAR TYPE DESIGNATION

- | | |
|--------------|--------------|
| DRY | WET - NORMAL |
| DRY - NORMAL | WET |
| NORMAL | |

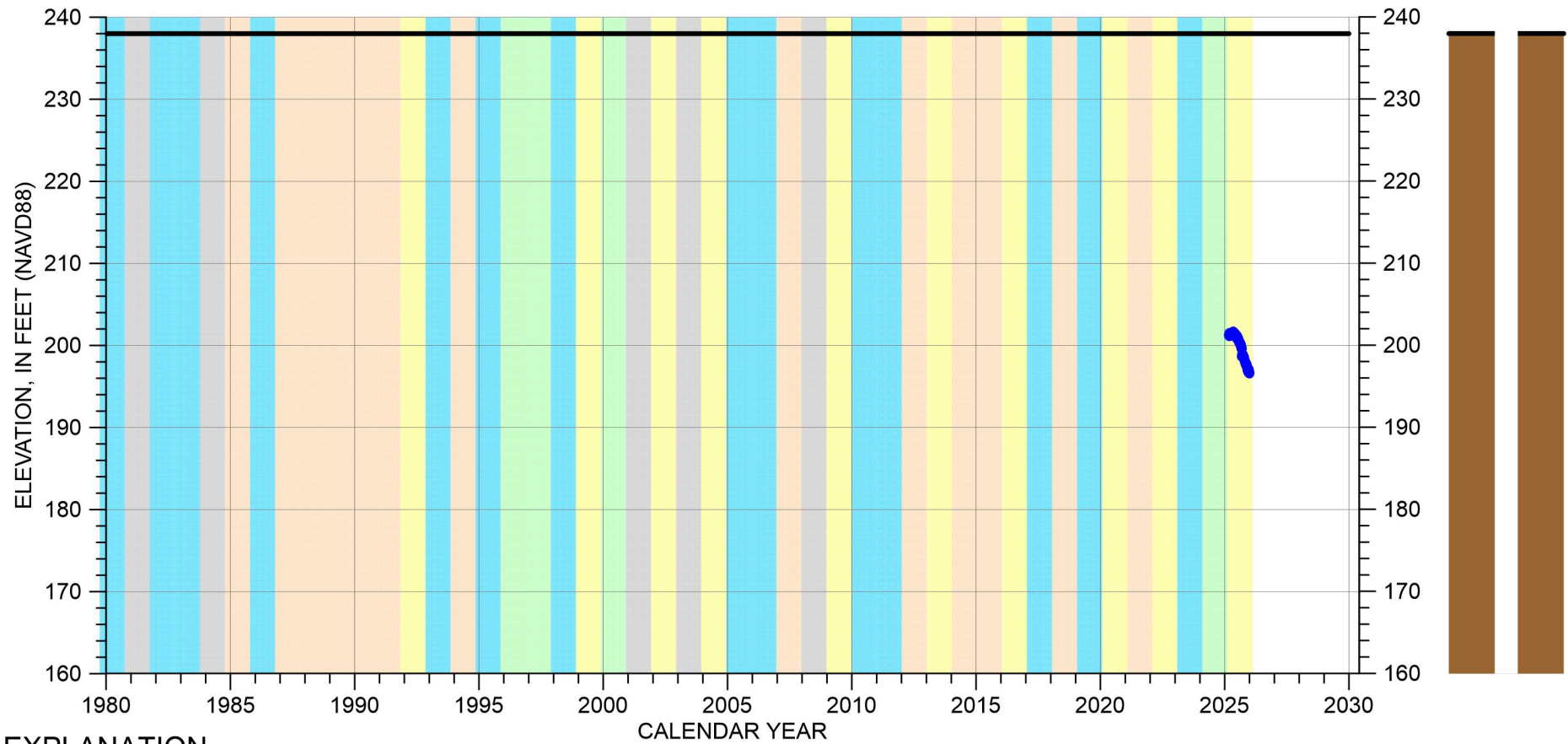


Perforated from
230.6 to 150.6 feet msl

Well bottom
145.6 feet msl

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 13S/03E-26J03

Langley Area Subbasin

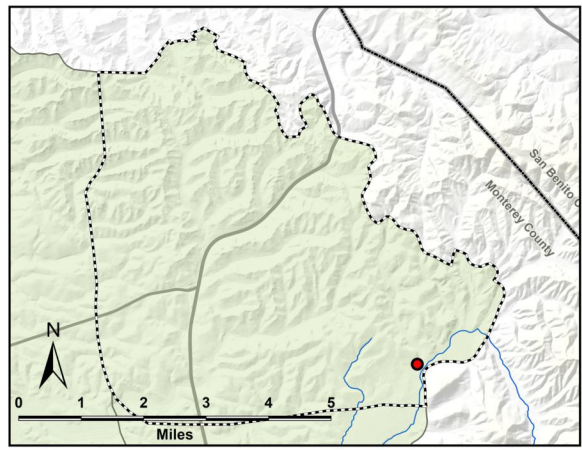


EXPLANATION

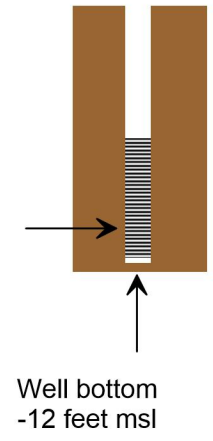
- - - Groundwater Elevation
- o Suspect Measurement
- Land Surface
- Measurable Objective
- Minimum Threshold

WATER YEAR TYPE DESIGNATION

- | | |
|--------------|--------------|
| DRY | WET - NORMAL |
| DRY - NORMAL | WET |
| NORMAL | |



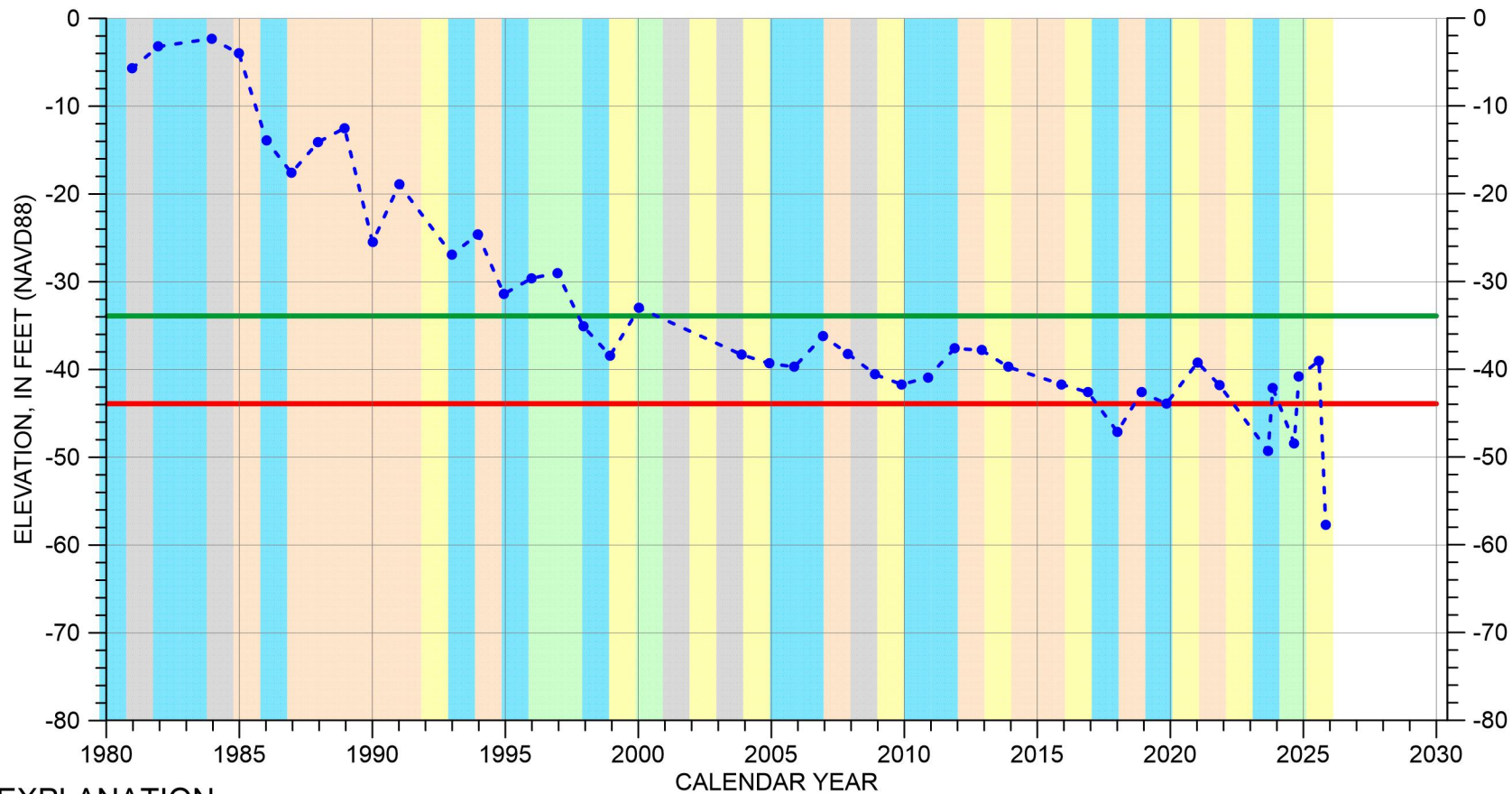
Perforated from
148 to 28 feet msl



Well bottom
-12 feet msl

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 13S/03E-29A01

Langley Area Subbasin

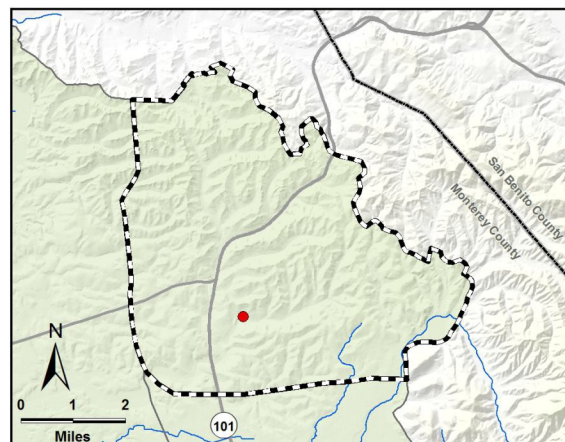


EXPLANATION

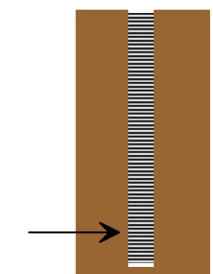
- - - Groundwater Elevation
- Suspect Measurement
- Land Surface (88 FT MSL)
- Measurable Objective
- Minimum Threshold

WATER YEAR TYPE DESIGNATION

- | | |
|--------------|--------------|
| DRY | WET - NORMAL |
| DRY - NORMAL | WET |
| NORMAL | |



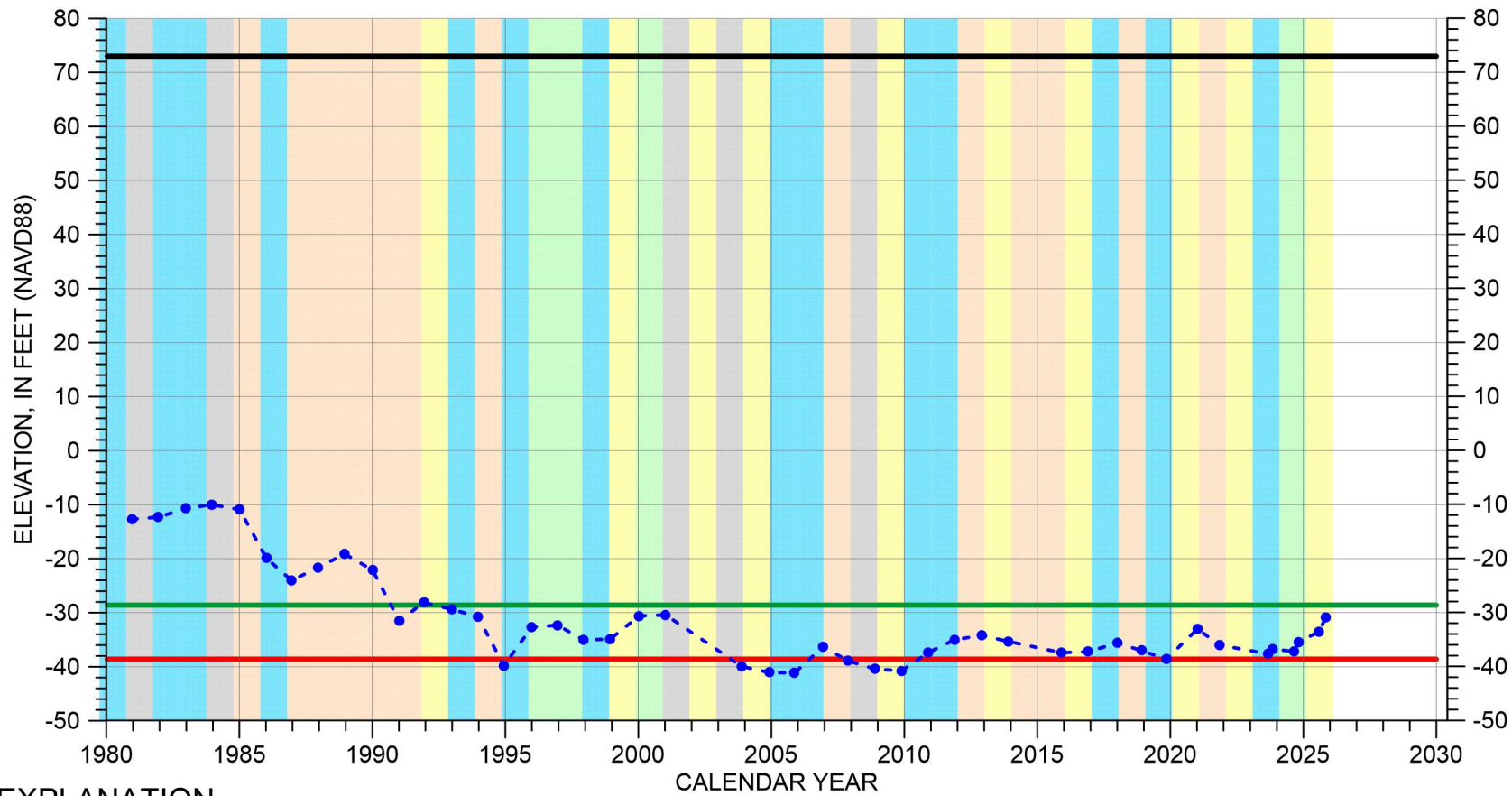
Perforated from
48 to -104 feet msl



Well bottom
-112 feet msl

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 13S/03E-29K01

Langley Area Subbasin

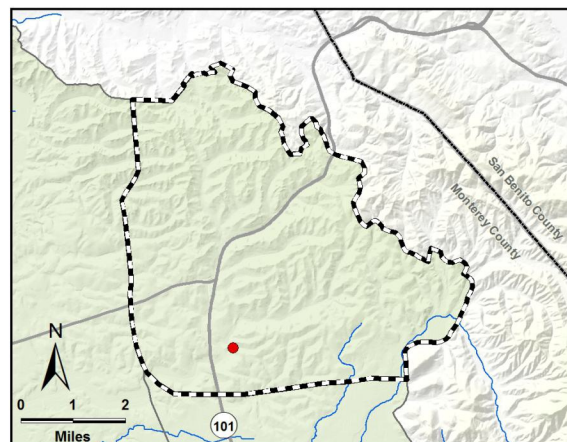


EXPLANATION

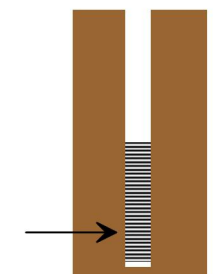
- - - Groundwater Elevation
- Suspect Measurement
- Land Surface
- Measurable Objective
- Minimum Threshold

WATER YEAR TYPE DESIGNATION

- | | |
|--------------|--------------|
| DRY | WET - NORMAL |
| DRY - NORMAL | WET |
| NORMAL | |



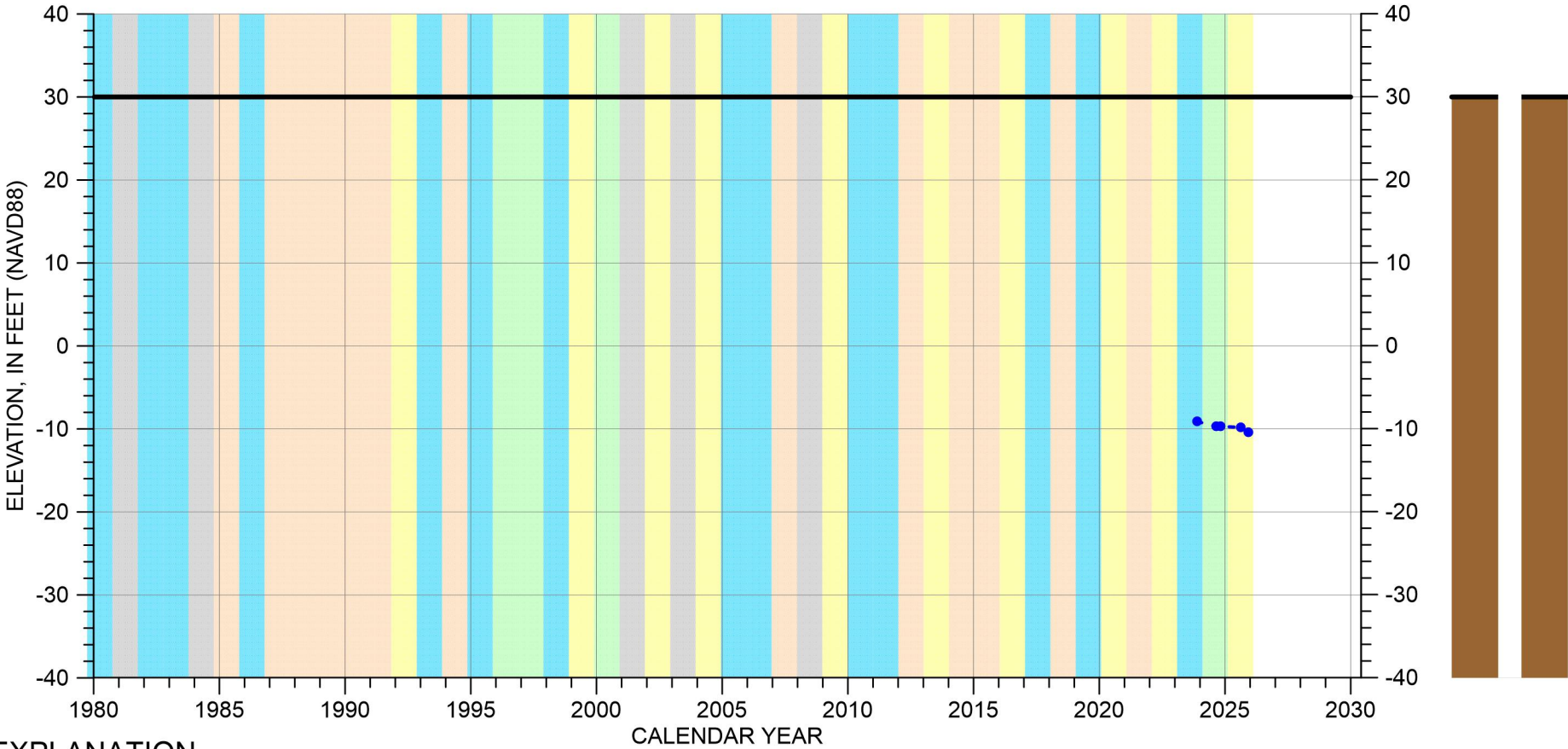
Perforated from
-55 to -254 feet msl



Well bottom
-262 feet msl

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 13S/03E-30R01

Langley Area Subbasin

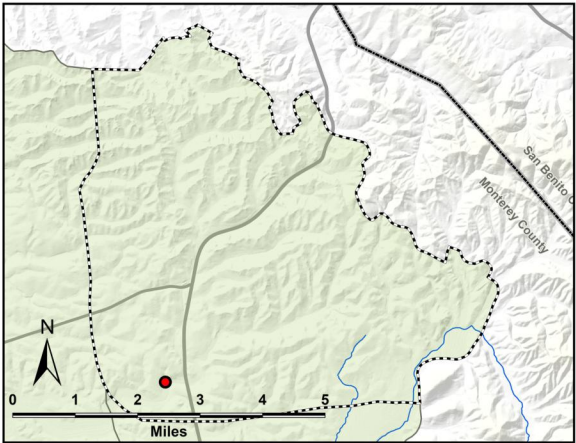


EXPLANATION

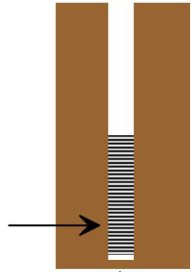
- - - Groundwater Elevation
- Suspect Measurement
- Land Surface
- Measurable Objective
- Minimum Threshold

WATER YEAR TYPE DESIGNATION

- | | |
|--------------|--------------|
| DRY | WET - NORMAL |
| DRY - NORMAL | WET |
| NORMAL | |



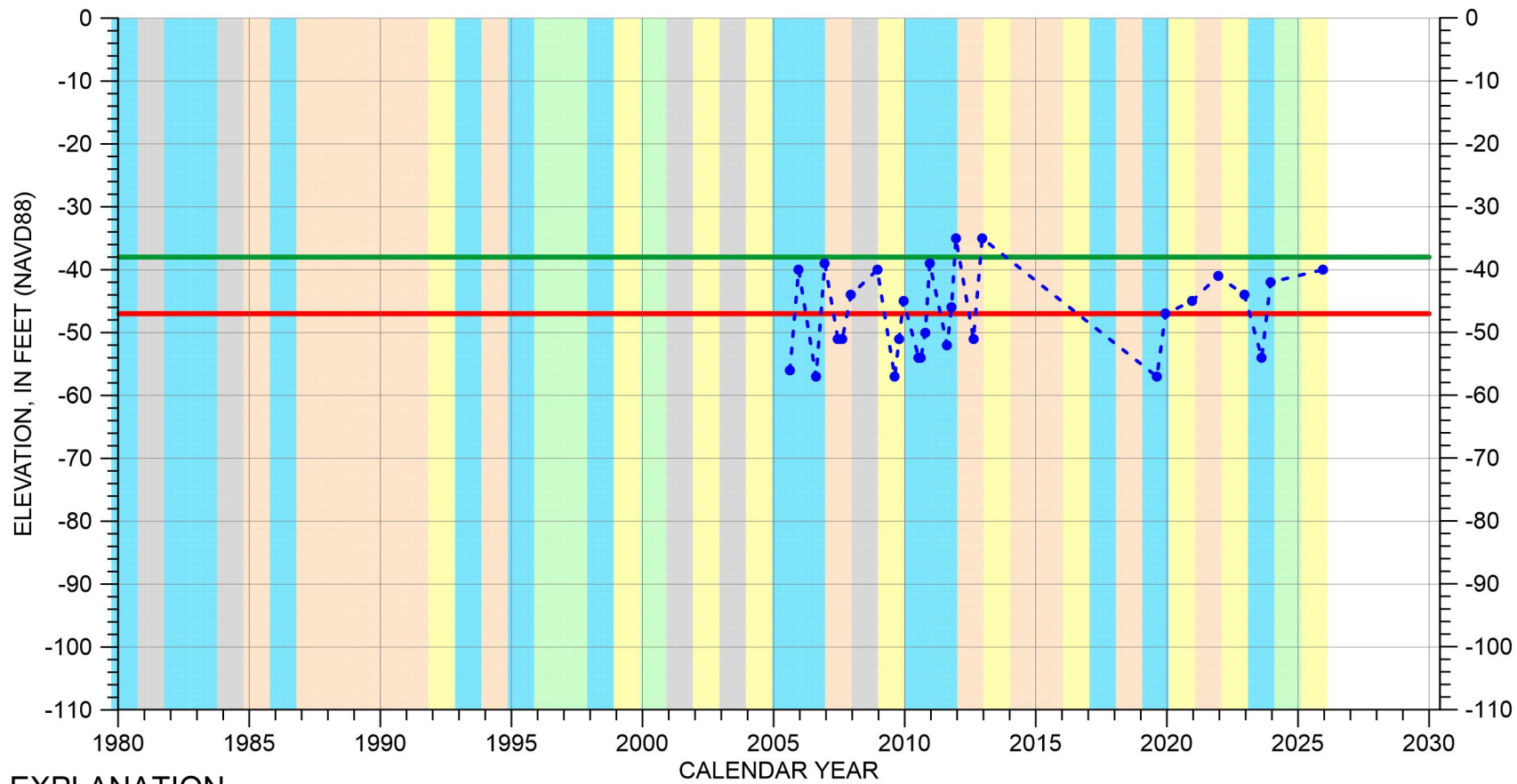
Perforated from
-251 to -534 feet msl



Well bottom
-534 feet msl

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 13S/03E-32H01

Langley Area Subbasin

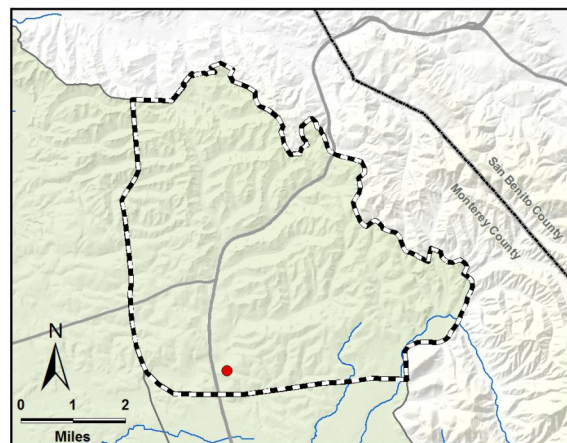


EXPLANATION

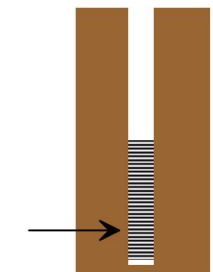
- - - Groundwater Elevation
- Suspect Measurement
- Land Surface (120 FT MSL)
- Measurable Objective
- Minimum Threshold

WATER YEAR TYPE DESIGNATION

- | | |
|--------------|--------------|
| DRY | WET - NORMAL |
| DRY - NORMAL | WET |
| NORMAL | |



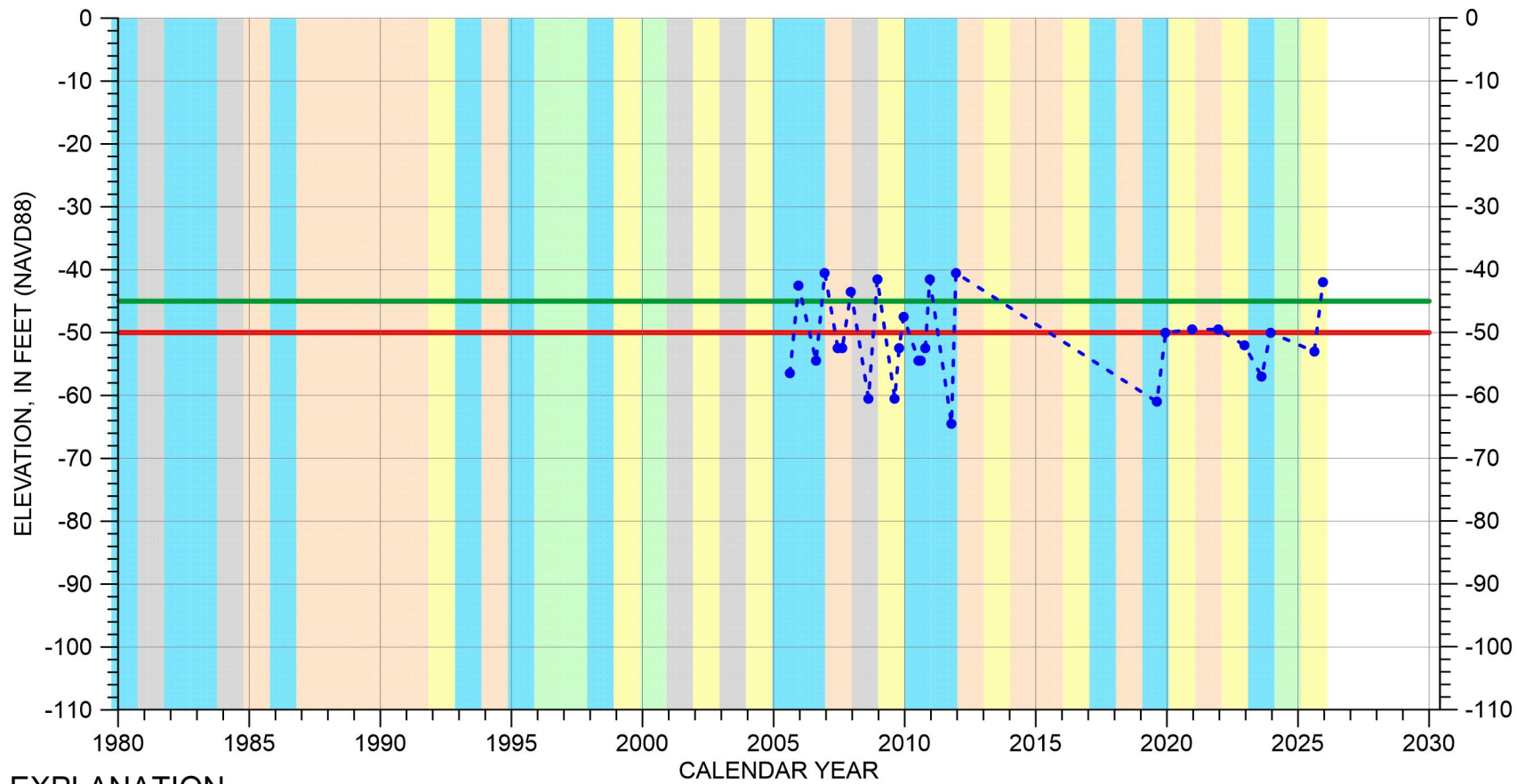
Perforated from
-132 to -270 feet msl



Well bottom
-280 feet msl

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 13S/03E-33T50

Langley Area Subbasin

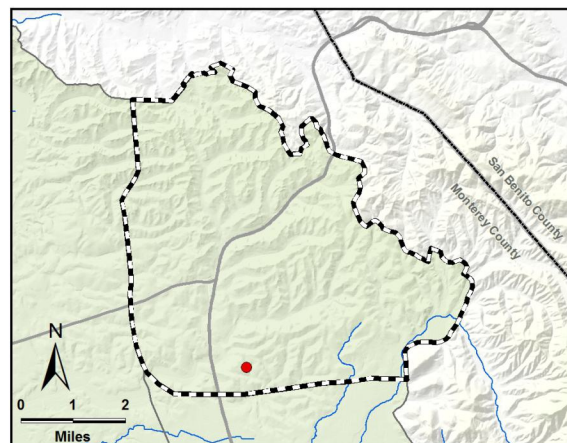


EXPLANATION

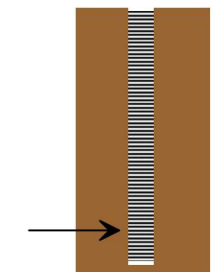
- - - Groundwater Elevation
- Suspect Measurement
- Land Surface (146 FT MSL)
- Measurable Objective
- Minimum Threshold

WATER YEAR TYPE DESIGNATION

- | | |
|--------------|--------------|
| DRY | WET - NORMAL |
| DRY - NORMAL | WET |
| NORMAL | |



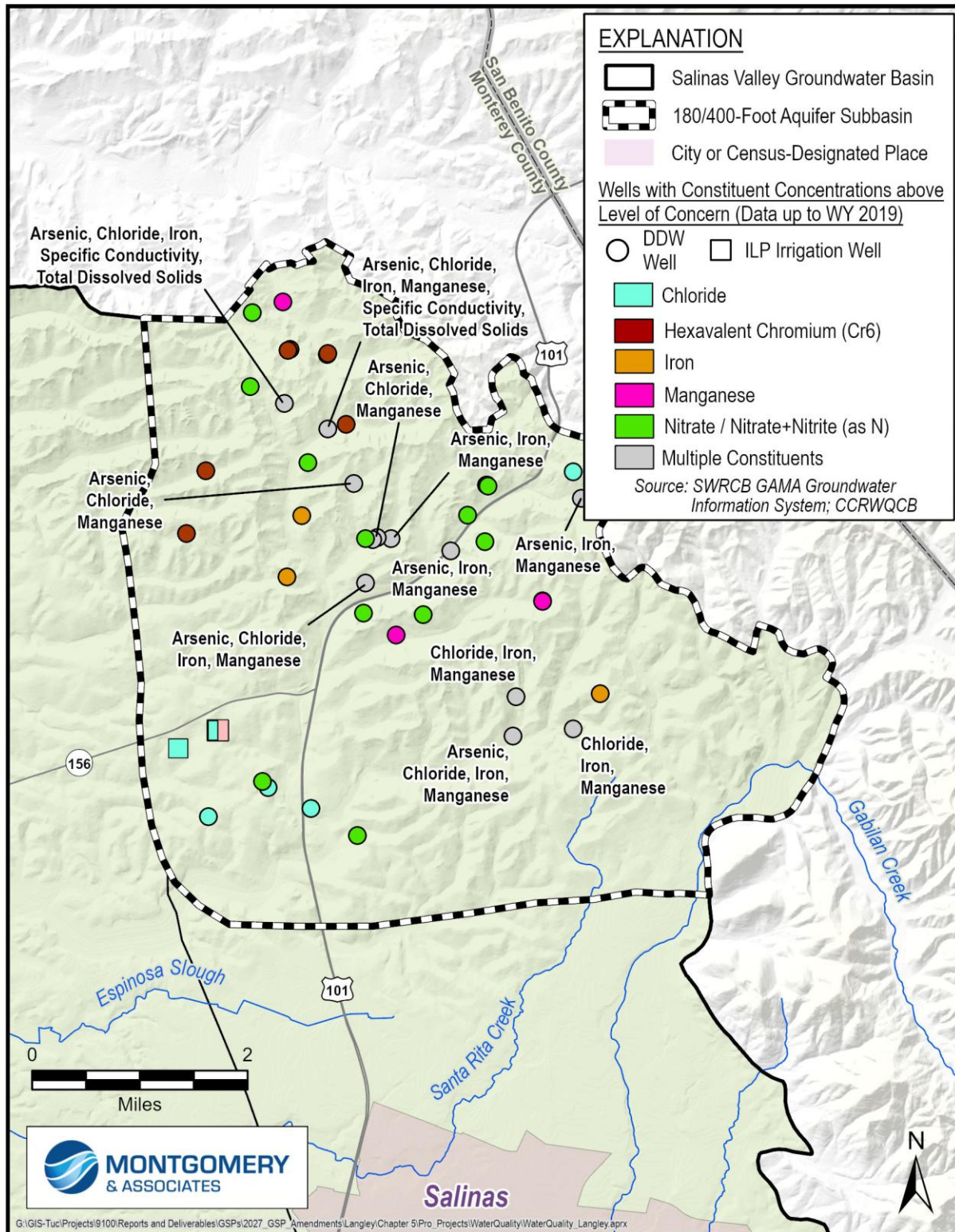
Perforated from
-94 to -359 feet msl



Well bottom
-359 feet msl

Appendix 5B

Constituent Level of Concern Exceedances Map



Exceedances of Concentration Level of Concern

Appendix 6A

Langley Subbasin Multi-Metric Trend Analysis for the Determination of Overdraft



TECHNICAL MEMORANDUM

DATE: September 15, 2026 **PROJECT #:** 9101.0103

TO: Salinas Valley Basin Groundwater Sustainability Agency

FROM: Stephen Hundt

REVIEWER: Staffan Schorr and Abby Ostovar, Ph.D.

PROJECT: Salinas Valley Groundwater Sustainability Plan 2027 Amendments

SUBJECT: Langley Subbasin Multi-Metric Trend Analysis for the Determination of Overdraft

INTRODUCTION

SGMA requires avoiding undesirable results for all sustainability indicators and mitigating long-term overdraft by 2040 for critically overdrafted basins and 2042 for high- and medium-priority basins. Long-term overdraft is the condition of a groundwater basin where the average annual amount of water extracted for a long-term period exceeds the long-term average annual supply of water to the basin. This depletion is distinct from the ordinary rise and fall of levels between wet and dry years. A decline in groundwater levels or storage during drought does not, by itself, constitute overdraft if extractions and recharge are managed so that dry-year losses are offset by wet-year gains. Accordingly, overdraft is evaluated based on long-term groundwater level trends over a period that is sufficiently long enough to distinguish persistent depletion from short-term climate variability, while remaining recent enough to reflect current conditions.

This appendix explains the methodology used to evaluate those long-term trends and presents the resulting well-by-well trend results that support the determination in Chapter 8.

METHODOLOGY

This section describes the methodology used to evaluate groundwater level trends and make the overdraft determination presented in Chapter 8. It explains the statistical approach used to detect trends and the reasoning behind the annual water level metric and trend period selected to represent long-term conditions. It then describes the weight-of-evidence approach used to combine statistical trend results with individual review of well records into a determination for each well, and how those well-level determinations were considered alongside other lines of evidence in reaching an overdraft determination for the Subbasin.



Statistical Trend Detection Approach

Groundwater level trends were assessed using the Mann-Kendall test (Kendall 1938, Mann 1945), a nonparametric method for detecting monotonic trends in time-series data, together with the Sen-slope estimator to quantify the rate of change where a trend was found. A single trend test applied to a single dataset can produce a result that is statistically valid but misleading as a description of the aquifer's long-term condition. Both the choice of annual metric and the choice of period can introduce this kind of distortion, as described below.

Rather than applying this test once, trends were calculated for each well across up to 5 candidate periods (the most recent 10, 15, 20, 25, and 30 years of record: 2016–2025, 2011–2025, 2006–2025, 2001–2025, and 1996–2025) and up to 3 annual metrics, for a maximum of 15 combinations per well depending on data availability.

Representative Annual Values

Groundwater levels vary continuously in response to pumping, recharge, and seasonal and interannual weather patterns. No single date, or point in the annual cycle, represents a truly stable annual snapshot of aquifer conditions. The date of the annual minimum and maximum shifts from year to year, and the annual peak and trough can be deeper or shallower, so a fixed measurement date can fall on a different part of the recovery curve in different years even where the underlying pattern of pumping and recharge is unchanged.

Where sufficiently frequent data were available, a 12-month rolling average was considered to smooth the seasonal cycle, but too few wells had data of that frequency to apply the approach broadly. Priority was given to retaining spatial coverage across the well network over narrowing the dataset to wells with more frequent measurements. The fall (November–December) water level, typically after the pumping season and before winter recharge, was used as the primary annual metric; the annual minimum and maximum were also evaluated where more frequent monitoring data supported them. Any of the 3 metrics were used to assess trends where enough years of data were available.

Trend Period

SGMA does not define a specific timeframe for determining overdraft. Nevertheless, a trend analysis period was needed to assess water level trends. In selecting that period, 2 considerations had to be balanced.

The hydrologic system is subject to 3 broad sources of climate-related variability and change, each relevant to trend detection. Annual and multi-year variability is the ordinary expression of

natural variance in precipitation and temperature from one year, or a few years, to the next. Decadal and multidecadal cycles, such as the Pacific Decadal Oscillation, may hold the system at a wetter or drier tendency for multiple decades, without permanently altering the underlying distribution of precipitation and temperature. Climate change is the third source and differs from the other two by shifting distributions of temperature and (potentially) precipitation.

These 3 sources call for different treatment. A genuine climate change-driven shift is not something this analysis attempts to isolate: it is itself the kind of long-term change relevant to an overdraft determination, so no special adjustment is needed to separate it from the signal the analysis is meant to detect.

Annual and multi-year variability, by contrast, is readily recognizable, and its impact on a trend calculation can be mitigated by choosing an appropriate period. The most recent 10 years illustrate the risk at the short end: a 2020-2022 drought was subsequently followed by above-normal years, producing a strongly positive trend that, taken at face value, would suggest the subbasins are in excellent condition. The broader record does not support that conclusion. The same risk exists at the long end of the record: the unusually wet mid-to-late 1990s can skew a long-term trend just as the recent drought-to-wet sequence can. A longer period of record was used, in part, to lessen the influence of the recent drought-recovery swing, without extending back far enough to reintroduce the same problem from the 1990s.

Decadal and multidecadal cycles are difficult to detect within a single basin's period of record, and even where recognized, SGMA's deadlines do not allow waiting 2 or 3 decades for a return to some prior climatic normal. No attempt was made to detect and correct for these cycles for this analysis.

Water management and use can also shift the system, through changes in land use, water use efficiency, alternative (non-groundwater) supplies, or reservoir operations. Where a change produces a clear, dateable shift in a hydrograph (as a change in reservoir operations or water supply source more often does), evaluating only the period after that shift can be reasonable. Where a change instead unfolds gradually, as most changes in irrigated land use and water use efficiency do, no comparably obvious point exists for drawing that line. The objective here differs from the climate consideration above. Because the current, or near-current, pattern of pumping and use is the condition SGMA calls on a subbasin to manage (unlike climate, which management cannot change), the period selected should weight recent conditions more heavily, favoring a shorter window than the climate consideration alone would suggest.

Balancing these considerations, trends over the most recent 15 and 20 years were used as the primary basis for the evaluation. The most recent 10 years was considered too short because it was heavily influenced by recovery from the mid-2010s drought and may not adequately represent longer-term conditions. Periods of 25 years or more were generally excluded because

they extend into the anomalously wet 1990s. The 25-year period was used only in occasional close cases, where the 15- and 20-year results were near the boundary between a discernible trend and no trend.

Weight-of-evidence Approach

Determining which wells' water level records provide reliable evidence of a long-term trend calls for a different kind of judgment than the statistical trend test itself. A well's data can be technically sufficient for a trend calculation while still reflecting measurement issues or an incomplete record that make the resulting trend a poor representation of the subbasin's long-term behavior.

A formal set of statistical screening criteria could be used to exclude such records, but developing a reliable filter is challenging. Criteria strict enough to remove potentially misleading records may also exclude data that, despite imperfections, provide valuable information and improve spatial coverage. Conversely, more permissive criteria may retain records that could be misleading. SGMA does not prescribe a threshold or methodology for making these distinctions, providing little basis for a purely rule-based approach. At the same time, relying solely on professional judgment without a documented framework would reduce transparency and make the evaluation difficult to reproduce.

To balance these considerations, a weight-of-evidence approach was used. Statistical trend results were calculated systematically for every well and metric described above, and the well-by-well hydrographs were then reviewed individually to identify cases where a statistically valid result did not represent a genuine long-term change in the subbasin. This individual review was practical because the number of wells with sufficient data for trend analysis was manageable to examine individually.

Trend Determination for Wells

Consistent with the period selection above, the 15- and 20-year results across all 3 annual metrics (up to 6 results per well) were used to evaluate whether a well showed a trend. In rare cases, where the 15 and 20-year results were inconclusive, the 25-year results were referenced. Trends were considered statistically significant at $p < 0.05$.

No fixed rule required agreement among a minimum number of these results before declaring a trend. A single significant result was generally treated as sufficient unless it was weak or visual review of the hydrograph suggested it should be discounted. Where a mix of significant positive and negative trends was found among the available results, no overall trend was identified. In

most wells with a discernible trend, multiple of the available results agreed in both direction and general magnitude.

Where a well showed a statistically significant trend, a Sen-slope (Sen 1968, Theil 1950) was calculated for each significant result and used to place the well into a slope category, in feet per year: 0 to 0.05, 0.05 to 0.1, 0.1 to 0.5, 0.5 to 2, or greater than 2. For representative monitoring sites (RMS), which carry a defined minimum threshold (MT), the slope was also used to classify how close the well is to crossing its MT if the observed rate of change continued. Each RMS well was placed into 1 of 6 categories: already below the MT and not increasing; already above the MT and not decreasing; or, for wells in neither of those 2 states, an estimated 0 to 10 years, 10 to 30 years, 30 to 50 years, or greater than 50 years until the MT would be crossed. Where a well's available results spanned more than 1 category, for either the slope category or the years-to-MT category, the most frequently indicated category was used as the well's representative category.

The years-to-MT estimate does not factor into the overdraft evaluation in this appendix. A statistically significant trend can be real without being large enough to consider it as consequential, and for non-RMS wells there is no established basis for determining when a trend warrants concern. For RMS wells, the MT provides that basis, and this metric is reported as additional context that may be useful to other management discussions.

Overdraft Determination

The well-level trend results described above are one of several lines of evidence considered in the overdraft determination presented in Chapter 8. Other lines of evidence include the change in groundwater storage estimated from the subbasin's historical water budget and a separate, single-period trend analysis using the most recent 15 years of data, both also presented in the amendment. No fixed threshold (for example, a required percentage of wells showing a declining trend) was used to determine whether these results, on balance, indicate overdraft. The determination instead reflects the relative weight of wells showing declining trends compared with those showing no trend or an increasing trend, considered together with the other lines of evidence above.

In most cases, wells showing no statistically significant trend were the majority result across a subbasin, even where the overall determination was that the subbasin is experiencing overdraft. A subbasin does not need to show statistically significant declining trends across most or all its monitoring network to be experiencing a net water imbalance and an overall decline in storage. A comparatively smaller number of consistent declining trends, combined with the other lines of evidence, can still support that conclusion.

RESULTS

Water level trends indicate that the Langley Subbasin is experiencing overdraft in certain areas. Of the 18 wells with sufficient data for trend analysis, the majority (56%) show declining trends, compared with 17% showing increasing trends and 28% showing no trend. There is no strong spatial pattern in trends; however, declining trends are more concentrated in the center-southern half of the Subbasin, and a few of the declining wells show nearly monotonic decline. The generally localized declining trends in the center-southern portion of the subbasin might be the result of hydrogeologic complexities in the Subbasin, including a potential fault zone. Overdraft is not occurring in other parts of the Subbasin, as indicated by stable or rising groundwater level trends. Therefore, the Subbasin as a whole is not in chronic overdraft.

Table 6A-1 presents the well-by-well trend results described in the Trend Determination for Wells section, for each well with sufficient data to support a trend calculation. For each well, the table reports whether a statistically significant trend was identified and its direction, the magnitude of that trend expressed as a slope category, and, for RMS wells, the estimated number of years until the well's MT would be reached at the observed rate of change if it continued. The results are sorted first by the trend evidence column, then RMS well, then alphabetically by well name. Wells with the classifier “high-confidence” had particularly strong trends and agreement across periods and annual metrics.

Table 6A-1. Trend Results for Langley Subbasin Wells

Well	RMS Well	Trend Evidence	Slope, in ft/year	Years to MT
13S03E10Q01	yes	down - high confidence	0.1 - 0.5	Below, not increasing
13S03E16J01	yes	down - high confidence	0.1 - 0.5	30 to 50
13S03E17F02	yes	down - high confidence	0.1 - 0.5	30 to 50
13S03E20B02	yes	down - high confidence	0.1 - 0.5	10 to 30
13S03E22F01	yes	down - high confidence	>2	Below, not increasing
13S03E29A01	yes	down - high confidence	0.1 - 0.5	Below, not increasing
13S03E33T50	yes	down - high confidence	0.5 - 2	10 to 30
13S03E15P01	no	down - high confidence	0.5 - 2	N/A
13S03E21Q01	no	down - high confidence	0.5 - 2	N/A
13S03E08D01	yes	down	0.05 - 0.1	30 to 50
13S03E10N01	yes	no	N/A	N/A
13S03E14M01	yes	no	N/A	N/A
13S03E17B01	yes	no	N/A	N/A
13S03E32H01	yes	no	N/A	N/A
13S03E20P01	no	no	N/A	N/A
13S03E19H01	yes	up	0.1 - 0.5	Above, not decreasing
13S03E29K01	yes	up	0.1 - 0.5	Above, not decreasing

Well	RMS Well	Trend Evidence	Slope, in ft/year	Years to MT
13S03E19P01	no	up	0.5 - 2	N/A
13S03E04L01	no	insufficient	N/A	N/A
13S03E16C03	no	insufficient	N/A	N/A
13S03E17F01	no	insufficient	N/A	N/A

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Appendix 7A

Monitoring Procedures from MCWRA CASGEM Monitoring Plan

4.0 Monitoring Procedures

This section addresses the various procedures and protocols involved in collecting, processing, and reporting data from wells in the CASGEM network.

4.1 Monitoring Frequency and Timing

Nineteen (19) of the CASGEM wells are currently, and will continue to be, measured on a monthly basis. The three (3) voluntary wells are also measured monthly. MCWRA will use the monthly measurements from August and either January, February, or March to satisfy the biannual CASGEM reporting criteria.

To determine the monthly distribution of seasonal high and low groundwater elevations, MCWRA analyzed measurements from approximately 50 wells throughout the Salinas Valley Groundwater Basin. This included wells in the 180/400 Foot Aquifer, East Side Aquifer, Forebay Aquifer, and Upper Valley Aquifer. The measurements were collected during eight (8) different Water Years (WY): WY 1985, representative of near normal conditions; WY 1991, representative of dry conditions; and the six most recent Water Years, WY 2009 through WY 2014. MCWRA reports this data on a quarterly basis; a sample report is included in Appendix B.

Based on this analysis of historical data, August is typically representative of seasonal low conditions (Figure 10). A relaxation of groundwater levels, or seasonal high conditions, is evident during the period from January to March (Figure 11). Data from these three months will be evaluated and the highest groundwater elevation from that series will be submitted to the CASGEM online submittal system. The month chosen to be representative of the seasonal high groundwater conditions will be consistent across all data groups.

Nineteen (19) of the CASGEM wells are equipped with pressure transducers which collect depth to water data on an hourly basis. This data will be synthesized so that biannual measurements representing seasonal high and low conditions are available for CASGEM reporting. The groundwater level measurement collected at noon on the fifteenth day of the month will be selected and compared to other monthly data to ensure that it is a representative value. Data from the month of August will be used to represent the seasonal low and a fall/winter measurement from either January, February, or March will be used to represent the seasonal high; the same month will be used as was selected based on monthly well measurements, as discussed above.

Four (4) of the wells in the CASGEM network are currently measured once per year, during the period from November to January. Based on the recent analysis of seasonal groundwater highs, this period will be shifted to cover the months from January through March. An additional measurement event will be added during the month of August for these wells in order to also capture the seasonal groundwater low.

Appendix C contains a summary of the frequency and timing of measurement of wells in the CASGEM network. Any new wells that are brought into the CASGEM program will be monitored on a

biannual basis, with data collection occurring on the same schedule as the other wells that are measured twice a year.

4.2 Well Locations

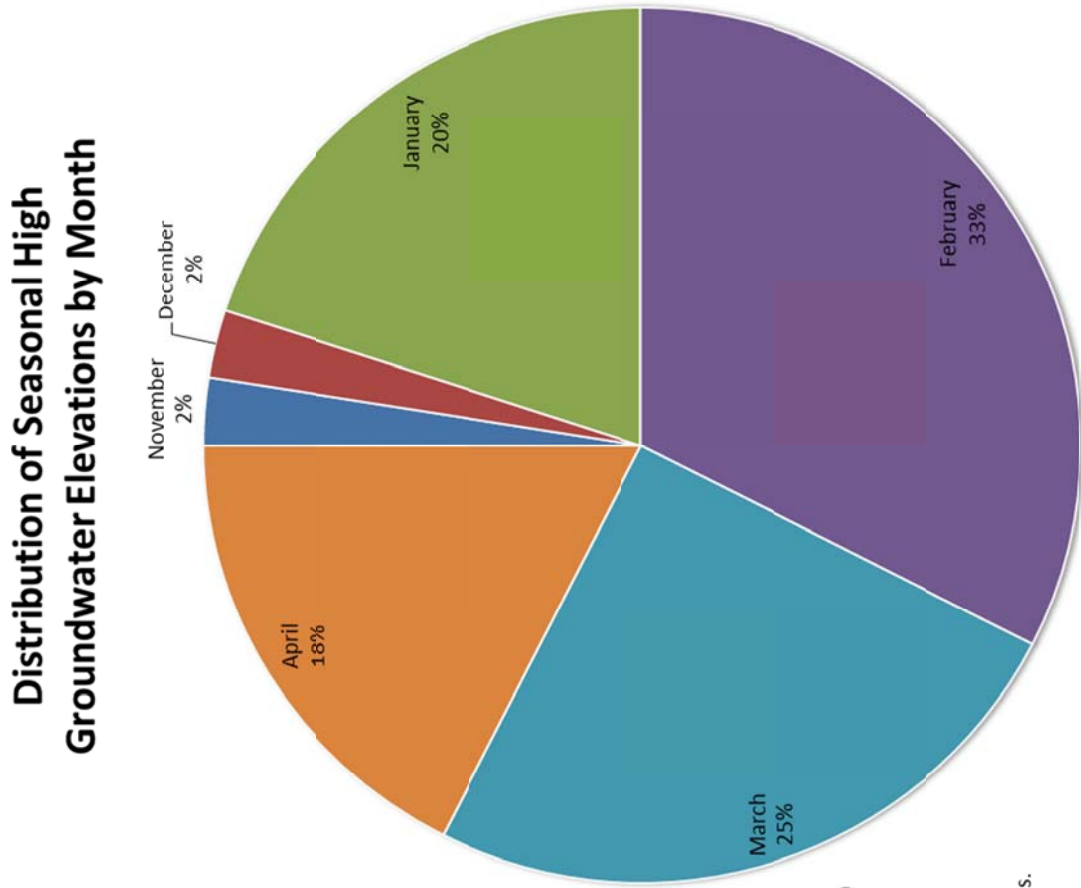
The latitude and longitude of each well was collected using a handheld GPS unit, which has accuracy to within one (1) meter. Coordinates for wells in the CASGEM network are shown in Appendix A. Any wells incorporated into the CASGEM network in the future will be geographically located using a similar method.

4.3 Reference Points

All of the wells that comprise the CASGEM network described herein are currently part of a groundwater level monitoring program conducted by MCWRA. As part of the existing monitoring programs, reference points (RP) have been established for all of the wells. To ensure consistency in measuring depth to water, a description of each well's RP is recorded in a field data collection notebook. In many cases, photographs have also been taken of the RP. Reference point elevations have been determined for all wells that are currently in a monitoring program; this data is listed in Appendix A.

A reference point will be determined for any new wells that are brought into the CASGEM network. Reference point elevations are determined using a digital elevation model from the United States Geological Survey (USGS) with a cell size of 32 feet by 32 feet.

Figure 10 – Distribution of Seasonal High Groundwater Elevations by Month



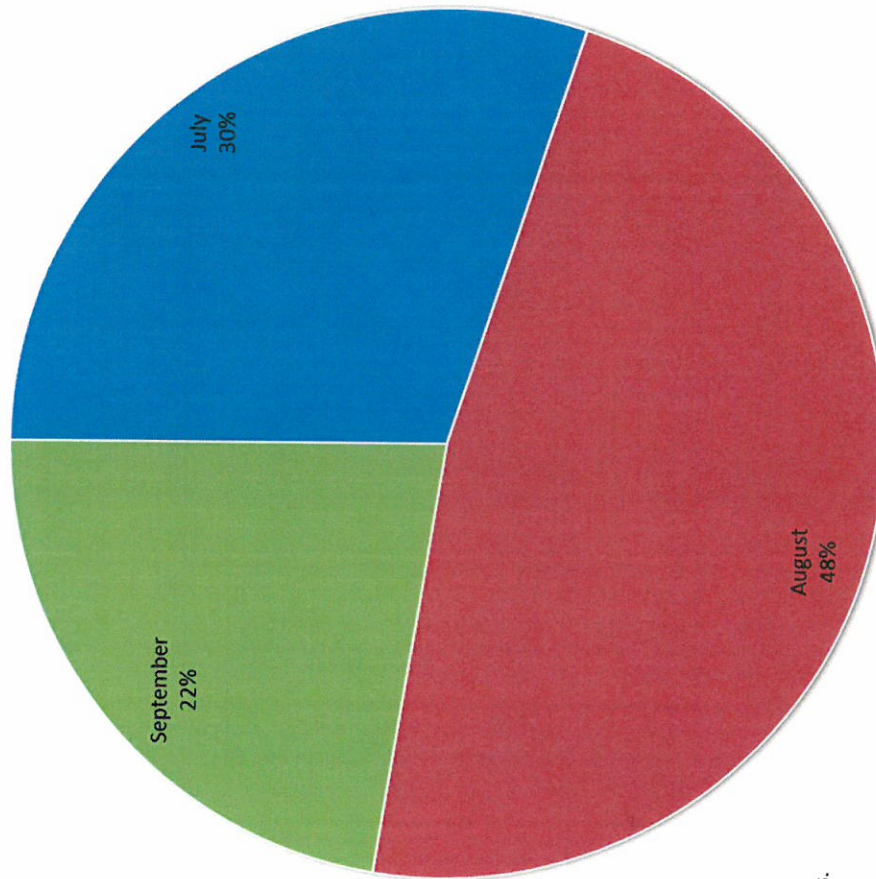
Notes

(1) Chart reflects data from the following subbasins of the Salinas Valley Groundwater Basin: 180/400 Foot Aquifer, East Side Aquifer, Forebay Aquifer, and Upper Valley Aquifer.

(2) Water Years 1985, 1991, and 2009-2014 were used in this analysis. These years represent near normal conditions (WY85), dry conditions (WY91), and the six most recent water years.

Figure 11 – Distribution of Seasonal Low Groundwater Elevations by Month

Distribution of Seasonal Low Groundwater Elevations by Month



Notes

(1) Chart reflects data from the following subbasins of the Salinas Valley Groundwater Basin: 180/400 Foot Aquifer, East Side Aquifer, Forebay Aquifer, and Upper Valley Aquifer.

(2) Water Years 1985, 1991, and 2009-2014 were used in this analysis. These years represent near normal conditions (WY85), dry conditions (WY91), and the six most recent water years.

4.4 Field Methods

Groundwater elevation data collected from wells in the CASGEM network is intended to reflect static conditions. Best efforts will be made to ensure that wells have not recently been pumped prior to collecting a data point. Depth to water measurements will be made using one or more of the methods discussed in the following sections. Measurement methods described in the following sections are based on the Department of Water Resources document *Groundwater Elevation Monitoring Guidelines* (December 2010) with some alterations specific to wells in the monitored basins/subbasins described in this Monitoring Plan.

4.4.1 Graduated steel tape

Prior to measurement:

- Ensure that the reference point on the well can be clearly determined. Check notes in the field data collection notebook.
- Review the notes and comments for previous measurements in the field data collection notebook to determine if there are any unique circumstances at this well.
- Take note of whether oil has previously been present at this well; this will be recorded in the comments section of the data form.

Making a measurement:

- Use the previous depth to water measurement to estimate a length of tape that will be needed.
- Lower the tape into the well, feeling for a change in the weight of the tape, which typically indicates that either (a) the tape has reached the water surface or (b) the tape is sticking to the side of the well casing.
- Continue lowering the tape into the well until the next whole foot mark is at the reference point. This value on the tape should be recorded in the field data collection notebook.
- Bring the tape to the surface and record the number of the wetted interval to the nearest foot.
- If an oil layer is present, read the tape at the top of the oil mark to the nearest foot. Note in the comments section of the data form that oil was present.
- Repeat this procedure a second time and note any differences in measurement in the field data collection notebook.

4.4.2 Electric water level meter

This method of measurement employs a battery-powered water level meter and a small probe attached to a ruled length of cable. Depth to water measurements collected using this equipment are recorded to the nearest tenth of an inch. This instrument is sometimes referred to as a “sounder”.

Prior to measurement:

- Review the field data sheet for the well and note whether oil has been present at this well in the past. The electric water level meter should not be used in wells where oil is present.
- Ensure that the reference point on the well can be clearly determined. Check notes in the field data collection notebook.
- Confirm that the water level meter is functioning and is turned on so that the beeping indicator will operate properly.

Making a measurement:

- Review previous depth to water measurements for the well to estimate the length of tape that will be needed.
- Lower the electrode into the well until the indicator sounds, showing the probe is in contact with the water surface.
- Place the tape against the reference point and read the depth to water to the nearest 0.1 foot. Record this value on the field data sheet.
- Make a second measurement and note any differences in measurement in the field data collection notebook.

4.4.3 Sonic water level meter

This meter uses sound waves to measure the depth to water in a well. The meter must be adjusted to the air temperature outside the well; there is a card with reference temperatures in the case with the sonic meter.

Making a measurement:

- Insert the meter probe into the access port and push the power-on switch. Record the depth from the readout.
- Record the depth to water measurement in the field data collection notebook.

4.4.4 Pressure transducer

Automated water-level measurements are made with a pressure transducer attached to a data logger. Pressure transducers are lowered to a depth below the water level in the well and fastened to the well head at a reference point. Data points are logged on an hourly basis. MCWRA uses factory-calibrated, vented pressure transducers (Appendix D). MCWRA staff collects the pressure transducer data once per quarter. During the data collection process, data loggers are stopped, and the data is downloaded onto a laptop, and then the data logger is reactivated and scheduled to begin collecting data again on the next hour. Upon return from the field, data is processed and reviewed for errors.

4.5 Data Collection, Processing, and Reporting

Following completion of all fieldwork, data is transcribed from field data sheets and checked for errors before being loaded into MCWRA's Oracle platform database. All data will be stored in the MCWRA database before being uploaded to the CASGEM website. Submittal of data to the CASGEM website will occur at a minimum of twice per year, no later than January 1 and July 1, per DWR CASGEM program guidelines.

Bi-annual submittal of data to the CASGEM website will include the following for each well in the CASGEM network, as described in the DWR document *CASGEM Procedures for Monitoring Entity Reporting*:

- Well identification number
- Measurement date
- Reference point and land surface elevation, in feet, using NAVD88 vertical datum
- Depth to water, in feet
- Method of measuring water depth
- Measurement quality codes
- Measuring agency identification
- Comments about measurement, if applicable

The following information will also be submitted to the CASGEM online system, as it is required by DWR unless otherwise noted:

- Monitoring Entity name, address, telephone number, contact person name and email address, and any other relevant contact information
- Groundwater basins being monitored (both entire and partial basins)
- State Well Identification number (recommended)
- Decimal latitude/longitude coordinates of well (NAD83)
- Groundwater basin or subbasin
- Reference point elevation of the well, in feet, using NAVD88 vertical datum
- Elevation of land surface datum at the well, in feet, using NAVD88 vertical datum
- Use of well
- Well completion type (e.g. single well, nested well, or multi-completion well)
- Depth of screened interval(s) and total depth of well, in feet, if available
- Well Completion Report number (DWR Form 188), if available

Appendix 7B

MCWRA's Quality Assurance Project Plan (QAPP) for SWI Monitoring

Quality Assurance Project Plan (QAPP)
For
Water Quality Monitoring
Associated with the Salinas Valley Integrated
Water Management Plan (SVIWMP)

EPA R9#03-238
X-97994701-0



Monterey County Water Resources Agency
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Telephone: (831) 755-4860
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Website: <http://www.mcwra.co.monterey.ca.us>

1.0 PROJECT MANAGEMENT

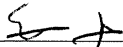
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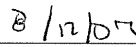
Quality Assurance Project Plan
For
Water Quality Monitoring Associated with
The Salinas Valley Integrated Water Management Plan (SVIWMP)
EPA R9#03-238
X-97994701-0

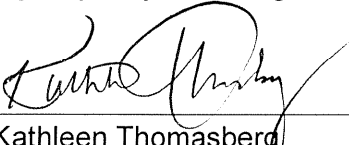
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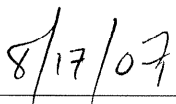
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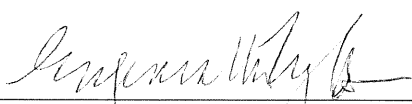
Approval Signatures

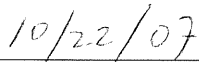

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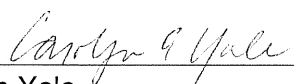

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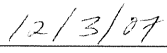

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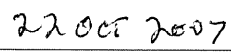

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D-4 Total Alkalinity

D-5 Metals

D-6 Anions

1.3 DISTRIBUTION LIST

The following is a list of organizations and persons who will receive copies of the approved QA Project Plan and any subsequent revisions:

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1.4 PROJECT/TASK ORGANIZATION

The organization responsible for overseeing this ground water monitoring program is the Monterey County Water Resources Agency (Agency). This project is funded through a grant from the Environmental Protection Agency (EPA), under the authority of Section §104 (b)(3) of the Clean Water Act. This project falls under the Monitoring and Assessment funding category. The Monterey County Health Department's Consolidated Chemistry Laboratory is a California state certified laboratory that will perform the chemical analyses for this ground water monitoring program. The laboratory will use standard analytical methods.

The roles and responsibilities of those involved in the implementation of the ground water monitoring program are described below. An organizational chart for the program is shown below.

Project Manager is the responsible official who will oversee the preparation of grants and the fiscal management of the project.

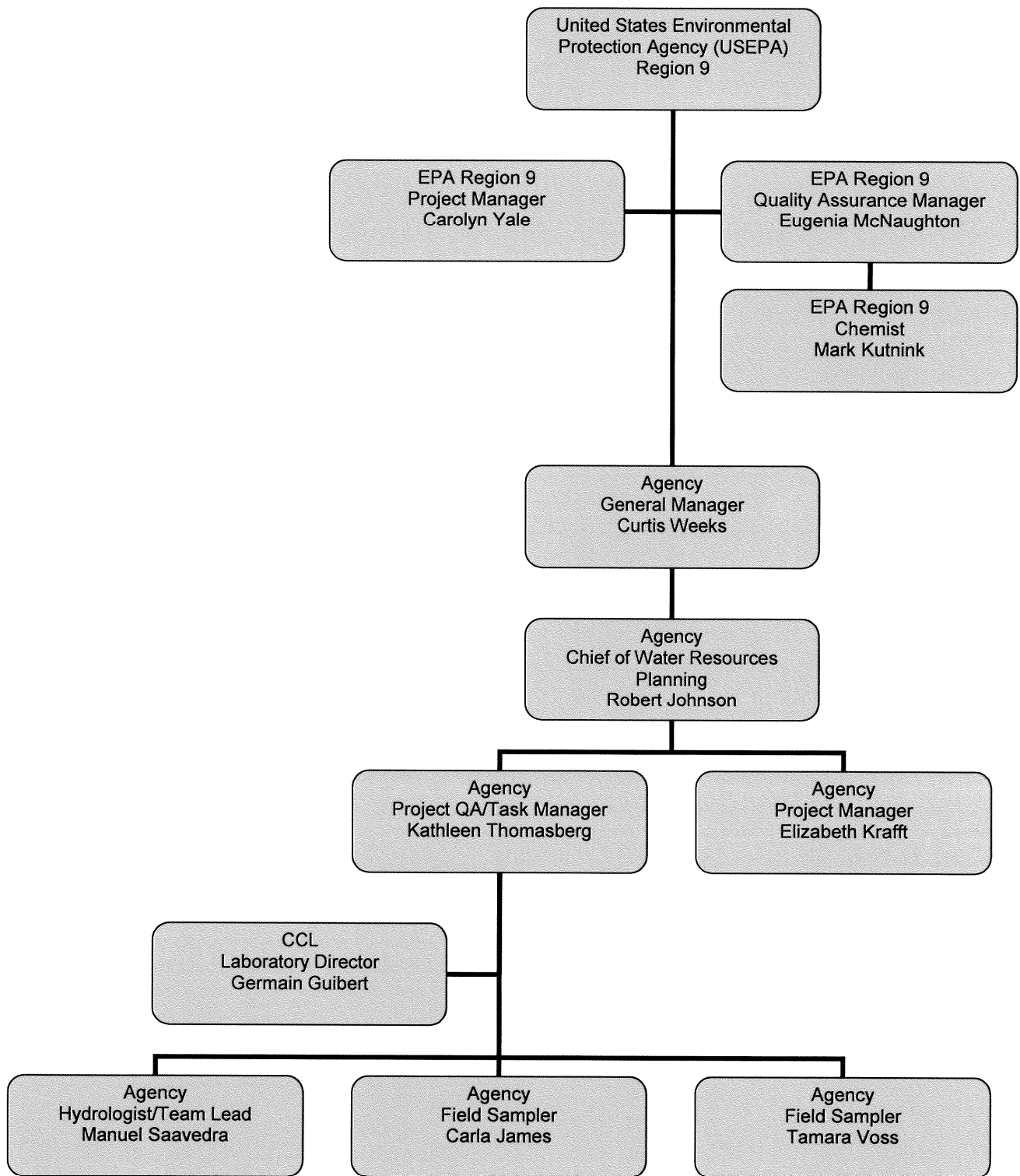
Project QA Manager is in charge of establishing the QA/QC protocols found in the QAPP as part of the sampling and analysis procedures. The QA Manager will also review and assess all analytical data from the contract laboratory and will be the liaison regarding data quality issues and concerns. She may stop all actions, including those conducted by the contract laboratory and will be responsible for ensuring that any amended versions of the QAPP are distributed to the organizations and individuals listed in Section 1.3.

Project Task Manager will oversee the ground water monitoring program. She will ensure that all QAPP protocols are followed and will oversee the writing and revisions of the QAPP. Since the Agency's Water Quality Department is not large, the Project Task Manager will function in the dual role of Task Manager and QA Manager.

Hydrologist/Team Lead will be responsible for coordinating with the Water Resources Technicians/ Field Samplers to review field and analytical requirements, documentation, and sampling schedules.

Water Resources Technicians/Field Samplers will be responsible for sample collection and communication with the contract laboratory regarding the sampling shipment schedule. They are also responsible for writing the QAPP.

ORGANIZATIONAL CHART



1.5 PROBLEM DEFINITION/BACKGROUND

1.5.1 Background

The Monterey County Water Resources Agency's (Agency) mission is to manage, protect, and enhance the quantity and quality of water for present and future generations of Monterey County (County). Monterey County, located along the California Central Coast, covers 3,322 square miles (8604 km²) and has a resident population of 424,842 (Fact Finder, 2007). The County supports a \$3.4 billion agricultural industry (Ag Commission, 2006) and a \$1.75 billion tourism industry (EPA Grant R9#03-238). The primary land use within the Salinas Valley is agricultural. Since the 1940's, irrigated acreage within the valley has increased substantially. Coastal regions of California are subject to rapid urbanization, and the milder coastal climate supports year-round intensive cultivation of many high-value crops (Hunt et al, 2003). As agricultural and urban areas have expanded, so have the water needs of the County (EPA Grant R9#03-238).

The Agency uses a network of wells to monitor ground water conditions in the Salinas Valley Ground Water Basin (Basin) (Geomatrix, 2001). The Basin is situated entirely within the County (EPA Grant R9#03-238). The Salinas Valley is surrounded by the Gabilan and Diablo Ranges on the east, by the Sierra de Salinas and Santa Lucia Range on the west, and is drained by the Salinas River, which empties into Monterey Bay in the north (DWR 1946a) (Fig 1). Four subareas based on differences in local hydrogeology and recharge have been identified (White Paper, 1995; DWR, 2003). These are known as the Pressure, East Side, Forebay, and Upper Valley subareas (Fig 2). These subareas are hydrologically and hydraulically connected (EPA Grant R9#03-238); all information collected to date indicates there are no barriers to the horizontal flow (of ground water) between these subareas (White Paper, 1995). The "boundaries" between these subareas have been identified as zones of transition between different depositional environments in past millennia (White Paper, 1995).

The primary surface water features overlying and influencing the Basin's hydrology are the Salinas River and its tributaries, the Nacimiento and San Antonio reservoirs, and the Monterey Bay (EPA Grant R9#03-238). The Salinas River extends approximately 120 miles from the river's headwaters in San Luis Obispo County, near Santa Margarita, and flows north/northwest and discharges into the Monterey Bay National Marine Sanctuary near Moss Landing in Monterey County (EPA Grant R9#03-238). The Nacimiento and San Antonio reservoirs, located in the upper watershed, serve as storage and flood control for the Basin.

Ground water recharge in Salinas Valley is principally from infiltration from the Salinas River, Arroyo Seco Cone, and to a much lesser extent, from deep percolation of rainfall (White Paper, 1995). Deep percolation of applied irrigation water is the second largest component of the ground water budget, but because it represents recirculation of existing ground water rather than an inflow of "new" water, it is not considered a source of recharge (White Paper, 1995). Nitrate contamination of ground water poses a significant threat to the beneficial use of ground water for drinking water and for some agricultural water uses (White Paper, 1995). Nitrate concentrations exceed drinking water standards in some parts of the Basin (MCWRA, 1997). The principal source of nitrates to ground water is almost certainly excess fertilizer that is leached by rainfall and applied irrigation water (White Paper, 1995).

Seawater intrusion is another source of inflow to the Basin, but because it is not usable freshwater it is also excluded as a source of recharge (White Paper, 1995). Historically, ground water flowed from subareas to the south and east through the (Pressure) and seaward to discharge zones in the walls of the submarine canyon in Monterey Bay (Durbin et al 1978; Greene 1970). Within the Pressure subarea, due to the impermeable nature of the clay aquitard above the 180-Foot Aquifer,

recharge from precipitation, agricultural return flows, or river flow is nil (DWR, 2003). Instead, recharge is from underflow originating in Upper Valley areas such as the Arroyo Seco Cone and Salinas River bed or the East Side subarea, and more recently, from seawater intrusion (DWR, 2003). Heavy pumping of the Pressure-180 Foot and Pressure-400 Foot aquifers has caused significant seawater intrusion into both of these aquifers, which was first documented in the 1930's (DWR 1946a). Ground water flow in the northernmost area of the Pressure subarea has been directed from the Monterey Bay inland since this time (DWR, 2003). With increased pumping in the East Side subarea since the 1970's, ground water flow is dominantly northeast in the Pressure's central and southern locations (DWR, 2003).

Declining ground water levels in the Pressure and East Side subareas, Basin overdraft, ground water contamination, including nitrate and seawater intrusion are serious concerns for the Agency. (EPA Grant R9#03-238)

1.5.2 Program Objectives

The Agency is charged with management of the Basin's ground water resources. Much of the Agency's investigative work pertaining to the occurrence and use of ground water is to identify the quality, quantity, and temporal trends of ground water resources within the County. A network of monitoring wells provides the information needed to manage and protect ground water resources and sustain beneficial uses. In order for the Agency to develop projects to mitigate problems, such as seawater intrusion, local ground water overdraft, and high nitrate concentrations, the Agency must first implement an effective and accurate monitoring program to identify the extent of the potential problem.

The Ground Water Quality Monitoring Objectives are:

- continued monitoring of the ambient ground water quality, including general minerals
- continued monitoring of coastal aquifers (including Pressure Deep Aquifer) for detection of advancing seawater intrusion
- continued monitoring to determine distribution of conductivity in ground water
- continued monitoring to determine distribution of nitrate in ground water and identification of problem areas

Ambient ground water quality will be used to establish a cohesive and succinct Water Quality Management Plan in accordance to the work begun under EPA-I and continued under EPA-II. For the purposes of this QAPP, the EPA-I grant has funded the Agency to develop this QAPP. The EPA-II grant is funding the Agency to implement the sampling described in the QAPP.

1.5.3 Program Goals

The ground water monitoring objectives in the Salinas Valley will be met by the goal of sampling all 344 wells located throughout the four subareas within the Salinas Valley Ground Water Basin, during the 2007 summer field season.

The ground water monitoring objectives along the coast, specifically located within the Pressure subarea will be met by the goal of sampling all 85 monitoring wells, during the 2007 summer field season.

The Agency's overarching goal for this program is the continued monitoring of the Basin's ambient ground water for use in the management of this important resource, and *not* for the purpose of regulatory control.

1.6 PROJECT/TASK DESCRIPTION

1.6.1 Work Statement and Produced Products

The Salinas Valley Ground Water monitoring will sample 344 wells located throughout the Salinas Valley Ground Water Basin for ten constituents (Table 1). Each well will be sampled once. Samples will be collected during the 2007 summer agricultural growing season and analyzed for a complete mineral panel. The Coastal Ground Water monitoring will sample 85 wells located within the area of historic seawater intrusion. Each well in the Coastal Program will be sampled once a month during the agricultural growing season. The first month's sample will be analyzed for complete mineral panel and the two remaining sampling events will be analyzed for partial mineral panel (three constituents) (Table 1). All water monitoring samples will be delivered the same day as collected to the contract laboratory for analysis.

All ground water sampling locations are accessible using a 4-wheel drive vehicle. All samples will be collected as a grab sample. All sampling locations will be recorded using global positioning system (GPS) equipment, and digital pictures will be taken at each site.

After laboratory analysis and data validation is completed, a technical memorandum (EPA II, XP-96995301 Task 2 Water Quality Assessment) will be written and submitted to US EPA. The technical memorandum, EPA II, XP-96995301 Task 2 Water Quality Assessment, will include result tables for chloride, nitrate, and specific conductivity, and maps of chloride, nitrate, and specific conductivity gradient contours.

1.6.2 Constituents to be monitored and measurement techniques

Samples will be sent to an off-site laboratory for analysis. Ground water samples will be analyzed for either complete or partial mineral panels. A complete mineral panel includes calcium, cation-anion balance, chloride, conductivity, magnesium, nitrate, pH, potassium, sodium, sulfate, and total alkalinity. A partial mineral panel consists of chloride, conductivity, and nitrate.

Sample analysis will be performed at the Monterey County Consolidated Chemistry Laboratory (CCL), which is part of the Environmental Health Department. Listed below is the laboratory's contact information and ELAP Certification number.

<i>Laboratory Name</i>	<i>Contact Information</i>	<i>Abbreviation</i>
Monterey County Consolidated Chemistry Laboratory ELAP Certification No 1395	1270 Natividad Road Salinas, CA 93906 Phone: 831-755-4516 Fax: 831-755-4652 http://www.co.monterey.ca.us/health	CCL

1.6.3 Project Schedule

The proposed project schedule is summarized below.

Prior to Sample Collection

January 2006 -	: Develop project strategy
January 2007	
15 January, 2007	: Submit Draft QA Project Plan
22 March, 2007	: Receive review comments on QA Project Plan from US EPA
6 July, 2007	: Submit Draft Final QA Project Plan
13 July, 2007	: Obtain QA Project Plan approval (to begin fieldwork)
20 July, 2007	: Submit Final QA Project Plan (signatory copy) EPA R9#03-238; X-97994701-0

Sample Collection

August 2007 -	: Coastal Ground Water (each well 3x, once per month)
September 2007	
August 2007 -	: Salinas Valley Ground Water (each well 1x)
September 2007	

Post Sample Collection

November 2007	: Compile all remaining laboratory analyses reports
1 - 15 December, 2007	: Evaluate laboratory data for QA/QC requirements
15 December, 2007	: Copy of analytical results sent to well owner/operators
16 - 31 December, 2007	: Summarize and tabulate data
January 2008	: Write Technical Memorandum (EPA II, XP-96995301 Task 2 Water Quality Assessment)
March 2008	: Submit Technical Memorandum (EPA II, XP-96995301 Task 2 Water Quality Assessment) to US EPA

1.6.4 Geographical Setting

The Salinas Ground Water Basin encompasses approximately 537.5 square miles (1,392 km²). The regional ground water flow is to the northwest. Seawater intrusion is a result of coastal pumping (Figure 3). Ground water pumping can dramatically impact localized coastal ground water flow.

1.6.5 Constraints

Ground water samples must be taken from the well while the pump is operating to ensure that the sample is representative of the aquifer and not standing water within the well casing. The Agency wants to measure the water quality when the aquifers are stressed due to pumping. For this reason the 2007 field sampling season will coincide with the agricultural irrigation season.

1.7 DATA QUALITY OBJECTIVES FOR MEASUREMENT DATA

This section describes the data objectives of the project and defines the measurement performance criteria deemed necessary to meet those objectives.

1.7.1 Objectives and Project Decisions

In Monterey County the Salinas Valley and Coastal Ground Water ambient monitoring programs are designed to characterize the ground water quality conditions of the Basin. All data generated from the sampling program in this project are tabulated as they have been over the many years of the program. Data generated from these monitoring activities allows the Agency to track changes in ground water quality over time and to assess potential impacts to ground water in the Basin. Water resource management and policy decisions may follow based on maps and tabulated data generated as a part of this project (program).

For the coastal ground water sampling program, the general mineral data are evaluated to determine if seawater intrusion is progressing landward as indicated by increasing well chloride values. The chloride values for all wells are evaluated, and then the 500mg/L chloride isochlor contours are mapped for the two coastal aquifers. When the maps are published, the information generated by MCWRA staff and approved by the MCWRA Board of Directors, is posted and passed on to Monterey County departments, regional government regulatory agencies, and public / private entities via the MCWRA web page, presentations, public meetings, and networking.

Monterey County departments such as the Planning Department and Health Department utilize the advancement of seawater as it relates to potable water and public health, while the agricultural community becomes aware of the proximity of their wells to the intrusion advancement, and the possible need for funds to drill new, deeper, wells and destroy the older high nitrate wells. Actions by regulators, depending on the entity, are related to prioritization of Regional Watershed and Water Quality Action Plans, and the associated success of MCWRA capital projects to halt seawater intrusion as governed by the State Water Resources Control Board adjudication process.

Actions by the MCWRA after the landward advancement of seawater have been ongoing for many years. Actions include consideration of more stringent Monterey County well drilling ordinances for assuring the continued prevention of cross-aquifer contamination in the coastal Salinas Valley, "Zone 6 Drilling Standards", April 19, 1988; the development and implementation of the Monterey County Recycling Projects, a tertiary treatment plant and treated water distribution system, to help further reduce agricultural pumping in the coastal Salinas Valley for halting seawater intrusion; and future use of these data will be utilized by the newly established Seaside Watermaster for comparison to and the development of the Monterey Peninsula seawater intrusion front.

For the Salinas Valley general mineral ground water sampling program, nitrate data tabulation and map representation has been the focus of the MCWRA for many years. All results over the laboratory's practical quantitative limit generated from this program are tabulated to evaluate the minimum, maximum, median, and mean value of nitrate as NO_3 in mg/L for each of the Salinas Valley Hydrogeologic Subareas.

For the Salinas Valley monitoring program, the Agency sends the general mineral testing results, including nitrate, to the well owners/growers who operate the wells sampled. Also, in this transmittal, the well operators are also provided with a conversion sheet of the nitrate concentration from mg/L nitrate as NO_3 to pounds of nitrate per acre inch of water, agricultural terms. If a nitrate

value in ground source water is elevated, then that growers can incorporate this available nitrate into their fertilizer crop scheduling. This is a method for growers to reduce applied nitrate to crops, while maintaining maximum crop productivity.

And, as with the Coastal monitoring program, the tabulated and mapped Salinas Valley nitrate data are posted and passed on to Monterey County departments, regional government regulatory agencies, and public / private entities via the MCWRA web page.

The MCWRA uses the well nitrate data during the technical well application review process. Monterey County Health Department (Health Department) issues well permits after the Agency provides a technical review of well applications for new, abandoned, or repaired wells. The well application proposal is evaluated with other well construction and water quality within a one miles radius of the new well and represented on a map. Agency staff makes qualitative recommendations to the Health Department on the new well's sanitary seal based on other well seals, the perforated intervals, and the nitrate values of wells in the area. The final decision for the well construction is made by the Health Department after the well drilling progresses.

Actions taken by the MCWRA are conditional. If extreme nitrate values are observed in agricultural production wells, then re-sampling of the wells may take place to confirm the elevated concentrations and may lead to increased sampling points for wells in the same vicinity and with the same well design. Continued increases in Salinas Valley ground water nitrate values could lead to special nitrate investigations on movement of nitrate in ground water and also outreach to the public on the reduction of nitrate to the environment.

1.7.2 Action Limits/Levels

Since the overarching goal for this project is the continued monitoring of ambient ground water, the Agency has set no specific water quality standards. As a result, the laboratory's practical quantitation limits (PQL) will serve as the Project Action Levels (PALs). Table 1 provides a listing of the parameter to be sampled and a summary of the laboratory's method detection limit, those minimum concentrations that can be detected above the instrumental background/baseline signal noise. Table 1 also provides the PQL, lowest calibration standard and PALs required by the Agency for the QAPP. The quality limits listed are deemed acceptable by the Agency to meet the project objectives.

1.7.3 Measurement Performance Criteria

The objective of data collection for this Monitoring Project is to produce data that represent the *in situ* conditions of the ground water. This objective will be achieved by using accepted standard methods for water collection and analysis and defining data quality indicators (DQIs) for each analytical parameter. The DQIs include accuracy, precision, comparability, sensitivity, completeness, and representativeness and are defined below and presented in Table 2. Some DQIs will be assessed quantitatively, while others will be qualitatively assessed. Example calculations have been provided for quantitative assessments and appropriate quality control (QC) samples have been identified. Laboratory Data Quality Objectives are given in Table 3.

Accuracy, or bias, is a measure of how close a result is to the expected value of the target analyte in a sample. Accuracy will be determined by the analysis of certified reference materials and matrix spikes, where the results can be compared with an expected value and expressed as %recovery. This is an assessment of laboratory analytical methods. For Laboratory Control Samples (LCS), it will be expressed as %recovery by the following equation:

$$\% \text{Recovery} = \frac{X}{T} \times 100$$

where,

X = Measured concentration

T = True spiked concentration

or, for Matrix Spike (MS) samples, by the following equation:

$$\% \text{Recovery} = \frac{(B - A)}{T} \times 100$$

where,

B = Measured concentration of spiked sample

A = Measured concentration of unspiked sample

T = True spiked concentration

The frequency of the LCS and MS samples associated with the analytical parameters will be 5%. MS and MSD samples will be spiked at 3-10 times the native sample concentration.

Accuracy/bias as related to contamination involves both field and laboratory components. Field blanks will be collected at a frequency of 5%. Laboratory blanks will be prepared and analyzed at a one per batch or 5% frequency.

Precision is concerned with the ability to quantitatively repeat results. To demonstrate the precision of a method or instrument, field duplicates will be collected, analyzed, and their results compared. Precision is expressed as relative percent difference (RPD) by the following equation:

$$\text{RPD (\%)} = \frac{|X_1 - X_2|}{(X_1 + X_2) / 2} \times 100$$

where,

X₁ = Original sample concentration

X₂ = Duplicate sample concentration

|X₁ - X₂| = Absolute value of X₁ - X₂

Field duplicates will be collected at a frequency of 10% for the first two sampling events. If the criterion of <25% RPD is met, then the remaining field duplicates will be collected at a 5% frequency. Laboratory duplicates will be prepared and analyzed at a one per batch or 5% frequency.

Comparability of the data can be defined as the similarity of data generated by different monitoring programs. Comparability helps to measure the scientific coherence and validity of a project. This objective is addressed primarily by using standard sampling and analytical procedures. Additionally, comparability of analytical data is addressed by result comparison of certified reference materials.

Sensitivity of the analytical instrument or method is the ability to detect and quantify an analytical parameter at the concentration level of interest. Sensitivity can be evaluated by method or instrument detection limit studies (MDL and IDL) or calculated practical quantitative limits (PQL) and method report limits (MRL).

Completeness is a measure of the amount of successfully collected and validated data relative to the amount of data planned to be collected for the project. Project completeness is typically based on the percentage of the data needed for the program or study to reach statistically valid conclusions. Because the SVIWMP is a monitoring program, data that are not successfully collected for a specific sample event or site can typically be recollected at a later sampling event. For this reason, most of the data planned for collection can not be considered statistically critical, and it is difficult to set a meaningful objective for data completeness. However, some reasonable objectives for the data are desirable, if only to measure the effectiveness of the Monitoring Program. %Completeness will be expressed by the following equation:

$$\%Completeness = \frac{N}{T} \times 100$$

where,

N = Number of usable results

T = Total number of samples planned to be collected

A completeness goal of 90% has been set for the ground water monitoring program.

Representativeness can be defined as the degree to which the environmental data generated by the monitoring program accurately and precisely represent actual environmental conditions. This objective is addressed by the overall design of the monitoring program. Specifically, assuring the representativeness of the data is addressed primarily by selecting appropriate locations, methods, times, and frequencies of sampling for each environmental parameter, and by maintaining the integrity of the sample after collection. Representativeness judges how well a single sample can describe the conditions of an entire sample population. Accurate, artifact-free sampling procedures and appropriate sample homogenization achieve representativeness.

1.8 TRAINING REQUIREMENTS/CERTIFICATION

1.8.1 *Training of Field Personnel*

A specialized training requirement for this project is for the use of Global Positioning Systems (GPS) Technology. Training in the use of handheld GPS units and software will be performed on an individual basis between the trainer and the trainee. Training will be provided by staff experienced in the use of GPS and Geographic Information Systems (GIS).

Field personnel will also be given initial instructions prior to the beginning of sample collection activities. These initial instructions will help familiarize the field personnel with sample collection containers, sample handling techniques, chain-of-custody forms, and sample transport. New field personnel will be accompanied by a trainer in the field as part of the initial instructions. All field samplers have completed a four-hour training session in the field. Training included confirmation of the well ID electrical meter tag number and MCWRA tag number, recognizing the appropriate sampling port, sample collection technique, proper handling of the sample during transportation to the lab, and accurate completion of the chain-of-custody forms. The completion of field training session has been documented in the Agency's personnel files.

All field personnel will follow sample collection procedures from accepted methods for the collection of ground water. Sample collection will follow protocols in accordance with recommended guidelines established by the U.S. Geological Survey (USGS) for ground water collection as described in the

National Field Manual for the Collection of Water-Quality Data, U.S. Geological Survey, Techniques of Water-Resources Investigations, Book 9, Chapters A1-A9. Field personnel will be familiar with the above-mentioned document.

Field personnel will also read and be familiar with this Quality Assurance Project Plan (QAPP) prior to beginning any sample collection activities.

1.8.2 Training of Laboratory Personnel

No specialized training of laboratory personnel is required for this project. The ground water constituents to be analyzed by the laboratory are routine and do not require additional expertise. In addition, the laboratory's QA plan notes that analysts 'must conduct sufficient preliminary tests using the methodology and typical samples to demonstrate competence in the use of the measurement procedure'.

1.8.3 GPS Training Documentation

Documentation of field personnel training for GPS includes: the name of the staff member being trained, the training date, the name of the trainer (instructor), and a checklist of satisfactory completion of each step. These training records are stored inside a monitoring binder and filed in the Agency's Water Quality Section. A sample GPS training record is attached in Appendix A.

Training documentation of laboratory personnel for routine methods is kept on file at the Consolidated Chemistry Laboratory (CCL). The CCL has written a policy regarding laboratory personnel training in their lab QA plan.

1.9 DOCUMENTATION AND RECORDS

1.9.1 QA Project Plan Distribution

The MCWRA Hydrologist/ Team Lead will safeguard the original QAPP and any subsequent revisions (both hard and electronic), plus keep a record of the distribution list in order to send out amendments to the QAPP and retrieve any obsolete versions (from the individuals listed earlier in section 1.3).

1.9.2 Field Documentation and Records

All field documentation generated by the sampling program will be kept on file in the Water Quality Section of the Agency. Field documentation includes field sheets, chain of custody (COC) forms, photographs, and labels (see Appendix B for examples of each).

1.9.2.1 Field Sheets

Field sheets are used to aid in the identification of each ground water source (well). The field sheets list the name of each well (as assigned by the well owner) and the State Well Number. The field sheets also contain a section that describes who the sampler should contact in order to have a well turned on, where to find the sample port, etc. The sampler is responsible for recording the sample date and time on the field sheet. Site observations should be written in the comments section of the field sheet, and initialed by the sampler. Site observations may include information such as detailed directions to the well location, changes to the electrical meter tag number, and the owner contact name and phone number. Field sheets also contain PG&E electrical meter numbers, which can be either verified or updated while the sampler is in the field.

Field sheets are double-checked by the sampler for completeness and accuracy while still in the field. The sampler should look for: incomplete and/or missing data/omissions, incorrect or invalid information, and clarity problems. Any discrepancies should be cleared up before the sampler leaves the field. Data that has been entered by one field sampler will be reviewed by a different field sampler to verify that no transcription errors have occurred. These data entry reviews will take place at least weekly.

Original field sheets are categorized (according to Coastal wells or Salinas Valley wells) inside binders which are kept in the Water Quality Section at the Agency for a period of 10 years. After such time, the copies are transferred to the Monterey County Record Retention Center and archived for a period of 5 years.

Data collected on field sheets will also be recorded electronically and stored in an Access database inside a shared network drive that is backed-up on a daily basis. These electronic records will be retained permanently.

1.9.2.2 Chain Of Custody (COC) Forms

Chain-of-custody (COC) forms will be provided by the Consolidated Chemistry Laboratory and filled out while the sampler is in the field. The COC will accompany the samples at all times in order to insure the custodial integrity of the samples. A sample is considered to be in custody if it is: in someone's physical possession, in someone's view, locked up, or secured in an area that is restricted to authorized personnel.

Care should be taken to protect the COC from physical damage (i.e., water, wind, etc). The COC will have the following information:

- Client Code
- Client Name
- Client Address
- Client Phone Number
- Client Fax Number
- Report Attention
- Sampler Name
- Collection Date
- Collection Time
- Sample Site (identified by state well identification number) or QC sample (if appropriate)
- Sample Type (all of the samples in this project will be **grab** samples)
- Matrix (all of the samples in this project will be **ground water** samples)
- Analyses Requested

Upon relinquishing the sample(s) to the Consolidated Chemistry Laboratory, the sampler will sign and date the COC form. Lab personnel will then receive the sample(s), mark the date and time received, assign unique lab identification numbers (lab IDs) to each sample, and sign the COC form. The signed COC form is then photocopied; the lab keeps the original, and a copy is given to the sampler.

Hard copies of COC forms are categorized (Coastal wells or Salinas Valley wells) inside binders which are kept in the Water Quality Section at the Agency for a period of 10 years. After such time,

the copies are transferred to the Monterey County Record Retention Center and archived for a period of 5 years.

Electronic COC information is also stored in an Access database inside a shared network drive that is backed-up on a daily basis. These electronic records will be retained permanently.

1.9.2.3 Photographs

The Agency maintains a photo catalog which contains photographs of the Coastal well site locations. The photo catalog is carried into the field to assist with the identification of each well. If there are significant changes to the appearance of the well site, then staff will take a new digital photo. The old photo in the catalog will then be replaced with a copy of the new photo. Photographs will be taken of the Salinas Valley wells after confirming the correct well location of each.

Two photographs of each well location will be taken using a high resolution digital camera. One photograph will be from a distance of 100 ft. or more to aid in the identification of the correct site location. The second photograph will be a close up of the well and pump head, which will be used to verify location of the correct sampling port. Printed hard copies of these two photographs for each well will be kept in the photo log book and labeled with the state well identification number as listed on the field sheets.

Photographs will serve to help verify information entered into the field sheets. Photographs are stored in an electronic database and labeled according to site number and date last photographed. Previous photos will be archived electronically for retrieval purposes if the need arises.

1.9.2.4 Labels

Labels for each sample site are pre-printed on Avery (size 5163) sheets (10 labels per sheet). Indelible ink will be used on the labels and clear packing tape will be applied over the label to prevent it from coming off if it gets wet. Each label will have the following information:

- Sample Site (pre-printed)
- Collection Date (to be filled out in the field)
- Collection Time (to be filled out in the field)
- Analyses Requested (complete or partial mineral panel)
- Sampler Name (to be filled out in the field)
- Comments (if any)

The sample site name (state well identification number) will serve as the unique identifier for each sample (e.g. 14S/02E-08M02). When the samplers arrive at the CCL a unique in-house lab number is assigned to each sample.

1.9.2.5 Field Quality Control Sample Records

Quality Control samples from the field will be identified using the state well identification number plus either -1 or -2 (e.g. 14S/02E-08M02-1, for a field blank).

- -1 = Field Blank
- -2 = Field Duplicate

1.9.3 Laboratory Documentation and Records

The Consolidated Chemistry Laboratory will keep a sample receiving log containing the completed COC forms submitted with the samples collected for this project. The CCL will keep records of all analyses performed as well as associated QC information, including: laboratory blanks, laboratory duplicates, matrix spikes, matrix spike duplicates and laboratory control samples. Hard copy data of analytical results will be maintained for three years by the CCL. The CCL maintains a Laboratory Information Management System (LIMS) which will be used to store electronic data.

The data generated by the CCL for each sampling event will be compiled into individual data reports. The individual data reports will include the following information:

- Sample results and associated Quantitative Limits (QLs)
- Cation-Anion Balance Sheet
- QC check sample records and acceptance criteria for the following:
 - Laboratory Control Sample(s)
 - Matrix Spike(s)
 - Matrix Spike Duplicate(s)
 - Analytical Duplicate(s)
 - Method Blank(s)
- Project narrative including a discussion of problems or unusual events (including, but not limited to, topics such as: receipt of samples in incorrect, broken, or leaky containers, with improperly or incompletely filled out COC forms; receipt and/or analysis of samples after the holding times have expired; summary of QC results exceeding acceptance criteria; etc.)

The above information is logged into the LIMS database at CCL.

The Public Health Chemist of the Consolidated Chemistry Laboratory will be responsible for reviewing, validating, and/or qualifying results on the data reports. Any deviations from sample preparation, analysis, and/or QA/QC procedures will be documented. Departure from QC acceptance limits will be highlighted. Once the data reports are finalized, the hard copy will be sent to the Project QA Manager at the Agency.

At the end of the sampling season, all data for both programs (Coastal and Salinas Valley) will be electronically transferred to the Agency. After data verification, the Agency Hydrologist/ Team Lead will upload the data to the Agency's Water Resources Agency Information Management System (WRAIMS) relational database.

1.9.4 Technical Reviews and Evaluations

Technical reviews and evaluations are limited to Field Activities and Laboratory Data Review Checklists.

1.9.4.1 Field Activities Review Checklist

Field personnel will be required to fill out a Field Activities Review Checklist as part of the double-check process upon returning from the field after each sampling event (see Appendix C).

1.9.4.2 Laboratory Data Review Checklist

Laboratory data reports from the CCL will be routed to the Project QA Manager at the Agency, who will do a preliminary assessment of the data. The data reports will then be given to the Agency

Hydrologist/ Team Lead who will be responsible for completing a Laboratory Data Review Checklist (see Appendix C).

1.9.5 Technical Memorandum

The Agency Project QA Manager is responsible for the preparation of the technical memorandum. The technical memorandum will be written in the "post sample collection" phase (see section 1.6.3). The technical memorandum will be submitted to USEPA for review by the EPA Region 9 Project Manager.

The technical memorandum will contain the following elements:

- Table of results for Chloride
- Table of results for Nitrate
- Table of results for Specific Conductance
- Map of Chloride contours for 500 mg/L values
- Map of Nitrates showing those sites which have values above and below the Drinking Water Standard Limit of 45 mg/L (nitrate as NO₃)
- Map of Conductivity contours

2.0 DATA GENERATION AND ACQUISITION

2.1 SAMPLING DESIGN

In the Salinas Valley, there are four hydrogeologic subareas: Pressure, East Side, Forebay, and Upper Valley. All four subareas were selected using a directed sampling design approach. These subareas were selected deliberately based on knowledge from previous monitoring work to contain analytes of interest, specifically nitrate and conductivity in the Salinas Valley Program, and chloride and conductivity in the Coastal Program. Actual sampling sites/wells within the Salinas Valley Basin Monitoring Program were chosen using a non-deliberate sampling approach. The wells included are acquired opportunistically. Site accessibility is a key issue for sampling. Permission of property owners must be secured before accessing private wells.

There are just over 1700 active wells in the Salinas Valley. Of this total number of wells, 344 wells make up the Salinas Valley Ground Water program and 85 wells make up the Coastal Ground Water program. The wells that make up these two programs have all been sampled in the past; some have data sets as far back as the 1950's, when this was a State of CA Department of Public Works (now the Department of Water Resources) program. The Agency wants to keep as complete and continuous a data set for each of these wells as possible.

Due to the time constraints the Agency is facing during this shortened 2007 field season, June - September, staff will prioritize which wells within the Salinas Valley portion of this project will be sampled. Wells to be sampled first will be located within approximately one mile radius of municipalities and industries (such as vegetable packing plants). We refer to these areas as high beneficial use areas. Ground water wells will be identified by State Well Numbers (Township, Range, Section, and Subsection).

All wells are high production agricultural wells. All wells are sampled in the same way, if the pump is in operation then a sample will be collected. If the pump is not operating then the field sampler will note it on the field sheets and come back to the well at a later date when the well is in operation. The pump must be operating for a sample to be collected. The age of well does not alter sampling

protocols. If a well is found to have been abandoned since the Agency last sampled the well, a notation will be made on the field sheets and the well will be removed from future sampling efforts.

2.1.1 Salinas Valley Ground Water

While it is known that high levels of nitrates exist in some aquifers of the Salinas Valley Ground Water Basin, a significant sampling effort to determine the extent in the ground water has not been conducted by the Agency for several years. There are a total of 344 sample locations within the Salinas Valley monitoring program. Sample locations are operational ground water wells, the majority of which are used for agricultural irrigation. The Pressure subarea has 158 wells, the East Side subarea has 66 wells, the Forebay has 84 wells, and the Upper Valley has 35 wells (Figures 4-7). Each of these wells will be sampled once during the 2007 summer field season (July-September). The primary criterion currently used to determine if a well will be included in the Salinas Valley monitoring program has been its status as previously sampled. This program is an ongoing ambient ground water monitoring program and continuity in sampling the same wells each field year is of prime importance, especially for water quality trend analysis. Other factors that are important in deciding if a well should be included in the monitoring program are; copy of the well completion report (commonly referred to as the driller's log), location of the perforation interval along the well casing to determine which aquifer is sampled, age of the well, and construction method used to drill the well. Additionally it is useful to know the proximity of the well to other water use (industrial, municipal, or domestic) areas. A list of Salinas Valley well names and locations are given in Table 4. All wells on this program are planned to be part of the monitoring design for subsequent years. Until these monitoring wells are abandoned or destroyed, they will remain part of this program.

2.1.2 Coastal Ground Water

The Agency currently conducts a seawater intrusion monitoring and mapping program (EPA II). This program will continue to evaluate the extent and status of seawater intrusion in the coastal areas of the Salinas Valley Basin (EPA II). The Coastal portion of the ground water program contains 85 wells, most of which are located in the Pressure subarea (Figure 8). Each well will be sampled three times, once each month of the summer 2007 field season (July-September). The first sample collection at each well will be analyzed for a complete mineral panel (Table 1), and following two collections will be analyzed for a partial mineral panel (Table 1). There are 21 wells located in the Pressure 180-Foot Aquifer, 52 wells within the Pressure 400-Foot Aquifer, two wells with perforations within both the Pressure 180-Foot and 400-Foot Aquifers, four wells are located within the Pressure Deep Zone Aquifer, three in the East Side Deep Aquifer, one in the East Side Shallow Aquifer, and one in the Prunedale Aquifer. The principal criterion for inclusion in the Coastal monitoring program is historical sampling and well availability. Additional criteria for selecting a well for inclusion into the Coastal monitoring program are: a well completion report, location of the perforation interval along the well casing to determine which aquifer is sampled (180, 400, or deep zone AQ), well age, and well construction type. A list of Coastal sites and their representative aquifers are listed in Table 5.

It can not be stressed enough how important the continued monitoring of these ground water wells are for the Agency to meet its mission of monitoring the quality of the County's ground water resources. Some of these well have been sampled since the 1950's and the loss of such a long term water quality record within the County of Monterey would irreplaceable.

2.2 SAMPLING METHODS

The objectives of the sampling procedure are to minimize changes in ground water chemistry during sample collection and transport to the laboratory, and to maximize the probability of obtaining a representative, reproducible ground water sample. This well-volume purging procedure provides a reproducible sampling technique with the goal that the samples obtained will represent water quality over the entire screen interval of the well.

Standing water in the well casing can be of a different chemical composition than that contained in the aquifer to be sampled. Solutes may be adsorbed on to, or desorbed from the well casing material, oxidation may occur, and biological activity is possible. Therefore, the stagnant water within the well must be purged so that the sample is representative of the aquifer. As a result, a well may be sampled only after the pump has been in operation for at least 15-20 minutes.

All the wells included in this project, from both the Salinas Valley area and the Coastal monitoring area are high production agricultural wells that contain deep turbine pumps operating at 500-1200 gallons per minute (gpm). Over the years of managing the ambient monitoring program, the Agency has determined that operating a deep turbine pump for 15-20 minutes before taking a sample is sufficient time to clear the entire well casing of three well volumes for ensuring a representative well sample. For referencing well casing volume, the Agency uses the well casing size provided in the well completion reports (driller's log) for each of the wells included in this monitoring program (National Field Manual for the Collection of Water-Quality Data, Chapter A2).

Sample bottles and caps are rinsed three times with ambient ground water prior to collection. The sample container is then filled, tightly capped, and labeled. No field sample filtration is required. Samples are put into a cooler with ice immediately and maintained at 4°C and delivered to the laboratory daily. See Table 6 for sample collection requirements. Extra sample containers, caps and field supplies will be carried in the truck as back-up should any problem arise in the field. Additionally, the Field Sampler will carry and maintain an updated hardcopy of the QAPP in the field to be used as a reference.

The following precautions will be followed in order to limit sampling error at the wellhead:

- Operate the pump long enough to produce water that is representative of the aquifer and not stagnant water from the casing.
- Take samples at the wellhead or near the wellhead and away from fertilizer injection ports.

Sample collection will follow protocols in accordance with recommended guidelines established by the U. S. Geological Survey (USGS) for ground water collection as described in the National Field Manual for the Collection of Water-Quality Data.

The National Field Manual for the Collection of Water-Quality Data, U.S. Geological Survey, Techniques of Water-Resources Investigations, Book 9, Chapters A1-A9 is maintained as a web-based document and is located at <http://pubs.water.usgs.gov/twri9A>. Updates and revisions for the National Field Manual can be found using this web-based approach.

2.3 SAMPLE HANDLING AND CUSTODY

This section describes how all samples will be treated after collection, during transport, and upon arrival at the CCL. It also includes information on proper sample disposal after laboratory analysis.

2.3.1 Sample Containers and Preservatives

Sample containers to be used in this project are high density polyethylene (HDPE), one pint (~0.5 L) and 0.5 gallon (~2 liter) sizes, for partial mineral or complete mineral analyses, respectively. The Agency has used these same sample container types during previous years of this ongoing ambient monitoring program and has never had any problems with container contamination issues. Field blanks will be closely monitored and, should a problem arise, corrective actions will be taken. Only one container (pint or half gallon) is needed per sampling site to provide the necessary volume to run the required lab analyses (see Table 6). Sample containers and caps are purchased in bulk from a plastic container manufacturer (Consolidated Container Company). The caps for the containers are packaged separately. The containers and caps are clean upon receipt, as long as they arrive with the outer cardboard packaging intact. The containers will be kept in a closed, dry environment away from the outside elements. Sterility is not of importance because this sampling project does not include microbiological testing. As previously mentioned, all containers and caps will be rinsed three times with ambient sample water prior to sample collection.

Sample containers are labeled with pre-printed labels, which lists which panel of analytes is requested, either complete mineral or partial mineral. The collection date, collection time, and sampler name are recorded in the field with an indelible marker. After being filled out, labels will be covered with clear plastic tape (packaging type) to protect the labels from destruction during transport.

No chemical *field preservation* of the samples is required. All samples will be kept at $4\pm 2^{\circ}\text{C}$.

Preservation of samples, if required prior to analysis, will be the responsibility of the contract lab (CCL). Part of the CC lab sample receiving protocols includes lab personnel verifying, at the time of sample receipt, if any samples require lab preservation. Refer to Table 6 for listings of preservatives for specific analytes.

2.3.2 Sample Packaging and Transport

All samples will be handled, prepared, transported and stored in a manner so as to minimize contamination and spills. After collection, sample caps will be checked for tightness, and the samples will be put in ice chests immediately. During travel between sites, ice chest lids will be kept tightly closed in order to keep the samples at the correct temperature and protect them from sunlight. Ice used for maintaining sample temperature will be double-bagged inside durable plastic bags (Ziploc type) and be of sufficient quantity so that all samples will be stored at $4\pm 2^{\circ}\text{C}$. Maximum holding times for specific analytes are listed in Table 6.

2.3.3 Sample Custody

Chain of custody (COC) procedures require that possession of samples be traceable from the time the samples are collected until completion and submittal of the analytical results. A completed chain of custody form is to accompany the samples to the contract laboratory (CCL). Requirements for COC paperwork can be found in Section 1.9.2.2 of this document.

All samples collected for this project will be transported from the field to the CCL via an Agency vehicle. The field sampler will deliver the samples directly to the CCL daily; there will be no intermediary transfers. Samples need to arrive at the CCL no later than 15:00, to ensure log-in and laboratory preservation. Personnel at the CCL will examine the samples for correct documentation and holding times. The CCL will follow sample custody procedures as outlined in their QA plan (see Appendix D).

2.3.4 Sample Disposal

All samples remaining after successful completion of analyses will be disposed of properly. It is the responsibility of the personnel at the CCL to ensure that all applicable regulations are followed in the disposal of samples or related chemicals. Sample disposal procedures used by the CCL are discussed in their QA plan (see Appendix D).

2.4 ANALYTICAL METHODS

All samples will be analyzed at the County Consolidated Chemistry Laboratory (CCL). Analyses will be performed following either EPA approved methods or methods from *Standard Method for the Examination of Water and Wastewater, 18th Edition*, see Table 1 (CCL's QA Manual cites 18th Edition, see Appendix D). Standard operating procedures (SOPs) from CCL have been included in Appendix D for each of the analyses. Should there be any deviation from these SOPs the Laboratory Director must contact the Project QA Manager.

The CCL will submit a data report and associated QC results after analyses are complete to the Project QA Manager. This data report is described in Section 1.9.3. After a preliminary assessment the Project QA Manager will pass the data on to the Team Lead, who will review the data report and QC results and evaluate its quality and usability in addressing the Project objectives.

2.5 QUALITY CONTROL

2.5.1 Field Sampling Quality Control

The assessment of field measurements will be determined from the collection and analysis of field blanks and field duplicates. For this monitoring program the field blanks will be collected at one every 20 samples or a frequency of 5%. Field duplicates will be collected at a frequency of 10% for the first two sampling events. If the criterion of <25% RPD is met, then the remaining field duplicates will be collected at a 5% frequency. Analytical acceptance criteria and corrective actions for field QC are listed in Table 2.

Deionized (DI) water will be acquired from the CCL and kept at 4±2°C, while transported into the field. Field blank samples will be obtained by pouring DI water into a pint (~500 mL) HDPE sample container that has been triple-rinsed with DI water at the sampling location. The container will be tightly capped, placed in the cooler and delivered to the contract laboratory. Field blanks are labeled with the sampling location (State Well Number) followed by "-1".

Field blanks will be used to evaluate the collection process (from field sampling through sample analysis) for contamination from exposure to ambient conditions, from sample containers or from improper sampling and handling technique. If target analytes are found in field blanks, sampling and handling procedures will be reevaluated and corrective actions taken. Corrective actions may consist of, but are not limited to, re-training of field personnel, discussions with the contract laboratory, invalidation or qualifying of results.

Field duplicates will be collected for every analytical parameter. The duplicate sample will be collected immediately after collection of the native, following the same sampling protocols. Field duplicates are labeled with the sampling location (State Well Number) followed by "-2".

Field duplicates will be used to evaluate the precision of the sample collection through analysis. The combined variability from sampling and analysis technique, in addition to sample heterogeneity, will

be assessed using field duplicates. If acceptance criteria are exceeded, field sampling and handling protocols will be reviewed and problems corrected. These may consist of, but are not limited to, additional training, revised sampling techniques and reevaluation of sampling location.

2.5.2 Laboratory Analyses Quality Control (Contract Laboratory)

The Monterey County Consolidated Chemistry Laboratory's (CCL) personnel are responsible for analytical Quality Control. Standard laboratory quality control elements include method blanks, laboratory control samples, analytical duplicates, matrix spikes and calibration procedures. Laboratory data quality objectives include QC acceptance criteria, frequency of analysis, and corrective actions. These data quality objectives and quality control elements for CCL are described in its QA Manual (Appendix D) and SOPs (Appendix D) and are listed in Table 3. After examination of these documents, the Agency believes that the laboratory will be able to meet the project data quality needs. Any deviation from these written procedures must be documented by the laboratory and reported to the Project QA Manager.

2.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

Testing, inspection, and maintenance of laboratory equipment are the responsibility of the Monterey County Consolidated Chemistry Laboratory and are detailed in its QA manual in Appendix D.

2.7 INSTRUMENT CALIBRATION AND FREQUENCY

Instrument calibrations are the responsibility of the Monterey County Consolidated Chemistry Laboratory and acceptance criteria for calibrations are detailed in its QA manual in Appendix D.

2.8 INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES

2.8.1 Initial Inspection of Supplies

As mentioned previously in Section 2.3.1, sample containers are purchased in bulk from an outside vendor who specializes in supplying plastics to the beverage industry. An initial inspection will be conducted upon receipt of each shipment. Each shipment will be considered acceptable for use if *all* of the following are true:

- The shipment arrives with the outer cardboard packaging intact.
- The containers are the correct type (HDPE) and size (0.5 gal/~2L or 1 pint/~0.5L).
- The insides of the containers are dry.
- The insides of the containers are free of dirt or any particulate matter.

2.8.2 Field Inspection of Supplies

Immediately prior to sample collection, field samplers will visually inspect each sample container for the following:

- Dirt or any particulate matter
- Cracks of any size
- Improper fit of the cap on the container

If the field sampler observes any of the above, then the container will be discarded and an acceptable container will be used instead.

2.8.3 Laboratory Inspection of Supplies

CCL will be responsible for establishing inspection and acceptance criteria for supplies that adhere to their internal QA/QC policies.

2.9 DATA ACQUISITION REQUIREMENTS (NON-DIRECT MEASUREMENTS)

Non-direct measurement data will not be used during this monitoring program. Should at some time in the future the Agency decide to use data from an external source, QA/QC requirements will be established. Should this occur, an addendum to this QAPP will be submitted to USEPA.

2.10 DATA MANAGEMENT

Data, as related to documentation and records, will be managed as outlined earlier in Section 1.9 of this QAPP.

In addition, the CCL will group QA/QC data under a separate client code so that QA/QC data can be filtered from regular sample data before being uploaded into the Agency's Data Management System (WRAIMS). This allows the Agency a greater flexibility both in quickly and easily accessing the data that included QA/QC samples for initial review, and increased flexibility in uploading and moving large data sets.

3.0 ASSESSMENT AND RESPONSE ACTIONS

This section lists review procedures that will be taken to ensure all the protocols outlined in the QAPP are consistently followed.

3.1 REVIEWS

3.1.1 Readiness Reviews

Water Resources Technicians/ Field Samplers will be trained by the Hydrologist/Team Lead before any field sampling begins. Training will cover proper sample collection and handling and the completion of all paperwork (COCs, field logbooks, etc). The Team Lead will ensure that Field Samplers have properly prepared all collection containers, paperwork and other supplies needed to complete a successful sampling event. Any problems discovered during the readiness review will be corrected before the Samplers begin work.

3.1.2 Field Reviews

The Team Lead will be responsible for overseeing that all field activities are in compliance with Agency protocols. The Team Lead will be available via phone should any questions arise while the Samplers are in the field. The Team Lead will also review all field paperwork such as COCs and field logbooks for completion. Additionally the field QC samples (field blanks and duplicates) will be used to evaluate the individual Sampler's technique. If problems are exposed they will be corrected straight away so that all further samples are valid. A stop-work order may be issued by the Project QA Manager at any time if a discrepancy or error is found that could negatively affect the data being collected.

3.1.3 Post Sampling Reviews

Post sampling reviews will be conducted following each sampling event in order to ensure all information is complete. Reviews will be conducted by the Field Sampler due to the small size of the staff. They will include evaluation of sampling activities and field documentation and will take place in the office, not in the field. Findings will be passed on to the Team Lead and the Project QA Manager to be incorporated into the next field event.

3.1.4 Laboratory Data Reviews

The Team Lead will be responsible for reviewing the laboratory's data for completeness and accuracy. The data will also be checked to determine that all specified methods were used and all related QC data was provided with the sample analytical results. These reviews will take place immediately upon receipt of data reports from the laboratory. This will ensure that any method deviations are corrected or explained, and any missing or incomplete data are provided. The Project QA Manager has the authority to request re-testing of laboratory data if it is invalid or would otherwise compromise the quality of the resulting project conclusions.

3.2 REPORTS

The Project QA Manager will be responsible for the technical memorandum (EPA R9# 03-238 Task 3.3) which will be provided in March 2008 to US EPA. The technical memorandum (EPA R9# 03-238 Task 3.3) will include result tables for chloride, nitrate, and specific conductivity, and maps of chloride, nitrate, and specific conductivity gradients. The technical memorandum will include a summary of any significant QA/QC issues and how they were resolved. It is currently understood that this project is of short enough duration that only a final technical memorandum to the EPA is necessary.

4.0 DATA VALIDATION AND USABILITY

4.1 DATA VERIFICATION AND VALIDATION

Data review is the in-house examination to ensure that the data have been recorded, transmitted, and processed correctly. The Team Lead is responsible for the data review. This examination will check for data entry errors, calculation errors, and data omission errors. If possible these errors will be corrected.

4.1.1 Field Data

Field data include logbooks, photographs, and COCs. The Field Sampler is responsible for reviewing the field data at the end of the sampling event. This includes determining that all information is complete and any deviations from the sampling methodologies are documented using the Field Activities Review Checklist (Appendix C).

4.1.2 Laboratory Data

Initial evaluation of the laboratory data are carried out by the CCL in agreement with protocols listed in their SOPs and QA manual. The Team Lead will also conduct an independent review of the data and QC parameters as described in sections 3.1.4 and using the Laboratory Data Review Checklist as detailed in section 1.9.4.4 and Appendix C.

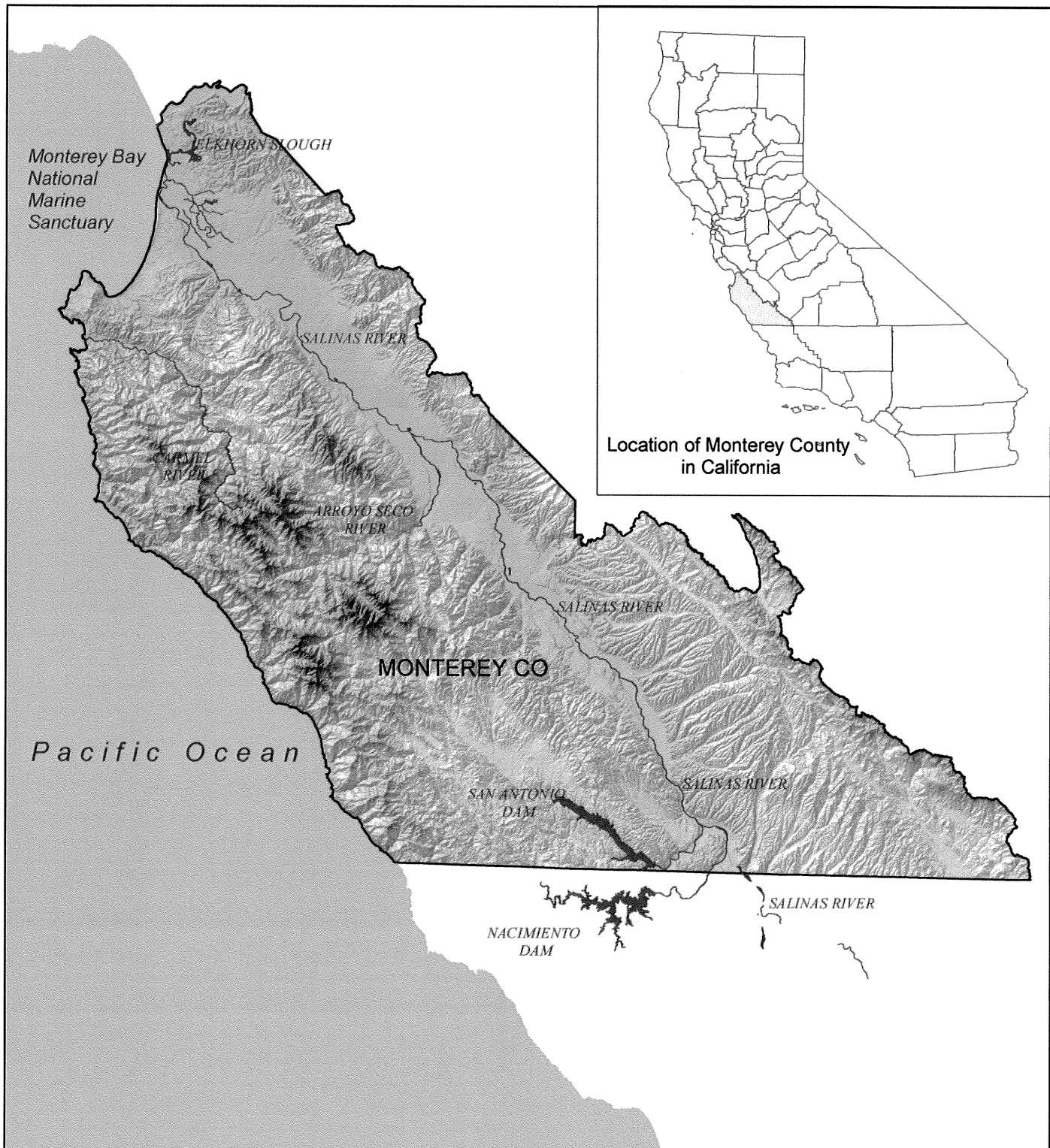
4.2 RECONCILIATION WITH USER REQUIREMENTS

The purpose of the continued ambient monitoring of the Salinas Valley Basin Ground Water is to assess the water quality to manage and protect ground water resources. For data to be useful in developing the overarching Salinas Valley Integrated Water Management Plan, it must first meet the requirement of this QA project Plan. The Project QA Manager will be responsible for making the final evaluation of the data's usability in meeting the Project objectives. All data passing this final evaluation will then be used to establish a cohesive and succinct Water Quality Management Plan in accordance to the work begun under EPA-I and continued under EPA-II. Additionally, the Agency will integrate these ground water quality data with previously collected data for use in trend analysis.

5.0 REFERENCES

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FIGURES



Legend

■ Water Bodies/ Channels

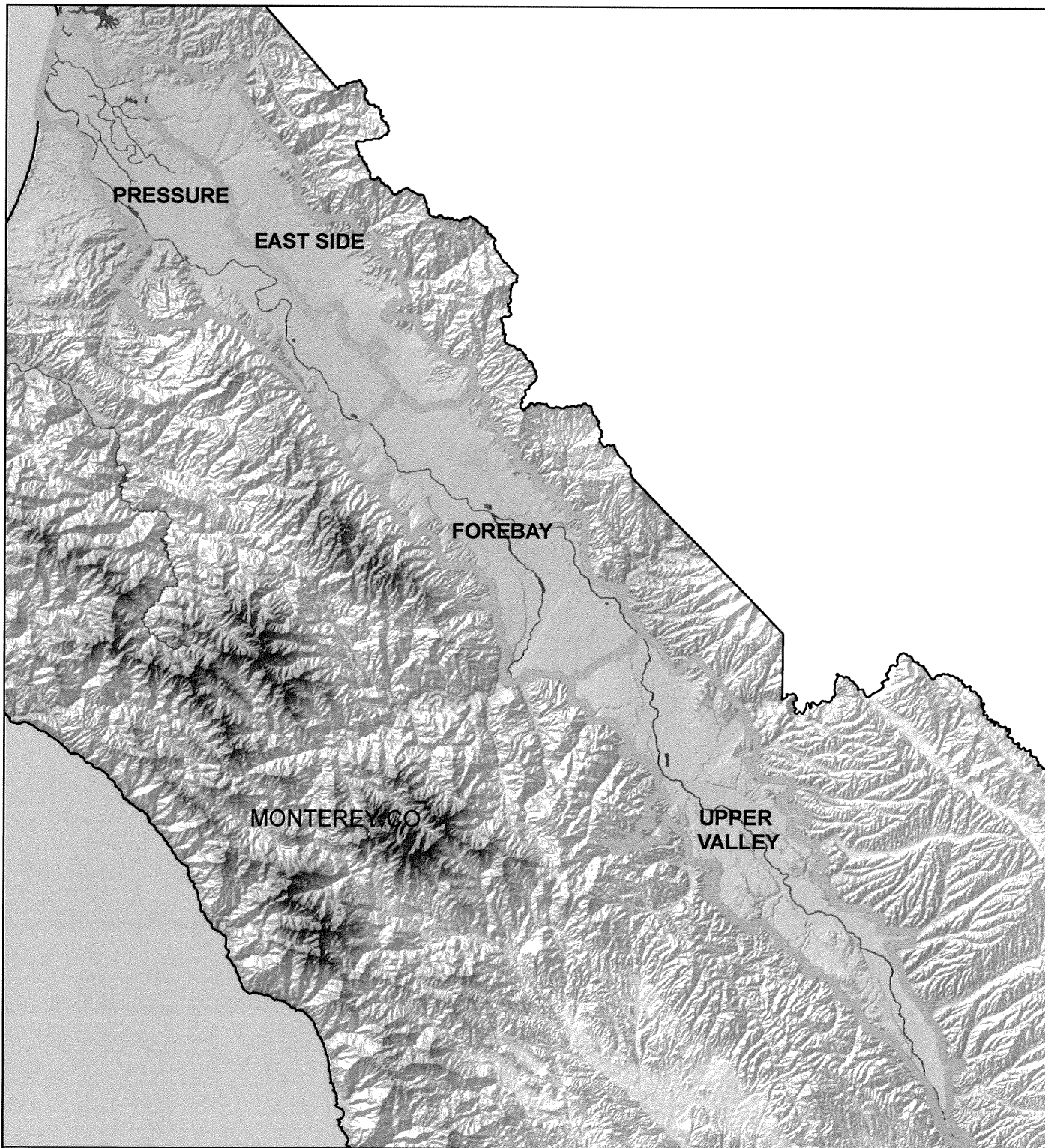
Monterey County, California

Figure 1



Note: The scale and configuration of all information shown hereon are approximate and are not intended as a guide for survey or design work.

Map Date: July 5, 2007



Legend

■ Water Bodies/ Channels

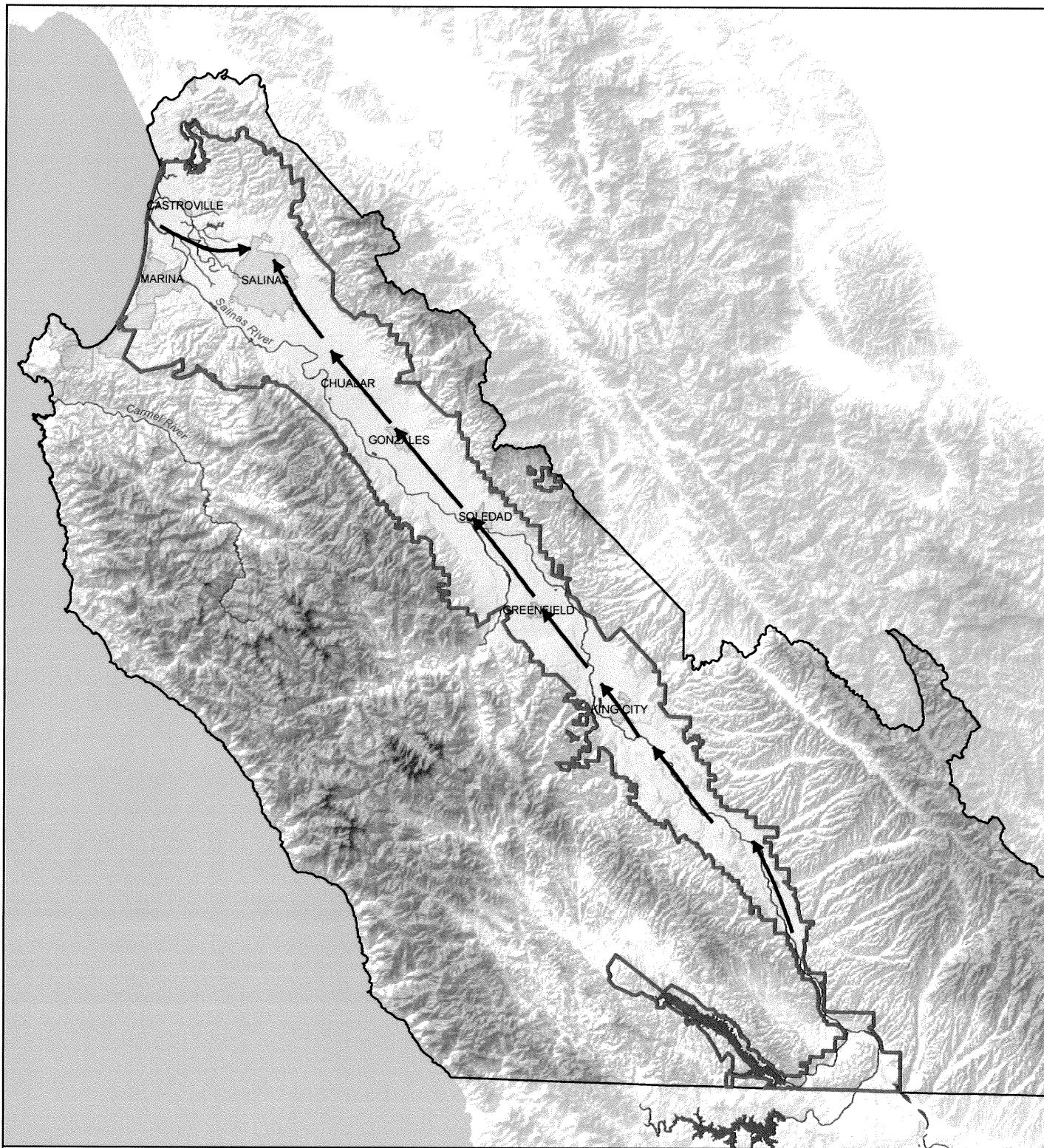
Salinas Valley Aquifers

Figure 2



Note: The scale and configuration of all information shown hereon are approximate and are not intended as a guide for survey or design work.

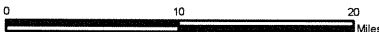
Map Date: July 5, 2007



Ground Water Flow Direction in the Salinas Valley

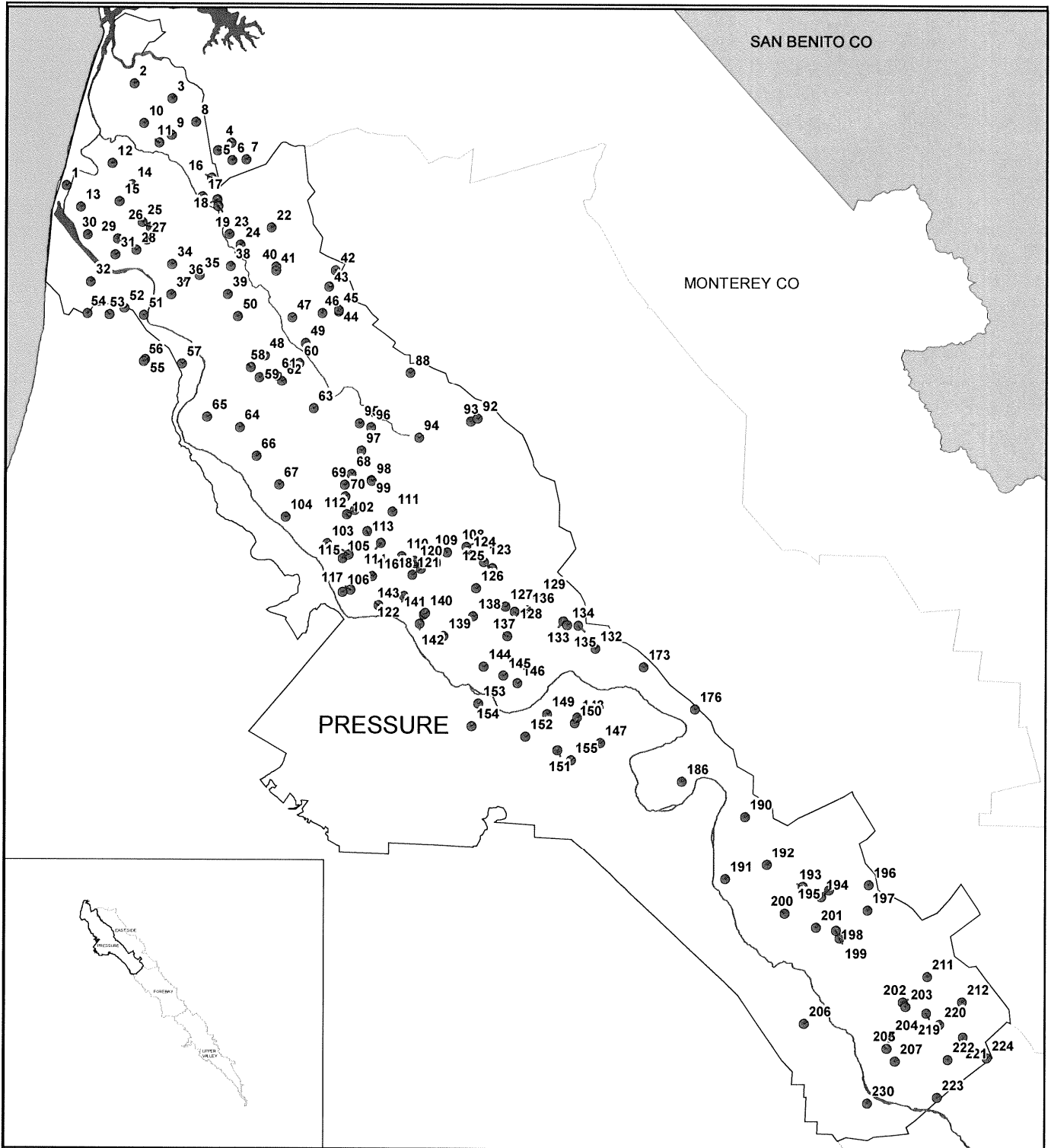
Figure 3

- Legend**
- ➔ Ground Water Flow Direction
 - ▭ Assessment Zone 2C
 - ▭ Monterey County
 - 🌊 Rivers and Other Bodies of Water



Note: The scale and configuration of all information shown hereon are approximate and are not intended as a guide for survey or design work.

Map Date: July 6, 2007



Legend:

- Study Well
- Rivers
- SUBAREA**
- SUBAREA
- PRESSURE

Salinas Valley Wells in the Pressure Subarea

Figure 4

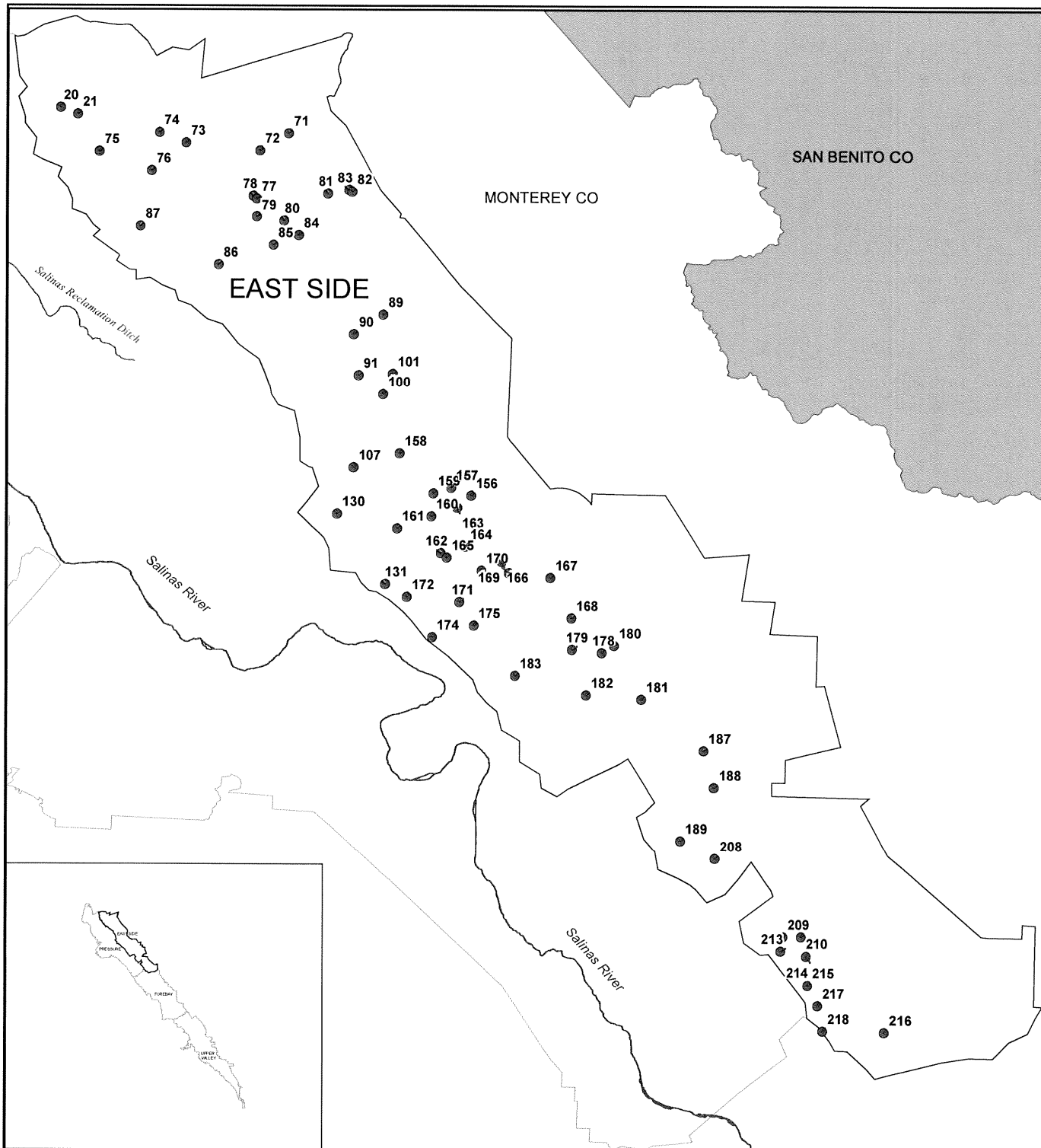


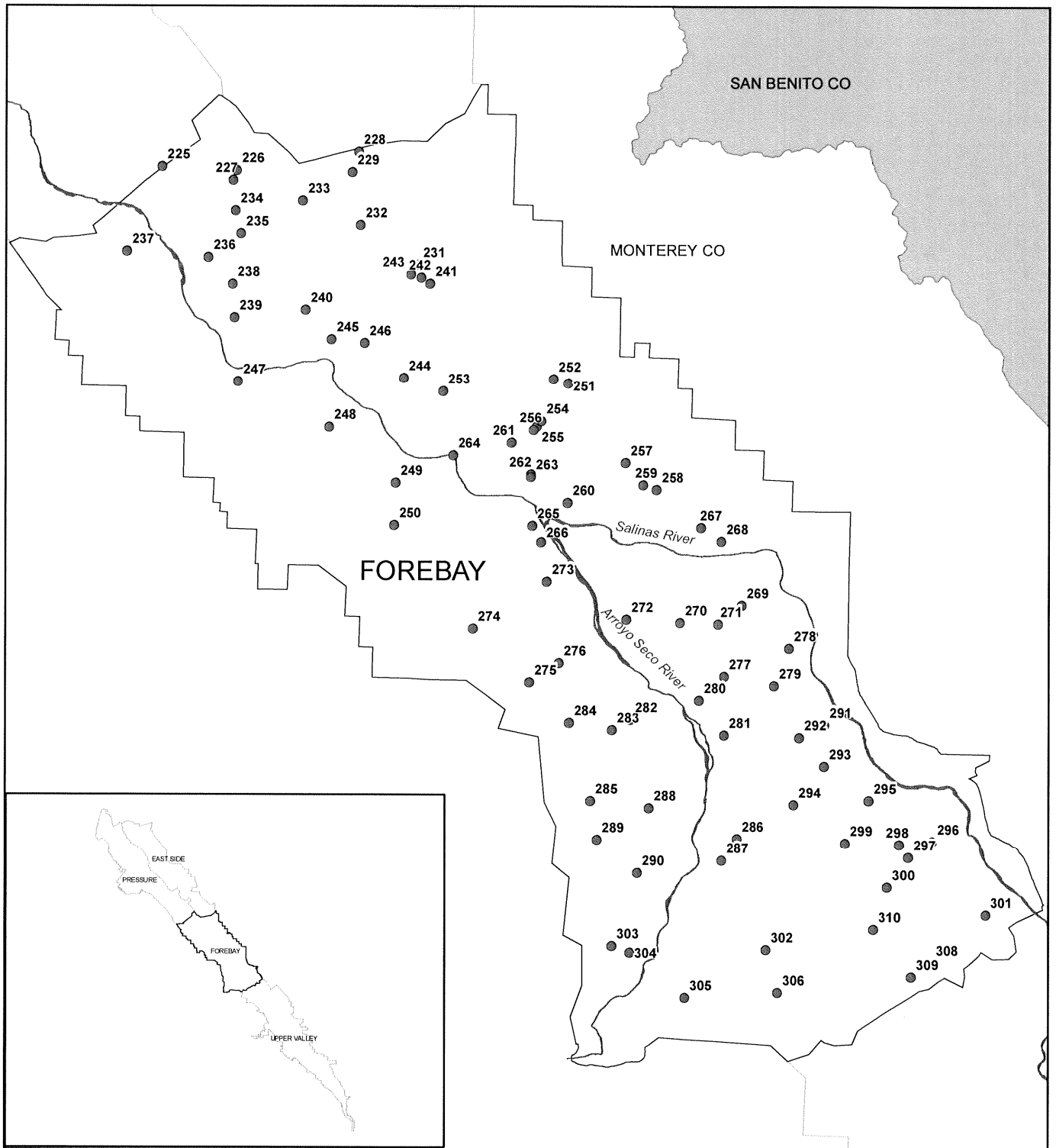
0 0.75 1.5 2.25 3 Miles



Note: The scale and configuration of all information shown hereon are approximate and are not intended as a guide for survey or design work.

Map Date: July 5, 2007



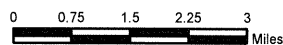


Legend:

- Study Well
- ▬ Rivers
- SUBAREA**
- SUBAREA
- FOREBAY

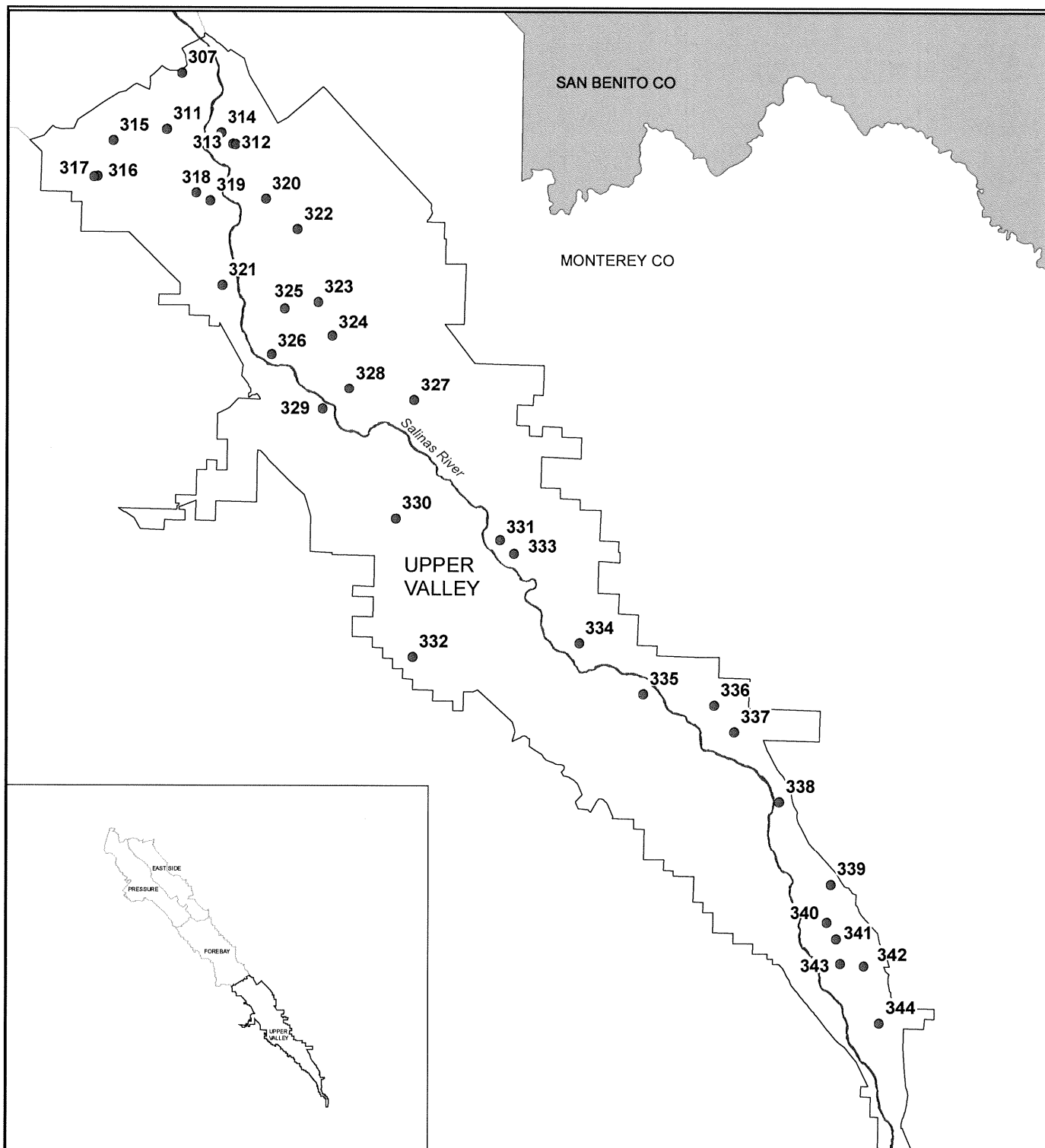
Salinas Valley Wells in the Forebay Subarea

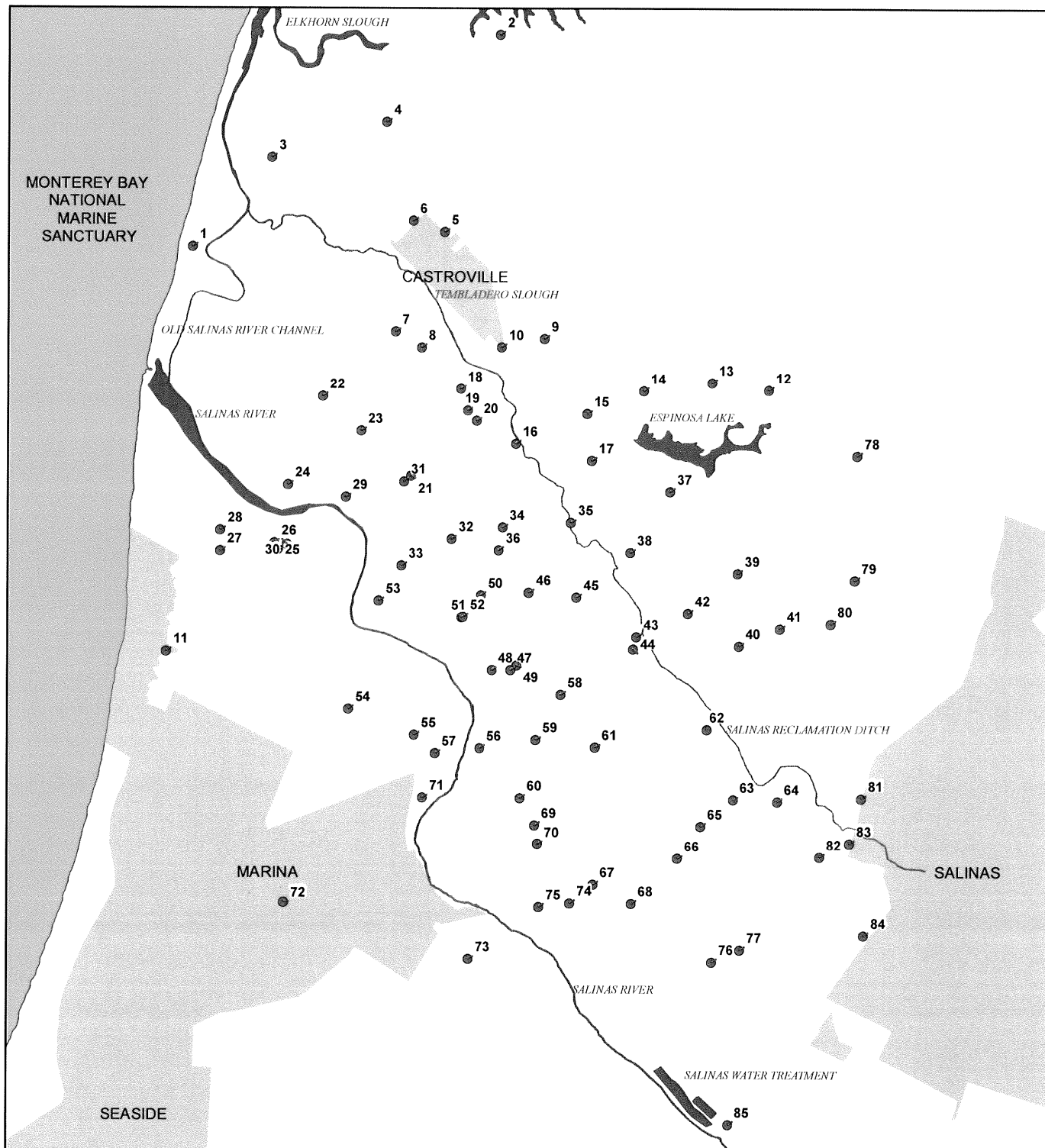
Figure 6



Note: The scale and configuration of all information shown herein are approximate and are not intended as a guide for survey or design work.

Map Date: July 5, 2007





Coastal Ground Water Monitoring Program Wells

Figure 8

Legend:

- Study Well
- Cities
- Water Bodies/ Channels



Note: The scale and configuration of all information shown herein are approximate and are not intended as a guide for survey or design work.

Map Date: July 02, 2007

TABLES

Table 1 COMPLETE MINERAL PANEL ANALYTES

ANALYTE	METHOD	LABORATORY MDL **	LABORATORY PQL	LOWEST CALIB. STD.	PAL
Calcium (Ca)	SM 3111 B ¹	0.02 mg/L	1.0 mg/L	1.0 mg/L	1.0 mg/L
CATION ANION BALANCE	Calculated	--	--	--	--
*Chloride (Cl)	EPA 300.0 ²	0.01 mg/L	1.0 mg/L	0.1 mg/L	1.0 mg/L
*Conductivity (SEC)	SM 2510 B	1 umho/cm @ 25 C	1 umho/cm @ 25 C	N/A	1 umho/cm @ 25 C
Magnesium (Mg)	SM 3111 B	0.005 mg/L ¹	1.0 mg/L	0.1 mg/L	1.0 mg/L
*Nitrate (NO3)	EPA 300.0	0.002 mg/L ²	1.0 mg/L	0.1 mg/L	1.0 mg/L
pH (Laboratory)	SM 4500-H B	pH Units (2 sig figs)	pH Units (2 sig figs)	N/A	pH Units (2 sig figs)
Potassium (K)	SM 3111 B	0.025 mg/L ¹	0.1 mg/L	0.1 mg/L	0.1 mg/L
Sodium (Na)	SM 3111 B	0.03 mg/L ¹	1.0 mg/L	0.1 mg/L	1.0 mg/L
Sulfate (SO4)	EPA 300.0	0.03 mg/L ²	1.0 mg/L	0.1 mg/L	1.0 mg/L
Total Alkalinity (as CaCO3)	SM 2320 B	1.0 mg/L	1.0 mg/L	N/A	1.0 mg/L

¹ = MDL study completed February 2007² = MDL study completed May 2007

* = Partial Mineral Panel analytes

** = These are the laboratory's latest MDLs and supersede the MDLs listed in Appendix D-1.

MDL = method detection limit; PQL = practical quantitative limit; PAL = project action level

All laboratory results are bracketed by calibration standards. No "estimated" results
(below the lowest calib std and above the MDL) are given to the Agency.

Table 2 QUALITY CONTROL REQUIREMENTS FOR LABORATORY ANALYSES

QA PROCEDURE	QA PARAMETER	FREQUENCY	CRITERION	CORRECTIVE ACTION
Field Blank	Field Contamination	1/20 field samples; 5% frequency	<MDL	Recollect sampling event or flag data if unable recollect
Field Duplicate	Field Precision	1/10 field samples for first two events; if criterion is met, then 1/20 field samples	RPD < 25%	Recollect sampling event or flag data if unable recollect
Method Blank	Analytical Contamination	3 per analytical batch	< RL	Reanalyze analytical batch
LCS (CRM)	Accuracy	1 per analytical batch	80-120% REC	Reanalyze analytical batch
Analytical Duplicate	Analytical Precision	1 per analytical batch	RPD < 25%	Reanalyze analytical batch
Matrix Spike	Matrix Interference and Accuracy	1 per analytical batch; at 3-10x the native conc.	75-125% REC	Reanalyze analytical batch
Matrix Spike Duplicate	Precision and Accuracy	1 per analytical batch; at 3-10x the native conc.	RPD <25%	Reanalyze analytical batch
Continuing Calibration	Analytical Control	1 per 10 sample runs	80-120% of initial slope	Reanalyze analytical batch
Assess percent of data successfully collected	Data Completeness	N/A	90%	N/A

MDL=Method Detection Limit; RPD=Relative Percent Difference; RL=Report Limit;

REC=Recovery; LCS=Laboratory Control Sample; CRM=Certified Reference Material

An analytical batch is defined as 20 or fewer samples.

Table 3 LABORATORY DATA QUALITY OBJECTIVES (DQOs)

<i>ANALYTE</i>	<i>METHOD BLANK</i>	<i>LCS (CRM)</i>	<i>ANALYTICAL DUPLICATE</i>	<i>MATRIX SPIKE</i>	<i>MATRIX SPIKE DUPLICATE</i>	<i>CONTINUING CALIBRATION</i>
Calcium (Ca)	yes	yes	yes	yes	yes	yes
Chloride (Cl)	yes	yes	yes	yes	yes	yes
Conductivity (SEC)	yes	yes	yes	no	no	yes
Magnesium (Mg)	yes	yes	yes	yes	yes	yes
Nitrate (NO ₃)	yes	yes	yes	yes	yes	yes
pH (Laboratory)	no	yes	yes	no	no	yes
Potassium (K)	yes	yes	yes	yes	yes	yes
Sodium (Na)	yes	yes	yes	yes	yes	yes
Sulfate (SO ₄)	yes	yes	yes	yes	yes	yes
Total Alkalinity (as CaCO ₃)	yes	yes	yes	no	no	yes

Table 4 SALINAS VALLEY WELLS AND LOCATIONS

STATE WELL NUMBER	AQUIFER	MAP ID	FALSE EASTING ¹	FALSE NORTHING ¹
13S/01E-36J01	PRESSURE 900	1	5741483.0	2170847.00002
13S/02E-20M02	PRESSURE 400	2	5748878.5	2182094.25003
13S/02E-21N01	PRESSURE 400	3	5753018.5	2180456.75002
13S/02E-27L01	PRESSURE 180	4	5759500.0	2175572.50002
13S/02E-27M01	PRESSURE 400	5	5758010.0	2174784.50002
13S/02E-27P01	PRESSURE 400	6	5759593.5	2173660.50002
13S/02E-27Q02	PRESSURE 400	7	5761129.5	2173768.75002
13S/02E-28B01	PRESSURE 400	8	5755624.0	2177900.75002
13S/02E-28E01	PRESSURE 400	9	5752984.0	2176434.75002
13S/02E-29F02	PRESSURE 400	10	5749961.0	2177732.25002
13S/02E-29J01	PRESSURE 400	11	5751657.5	2175604.25002
13S/02E-31A02	PRESSURE 900	12	5746516.5	2173308.00002
13S/02E-31N02	PRESSURE 400	13	5743060.5	2168496.25002
13S/02E-32M02	PRESSURE 900	14	5748673.0	2170965.00002
13S/02E-32N01	PRESSURE 400	15	5747285.0	2169132.75003
13S/02E-33H03	PRESSURE 180	16	5757325.5	2171726.00002
13S/02E-33R01	PRESSURE 180	17	5756359.5	2169699.75003
13S/02E-34M02	PRESSURE 180	18	5757952.0	2169365.25003
13S/02E-34N01	PRESSURE 180	19	5758043.5	2168657.25003
13S/02E-36J01	EAST SIDE BOTH	20	5772057.0	2168257.00002
14S/02E-01A01	EAST SIDE	21	5773736.0	2167596.00002
14S/02E-02E02	PRESSURE 400	22	5763989.0	2166284.00003
14S/02E-03F02	PRESSURE 180	23	5759284.0	2165549.00003
14S/02E-03K02	PRESSURE 400	24	5760546.0	2164390.00002
14S/02E-05F04	PRESSURE 400	25	5749784.5	2166850.50002
14S/02E-05G03	PRESSURE 400	26	5750701.5	2166258.50002
14S/02E-05K01	PRESSURE 400	27	5750303.5	2164892.00002
14S/02E-05P02	PRESSURE 400	28	5749120.0	2163754.25002
14S/02E-06J03	PRESSURE 400	29	5747119.5	2164986.75002
14S/02E-06L01	PRESSURE 900	30	5743826.5	2165438.75002
14S/02E-06R02	PRESSURE 400	31	5746852.5	2163229.50003
14S/02E-07K01	PRESSURE 400	32	5744199.0	2160286.75002
14S/02E-08A01	PRESSURE 400	33	5751818.0	2162226.75002
14S/02E-09D03	PRESSURE 400	34	5753098.5	2162246.50002
14S/02E-09H03	PRESSURE 400	35	5756070.0	2161048.75002

STATE WELL NUMBER	AQUIFER	MAP ID	FALSE EASTING ¹	FALSE NORTHING ¹
14S/02E-09L02	PRESSURE 400	36	5754291.5	2160250.25002
14S/02E-09N01	PRESSURE 400	37	5752950.5	2158867.00003
14S/02E-10C01	PRESSURE 400	38	5759437.0	2162015.75002
14S/02E-10P02	PRESSURE 400	39	5759125.0	2158942.75002
14S/02E-11C01	PRESSURE 180	40	5764471.5	2161959.50002
14S/02E-11D01	PRESSURE 180	41	5764508.5	2161568.25002
14S/02E-12B01	PRESSURE 400	42	5771184.5	2161614.00002
14S/02E-12L02	PRESSURE 400	43	5770434.5	2159815.50002
14S/02E-12Q01	PRESSURE 400	44	5771537.0	2157088.75002
14S/02E-13B02	PRESSURE 180	45	5771526.0	2157219.75003
14S/02E-13D01	PRESSURE 180	46	5769699.5	2156883.75002
14S/02E-14B01	PRESSURE 180	47	5766275.0	2156434.00002
14S/02E-14N03	PRESSURE 400	48	5763230.0	2152205.50003
14S/02E-14R01	PRESSURE 180	49	5767842.5	2153580.50002
14S/02E-15B01	PRESSURE 400	50	5760275.5	2156533.25002
14S/02E-17B02	PRESSURE 400	51	5749990.5	2156598.25002
14S/02E-17C01	PRESSURE 180	52	5747844.0	2157381.75003
14S/02E-18A01	PRESSURE 400	53	5746233.0	2156686.25002
14S/02E-18C01	PRESSURE 400	54	5743827.5	2156787.25002
14S/02E-20B01	PRESSURE 180	55	5750165.5	2151711.75003
14S/02E-20B02	PRESSURE 180	56	5750001.0	2151554.75003
14S/02E-21F02	PRESSURE 180	57	5754169.5	2151251.50002
14S/02E-22H01	PRESSURE 400	58	5761690.5	2150902.75002
14S/02E-22H02	PRESSURE 180	59	5762674.0	2149777.00002
14S/02E-23A01	PRESSURE 180	60	5767130.0	2151399.50002
14S/02E-23F01	PRESSURE 180	61	5764570.5	2149971.00002
14S/02E-23L03	PRESSURE 400	62	5765164.5	2149382.00002
14S/02E-25D03	PRESSURE 400	63	5768753.5	2146325.50002
14S/02E-27K01	PRESSURE 180	64	5760536.0	2144212.25002
14S/02E-28H02	PRESSURE 180	65	5756940.5	2145354.75002
14S/02E-34A03	PRESSURE 400	66	5762394.5	2141097.75002
14S/02E-35L02	PRESSURE 400	67	5764879.0	2137944.25002
14S/02E-36H01	PRESSURE 180	68	5773015.5	2139158.50003
14S/02E-36J02	PRESSURE 400	69	5772268.5	2137939.00002
14S/02E-36R02	PRESSURE 400	70	5772326.5	2136698.50002
14S/03E-02E03	EAST SIDE BOTH	71	5794727.5	2165742.50002
14S/03E-03K01	EAST SIDE BOTH	72	5791884.0	2164011.25002

STATE WELL NUMBER	AQUIFER	MAP ID	FALSE EASTING ¹	FALSE NORTHING ¹
14S/03E-04E01	EAST SIDE BOTH	73	5784479.5	2164809.75002
14S/03E-05B02	EAST SIDE BOTH	74	5781839.5	2165837.25002
14S/03E-06L01	EAST SIDE SHALLOW	75	5775895.0	2163924.50003
14S/03E-08C01	EAST SIDE BOTH	76	5781050.5	2162072.25002
14S/03E-10F02	EAST SIDE	77	5791569.0	2159330.50002
14S/03E-10F03	EAST SIDE BOTH	78	5791236.5	2159578.00002
14S/03E-10P01	EAST SIDE	79	5791544.0	2157558.25002
14S/03E-10R02	EAST SIDE BOTH	80	5794251.5	2157151.00002
14S/03E-11H01	EAST SIDE SHALLOW	81	5798504.0	2159823.00002
14S/03E-12E01	EAST SIDE SHALLOW	82	5800865.5	2160009.25003
14S/03E-12E02	EAST SIDE	83	5800608.5	2160173.25003
14S/03E-14D01	EAST SIDE SHALLOW	84	5795697.5	2155748.25003
14S/03E-15H03	EAST SIDE BOTH	85	5793222.5	2154777.00002
14S/03E-16K03	EAST SIDE	86	5787748.0	2152845.50003
14S/03E-17D01	EAST SIDE	87	5779979.0	2156594.00002
14S/03E-20D01	PRESSURE 400	88	5779540.0	2150357.75002
14S/03E-24H01	EAST SIDE SHALLOW	89	5803951.0	2147934.50002
14S/03E-24N01	EAST SIDE	90	5801060.0	2146002.50002
14S/03E-25L02	EAST SIDE BOTH	91	5801508.5	2141975.75002
14S/03E-28B02	PRESSURE 400	92	5786919.0	2145249.50002
14S/03E-28F02	PRESSURE 400	93	5786200.6	2144963.98574
14S/03E-29L04	PRESSURE 180	94	5780547.4	2143125.21920
14S/03E-30E01	PRESSURE 180	95	5773899.5	2144670.25003
14S/03E-30F02	PRESSURE 180	96	5775180.5	2144268.50002
14S/03E-30N01	PRESSURE 180	97	5774083.5	2141696.50002
14S/03E-31F01	PRESSURE 180	98	5775271.5	2138346.50003
14S/03E-31F02	PRESSURE 400	99	5775228.5	2138492.00002
14S/03E-36A01	EAST SIDE SHALLOW	100	5803921.0	2140085.50002
14S/04E-30N01	EAST SIDE BOTH	101	5804847.5	2142132.00001
15S/02E-01A03	PRESSURE 400	102	5772482.0	2134724.00002
15S/02E-01K01	PRESSURE 180	103	5770291.5	2131514.75002
15S/02E-02G01	PRESSURE 400	104	5765615.0	2134401.50002
15S/02E-12A01	PRESSURE 400	105	5772051.5	2129878.50002
15S/02E-12R01	PRESSURE 400	106	5772057.5	2126203.25003
15S/03E-01L01	EAST SIDE	107	5801038.5	2132896.75002
15S/03E-04K03	PRESSURE 400	108	5785732.5	2131172.00002
15S/03E-04N03	PRESSURE 400	109	5783621.0	2130577.75002

STATE WELL NUMBER	AQUIFER	MAP ID	FALSE EASTING ¹	FALSE NORTHING ¹
15S/03E-05N01	PRESSURE 180	110	5778619.0	2130164.00003
15S/03E-06A03	PRESSURE 180	111	5777613.0	2135010.00002
15S/03E-06D02	PRESSURE 400	112	5773392.0	2135175.75002
15S/03E-06F02	PRESSURE 400	113	5774781.5	2132857.75002
15S/03E-06K01	PRESSURE 400	114	5776302.5	2131605.50002
15S/03E-07D02	PRESSURE 400	115	5772729.0	2130304.25002
15S/03E-07G01	PRESSURE 400	116	5775356.0	2127909.75002
15S/03E-07N01	PRESSURE 180	117	5772911.5	2126430.50002
15S/03E-08B04	PRESSURE 400	118	5780790.5	2128738.25002
15S/03E-08C06	PRESSURE 180	119	5780025.5	2129640.75003
15S/03E-08C07	PRESSURE 400	120	5780124.5	2129385.50002
15S/03E-08F07	PRESSURE 400	121	5779786.0	2128096.50002
15S/03E-08N03	PRESSURE 400	122	5778859.5	2125760.50002
15S/03E-09B01	PRESSURE 180	123	5787613.5	2129526.50003
15S/03E-09C01	PRESSURE 180	124	5785912.0	2130387.75002
15S/03E-09H02	PRESSURE 180	125	5788543.5	2128841.50003
15S/03E-09K04	PRESSURE 400	126	5786815.0	2126625.50003
15S/03E-10P01	PRESSURE 180	127	5789973.0	2124641.25002
15S/03E-10P03	PRESSURE 180	128	5790992.5	2124075.25002
15S/03E-10R02	PRESSURE 180	129	5793537.5	2125764.25002
15S/03E-12E02	EAST SIDE BOTH	130	5799472.0	2128349.25000
15S/03E-13J02	EAST SIDE	131	5804170.5	2121482.50002
15S/03E-13N01	PRESSURE 180	132	5799834.5	2120075.00003
15S/03E-14C01	PRESSURE 180	133	5796323.5	2123063.75002
15S/03E-14G01	PRESSURE 180	134	5796738.0	2122656.50003
15S/03E-14H01	PRESSURE 180	135	5797941.0	2122606.00002
15S/03E-15B01	PRESSURE 400	136	5792336.0	2124219.00002
15S/03E-15L02	PRESSURE 180	137	5790177.0	2121393.00002
15S/03E-16B03	PRESSURE 400	138	5786481.0	2123545.50002
15S/03E-16M01	PRESSURE 180	139	5783233.5	2121388.25002
15S/03E-17B01	PRESSURE 180	140	5781259.5	2123911.75003
15S/03E-17B02	PRESSURE 180	141	5781099.5	2123757.50002
15S/03E-17G01	PRESSURE 180	142	5780630.0	2122750.25002
15S/03E-18B01	PRESSURE 180	143	5776074.5	2124737.50002
15S/03E-21A01	PRESSURE 180	144	5787617.0	2118056.00002
15S/03E-22F02	PRESSURE 180	145	5789756.5	2117099.00002
15S/03E-22G01	PRESSURE 180	146	5791343.0	2116241.25002

STATE WELL NUMBER	AQUIFER	MAP ID	FALSE EASTING ¹	FALSE NORTHING ¹
15S/03E-25L01	PRESSURE 180	147	5800408.5	2109728.50003
15S/03E-26A01	PRESSURE 400	148	5797857.5	2112518.00002
15S/03E-26D01	PRESSURE 180	149	5794548.5	2112893.75003
15S/03E-26H02	PRESSURE 180	150	5797573.5	2111904.75002
15S/03E-26P01	PRESSURE 400	151	5795686.5	2108925.25002
15S/03E-27J01	PRESSURE 400	152	5792207.5	2110413.00002
15S/03E-28B02	PRESSURE 400	153	5787075.5	2113993.25002
15S/03E-28G01	PRESSURE 180	154	5786358.0	2111546.50003
15S/03E-35B05	PRESSURE 180	155	5797153.0	2107813.50003
15S/04E-05K01	EAST SIDE	156	5812585.0	2130171.00001
15S/04E-05M01	EAST SIDE BOTH	157	5810608.5	2130920.50001
15S/04E-06D04	EAST SIDE BOTH	158	5805535.0	2134296.75001
15S/04E-06R01	EAST SIDE BOTH	159	5808832.0	2130397.50001
15S/04E-07A01	EAST SIDE BOTH	160	5808667.0	2128112.25001
15S/04E-07E02	EAST SIDE	161	5805290.0	2126918.25001
15S/04E-07R01	EAST SIDE SHALLOW	162	5809617.5	2124497.75001
15S/04E-08C01	EAST SIDE SHALLOW	163	5811226.0	2128961.75001
15S/04E-08L01	EAST SIDE BOTH	164	5812038.0	2125163.50001
15S/04E-08N01	EAST SIDE BOTH	165	5810237.5	2124086.00001
15S/04E-09N01	EAST SIDE	166	5815679.0	2123673.25001
15S/04E-15D02	EAST SIDE SHALLOW	167	5820525.5	2122131.50001
15S/04E-15P02	EAST SIDE BOTH	168	5822591.0	2118164.75001
15S/04E-16D01	EAST SIDE BOTH	169	5816370.5	2122604.00001
15S/04E-17B01	EAST SIDE	170	5813674.5	2122802.00001
15S/04E-17P02	EAST SIDE SHALLOW	171	5811444.0	2119748.75001
15S/04E-18L01	EAST SIDE	172	5806258.0	2120249.25001
15S/04E-19D02	PRESSURE 400	173	5805231.0	2118084.25001
15S/04E-19H03	EAST SIDE	174	5808765.0	2116311.75003
15S/04E-20B02	EAST SIDE SHALLOW	175	5812893.0	2117437.00001
15S/04E-20N01	PRESSURE 400	176	5810999.0	2113437.25001
15S/04E-20Q01	EAST SIDE	177	5813019.5	2113916.75003
15S/04E-22J01	EAST SIDE	178	5825620.5	2114797.50001
15S/04E-22L02	EAST SIDE BOTH	179	5822626.0	2115130.25001
15S/04E-23M01	EAST SIDE	180	5826800.0	2115510.00001
15S/04E-26G01	EAST SIDE	181	5829452.0	2110273.75001
15S/04E-27G01	EAST SIDE BOTH	182	5824082.0	2110658.00001
15S/04E-28C01	EAST SIDE	183	5817013.0	2112539.50001

STATE WELL NUMBER	AQUIFER	MAP ID	FALSE EASTING ¹	FALSE NORTHING ¹
15S/04E-28C01	EAST SIDE	184*	*	*
15S/04E-29K03	EAST SIDE	185*	*	*
15S/04E-32E01	PRESSURE 180	186	5809573.0	2105524.75003
15S/04E-36H01	EAST SIDE BOTH	187	5835591.5	2105235.00001
15S/04E-36R02	EAST SIDE BOTH	188	5836592.5	2101652.75001
16S/04E-01L02	EAST SIDE	189	5833261.5	2096387.25003
16S/04E-04C01	PRESSURE 400	190	5816563.5	2101653.00001
16S/04E-08J01	PRESSURE 180	191	5814399.5	2094772.87501
16S/04E-09A01	PRESSURE 180	192	5818962.5	2096385.75001
16S/04E-10K01	PRESSURE 400	193	5822871.5	2093933.87501
16S/04E-10R02	PRESSURE 400	194	5824891.5	2092808.00001
16S/04E-11E02	PRESSURE 400	195	5825734.0	2093587.12501
16S/04E-12M01	PRESSURE 400	196	5830110.0	2094179.62501
16S/04E-13D01	PRESSURE 400	197	5829977.5	2091400.75001
16S/04E-14M01	PRESSURE 400	198	5826507.0	2089158.00001
16S/04E-14M02	PRESSURE 400	199	5826934.0	2088314.12501
16S/04E-15D01	PRESSURE 180	200	5820915.5	2091029.00003
16S/04E-15H02	PRESSURE 400	201	5824314.0	2089470.00001
16S/04E-24R01	PRESSURE 400	202	5833826.5	2081330.00003
16S/04E-25A01	PRESSURE 400	203	5834115.0	2080854.00001
16S/04E-25K01	PRESSURE 180	204	5832503.0	2077482.12501
16S/04E-25Q01	PRESSURE 400	205	5832125.5	2076199.75001
16S/04E-27G01	PRESSURE 180	206	5823057.0	2078926.75001
16S/04E-36B01	PRESSURE 180	207	5833029.5	2074811.87501
16S/05E-07G01	EAST SIDE BOTH	208	5836648.0	2094674.00003
16S/05E-17P01	EAST SIDE BOTH	209	5843361.0	2086999.12503
16S/05E-17R01	EAST SIDE SHALLOW	210	5845212.0	2087024.25003
16S/05E-19F01	PRESSURE 180	211	5836477.0	2084158.37503
16S/05E-19R01	PRESSURE 180	212	5840423.0	2081360.37503
16S/05E-20C01	EAST SIDE	213	5843125.0	2085585.12503
16S/05E-20H01	EAST SIDE	214	5845691.0	2085074.25003
16S/05E-20R01	EAST SIDE BOTH	215	5845834.0	2082220.00003
16S/05E-27G01	EAST SIDE	216	5853466.8	2077678.05320
16S/05E-28D01	EAST SIDE BOTH	217	5846865.0	2080272.25003
16S/05E-28P01	EAST SIDE BOTH	218	5847355.5	2077784.37503
16S/05E-30C01	PRESSURE 180	219	5836401.5	2080129.50003
16S/05E-30G01	PRESSURE 180	220	5837912.0	2078876.87503

STATE WELL NUMBER	AQUIFER	MAP ID	FALSE EASTING ¹	FALSE NORTHING ¹
16S/05E-30J02	PRESSURE 400	221	5840526.5	2077512.50003
16S/05E-31A01	PRESSURE 180	222	5838804.0	2075067.12503
16S/05E-31Q01	PRESSURE 180	223	5837656.0	2070857.75003
16S/05E-32C01	PRESSURE 180	224	5843159.0	2075228.62503
16S/05E-32M01	FOREBAY	225	5840439.0	2072879.00003
16S/05E-33F01	FOREBAY	226	5847064.0	2072544.75003
16S/05E-33Q01	FOREBAY	227	5846731.0	2071679.00003
16S/05E-35C01	FOREBAY	228	5857923.0	2074215.75003
16S/05E-35L01	FOREBAY	229	5857341.0	2072381.25003
17S/04E-01D01	PRESSURE 180	230	5829970.4	2070190.88233
17S/05E-01R01	FOREBAY	231	5863270.5	2064114.75003
17S/05E-02G01	FOREBAY	232	5858061.5	2067655.75001
17S/05E-03B01	FOREBAY	233	5852910.5	2069821.37503
17S/05E-04C01	FOREBAY	234	5846947.5	2068985.25003
17S/05E-04K01	FOREBAY	235	5847433.5	2066928.37503
17S/05E-04N01	FOREBAY	236	5844523.0	2064819.50003
17S/05E-06Q01	FOREBAY	237	5837274.0	2065350.12503
17S/05E-09G01	FOREBAY	238	5846689.0	2062431.75003
17S/05E-09Q01	FOREBAY	239	5846868.5	2059437.25003
17S/05E-10Q01	FOREBAY	240	5853142.5	2060133.00003
17S/05E-12B01	FOREBAY	241	5864362.0	2062470.37503
17S/05E-12B02	FOREBAY	242	5863570.5	2063023.50003
17S/05E-12B03	FOREBAY	243	5862636.0	2063300.00003
17S/05E-13L02	FOREBAY	244	5861995.0	2054065.12503
17S/05E-14D01	FOREBAY	245	5855476.7	2057512.98904
17S/05E-14G01	FOREBAY	246	5858431.5	2057156.87503
17S/05E-21A01	FOREBAY	247	5847203.9	2053734.78530
17S/05E-23L01	FOREBAY	248	5855276.5	2049667.00003
17S/05E-25L01	FOREBAY	249	5861282.5	2044709.87503
17S/05E-36F02	FOREBAY	250	5861156.5	2040988.13679
17S/06E-16N01	FOREBAY	251	5876658.0	2053579.37503
17S/06E-17R01	FOREBAY	252	5875370.0	2053960.00003
17S/06E-19D01	FOREBAY	253	5865512.0	2052870.75003
17S/06E-20K01	FOREBAY	254	5874270.5	2050202.50003
17S/06E-20Q02	FOREBAY	255	5873861.0	2049734.12503
17S/06E-20Q03	FOREBAY	256	5873624.0	2049413.37503
17S/06E-27E03	FOREBAY	257	5881725.5	2046512.12503

STATE WELL NUMBER	AQUIFER	MAP ID	FALSE EASTING ¹	FALSE NORTHING ¹
17S/06E-27K01	FOREBAY	258	5884526.5	2044144.50003
17S/06E-27L01	FOREBAY	259	5883319.0	2044534.62503
17S/06E-28N01	FOREBAY	260	5876603.5	2042971.37503
17S/06E-29C01	FOREBAY	261	5871659.0	2048323.00003
17S/06E-29K01	FOREBAY	262	5873377.5	2045490.50003
17S/06E-29Q01	FOREBAY	263	5873361.0	2045274.25003
17S/06E-30F01	FOREBAY	264	5866434.0	2047190.00003
17S/06E-32G01	FOREBAY	265	5873481.5	2040947.12503
17S/06E-32J02	FOREBAY	266	5874264.0	2039466.50003
17S/06E-35F01	FOREBAY	267	5888535.0	2040776.00003
17S/06E-35J01	FOREBAY	268	5890370.5	2039573.75003
18S/06E-01E01	FOREBAY	269	5892201.0	2033873.12503
18S/06E-02N01	FOREBAY	270	5886656.0	2032336.12503
18S/06E-02R01	FOREBAY	271	5890070.0	2032210.75003
18S/06E-03P01	FOREBAY	272	5881836.0	2032629.37503
18S/06E-05H01	FOREBAY	273	5874765.0	2035980.12503
18S/06E-07A01	FOREBAY	274	5868250.5	2031805.25003
18S/06E-08R01	FOREBAY	275	5873246.0	2027074.87503
18S/06E-09M02	FOREBAY	276	5875856.5	2028751.00003
18S/06E-11J01	FOREBAY	277	5890622.5	2027590.87503
18S/06E-12A01	FOREBAY	278	5896424.0	2030093.87503
18S/06E-12R02	FOREBAY	279	5895096.5	2026768.25003
18S/06E-14B01	FOREBAY	280	5888379.5	2025469.87503
18S/06E-14R01	FOREBAY	281	5890625.0	2022391.37503
18S/06E-15F01	FOREBAY	282	5882187.0	2023781.12503
18S/06E-15M01	FOREBAY	283	5880584.0	2022838.50003
18S/06E-16L01	FOREBAY	284	5876773.5	2023478.50003
18S/06E-21Q01	FOREBAY	285	5878665.0	2016542.37503
18S/06E-25F01	FOREBAY	286	5891762.0	2013188.12503
18S/06E-26R01	FOREBAY	287	5890408.5	2011271.25003
18S/06E-27A01	FOREBAY	288	5883864.0	2015914.75003
18S/06E-28J01	FOREBAY	289	5879251.0	2013091.87503
18S/06E-34B01	FOREBAY	290	5882838.0	2010128.37503
18S/07E-18K01	FOREBAY	291	5899619.5	2023322.62503
18S/07E-18P01	FOREBAY	292	5897367.5	2022162.75003
18S/07E-19G02	FOREBAY	293	5899561.5	2019657.12503
18S/07E-19N01	FOREBAY	294	5896875.0	2016213.75002

STATE WELL NUMBER	AQUIFER	MAP ID	FALSE EASTING ¹	FALSE NORTHING ¹
18S/07E-20K01	FOREBAY	295	5903526.5	2016596.50003
18S/07E-28K01	FOREBAY	296	5909064.5	2012996.12503
18S/07E-28N02	FOREBAY	297	5906995.5	2011573.25003
18S/07E-29J01	FOREBAY	298	5906172.5	2012704.50003
18S/07E-29M01	FOREBAY	299	5901432.0	2012790.87503
18S/07E-32G02	FOREBAY	300	5905129.0	2008896.37503
18S/07E-34P02	FOREBAY	301	5913853.5	2006429.50003
19S/06E-01H01	FOREBAY	302	5894418.0	2003322.50003
19S/06E-03E02	FOREBAY	303	5880577.0	2003637.62503
19S/06E-03K01	FOREBAY	304	5882172.5	2003068.00003
19S/06E-11C01	FOREBAY	305	5887118.5	1999053.25003
19S/06E-12A01	FOREBAY	306	5895441.5	1999532.50003
19S/07E-03H02	UPPER VALLEY	307	5916058.0	2002263.25003
19S/07E-04G01	FOREBAY	308	5908976.0	2002192.50003
19S/07E-04Q01	FOREBAY	309	5907241.5	2000938.12503
19S/07E-05B02	FOREBAY	310	5903922.5	2005128.00003
19S/07E-10P02	UPPER VALLEY	311	5914112.0	1994937.37503
19S/07E-13D01	UPPER VALLEY	312	5923060.5	1993005.87503
19S/07E-13D02	UPPER VALLEY	313	5922703.0	1993016.87503
19S/07E-13D03	UPPER VALLEY	314	5921177.5	1994464.25003
19S/07E-16D01	UPPER VALLEY	315	5907215.0	1993447.25003
19S/07E-20A01	UPPER VALLEY	316	5904728.0	1988737.75003
19S/07E-20A02	UPPER VALLEY	317	5905140.0	1988780.50003
19S/07E-23F01	UPPER VALLEY	318	5917918.5	1986682.87503
19S/07E-23G01	UPPER VALLEY	319	5919819.5	1985678.50003
19S/07E-24H02	UPPER VALLEY	320	5927076.5	1985899.12503
19S/07E-36N01	UPPER VALLEY	321	5921376.0	1974705.75003
19S/08E-30A01	UPPER VALLEY	322	5931268.5	1981945.62503
20S/08E-05C02	UPPER VALLEY	323	5933968.0	1972500.37503
20S/08E-05R03	UPPER VALLEY	324	5935855.5	1968133.00003
20S/08E-06B01	UPPER VALLEY	325	5929631.0	1971657.50003
20S/08E-07E01	UPPER VALLEY	326	5927847.5	1965744.25003
20S/08E-15H03	UPPER VALLEY	327	5946414.0	1959720.37503
20S/08E-16C01	UPPER VALLEY	328	5938055.0	1961243.37501
20S/08E-17K03	UPPER VALLEY	329	5934573.0	1958618.62503
20S/08E-34G01	UPPER VALLEY	330	5944061.5	1944379.50003
20S/08E-36R01	UPPER VALLEY	331	5957517.0	1941628.62503

STATE WELL NUMBER	AQUIFER	MAP ID	FALSE EASTING ¹	FALSE NORTHING ¹
21S/08E-15J01	UPPER VALLEY	332	5946267.0	1926489.62503
21S/09E-06C01	UPPER VALLEY	333	5959365.5	1939884.62503
21S/09E-16E02	UPPER VALLEY	334	5967913.5	1928310.37503
21S/09E-22J01	UPPER VALLEY	335	5976378.5	1921774.75003
21S/09E-24Q01	UPPER VALLEY	336	5985537.5	1920320.00003
21S/10E-30E02	UPPER VALLEY	337	5988110.5	1916891.25003
21S/10E-32N01	UPPER VALLEY	338	5993930.5	1907839.00003
22S/10E-09P01	UPPER VALLEY	339	6000619.0	1897117.87503
22S/10E-16P01	UPPER VALLEY	340	6000072.0	1892154.87503
22S/10E-21C01	UPPER VALLEY	341	6001268.5	1890089.75003
22S/10E-22N01	UPPER VALLEY	342	6004921.0	1886561.87503
22S/10E-28B01	UPPER VALLEY	343	6001816.0	1886849.25003
22S/10E-34G01	UPPER VALLEY	344	6007012.0	1879185.87503

¹ State Plane Coordinate System, California Zone IV, Feet, North American Datum 1983

*Coordinates to be collected

Table 5 COASTAL WELLS AND LOCATIONS

STATE WELL NUMBER	AQUIFER	MAP ID	FALSE EASTING ¹	FALSE NORTHING ¹
13S/01E-25R01	PRESSURE 900	1	5742345.5	2174687.00002
13S/02E-15M01	PRUNEDALE	2	5757881.5	2185405.50002
13S/02E-19Q03	PRESSURE 900	3	5746313.5	2179184.50002
13S/02E-20J01	PRESSURE 400	4	5752096.0	2180981.25002
13S/02E-28L02	PRESSURE BOTH	5	5755055.5	2175441.75002
13S/02E-28M02	PRESSURE 400	6	5753447.0	2175997.50002
13S/02E-32J03	PRESSURE 400	7	5752560.0	2170401.75002
13S/02E-33N04	PRESSURE 400	8	5753898.0	2169605.00002
13S/02E-34G01	PRESSURE 400	9	5760129.5	2170052.25002
13S/02E-34M01	PRESSURE 400	10	5757997.5	2169621.75002
14S/01E-13J02	PRESSURE 400	11	5741048.0	2154289.50002
14S/02E-01C01	EASTSIDE DEEP	12	5771477.5	2167454.25002
14S/02E-02A02	EASTSIDE DEEP	13	5768561.0	2167823.50002
14S/02E-02C03	PRESSURE 400	14	5765109.0	2167416.00002
14S/02E-03H01	PRESSURE 400	15	5762283.0	2166255.50002
14S/02E-03M02	PRESSURE 400	16	5758710.5	2164740.50002
14S/02E-03R02	PRESSURE 400	17	5762517.0	2163892.75002
14S/02E-04B01	PRESSURE 400	18	5755909.0	2167499.00002
14S/02E-04G02	PRESSURE 400	19	5756262.0	2166403.75002
14S/02E-04H01	PRESSURE 400	20	5756715.0	2165886.25002
14S/02E-04N03	PRESSURE 400	21	5753365.0	2163112.75002
14S/02E-05C03	PRESSURE 400	22	5748893.5	2167132.50002
14S/02E-05K02	PRESSURE 400	23	5750829.0	2165370.75002
14S/02E-07A01	PRESSURE 400	24	5747142.5	2162655.25002
14S/02E-07J02	PRESSURE 400	25	5746655.0	2159408.25002
14S/02E-07J03	PRESSURE DEEP ZONE	26	5746476.9	2159735.06998
14S/02E-07L04	PRESSURE 400	27	5743780.0	2159328.00002
14S/02E-07L05	PRESSURE 400	28	5743784.5	2160380.50002
14S/02E-08C03	PRESSURE 400	29	5750055.0	2162036.75002
14S/02E-08M02	PRESSURE 400	30	5747103.0	2159672.50002
14S/02E-09D04	PRESSURE 400	31	5753016.5	2162818.75002
14S/02E-09K02	PRESSURE 400	32	5755450.0	2159946.25002
14S/02E-09N02	PRESSURE 400	33	5752897.5	2158609.50002
14S/02E-10E02	PRESSURE 400	34	5758062.0	2160525.75002
14S/02E-10H01	PRESSURE 400	35	5761492.0	2160761.75002

STATE WELL NUMBER	AQUIFER	MAP ID	FALSE EASTING ¹	FALSE NORTHING ¹
14S/02E-10M02	PRESSURE 400	36	5757853.5	2159387.75002
14S/02E-11B01	PRESSURE 400	37	5766446.0	2162325.25002
14S/02E-11M03	PRESSURE 400	38	5764448.5	2159266.75002
14S/02E-12N02	PRESSURE 180	39	5769893.5	2158219.50002
14S/02E-13F01	PRESSURE 180	40	5769952.5	2154587.75002
14S/02E-13G01	PRESSURE 400	41	5772057.5	2155470.50002
14S/02E-14A01	PRESSURE 400	42	5767367.0	2156210.25002
14S/02E-14L02	PRESSURE 180	43	5764775.5	2155024.75003
14S/02E-14L03	PRESSURE 400	44	5764610.5	2154419.75002
14S/02E-15A01	PRESSURE 400	45	5761774.5	2157015.50002
14S/02E-15C02	PRESSURE 400	46	5759385.5	2157259.00002
14S/02E-15L02	PRESSURE 180	47	5758452.0	2153366.00003
14S/02E-15N01	PRESSURE 400	48	5757522.5	2153353.25002
14S/02E-15P01	PRESSURE 400	49	5758767.5	2153584.50002
14S/02E-16A02	PRESSURE 400	50	5756957.5	2157123.50002
14S/02E-16G01	PRESSURE 400	51	5755957.0	2155999.50002
14S/02E-16H01	PRESSURE 400	52	5756041.0	2156035.25002
14S/02E-17A02	PRESSURE 400	53	5751744.5	2156837.50002
14S/02E-20B03	PRESSURE 900	54	5750210.5	2151407.25003
14S/02E-21E01	PRESSURE 400	55	5753561.0	2150101.50003
14S/02E-21J01	PRESSURE 180	56	5756896.0	2149447.75002
14S/02E-21L01	PRESSURE 180	57	5754605.0	2149175.75002
14S/02E-22B01	PRESSURE 400	58	5760986.0	2152124.75002
14S/02E-22L01	PRESSURE 400	59	5759725.0	2149855.00002
14S/02E-22P02	PRESSURE 180	60	5758952.5	2146937.25002
14S/02E-23M01	PRESSURE 180	61	5762708.0	2149478.75002
14S/02E-24E01	PRESSURE 180	62	5768326.5	2150393.25002
14S/02E-24P02	PRESSURE 400	63	5769670.0	2146858.75002
14S/02E-24Q01	PRESSURE 180	64	5771942.5	2146772.50003
14S/02E-25D04	PRESSURE 180	65	5768019.0	2145519.50003
14S/02E-26J03	PRESSURE 400	66	5766847.5	2143883.00002
14S/02E-26N03	PRESSURE 180	67	5762617.0	2142567.75002
14S/02E-26P01	PRESSURE 180	68	5764519.0	2141615.00003
14S/02E-27C02	PRESSURE 400	69	5759686.0	2145562.00002
14S/02E-27F02	PRESSURE 180	70	5759825.0	2144647.75002
14S/02E-28C01	PRESSURE 400	71	5753983.5	2146953.50002
14S/02E-32D06	PRESSURE 180	72	5746981.0	2141653.75003

STATE WELL NUMBER	AQUIFER	MAP ID	FALSE EASTING ¹	FALSE NORTHING ¹
14S/02E-33P01	PRESSURE BOTH	73	5756348.0	2138806.75003
14S/02E-34A04	PRESSURE 180	74	5761465.0	2141623.00002
14S/02E-34B03	PRESSURE 180	75	5759909.5	2141431.00002
14S/02E-36E01	PRESSURE 180	76	5768600.0	2138685.00002
14S/02E-36G01	PRESSURE 400	77	5770039.0	2139297.50002
14S/03E-06L02	EASTSIDE DEEP	78	5775957.0	2164155.50002
14S/03E-07P02	EASTSIDE SHALLOW	79	5775832.0	2157899.00003
14S/03E-18E02	PRESSURE 400	80	5774633.5	2155704.50003
14S/03E-19Q02	PRESSURE 180	81	5776192.0	2146948.50002
14S/03E-30E03	PRESSURE 400	82	5774081.0	2143975.75002
14S/03E-30F01	PRESSURE 180	83	5775609.5	2144673.00002
14S/03E-31B01	PRESSURE 180	84	5776312.0	2140030.50002
15S/02E-12C01	PRESSURE 180	85	5769441.0	2130513.75002

¹ State Plane Coordinate System, California Zone IV, Feet, North American Datum 1983

Table 6 REQUIREMENTS FOR SAMPLE COLLECTION¹

ANALYTE	CONTAINER TYPE	SAMPLE VOLUME	PRESERVATIVE	HOLDING TIME
Calcium (Ca)	polyethylene (HDPE ²)	200 mL ³	HNO ₃ pH<2	3 days w/o pres. 6 months w/ pres.
CATION ANION BALANCE ⁴	N/A Calculation	N/A Calculation	N/A Calculation	N/A Calculation
Chloride (Cl) ⁵	polyethylene (HDPE ¹)	100 mL ²	4±2°C	28 days
Conductivity (SEC) ⁵	polyethylene (HDPE ¹)	100 mL ²	4±2°C	28 days
Magnesium (Mg)	polyethylene (HDPE ¹)	200 mL ²	HNO ₃ pH<2	3 days w/o pres. 6 months w/ pres.
Nitrate (NO ₃) ⁵	polyethylene (HDPE ¹)	100 mL ²	none HSO ₄ ; pH<2	48 hours at 4° C 28 days
pH (Laboratory)	polyethylene (HDPE ¹)	30 mL ²	none	48 hours at 4° C
Potassium (K)	polyethylene (HDPE ¹)	200 mL ²	HNO ₃ pH<2	3 days w/o pres. 6 months w/ pres.
Sodium (Na)	polyethylene (HDPE ¹)	200 mL ²	HNO ₃ pH<2	3 days w/o pres. 6 months w/ pres.
Sulfate (SO ₄)	polyethylene (HDPE ¹)	100 mL ²	4±2°C	28 days
Total Alkalinity (as CaCO ₃)	polyethylene (HDPE ¹)	100 mL ²	4±2°C	14 days

¹ = CCL QA Manual and SOPs

² = High Density Polyethylene

³ = only one 0.5 gal (~2L) container is needed for all analyses

⁴ = Cation anion balance is a calculation

⁵ = Analytes in partial mineral panel, one pint (~500 mL) container is need for analyses

APPENDICES

APPENDIX A

GLOBAL POSITIONING SYSTEM (GPS) TRAINING

Appendix A-1: GPS Training Record

Appendix A-2: TSC1 Asset Surveyor Manual

Appendix A-3: Pro XR/XRS Receiver Manual

Geographic Positioning System (GPS) Training Record

Name of Trainee

Name of Trainer

Date of Training

	Satisfactory Completion / Understanding
Verification of access to Pathfinder Office software	
Preparation of data dictionary	
Set-up of equipment	
Trimble® TSC1 Asset Surveyor ¹	
Trimble® Pro XR Receiver ¹	
Connector cables	
Batteries (Asset Surveyor and Receiver)	
Confirmation of communication between Asset Surveyor and Receiver	
Acquiring satellites	
Setting up and checking critical settings	
-logging intervals	
-PDOP mask ²	
Proper packing and unpacking of equipment	
Transferring data files from Asset Surveyor to the computer	

¹ The Agency uses Trimble® products, the GPS industry standard.

² PDOP = Position Dilution Of Precision

TSC1 Asset Surveyor

Operation Manual



 **Trimble**
ADDING VALUE TO GPS



TSC1 Asset Surveyor

Operation Manual

Part Number 34182-05-ENG

Version 5.00

October 1999

Revision A

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1 Quick Setup

The instructions in this chapter are a simplified version of the various steps found in Chapters 4, 5, and 6 of this manual. The purpose of the simplified version is to provide quick setup guides with reasonable default values that can be distributed to field crews to ensure proper setup of rover or base station receivers.

Data is logged to the TSC1 with the Asset Surveyor software. For full details on configuration and data collection, refer to the *TSC1 Asset Surveyor Software User Guide*.



Note – The steps outlined in this chapter do not include steps required to collect data using carrier phase information. For instructions on how to collect high accuracy features, see Chapter 7, Carrier Phase Data Collection.

1.1 Before Leaving the Office

1. Install the Pathfinder Office software on your office computer (refer to the *Pathfinder Office Getting Started Guide*).
2. Using the Pathfinder Office software, prepare any data files or data dictionaries you require, and transfer them to the TSC1. If you want to update GPS or attribute information on features stored in a GIS, import the data files and data dictionary into Pathfinder Office and then transfer them to the TSC1. You may also want to transfer any waypoint and coordinate system files to the datalogger.

3. Check that you have all the required equipment, and that it is operational. Set up and connect your GPS system (the appendix for your GPS receiver lists the equipment and shows you how to connect it).
4. If the GPS receiver has an On/Off switch, turn it on (the Series 4000, GPS Total Station 4700, GPS Total Station 4800, Site Surveyor 4400 and 4600LS receivers have an On/Off switch).

Start the Asset Surveyor software to check that it and the GPS receiver are communicating correctly. If communication is established, the GPS status line appears. If communication fails, an error message pops up on the screen.

5. Check all critical settings in the Asset Surveyor software.
You should also check non-critical and display settings, especially if the system has been used by someone else recently. For details of how to configure Asset Surveyor, refer to the *TSC1 Asset Surveyor Software User Guide*.
6. Turn everything off and pack it into carrying cases if you have to travel a significant distance to the survey site. Pack spare sets of batteries if you expect to operate the receiver for any length of time.

1.2 In the Field

1. Travel to the survey site, remembering to carry all the required equipment with you.
2. Reassemble the system.
3. If the GPS receiver has an On/Off switch, turn it on. Then start the Asset Surveyor software, if it is not already on.

Wait until the GPS receiver acquires enough satellites to start computing GPS positions, before beginning to work. The number of satellites being tracked displays on the status line.

You should now change some of the configuration settings as follows:

Main menu

- | | |
|-------------------------|--|
| 1. <i>Configuration</i> | Highlight <i>Configuration</i>
then press the  key |
|-------------------------|--|

Configuration menu

- | | |
|-----------------------------|---|
| 2. <i>GPS rover options</i> | Press  |
| 3. <i>Logging options</i> | Press  |

Logging options screen

- | | |
|-----------------------------|---|
| 4. <i>Point feature</i> | Synchronized with the base station |
| 5. <i>Line/area</i> | Synchronized with the base station |
| 6. <i>Not in feature</i> | Synchronized with the base station |
| 7. <i>Minimum positions</i> | 3 |
| 8. <i>Allow GPS update</i> | 'Warn first' |
| 9. <i>Warning distance</i> | 'Any' |
| 10. To accept | Press  |

Position filters screen

- | | |
|--------------------------|---|
| 11. <i>Position mode</i> | 'Manual 3D' or 'Overdet. 3D'
depending on canopy density |
| 12. <i>PDOP mask</i> | 4 or 6 (depending on receiver) |
| 13. To accept | Press  |



4. Create a new data file, associating the correct data dictionary with it. Alternatively, re-open an existing data file.
5. Begin collecting data. Collect, review and update all the features necessary.
6. Close the data file.
7. Disconnect and repack the components of the system. Remember to turn off the GPS receiver, if it has an On/Off switch. Return to your office.

1.3 Back in the Office

1. Transfer the data files from the TSC1 to the PC using the Pathfinder Office software.
2. Use the Pathfinder Office software for differential correction, plotting, and exporting the data file(s) to a GIS.
3. Recharge the TSC1 datalogger and GPS receiver batteries.

1.4 Rover Configuration

Use the following procedure to set up your system in a rover configuration.

From the *Utilities* menu, select *Factory defaults*. This resets the Asset Surveyor software to its default configuration and then restarts the datalogger.

Antenna options screen

- 14. *Height* Height to antenna's phase center
- 15. *Measure* 'Vertical'
- 16. *Type* For a list of antenna types, see the *TSC1 Asset Surveyor Software User Guide*
- 17. *Confirm* Select 'Per feature', 'Per file', or 'Never'
- 18. To accept Press 

GPS rover options menu

- 19. To return to the *Configuration* menu Press 

Configuration menu

- 20. *Communication options* Press 
- 21. *Real-time input options* Press 

Real-time input options screen

- 22. RTCM age limit 5 or 10 (depending on your radio)
- 23. To accept Press 
- 24. To return to the *Configuration* menu Press 

Configuration menu

- 25. To exit the *Configuration* menu Press 

1.4.1 Data Collection

Use the following procedure to set up your system for rover data collection.

Main menu

1. Select *Data collection* and press 

Data collection menu

2. Create a data file
-or-
Open an existing data file
Select *Create new file*:
Press  and then press 
-or-
Select *Open existing file*.
Press 
Select an existing file to append to or update, and press 
3. To exit *Data collection* Press  and press  to confirm exit

1.5 Base Station Configuration

Use the following procedure to set up your system in a base station configuration.

Main menu

1. *Configuration* Highlight *Configuration* then press the  key

Configuration menu

2. *GPS base station options* Press 
3. *Logging options* Press 

Logging options screen

4. *Measurements* One to five seconds (depending on rover interval and free space)
5. To accept Press 
6. To return to the *Configuration* menu Press 

Configuration menu

7. To exit the *Configuration* menu Press 

1.5.1 Base Station Data Collection

Use the following procedure to set up your system for base station data collection.

Main menu

1. *Data collection* Press 

Data collection menu

2. *Create base file* Press 

Create File screen

3. *Create file* Press 

Antenna options screen

4. *Height* Height to antenna's phase center
5. *Measure* 'Vertical'
6. *Type* For a list of antenna types, see the *TSC1 Asset Surveyor Software User Guide*
7. *To accept* Press 

Reference Position screen

8. Enter reference position Type lat/lon (or north/east) and altitude, and press 
- or-
- Use an existing waypoint Press , select the waypoint and press 
- or-
- Use an approximate position Press  and press 
- or-
- Leave as is and set in the Pathfinder Office software Press 

Base Station screen

9. To exit *Base station* Press  and press  to confirm exit.

Key Symbols

The Asset Surveyor software uses both *hard* (that is, physical) keys on a keypad and *soft* (that is, visual) keys on the datalogger's screen.

Hard (physical) keys on the TSC1 keypad are indicated as follows:

, , and so on.

Softkeys on the TSC1 screen are indicated as follows:

, , , and so on.

A softkey is activated by pressing the corresponding function key (F1...F5) on the TSC1 keypad.

Warnings, Cautions, Notes, and Tips

Warnings, cautions, notes, and tips draw attention to important information, and indicate its nature and purpose.



Warning – Warnings alert you to situations that could cause personal injury or unrecoverable data loss.



Caution – Cautions alert you to situations that could cause hardware damage or software error.



Note – Notes give additional significant information about the subject to increase your knowledge, or guide your actions.



Tip – Tips indicate a shortcut or other time- or labor-saving hint that can help you make better use of the product.

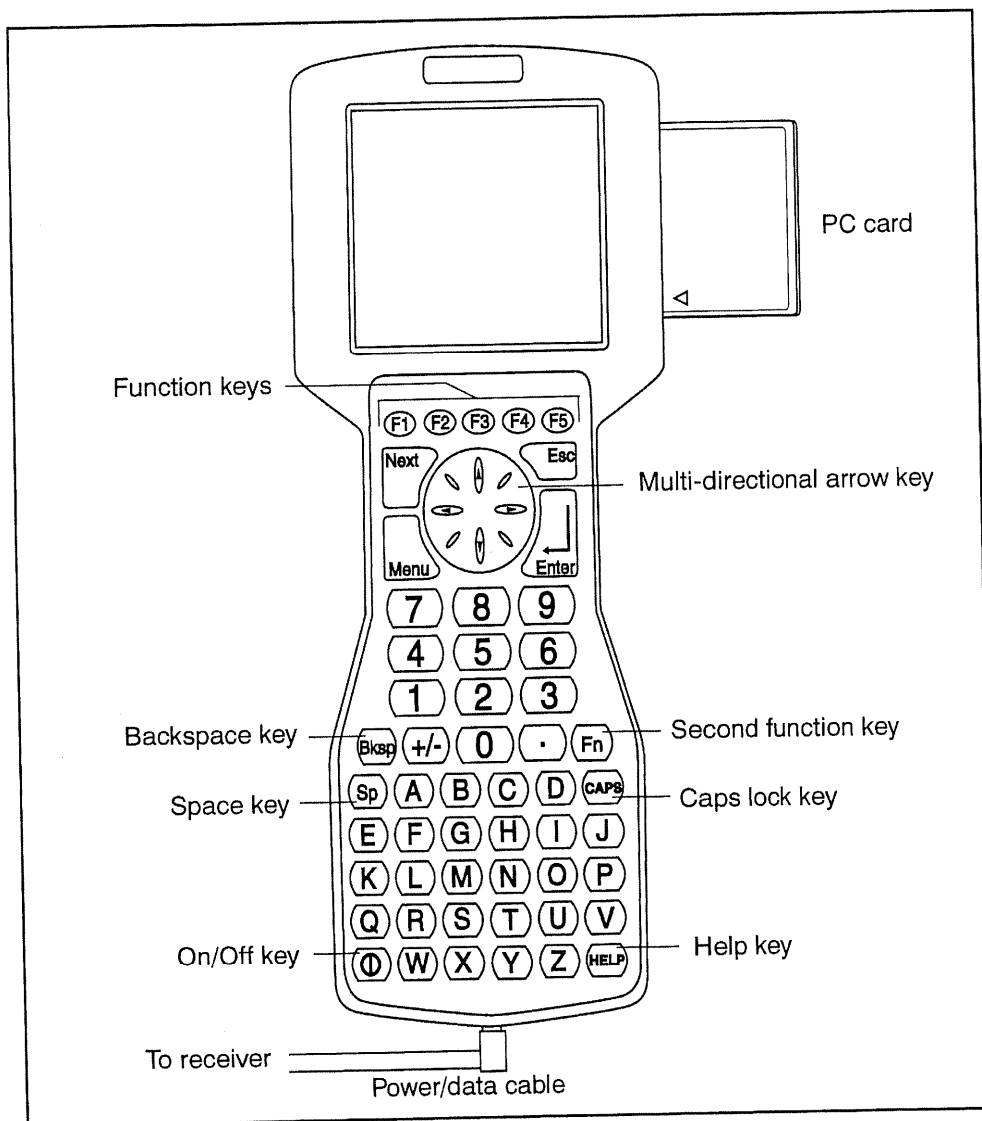


Figure 3-1 Front View of the TSC1 Datalogger

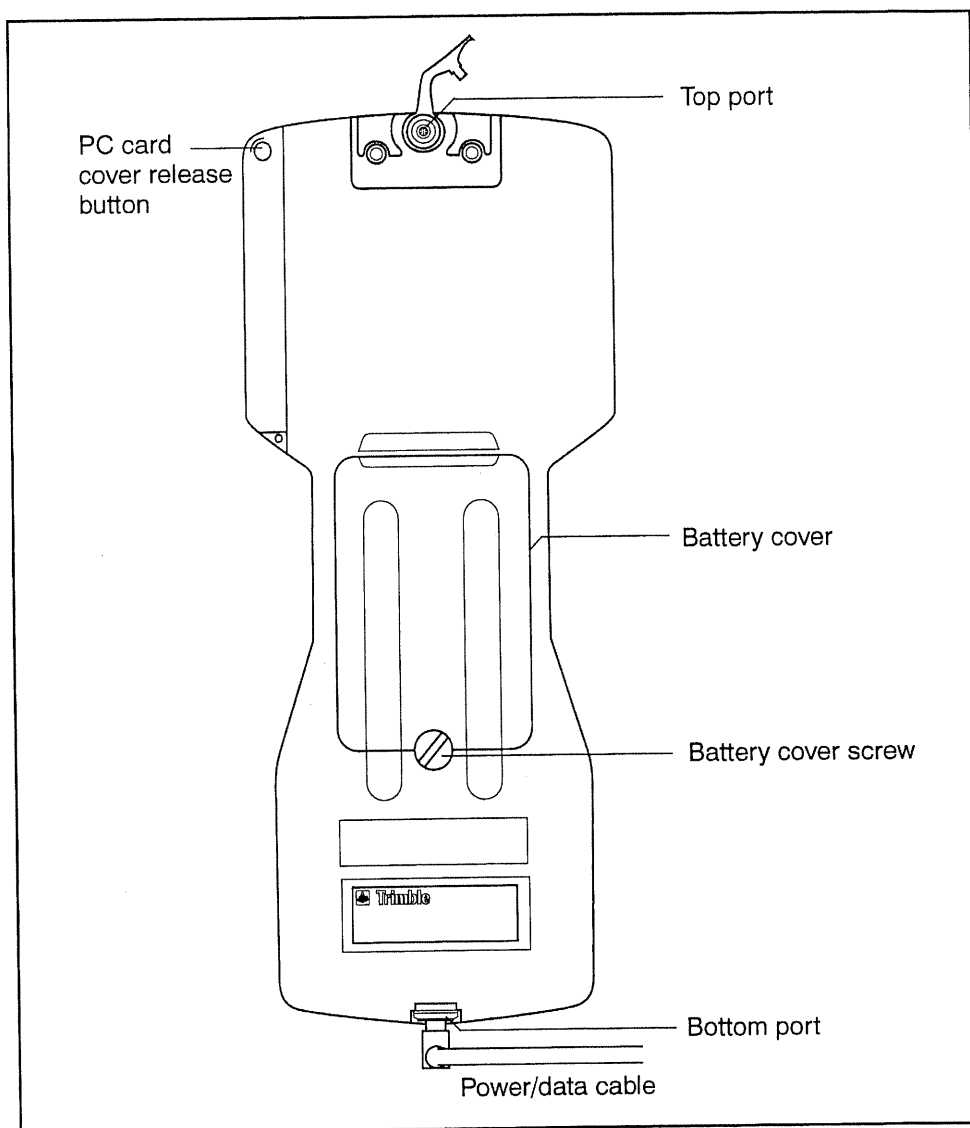


Figure 3-2 Back View of the TSC1 Datalogger

3.2 Turning the TSC1 Datalogger On and Off

To turn on the TSC1 datalogger, make sure that power is supplied (see Power Sources, page 3-11). Then press the green on/off key marked .

To turn off the TSC1, hold down  for one second.



Tip – For the location of the  key and other keys on the TSC1 datalogger's keypad, refer to Figure 3-1.

3.2.1 Hard Keys

Hard keys are the physical keys on the TSC1 keypad, such as , , , , , and . Use these keys to enter data and to access different screens.

3.2.2 Alternate Keys

Alternate keys give some hard keys a second function. Some of the second functions are displayed on the hard keys in small yellow lettering. To use a second function, press the  hard key and then press the alternate hard key.

Table 3-1 shows some of the functions that you can access using alternate keys.

Table 3-1 Useful Second Functions

Keys	Function
 	Page down
 	Page up
 	Home
 	End
 	Previous screen
 	Contrast up
 	Contrast down

3.2.3 Softkeys

Softkeys are displayed on the bottom line of the TSC1 screen. A softkey corresponds to the adjacent hard key: (F1), (F2), (F3), (F4), (F5). Press the hard key to activate the softkey on the screen. To activate the  softkey, for example, press (F1). See Figure 3-3.

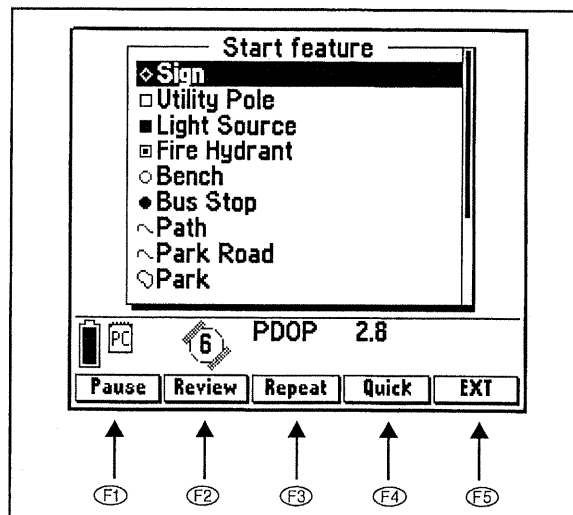


Figure 3-3 How Function Keys Correspond to Softkeys

Softkeys relate to particular forms or fields and only appear when these forms or fields are accessed. For example, the  softkey only appears when a line feature is opened for data collection, as this functionality applies to line features only.

3.2.4 Menu Key

To return to the *Main menu* at any time, press the  hard key. Use this key in conjunction with the  key to move around the Asset Surveyor screens quickly.

3.2.5 Next Key

To simplify the task of moving around menus, the  hard key offers quick access to open screens (windows).

3.2.6 Help Key

Press the  hard key at any time to obtain further information about a topic. When you press it, the *Help* menu appears. To exit *Help*, press  from the *Help* menu.

3.3 Screen

The TSC1 has an LCD screen. This screen responds to heat, and prolonged exposure to full sunlight can cause it to darken. If the screen does darken, turn it away from direct sunlight until it returns to normal.



Caution – Repeated exposure to direct sunlight can cause the screen to degrade.

3.3.1 Contrast

To increase the screen contrast, press  .

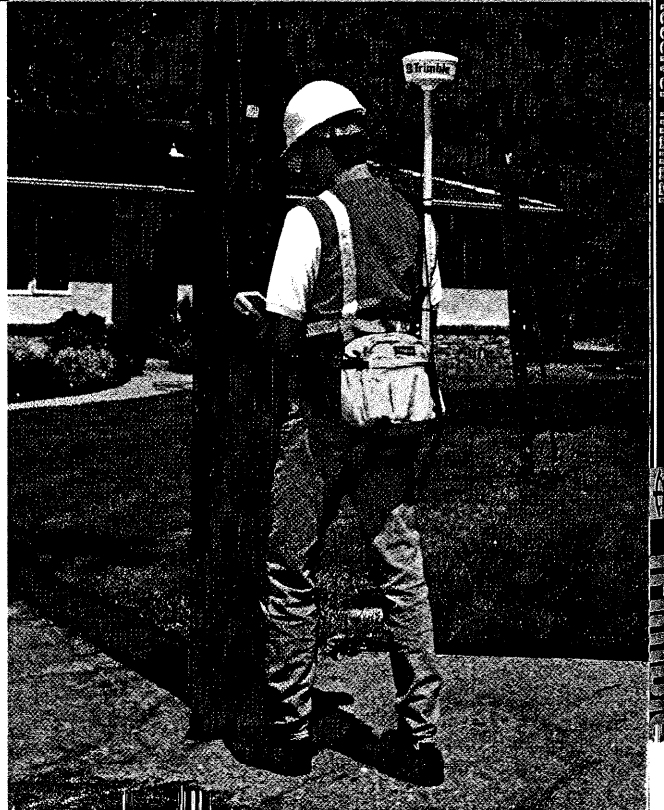
To decrease the screen contrast, press  .

3.3.2 Backlight

To toggle the screen backlight on and off, press  .

Pro XR/XRS

Receiver Manual



Pro XR/XRS

Receiver Manual

Part Number 31172-20-ENG

Revision A

May 1998

*Trimble Navigation Limited
Mapping and GIS Systems Division
645 North Mary Avenue
P.O. Box 3642
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www.trimble.com*

4 Pro XR/XRS System Equipment

This chapter provides details of the equipment associated with the Pro XR and Pro XRS receivers and shows how to assemble the equipment.

4.1 Pro XR Receiver Front Panel

The Pro XR receiver, shown in Figure 4-1, is mounted in a weatherproof housing.

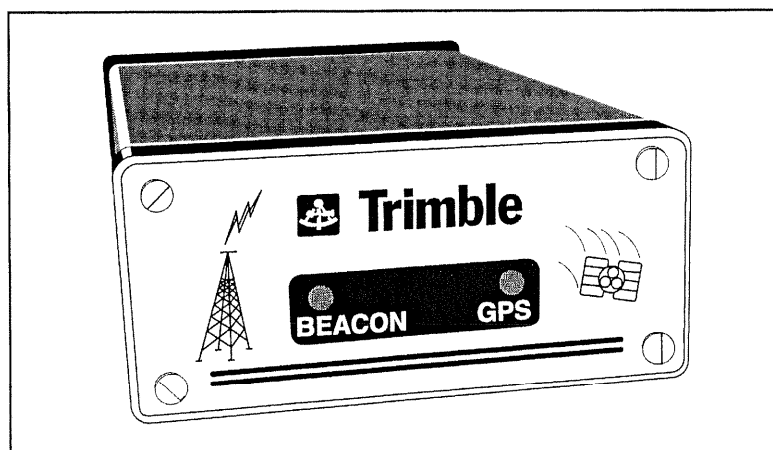


Figure 4-1 Pro XR Receiver Front Panel

4.2.1 Pro XR Status Lights

The two status lights on the front panel of the Pro XR receiver provide the status information listed in Table 4-1.

Table 4-1 Pro XR Status Lights

	GPS	Beacon
OFF	Unit not powered up	Unit not powered up or beacon function is disabled
FAST FLASH	Searching for satellites	Searching for MSK signals
SLOW FLASH	Found one or more satellites. Not enough for a position fix.	Found MSK signal. RTCM data has not been sent to GPS receiver.
ON	Performing position fixes	Good RTCM data is being provided to the GPS receiver

4.3 Back Panel

The Pro XR and Pro XRS receivers have two serial communications ports (RS232) and an antenna cable port. The serial communications ports, shown in Figure 4-3, are 12-pin(m) bulkhead connectors located on the back panel of the Pro XR and Pro XRS receivers.

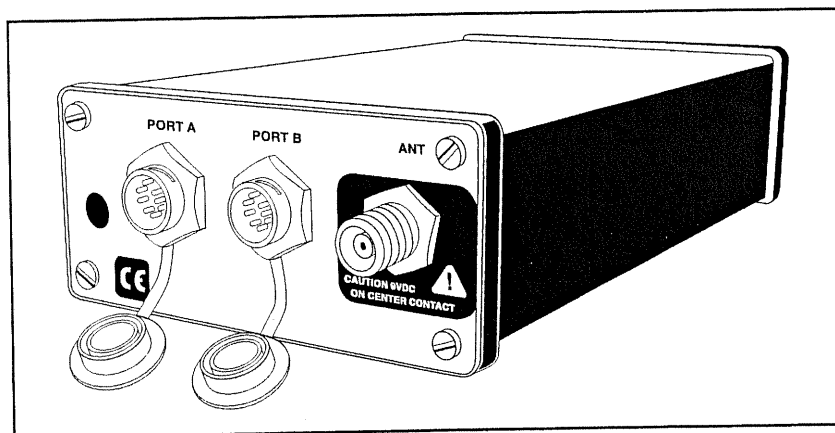


Figure 4-3 Pro XR/XRS Receiver Back Panel

4.3.1 Port A

Port A offers RS232 communication standards. It is designed for NMEA-0183 output and RTCM input.

4.3.2 Port B

Port B also offers RS232 communication standards. It is designed for two-way data flow, external sensor input and power.

4.3.3 Antenna Port

The antenna connector is a TNC(f) connector located on the far right on the back panel of the Pro XR or Pro XRS receiver.

4.4 GPS Pro XR Cabling

To use the TSC1 handheld with a GPS Pro XR receiver, connect the system as shown in Figure 4-4.

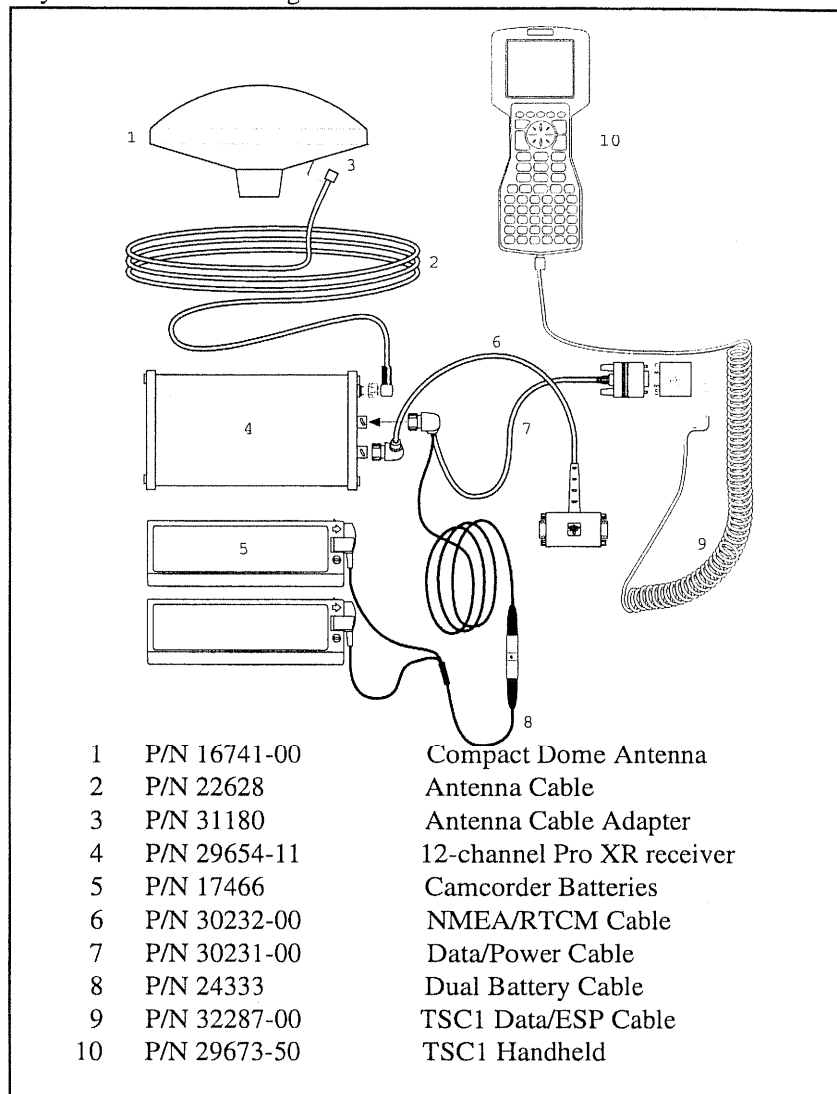


Figure 4-4 GPS Pro XR / TSC1 Connection Diagram

4.7 Pro XR/XRS System Hip Pack

The Pro XR and Pro XRS systems come equipped with an ergonomic hip pack carrying system, see Figure 4-18. The receiver, batteries and antenna are carried in the field using this hip pack/strapping system.

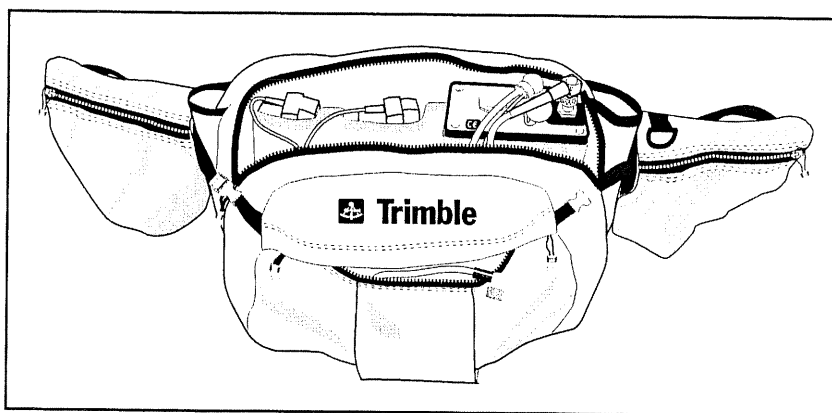


Figure 4-18 Pro XR/XRS System Hip Pack

4.7.1 Pro XR/XRS Hip Pack Contents

The Pro XR and Pro XRS systems are packed so that they are almost ready for use. The items not included in the hip pack are three 1-foot antenna poles, one 6-inch antenna pole and the data collector cable (P/N 30233-00 for TDC1, P/N 30234 for TDC2, or P/N 30236 for Field Computer/MC-V). These are located inside the shipping case.

The large interior of the hip pack contains: the Pro XR or Pro XRS receiver, two camcorder batteries, the power/data cable, and the camcorder power cable. All of these are set up inside the pack and ready for use. The exterior pocket of the hip pack contains a 3-meter antenna cable attached to the receiver and routed through a passage between the large interior pocket and exterior pocket. Both the data collector cable and antenna are routed out of the exterior pocket through the double zipper.

To route the data collector cable:

1. Locate the data collector cable and connect it to the data power cable, DE-9 connector labeled TO RECEIVER.
2. Once connected, feed the coiled cable through the passage and into the exterior pocket.

4.7.2 Wearing and Adjusting the Hip Pack

The Pro XR/XRS hip pack, once adjusted to suit, is comfortable and easy to use. See Figure 4-19.

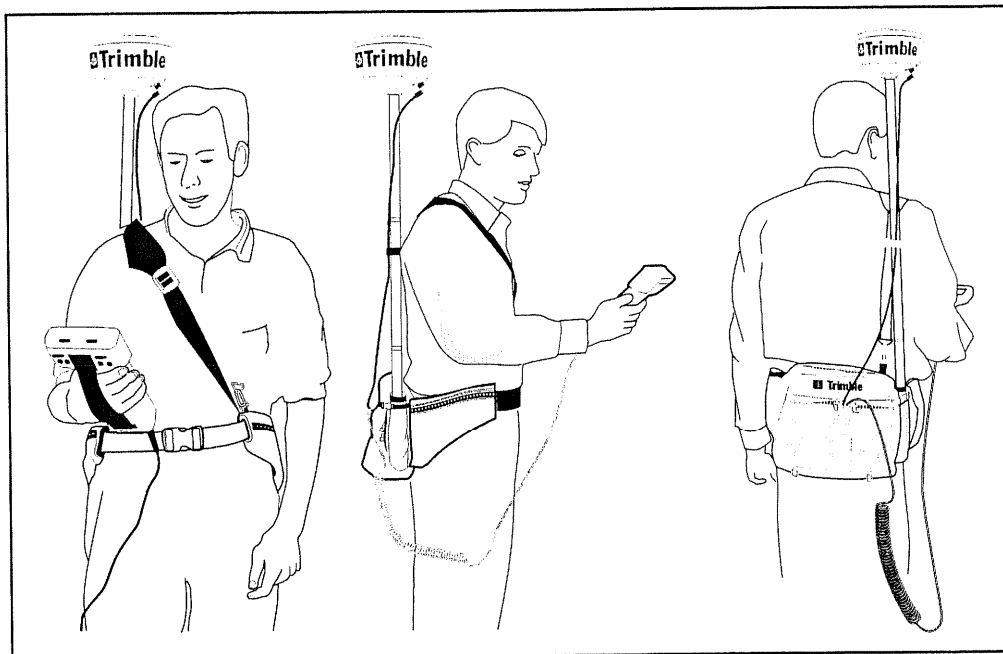


Figure 4-19 View of Hip Pack Setup

Antenna

When wearing the hip pack, the antenna height should be 3-4 inches above your head. The number of antenna pole sections required varies depending on your height. For example, if you are 5'5" tall, you may need two 1-foot and one 6-inch pole sections. If you are 6'2" tall, you may need three 1-foot poles. Try out different pole heights.

To set up the antenna with the hip pack:

1. Attach the pole sections together and connect the antenna onto the top of the pole sections.
2. Attach the pole/antenna to the hip pack.
3. Choose the side of your body that you prefer the antenna to be on and slide the pole sections into the small sleeve on that side of the hip pack.

Hip Pack and Strap

To adjust the hip pack and strap:

1. Connect the strap to the rear D-ring on the side of the pack on which the antenna is located.
2. Connect the other end of the strap to the D-ring on the belt on the opposite of the bag.
3. Slide the antenna pole through the velcro connection on the strap.
4. Put the strap over your head and across your opposite shoulder.

At this point, the shoulder strap should lead naturally from the antenna pole across your chest to the belt.

5. Buckle the hip pack around your waist/hip area so that the belt buckle is centered in the middle of your body.

The pack should adjust to fit close to the small of your back.

6. Adjust the front and back straps so the shoulder strap is situated squarely on your shoulder.
7. Put the pack on by slipping the strap over your head and across your body and then buckling the belt of the hip pack.

The hip pack includes side compression straps that can be pulled towards you to hold the pack firmly and comfortably against your back.

Remove the hip pack/strap by unbuckling the belt and slipping the strap over your head.

The hip pack and strap can also double as a shoulder bag. Tuck the belt portion of the pack into the webbing material on the back of the pack and hook the strap on the large D-rings of the pack. The unit can now be carried on your shoulder instead of around your waist.

The pack has extra room in the interior and exterior pockets for additional items you may need in the field. The hip pack also includes straps on the bottom of the pack to secure an extra sweater or coat while in the field.

4.8 Optional Range Poles and Tripods

Range poles and tripods are very useful when collecting carrier phase data. The height of the antenna can be accurately measured, and the antenna can be held still easily, compared to an antenna mounted from the hip pack.

APPENDIX B

FIELD DOCUMENTATION

Appendix B-1: Example of Field Sheet

Appendix B-2: Example of Chain of Custody Form (COC)

Appendix B-3: Example of Photo-Log

Appendix B-4: Example of Sample Labels

MONTEREY COUNTY WATER RESOURCES AGENCY - COASTAL GROUND WATER MONITORING PROGRAM

June 2007

F CODE	SWID	STATUS	AQUIFER	USE	WELL NAME	METER No	PLANT No	SAMPLE PT	VISIT DATE	APPT. DATE	SAMPLE DATE	SAMPLE TIME	SAMPLER	REMARKS
886	14S/02E-24E01	ACTIVE	P400	AG	R3P1	4571R8	92205	DL						D'Arriago Bros. RSP1. Tag #1164. Well is at corner of San Jon Rd and Hwy 183. Go twice then call Ed Mora 206-9164 or Jesse Aragon 909-073. See photo
331	14S/02E-36E01	ACTIVE	P180	AG	BARDIN 12	0R1749	92428	faucet on booster						T & A. Bardin #12. Tag #1037. Well on Hitchcock Rd. off Blanco Rd. office. Go twice, then call Dennis. See photo
673	14S/02E-13F01	ACTIVE	P180	AG	SAN JON B	R39873	95522	DL						Sea Mist. San Jon well B. Tag #1186. Call Chris. Three day notice. See photo
975	14S/02E-12N02	CSIP-SBI	P180	AG		92593R	91785	DL						Schneider. Domestic well. Tag #2960. Run for 30 min. to stabilize conductivity. EC = 2920 (Jul '04). Call Tim Schneider 449-0874. Two week notice. Take EC meter, a bucket and last years results. See photo
1055	14S/02E-15A01	CSIP-SUPP	P400	AG	15A01	R69587	94951	DL			6/12/2007	9:05:00 AM		CSIP-SUPP. Well 15A1. PCA site #17. Go twice, then call Bill or Jesse. See photo
1324	14S/02E-15C02	CSIP-SUPP	P400	AG	15C02	42542R		DL			6/12/2007	8:55:00 AM		CSIP-SUPP. Well 15C2. Tag #2838. PCA site #19. Go twice, then call Bill or Jesse. See photo
861	14S/02E-15P01	CSIP-SBA	P400	AG	MORO COJO #1 (YARD)	31535R	95209	DL						Higashi Farms. Moro Cojo #1. By house and shed. Call Peter. 2 day notice. See photo
279	14S/02E-16H01	CSIP-SBA	P400	AG	CONLEY	91R418		DL						Higashi Farms. Connely Ranch well. Tag #2856. Call Peter Odello 57926 or Charlie 578-7416. See photo. INACTIVE
2779	14S/02E-21E01	ABAN	P400	AG	MARINA-ARMSTRONG WELL	02384R		DL						Armstrong. Marina-Armstrong well. Tag #2962. SW of MRWPCA, sample from ball valve on pressure/flow control valve. Jack Armstrong 455-1901. See photo. INACTIVE
766	14S/02E-22P02	ACTIVE	P180	AG	VIERRA #1	1843T	95485	truck fill valve						Crown Packing. Vierra #1. Tag #1095. Call Bill or Jose. Two day notice. See photo
859	14S/02E-15N01	CSIP-SBA	P400	AG	MORO COJO #2	3538R4	95037	DL						Higashi Farms. Moro Cojo #2. Big yellow truck-fill. Call Peter. 2 day notice. See photo
1282	14S/02E-24P02	ACTIVE	P400	AG	BORONDA SCHOOLHOUSE #1	93258T		DL						Crown Packing. Boronda Schoolhouse well. Tag #1099. Call Bill Sullivan 214-4650 or Jose Luis Lepe 970-6889. Well next to house/metal shed on McFadden Road, close to elem. school. Two day notice. See photo
22929	14S/02E-28H04	ACTIVE	PDEEP	AG	JACKS YARD									New Deep aquifer well located 54 mi W of Cooper Rd & 27 mi S of McFadden Rd on the Nissen Rch

ENVIRONMENTAL ANALYSIS REQUEST FORM

MONTEREY COUNTY CONSOLIDATED CHEMISTRY LABORATORY
1270 NATIVIDAD ROAD, SALINAS, CALIFORNIA 93906 Phone (831) 755-4516

Shaded areas for laboratory use only

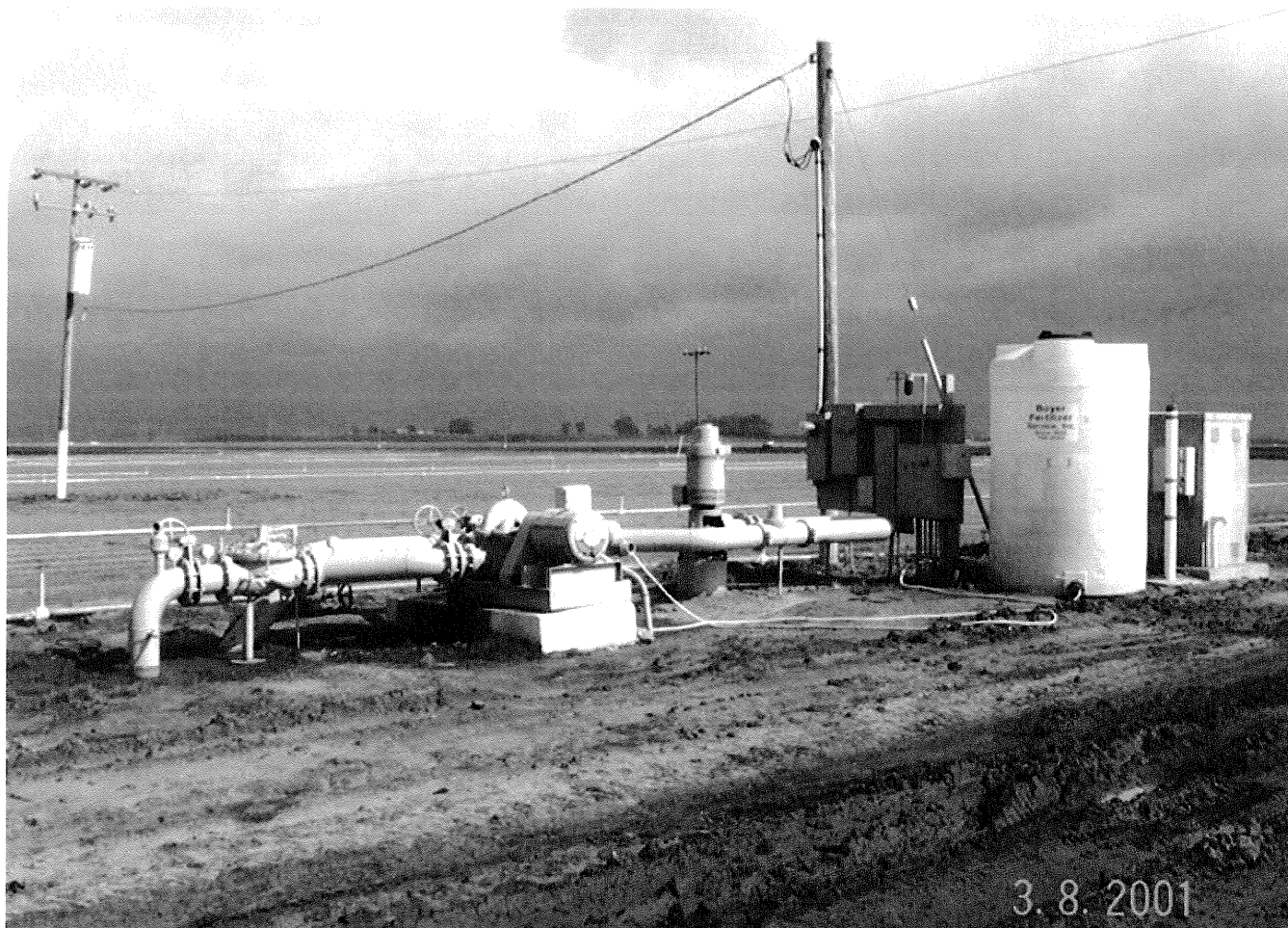
Chain of Custody:

Collected by (Print & sign):	Received by:	Date & Time:
Relinquished by:	Received for Laboratory:	Date & Time:

Client Name:			Report Attention:			ANALYSES REQUESTED										
Address:			Copy to:													
City, State, Zip:			Phone:			Fax:										
Laboratory Number	Sample ID or System #	Sample Site or Description	Collection Date & Time	Matrix ⁽¹⁾ 1-Routine 2-Repeat 3-Replacement	No. of Containers	Coliform	MMO	Quant.	Low-D	Nitrate						

⁽¹⁾ **D**=Drinking Water (Specify as routine, repeat or replacement) **W**=Wastewater (Specify as grab or composite) **O**=Other (identify)

[] Payment received with delivery			Amount:			Sample comments (irregularities/preservation, billing information if different than reporting):		
Check:			Initials:					
Receipt #:			Date:					



15S/04E-07A01

Sampling Date:

Sampler:

Sampling Time:

Comments:

Complete General Mineral Analyses

15S/04E-08M04

Sampling Date:

Sampler:

Sampling Time:

Comments:

Complete General Mineral Analyses

15S/04E-15D02

Sampling Date:

Sampler:

Sampling Time:

Comments:

Complete General Mineral Analyses

15S/04E-17P02

Sampling Date:

Sampler:

Sampling Time:

Comments:

Complete General Mineral Analyses

15S/04E-19H03

Sampling Date:

Sampler:

Sampling Time:

Comments:

Complete General Mineral Analyses

15S/04E-20B02

Sampling Date:

Sampler:

Sampling Time:

Comments:

Complete General Mineral Analyses

15S/04E-26G01

Sampling Date:

Sampler:

Sampling Time:

Comments:

Complete General Mineral Analyses

15S/04E-36H01

Sampling Date:

Sampler:

Sampling Time:

Comments:

Complete General Mineral Analyses

APPENDIX C

REVIEW CHECKLISTS

Appendix C-1: Field Activities Review Checklist

Appendix C-2: Laboratory Data Review Checklist

Field Activities Review Checklist

Sampling Location(s):

Sampling Date:

Item	Yes	No	NA	Comment
All required information was entered into field sheets in ink, and sheets were signed and dated by the field sampler.				
Deviations from SOPs, along with any pertinent verbal approval authorizations and dates, were documented on the field sheets.				
Samples were collected at the correct sites.				
The correct number of samples for each type of analysis and the correct volume was collected (0.5 gal/ ~2L for complete mineral panel OR one pint/ ~0.5L for partial mineral panel).				
Acceptable sample containers, appropriate for the intended analysis, were used.				
Field blanks were collected, and at the correct frequency (one every 25 samples).				
Field duplicates were collected, and at the correct frequency (one every 25 samples).				
Samples were packed with double-bagged ice and transported at the proper temperature ($4\pm2^{\circ}\text{C}$).				
Chain of custody (COC) documents were completed properly.				
Sample holding times were not exceeded during field operations. See Table 6 (QAPP).				

Reviewer's Name (print):

Reviewer's Signature:

Reviewer's Title:

Date of Review:

Laboratory Data Review Checklist

Sampling Location(s): _____

Sampling Date: _____

Item	Yes	No	NA	Comment
Samples arrived at the laboratory at the proper temperature ($4 \pm 2^\circ\text{C}$).				
All requested analyses were performed and were documented in the analytical report.				
Analyses were performed according to the methods specified in the approved QA Project Plan.				
Holding times for extraction and analysis were not exceeded. See Table 6 (QAPP).				
Field Blanks results were below MDLs and were analyzed at a frequency of one every 25 samples.				
Field Duplicate results were $\leq 25\%$ RPD and were analyzed at a frequency of one every 25 samples.				
Method detection limits were included in the report.				
A narrative summarizing the analyses and describing any analysis problems was included in the data report.				
Data qualifiers and flags were explained in the data report.				
Initial calibration data were within laboratory SOP defined acceptance criteria ($r^2 \geq 0.995$) for all analyses.				
Method blanks were performed at 3 per analytical batch, and were below MDL.				
Laboratory Control Sample (LCS) data were included for all analyses for every analytical batch.				
Laboratory Control Sample Results were within 80-120% recovery.				

Item	Yes	No	NA	Comment
Analytical Duplicate data were included for all analyses for every analytical batch.				
Analytical Duplicate results were < 25% RPD.				
Matrix spike data were included for all pertinent analyses for every analytical batch, and recoveries were within 75-125%.				
Matrix spike additions were at 3-10x the native.				
Matrix spike duplicates were ≤ 25% RPD.				
Continuing calibration data were within QAPP defined acceptance criteria (80-120% of initial slope) for all analyses.				

Reviewer's Name (print):

Reviewer's Signature:

Reviewer's Title:

Date of Review:

APPENDIX D

MONTEREY COUNTY CONSOLIDATED CHEMISTRY LABORATORY

QA MANUAL AND STANDARD OPERATING PROCEDURES

Appendix D-1: QA Manual

Appendix D-2: Specific Conductance, based on SM 2510 B

Appendix D-3: pH, based on SM 4500-H B

Appendix D-4: Total Alkalinity, based on SM 2320 B

Appendix D-5: Metals, based on SM 3111 B

Appendix D-6: Anions, based on EPA 300.0

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ORGANIZATION AND RESPONSIBILITY

On October 11, 1988, the Monterey County Board of Supervisors, in Resolution No. 88-508, authorized the Director of the County Health Department and the General Manager of Monterey County Flood Control and Water Conservation District (MCFC&WCD) to consolidate laboratory services for their respective programs into one facility. A Laboratory Steering Committee, comprised of representatives from both agencies, was established for the purpose of providing the planning, operation, and future development of the Consolidated Environmental Laboratory.

Each year the Steering Committee develops a Memorandum of Agreement (MOA) that describes and confirms the services to be provided by the Health Department to the Water Resources Agency (formerly the Flood Control and Water Conservation District) and defines the responsibilities of each party. In addition to providing laboratory support for the Health Department and the Water Resources Agency, the Consolidated Chemistry Laboratory provides analytical services to the Monterey Regional Water Pollution Control District, the County Department of Public Works and numerous water supply systems and wastewater treatment facilities.

The Consolidated Environmental Laboratory is accredited by the State Department of to perform tests in the following fields: 1) microbiology of drinking water and waste water; 2) inorganic chemistry and physical properties of drinking water; 3) analysis of toxic chemical elements in drinking water; 4) wastewater inorganic chemistry, nutrients and demand; and 5) toxic chemical elements in wastewater. A list of analyses and methods used in the laboratory is included in Appendix A.

The following is a brief description of the staff support for the Consolidated Chemistry Laboratory:

1. Director - Plans, organizes and controls laboratory operations. Coordinates laboratory interactions with other programs in the Health Department. Administers laboratory budget, billing and purchasing. Develops laboratory policy and procedures and supervises staff.
2. Public Health Chemist – Principal analyst. Performs complex organic and inorganic chemical analysis, evaluates and implements laboratory methods, develops and maintains quality assurance, reports results and maintains records, purchases equipment and supplies, provides technical consultation to Environmental Health and Water Resources Agency. Trains analysts and documents competency
3. Water Quality Specialist- Performs broad range of professional scientific work related to water quality and environmental issues; is proficient in

performing water quality analyses and managing the laboratory water quality database. Interpret and explain regulatory guidelines to clients.

4. Public Health Microbiologists - Assist Public Health Chemist in performing microbiological analyses and performing quality control.
5. Laboratory Assistant - Prepares culture media and reagents, assists in the processing of specimens, performs low to moderately complex environmental analyses and clinical analyses where interpretation or medical judgement is not required.
5. Laboratory Helper - Washes and sterilizes glassware and supplies. Prepares and labels mailing containers and specimen collection kits. Accession laboratory specimens. Sterilizes and disposes infectious waste. Maintains stockroom.
6. Typist-Clerk II - Enters clients and laboratory results into computer. Prints reports/forms. Prepares billing statements; receives and accounts for payments. Distributes laboratory results, and maintains laboratory files.

QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT OF DATA

Quality Assurance (QA) includes all aspects of laboratory operation that affect the accuracy and reliability of sample test results. In addition to quality control of the analytical test process, quality assurance practices include: 1) proper sample collection, receiving and holding, 2) proper maintenance of equipment, 3) accurate data reduction, validation and reporting; and, 4) periodic performance and systems audits.

CUSTODY, HOLDING AND DISPOSAL OF SAMPLES

Quality assurance includes proper labeling of samples, proper completion of the chain of custody/analysis request form, proper collection, preservation and storage of samples, proper accessioning of samples, and proper disposal of the sample.

- 1) Sample Collection/Labeling. Sample collection is a coordinated effort between the client and the laboratory. The laboratory will provide clients with appropriate sample containers and sample collection/preservation instructions. The laboratory will also request duplicates and blanks according to client's sample plan requirements. All samples submitted for testing should be appropriately labeled. Sample containers provided by our laboratory have a suitable label which should be filled out at the time of sampling by the sample collector. The following information must be provided with all samples:
 - a) Sample identification - submitters identification of sample (e.g. well number)
 - b) Location - an address or brief description of the place the sample was taken.
 - c) Time and date taken.
 - d) Name of sample collector.
 - e) Any preservatives
- 2) Chain of Custody/Analysis Request Form. A Chain of Custody/Analysis Request form should accompany all samples (see Appendix B). The Chain of Custody/Analysis Request form must include the following information: submitter name and address; sample identification; location of sample collection; date & time of collection; sample type; analysis to be performed; signatures of persons involved in the collection and chain of possession; and inclusive dates of possession.
- 3) Sample Receiving. Laboratory personnel receiving samples should assure that samples are properly collected, labeled, and the Custody/Analysis Request form has been completed:
 - a) The laboratory assistant receiving the specimen must sign and date the Custody/Analysis Request form. Make sure that any special requests made by the client are recorded under the comments section of the form
 - b) Assign each sample a unique laboratory identification number. Place

preprinted lab number on analysis request form and sample container. When a sample is collected in multiple containers for different analyses, each container should receive the same laboratory number. (Exception: sample containers for analytes requiring a rapid turnaround time (e.g. coliforms) may receive separate number to expedite reporting).

- c) Check that the samples meet the criteria described in Table 1006:I Summary of Special Sampling or Handling Requirements in 18th ed. of *Standard Methods for the Examination of Water and Wastewater* (Appendix C)
 - i) Samples should be collected in a suitable container; samples collected in bottles of unknown origin or questionable cleanliness should be brought to the attention of the Water Quality Specialist or the Public Health Chemist.
 - ii) Samples should be adequately labeled
 - iii) Samples should be checked for proper preservative, holding time, and holding temperature.
 - iv) Samples should be adequately sealed. Notify public health chemist if there is evidence of leakage. Verify that adequate sample volume exists to perform requested analysis.
 - d) NOTE: Samples that are not properly identified or are otherwise unsuitable for testing (e.g. improperly preserved or exceeding holding/transport time) are recorded on the "Sample Invalidation Log" and the Water Quality Specialist or Public Health Chemist notifies the client. Samples not meeting collection/preservation criteria may be tested only if resampling is impossible; results from such samples must be qualified on the laboratory report by comments describing sample deficiency.
- 4) When the sample meets criteria for acceptance by the laboratory, required preservatives are added immediately and the sample is stored under conditions specified by the analytical method to be used. For samples requiring thermal preservation, a laboratory refrigerator and freezer is available. The temperature is maintained at 4 degrees and below -10°C respectively. Temperatures are monitored each day.
 - 5) Chain of Custody/Analysis Request forms are given to the clerk to enter into a password protected computer laboratory information management system. Refer to "Water Sample Entry" in Clerical Manual for instructions on sample log-in.
 - 6) Disposal of samples: Upon completion of all analyses, any remaining

sample will be stored for at least one month prior to disposal. Chain-of-Custody form, worksheets and lab reports are retained for three years.

NOTE: Longer retention of samples or data may be required when legal action is probable. The samples and any associated extracts or digests are disposed of following recommendations found in the book, *Prudent Practices for Disposal of Chemicals from Laboratories*, National Academy Press, Washington, D.C. 1983.

CALIBRATION PROCEDURES AND FREQUENCY

Calibration is the process for determining the correctness of the assigned values of the physical standards used or the scales of the measuring instruments. Calibration accuracy is critically dependent on the reliability of the standards used for the required comparisons. Only the highest quality chemicals are used to provide necessary standard solutions, and due care is exercised in their preparation. The concentrations of the calibration standards bracket the expected concentration of the analyte in the samples. No data is reported beyond the range of calibration of the methodology. The calibration data, when plotted graphically, is referred to as a calibration curve. The calibration must be done under the same instrumental and chemical conditions as those that will exist during the measurement process. The frequency of calibration depends on the accuracy requirements of the investigation and the stability of the instrument used for the measurements:

At a minimum, three different dilutions of the standard will be measured when an analysis is initiated. Correlation coefficient must be > 0.995 . Reportable analytical results are those within the range of the standard dilutions used. Do not report values above the highest standard. The lowest reportable value is the Method Detection Limit (MDL), providing that the lowest calibration standard is less than 10 times the MDL.

- 1) Atomic Absorption Spectrophotometers - Two approaches are used to calibrate atomic absorption spectrophotometers. These methods are direct comparison and standard additions.
 - a) Direct comparison is the simple approach, and can be used with many instruments to give a direct readout of the concentration of an element in an unknown sample. To obtain good precision (e.g., 1-2% coefficient of variation), the absorbance levels measured must be about 0.1 to 0.6 units. Standard and sample solutions should be similar in bulk matrix constituents, particularly acid and salt content. Interference suppressants are used in all solutions when required. A number of standards (usually three to five in increasing concentration) as well as a blank, are prepared to cover the concentration range. A volume of type II reagent water with the same amounts of acids as the samples and standards) will be used for calibration blank. These solutions are run in absorbance to check linearity of the calibration curve.
 - b) The method of standard additions is used when samples contains severe matrix interference. In this case it is possible to add small amounts of conventional standard solutions, in increasing amounts, to aliquots of each sample. A calibration graph can then be constructed. This method will often be used in work with the graphite furnace.

- 2) UV-VIS Spectrophotometer - The calibration procedure for the UV-VIS spectrophotometer is similar to that for the A.A. spectrophotometers. An integration interval is not required as the signal is very stable. It is important to use blanks and allow at least 1/2 hour warm up time.
- 3) PH Meters - The proper calibration of pH meters requires the use of two buffer solutions and a thermometer. The two buffer solutions must cover the expected range of samples to be tested. A third buffer is used to confirm calibration. The pH meter should be calibrated each day. The temperature of the buffers must be entered into the meter.
- 4) Conductivity Meter - The conductivity meter does not require frequent calibration but should be checked against a known standard each day of use. Recalibrate when there is significant deviation with the value of the standard.
- 5) Ion Chromatograph- Calibration of the Ion Chromatograph is performed at least once each year and whenever: 1) Controls are out of range; or, 2) the column, suppressor or detector is changed.
- 6) Inductively Coupled Plasma/Mass Spectrometer – Calibration of the ICP-MS is performed every day of analysis and whenever controls are out of range. See the SOP for more information.

ANALYTICAL PROCEDURES

The laboratory employs only methods approved by Environmental Laboratory Accreditation Program. Analysts must conduct sufficient preliminary tests using the methodology and typical samples to demonstrate competence in the use of the measurement procedure.

Each time an analytical procedure is performed controls are included and duplicate samples and known additions are tested to insure accuracy and precision. Results are not reported unless all controls are within acceptance limits referenced in Standard Methods 18th Edition, 1992.

To monitor reliability of analytical measurements, data is periodically obtained on detection limits, accuracy, precision and recovery.

ACQUISITION, REDUCTION, VALIDATION OF REPORTING DATA

The analytical chemist is responsible for describing and reporting the data in an appropriate manner. In order to insure the accurate transcription, calculation and reporting of analytical data, the chemist will adhere to the following quality assurance procedures.

- 1) Use documented procedures and record all significant experimental details in such a way that the measurements could be reproduced by a competent analyst at a later date.
- 2) All measurements are made so that results are representative of the matrix (soil, water, etc.) and conditions being measured.
- 3) Report data only to the number of significant figures consistent with their limits of uncertainty.
- 4) Report data with the proper units of concentration. Units should be chosen which clearly indicate whether the concentration is in terms of weight by weight, weight by volume or volume by volume. Unless otherwise specified, all data are calculated and reported in standard units to allow comparison with data reported by other laboratories.
- 5) The analytical methodology used will be cited. The raw data for each sample, along with reagent blanks, control, and spiked samples will be suitably identified if included in the report. If average values are reported, an expression of the precision, including the number of measurements, must be included.
- 6) The report should include date and place of sampling, sampling point, the name of the sample collector, identification as to type of sample, date and time of submittal to the lab, date of analysis, name of the analyst, and the result. Any conditions which may effect the interpretation of the data should be noted in the report.. All results will be reviewed by a Water Quality Specialist or Public Health Chemist before a final report is released.
- 7) Laboratory records will be retained in a permanent file for three years.
- 8) Retain samples for one month after issuing final report and retain data and documentary evidence for three years.

INTERNAL QUALITY CONTROL

Quality Control (QC) may be defined as those measures undertaken in the laboratory to maintain the analytical testing process within acceptable limits of accuracy and precision.

The Quality Control Program consists of the following elements: documentation of operator competence, recovery of known additions, analysis of externally supplied standards, analysis of method blanks, and testing of replicate samples:

- 1) Operator competence The principal analyst is responsible for: 1) developing a standardized training syllabus for the methods employed in the laboratory; 2) assuring that test personnel are adequately trained; 3) assessing the competency of test personnel, and 4) maintaining documentation of training and competency of all test personnel.
 - a) Before test personnel are permitted to do reportable work , competency in performing the analysis is to be demonstrated. Commonly, the analyst performs replicate analysis under the supervision of the principal analyst. General limits for acceptable work are found in Standard Methods 18th Edition, 1992 in Table 1020 :I.
 - b) After initial demonstration of competency, the principal analyst will assure test personnel maintain competency through testing internal or external proficiency test samples at least once each year.
- 2) With each batch of samples tested, controls will be tested to verify the accuracy of results as described below. Controls used with each method are outlined in Appendix D.
 - a) Recovery of known additions as part of all regular analytical protocols except titrimetric and gravimetric methods. Use known additions to verify the absence of matrix effects. Spiked samples shall be analyzed with a minimum frequency of ten percent of the samples per matrix per batch of samples. Spike recovery must be between 80-120% for potable water (75-125% for waste water). When a spike sample fails to meet this criteria, retest all samples following the last acceptable spike sample. Spike recovery calculated as % of the known addition recovered.
 - b) Analyze control standards with a minimum frequency of ten percent of the samples per matrix, per batch of samples. If there are less than 10 samples in a batch, at least one per matrix per batch must be analyzed. The concentration of the sample shall be within the working range of the method. Sources of these samples include but are not limited to: performance evaluation samples from the EPA, commercially available standards, or standards prepared in-house but from sources different

from calibration standard. Control standards must be within the published acceptance range (for external controls). If the control standard does not have a published acceptance range, recovery of the control should be within 10% of the known value. When a control standard fails to meet this criteria, retest all samples following the last acceptable control.

- c) Method blanks will be analyzed with each batch of samples. The use of method blanks provides a measurement of laboratory contamination. Blanks cannot exceed the minimum detection level. See Appendix A.
- d) Replicate samples will be analyzed with a minimum frequency of ten percent of samples per matrix, per batch of samples for drinking water. For wastewater the requirement is 5%. If there are less than ten samples per batch, at least one sample per matrix per batch must be analyzed. If the analyte is not detected, replicate matrix spike samples will be analyzed. The percent difference between replicate samples must be within 20% for potable water (25% for wastewater). When a replicate sample fails to meet this criteria, retest all samples following the last acceptable replicates. Duplicate % difference calculated as the difference as a percent of the mean. $[100(X1-X2)/avg]$.
- e) In addition to the control standards tested with each run, an external reference standard for each analyte will be tested at least once each quarter.

All of the quality assurance control procedures will be followed in the laboratory. All documentation for these checks should be available for inspection by laboratory management.

PREVENTIVE MAINTENANCE

As part of the QA plan, the laboratory has a comprehensive preventive maintenance program. Balances, spectrophotometers, and other instruments undergo routine maintenance and accuracy checks by a manufacturer's representative or by laboratory personnel as described below. All preventive maintenance performed in-house is documented on preventive maintenance forms. Instruments which undergo routine professional maintenance have labels affixed to indicate date of last servicing. Manufacturer's instructions and service manuals are readily accessible.

Adequate spare parts are kept on hand to perform routine maintenance and minimize downtime. The spectrophotometers have maintenance contracts that provide for immediate servicing in the event of malfunction. Equipment records documenting preventive maintenance and emergency servicing/repairs are kept for a minimum of three years.

- 1) Thermometer/temperature-reading instruments: Accuracy of thermometers or recording instruments are checked annually against a certified National Bureau of Standards (NBS) thermometer or one traceable to NBS and conforming to NBS specifications. All thermometers are relabeled with date calibrated and correction factor.
- 2) Balance: Balance accuracy is verified each week using ASTM type 1 reference weights. Accuracy checks are documented on preventive maintenance chart. Balances are serviced and certified annually through a maintenance contract. Type 1 weights are re-certified at least every five years.
- 3) pH meter: pH meters are standardized with at least two NIST traceable standard buffers (pH 4.0, 7.0, or 10.0) and compensated for temperature before each series of tests. A third buffer is used to confirm calibration. Date buffer solutions when opened and discard buffer after expiration date on bottle. Buffers prepared from powders are replaced after four weeks.
- 4) Water deionization unit: Conductivity of the RO and Nanopure water is checked each month. A heterotrophic plate count on Nanopure water is also performed monthly. Filters are changed as indicated by conductivity readings and heterotrophic plate count. Records are maintained on preventive maintenance chart. Water is tested annually for bacteriologic quality and heavy metals.
- 5) Autoclave: Autoclave charts are used to document date, time, temperature and contents of each load. Chem-di indicators and heat sensitive tape are used with each load to identify materials that have been autoclaved; results are recorded on autoclave chart. Autoclave performance is

checked each month with biological indicator (e.g. spore suspension). Autoclaves are serviced quarterly under maintenance contract. The accuracy of autoclave recording thermometer is checked annually. The autoclave operating temperature is monitored on a weekly basis.

- 6) Refrigerator: Temperatures are recorded daily and units defrosted and cleaned as needed. All media and reagents stored in the refrigerator are labeled.
- 7) Freezer: Temperatures are recorded daily. Identify and date materials stored. Defrost and clean semiannually; discard outdated materials.
- 8) Ultraviolet sterilization lamps: Unit is cleaned monthly by wiping lamps with a soft cloth moistened with ethanol. Test lamps quarterly with UV light meter and replace if they emit less than 70 % of initial output or if agar spread plates containing 200 to 250 microorganisms, exposed to the light for 2 minutes, do not show a count reduction of 99%.
- 9) Water bath: Fecal coliform water bath is checked twice daily. All other water baths are checked each day of use.
- 10) Incubator: Check and record temperature twice daily (morning and afternoon) on the shelf areas in use. Locate incubator where room temperature is in the range of 16 to 27°C.
- 11) Fume hoods/Biological Safety Cabinets: Fume hoods are checked once each month using a velometer; readings are recorded on preventive maintenance chart. Hoods and safety cabinets are certified annually through service contract.

PERFORMANCE AND SYSTEMS AUDITS

Corrective action is required when data is outside of predetermined limits for acceptability. The corrective actions can be triggered by the following quality assessment activities: Control Chart analysis; proficiency evaluation testing; and QA audits.

1) CONTROL CHART ANALYSIS:

The laboratory's quality assessment techniques will be used to maintain the precision and accuracy of all laboratory analyses within a state of statistical control. Precision and accuracy measurements are the best way to assess analytical performance. Precision is the degree of reproducibility of a particular analytical procedure. Accuracy is a measure of the agreement between an experimental determination and the true value.

- a) **PRECISION** - Assess precision by replicate analysis, by repeated analysis of a stable standard, or by analysis of known additions to samples. Precision is specified by the standard deviation of the results. The formula for determining standard deviation (SD) is:

$$SD = \sqrt{\sum (X_1 - X)^2 / (N - 1)}$$

X_1 is the value of the individual measurements; X is the mean of all measurements for a given sample and N is the number of measurements.

The purpose of determining precision is to establish the typical variance of the method in the absence of any matrix influence. In the course of determining precision, there are two cases that indicate there is a problem with the precision data:

- i) The measured values show wide variation from one to another for a given day.
- ii) The measured values show little variance from one to another for a given day, but the mean and standard deviation show wide variation from one day to another.

If either of the above occurs, factors such as sample homogeneity, instrument calibration, or analyst error should be checked, documented, and corrected. The precision measurements should then be repeated.

- b) **ACCURACY** - The best method to determine accuracy is to spike an aliquot of reagent water with a known amount of the constituent being measured and analyze the sample. The amount spiked should be at least five to ten times greater than the analytical detection limit.

To evaluate the data accuracy, the percent recovery of the spike must be determined. The formula for determining percent recovery is:

$$\% \text{ recovery} = [100(S - S_1) \div S_2]$$

Where S is the concentration of the spiked sample; S₁ is the concentration of the unspiked sample; S₂ is the concentration of the spike added to the sample.

If the percent recovery deviates significantly from 100% and the method has not demonstrated significant bias, the problem must be detected and corrected prior to continuing the analysis. Sources of this problem include incorrect standard or spike solution concentration or a problem in the procedural detection system.

Precision, accuracy, and detection limits for all methods used in the laboratory is comparable to values referenced in Standard Methods 18th Edition, 1992 and EPA Methods for Chemical Analysis of Water and Wastes, March 1983.

- 2) PERFORMANCE EVALUATION SAMPLES: The laboratory director is responsible for enrolling the laboratory in ELAP approved proficiency testing program(s) and assuring that proficiency testing is performed for all regulated tests. The principal analyst (Public Health Chemist) will conduct and document internal proficiency testing at least once a year for tests where proficiency testing is not available. Proficiency test samples are treated in the same manner as routine samples (ie. tested the same number of times, tested using personnel who routinely perform testing, tested using routine methods and tested during patient testing).
- 3) QUALITY ASSURANCE AUDIT: The quality assurance program will be audited quarterly and any deviations from the program will signal corrective action to be taken. Quality assurance audit will be documented in a written report. The audit will include the following aspect:
 - a) Competency of test personnel must be evaluated annually and be documented
 - b) Evidence of the systematic use of control samples, replicate measurements and reference materials all in conjunction with control charts.
 - c) Proper labeling of reagents and samples.
 - d) Use of approved methods.

- e) Results on blind samples.
- f) Acceptable safety equipment and procedures.
- g) Quality assurance reports generated on a regular basis.
- h) Documentation on equipment performance and maintenance.
- i) Training records.
- j) All relevant files accessible and organized.
- k) Laboratory personnel following good laboratory practices.
- l) Laboratory personnel following good measurement practices

The Public Health Chemist will be responsible for initiating and documenting any corrective action necessary. Corrective action will be documented on the appropriate control chart, performance evaluation report, or QA audit report. No data shall be reported until the cause of the problem is located and corrected or the laboratory demonstrates the cause was a random event and no longer affects data. Although the elimination of events requiring corrective action may not be achieved, a reduction in the repetition of these events is the objective of this program.

REFERENCES FOR QUALITY ASSURANCE DOCUMENT

- 1) Standard Method for the Examination of Water and Wastewater, 18th edition, 1992.
- 2) Handbook for Analytical Quality Control in Water and Wastewater Laboratories. EPA-600/4-79-019, March 1979, USEPA.
- 3) Manuals for the Certification of Laboratories Analyzing Drinking Water Criteria and Procedures/Quality Assurance. EPA QAMS-005/80, Interim Guidelines, EPA-570/9-82-009, USEPA.
- 4) Methods for Chemical Analysis for Water and Waste. EPA-600/4-79-020, March 1983.

Written by: Gerry Guibert & David Holland

Date: May 1993

Revised: January 1999

Revised: September 21, 2004

Approved by: _____

(Laboratory Director's Signature)

Monterey County
Consolidated Chemistry Laboratory

ANALYTICAL METHODS FOR WATER ANALYSIS

PARAMETER	HOLD TIMES	METHOD REFERENCE	MDL	UNITS
Free Chlorine	.25 h; ASAP	SM 4500-Cl G	0.02	mg/L
Total Chlorine	.25 h; ASAP	SM 4500-Cl G	0.05	mg/L
Enterococcus	8 h	IDEXX	1/100 ml	
Heterotrophic Plate Count	8 h	SM 9215 B	1	CFU
E. coli – MPN	6 h waste 8 h source 30 h potable	SM 9221 B	2/100 ml	
Fecal Coliform – MPN	6 h waste 8 h source 30 h potable	SM 9221 B	1/100 ml	
Total Coliform – MPN	6 h waste 8 h source 30 h potable	SM 9221 B	2/100 ml	
Total Coliform – Quantitray	6 h waste 8 h source 30 h potable	SM 9223	1/100 ml	
E. coli – Presence/Absence	30 h potable	SM 9223	1/100 ml	
Total Coliform – P/A	30 h potable	SM 9223	1/100 ml	
pH	.25 h; ASAP	SM4500H B		pH units
Bicarbonate	ASAP (with pH)	SM 2320 B	10	mg/L
Calcium Carbonate	ASAP (with pH)	SM 2320 B	1	mg/L
Carbonate	ASAP (with pH)	SM 2320 B	1	mg/L
Solids	24 h	SM 2540 F	0.1	mL/L
Color Determination	48 h	SM 2120 B	2	CU
Odor	NS; 48 h (rec 6h)	SM 2150 B	1	TON
Turbidity	48 h	SM 2130 B	0.05	NTU
Nitrate	48 h	EPA 300.0	1	mg/L
Nitrite as (N)	48 h	SM 4500 NO2-B	10	ug/L
Total Dissolved Solids	7 d	SM 2540 C	5	mg/L
Total Suspended Solids	7 d	SM 2540 D	5	mg/L
Alkalinity	14 d	SM 2320 B	1.0	mg/L, CaCO3
Bromide	28 d	EPA 300.0	1	mg/L
Chloride	28 d	EPA 300.0	1	mg/L
Fluoride	28 d	EPA 300.0	0.02	mg/L
Sulfate	28 d	EPA 300.0	1	mg/L
Conductivity	28 d	SM 2510 B	1	umhos at 25C
Ammonia (N)	28 d	SM 4500 NH3 F	0.05	mg/L
Orthophosphate	NS; 28 d	SM 4500 P E	0.03	mg/L
Total Phosphorus	28 d	SM 4500 P E	0.03	mg/L

Monterey County
Consolidated Chemistry Laboratory

PARAMETER	HOLD TIMES	METHOD REFERENCE	MDL	UNITS
Aluminum	6 months	EPA 200.8	5	ug/L
Antimony	6 months	EPA 200.8	0.5	ug/L
Arsenic	6 months	EPA 200.8	1	ug/L
Barium	6 months	EPA 200.8	0.5	ug/L
Beryllium	6 months	EPA 200.8	0.5	ug/L
Cadmium	6 months	EPA 200.8	0.5	ug/L
Chromium	6 months	EPA 200.8	5	ug/L
Copper	6 months	EPA 200.8	0.5	ug/L
Iron	6 months	SM 3111B	100	ug/L
Lead	6 months	EPA 200.8	0.5	ug/L
Manganese	6 months	EPA 200.8	0.5	ug/L
Mercury	6 months	EPA 200.8	0.25	ug/L
Nickel	6 months	EPA 200.8	0.5	ug/L
Selenium	6 months	EPA 200.8	5	ug/L
Silver	6 months	EPA 200.8	5	ug/L
Thallium	6 months	EPA 200.8	0.5	ug/L
Zinc	6 months	EPA 200.8	5	ug/L
Calcium	6 months	SM 3111B	1.0	mg/L
Magnesium	6 months	SM 3111B	0.1	mg/L
Potassium	6 months	SM 3111B	0.1	mg/L
Sodium	6 months	SM 3111B	0.1	mg/L
Hardness as CaCO ₃	6 months	SM 2340 B	1.0	mg/L
Boron	6 months	SM 4500 B B	0.1	mg/L

Shaded areas for laboratory use only

Chain of Custody:

Collected by (Print & sign):	Received by:	Date & Time:
Relinquished by:	Received for Laboratory:	Date & Time:

Client Name:		Report Attention:		ANALYSES REQUESTED																					
Address:		Copy to:		City, State, Zip:		Sample Site or Description	Collection Date & Time	Matrix ⁽¹⁾ 1-Routine 2-Repeat 3-Replacement	No. of Containers	Coliform	MMO	Quant.	Low-D	Nitrate											
Phone:		Fax:																							
Laboratory Number	Sample ID or System #																								

(1) **D**=Drinking Water (Specify as routine, repeat or replacement) **W**=Wastewater (Specify as grab or composite) **O**=Other (identify)

[] Payment received with delivery		Amount: _____		Sample comments (irregularities/preservation, billing information if different than reporting):	
Check: _____	Initials: _____				
Receipt #: _____	Date: _____				

SPECIFIC CONDUCTANCE
EPA 120.1/SM 2510 B
umhos at 25°C

Scope and Application:

This method is applicable to drinking, surface and saline waters, domestic and industrial wastes and acid rain.

Summary of Method:

The specific conductance of a sample is measured by use of a self-contained conductivity meter, the YSI Model 32. The conductivity meter is used in the temperature compensated mode.

Sample Criteria & Acceptability:

A minimum of 100 ml sample should be submitted in a clean container provided by the laboratory. Samples can be stored for up to 28 days at 4°C. The samples must be brought to room temperature before testing. If the sample does not meet the above criteria, document it on the worksheet but perform the test.

Reagents:

0.02 Molar Standard Potassium Chloride Solution:

1. Dry 0.85 g of Reagent Grade Potassium Chloride (KCl) for 4 hours at 105°C. Use immediately or store in a desiccator until use.
2. Dissolve 0.7456g of pre-dried potassium chloride in a 1 liter Class A volumetric flask using deionized water.
3. Label the flask with Potassium Standard Solution, 0.7456 g KCl/L, date made, outdate of 3 months, and initial.
4. Alternately, order two 500 ml containers of the Traceable Conductivity Calibration Standard near the 1414 micromho/cm range; from Fisher Scientific, Cat No. 09-328-11.

Control

1. Check deionized water. It should read less than 1 umho. If the reading is higher, clean cell and repeat reading of deionized water. If reading is still high, notify the Chemist.
2. Use current Quality Control sample with each run. The control must be in range before proceeding with specimens. The 0.01 M KCl can be used as control.

Conductance Meter Maintenance:

1. Store cell in deionized water. If the cell has been stored dry, soak in deionized water for 24 hours.
2. Check the platinum black coating on the electrode. If the coating appears thin or if it is flaking off the electrode, the cell should be cleaned and the electrodes replatinized. See "Instruction Manual YSI Model 32 Conductance Meter" pages 11 and 12 for instructions.
3. The electrode should be cleaned and replatinized every four months. Record the preventative maintenance on the "PM Worksheet".

Conductance Meter Calibration Check:

Instrument must be standardized with KCl solution before daily use.

1. Pour 50 ml of the standard potassium chloride solution into a 250 ml beaker. Alternately, immerse the conductivity cell and thermometer in the Rinse Bottle, then transfer to the Read Bottle for actual reading
2. Immerse conductivity cell in sample. The electrodes must be submerged and the electrode chamber must be free of trapped air. Tap the cell to remove any bubbles, and dip it two or three times to assure proper wetting.
3. Rotate the Range Switch to the lowest range position that gives a reading (within range) on the display. An over-range value is indicated by a "1" followed by blanks. An under-range value is indicated by a reading followed by a small letter "u". Readings may be in error when operating in the under range conditions. On the 0.1 – 2 micromho range; allow extra time to stabilize.
4. The conductance value of the solution is displayed on the meter. The units in which it is to be read are determined by the Range Switch, either in mU or in uU (or milli and micro siemens).

2 uU, 20 uU, 200 uU reading = final result
2 mU, 20 mU, 200 mU readings x 1000 = final result

5. Use the table below to check accuracy of cell constant:

Conductivity of 0.01 M KCl	
Temperature in Centigrade	Micro-ohms/cm
21	1305
22	1332
23	1359
24	1386
25	1413
26	1441
27	1468
28	1496

6. If the standard is within range, rinse the cell three times with deionized water, and start testing unknowns as described in steps 2-4.

Reporting:

Report results to three significant figures. Report in units of micromhos per centimeter at 25 °C

References:

1. Instruction Manual YSI Model 32 Conductance Meter", Item 060818, PN A32018 R, October 88 EP
2. Methods for Chemical Analysis of Water and Wastes", EPA- 600: 4-79-020, March 1983, pages 120.1-1 to 120.1-3.
3. "Standard Methods for the Examination of Water and Wastewater", 18th Edition, 1992.

Written by: David Perez, Date: February 1993

Revised: January 12, 2007

Approved by: _____

Chemist

pH
SM 4500-H B
Electrometric

Scope and Application

Application to drinking, surface, ground and saline waters as well as acid rain, and wastewater (domestic and industrial).

Principle of Operation

pH is defined as the negative logarithm of the hydrogen ion concentration in moles per liter. The pH scale goes from zero to fourteen with a value of seven units to be considered neutral. Values below seven are acid; values above seven are basic. It is important to note that a one-unit change in pH represents a ten-fold change in the concentration of the hydrogen ion.

pH has a great impact on almost all biological and chemical processes used for water and wastewater treatment, and proper measurement of this value is critical. pH is measured using a pH meter consisting of a potentiometer, glass pH electrode, reference electrode and temperature compensating device. When calibrating the instrument, use two buffers that bracket the expected pH value for greatest accuracy.

Specimen collection and Handling

Collect sample in plastic or glass container. Test sample immediately upon receiving and/or within two hours after collection.

Instrument Calibration:

Two buffer calibration:

1. Fill a 50 ml beaker with up to 30 ml of pH 7 buffer. Add a stir bar and set the knob on the magnetic stirrer to the second line on the dial (slow spin). Place the electrode in the pH 7 buffer; make sure that the reference electrode is filled with KCl and is open. Allow the electrode to equilibrate for 5 minutes.
2. Release Standby button and press the pH button. Measure the temperature of the buffer solution and set the temperature control. Turn the large slope knob to 100 and the inner knob fully clockwise.
3. Adjust the calibration control until the readout displays 7.00. Press the mv button and record the mv reading on the worksheet. Remove electrodes from the buffer and rinse with deionized water.
4. Fill a 50 ml beaker with up to 30 ml of pH 4 buffer. Add a stir bar and set the knob on the magnetic stirrer to the second line on the dial (slow spin). Place the electrode in the pH 4 buffer and allow the electrode to equilibrate for 5 minutes. Press the pH button.
5. Adjust the slope knob until the readout displays 4.00. Press the mv button and record the mv reading on the worksheet. Remove electrodes from the buffer and rinse with deionized water.
6. Fill a 50 ml beaker with up to 30 ml of pH 6.86 buffer. Add a stir bar and set the knob on the magnetic stirrer to the second line on the dial (slow spin). Place the electrode in the pH 6.86 buffer and allow the electrode to equilibrate for 5 minutes. Press the pH button and record the result on the worksheet and quality control graph. PH should be 6.86 ± 0.1 ; notify chemist if out of range.
7. Rinse the electrodes with deionized water.

8. Record mv readings of calibration buffers. Calculate change in millivolts and divide by 3. The result should be 58 ± 2 mv.
9. If the slope is within limits, begin testing unknowns. If the slope is out of range, re-calibrate the pH meter. If the second calibration slope is out of range, notify the chemist.

Controls

1. Run every tenth specimen in duplicate. The duplicates should be within 20% of each other.
2. Check the 6.86 control buffer after every tenth specimen. Record the results on the worksheet and quality control chart.

Procedure

Once the pH meter has been calibrated, the unknown samples can be tested.

1. Pour 30 ml of unknown (or 50 ml of unknown if also testing for alkalinity) into a 150 ml beaker containing a small stir bar. Start the stirrer. Keep the automatic stirrer at a constant moderate rate (The speed is marked on the dial by a pen marking).
2. Allow the display to stabilize, and record the results on the worksheet.
3. Rinse the electrode with deionized water between specimens. Blot dry with a 'kimwipe'. Do not rub the electrode; the static electricity can alter readings.

Reporting

Report the result to the nearest tenth (0.1).

References:

1. "Method for Chemical analysis of Water and Wastes", EPA 600/4-79-020, Revised March 1983.
2. Standard Methods for the Examination of Water and Wastewater 18th edition 1992

Written by: David Perez
Date: December 1994

Approved by: _____
Chemist

Total Alkalinity

SM 2320 B

Titration

Principle

Total alkalinity is defined as the acid-neutralizing capability of water. It is reported as due to bicarbonate (HCO_3), carbonate (CO_3), and hydroxide (OH). Unaltered sample is titrated potentiometrically to pH 8.3 endpoint for “carbonate” alkalinity and 4.5 endpoint for “bicarbonate” alkalinity.

Note: Samples with a pH less than 8.3 (i.e. most drinking water samples) are reported as having non-detectable hydroxide and carbonate alkalinity; for these samples total alkalinity is due entirely to the bicarbonate content of the water. Bicarbonate alkalinity (as HCO_3) can be calculated from total alkalinity (as CaCO_3) by multiplying by a factor of 1.22.

Applicable to drinking and surface waters, domestic and industrial wastes, and saline waters.

Sample Criteria & Acceptability

Samples should be submitted in clean containers provided by the laboratory. A minimum of 100ml of sample should be submitted for testing. Samples, which cannot be tested within 24 hours of collection, should be stored at 4°C and tested within 14 days. If any sample does not meet the above criteria, document it on the worksheet but perform the test.

Equipment

1. pH meter that can read to 0.05 pH units.
2. Two 1,000 ml Class A volumetric flasks.
3. Magnetic stirrer and magnetic stir bars.
4. Two 100 mL beakers.
5. One 250 mL flask
6. One 50 mL graduated cylinder

Reagents

The day before preparing standardize sulfuric acid, dry 0.1 g of Tris Buffer for at least 3 hours at 103 C (overnight is acceptable). After drying, immediately weigh out the Tris buffer. If that is not possible, store the reagent in the desiccators until used.

1. Standardized 0.02 N H_2SO_4 (sulfuric acid) + 0.004 units:

The concentrated H_2SO_4 and stock 1.0 N H_2SO_4 may be found in acid cabinet below hood.

- a. Prepare a 1.0 N H_2SO_4 Stock Solution: Fill a 1,000 ml Class A volumetric flask three quarters full with deionized water. Carefully add 28.0 mL of concentrated H_2SO_4 using a 25 mL and 3 mL Class A volumetric pipette. Fill to the mark with deionized water and mix. Transfer to plastic bottle and label as 1.0 N H_2SO_4 Stock Solution, date made, outdate of 1 year, and initial. Cap tightly.
- b. Prepare a standardized 0.02 N H_2SO_4 .
 1. Fill a 1,000 mL Class A volumetric flask three quarters full with deionized water. Carefully add 20.0 mL of the Stock H_2SO_4 using a 20 mL Class A pipette. Fill to mark and mix thoroughly.
 2. Weigh out between 0.0700 to 0.0800 g of Tris buffer using the analytical balance. Record the weight of the Tris Buffer to four places in the “Standard & Reagent Preparation” notebook. Add the buffer to 250 mL flask containing 25 mL of deionized water and stir bar; mix.

3. Add 3 drops of Hach Brom Cresol Green-Methyl Red indicator solution (Hach cat. number 451) to the Tris buffer solution.
 4. Fill the titrating buret with the 0.02 N H₂SO₄ solution. Titrate the solution until a stable pink color is reached. Record the volume of reagent used.
 5. Calculations:

$$\text{Normality of H}_2\text{SO}_4 = \text{Wt of Tris Buffer (g)} \div (0.121137 \text{ g/meq Tris} \times \text{mL of 0.02 N H}_2\text{SO}_4 \text{ used})$$

Example:

$$0.0879 \text{ g Tris Buffer} \div (0.121137 \text{ g/meq Tris} \times 35.7 \text{ ml H}_2\text{SO}_4) = 0.0203 \text{ N H}_2\text{SO}_4$$
 6. Transfer the 0.02 N H₂SO₄ to a one liter plastic bottle. Record the normality on the bottle, date made, outdate of 3 months, and initial. Store at room temperature.
2. Alternatively, order 0.02 N H₂SO₄, already prepared and standardized from a vendor such as Fisher Scientific. Record lot on QC worksheet.

Controls

1. Run deionized water as blank. Value of blank should be less than 2 mg/L of calcium carbonate (approximately 0.1 mL of H₂SO₄).
2. Use one quality control standard. This is a solution of sodium bicarbonate (100 mg/l). Run once with each set of samples and record results on control chart. Consult chemist if out of control situation exists.
3. Run every 10th specimen in duplicate. Calculate the relative standard deviation (RSD) of the replicates using the following formula: $\text{RSD} = \text{SD} \div \text{mean} \times 100$. The RSD should be less than 10%. If the replicates are outside of this range, repeat the specimen a third time. Check with the chemist for instructions.
4. Each quarter an external reference sample is to be analyzed. In the case of results exceeding acceptance values, document corrective action. Place any corrective action records in proficiency file

Procedure:

If applicable, standardize the pH meter each day of use (see supplemental procedure). Record slope with offset on worksheet.

Run the blank and control first. If the control is within range (range found in the "QC Inorganic True Value" binder), run the samples. Repeat the control if it is out of range. Notify the chemist if the control is out of range a second time.

1. Add 50 mL of control or sample to a 100 ml beaker containing a magnetic stir bar. Set magnetic stirrer at low speed.
2. Carefully lower pH probe into the solution. **If the pH is above 8.3 consult principal analyst!**
3. Fill the titrating buret to the zero mark with the standardized H₂SO₄. Carefully add the H₂SO₄ to the sample until a pH of 4.5 ± 0.05 is reached.
4. Record the volume of H₂SO₄ added to the sample, to the nearest tenth, on the chemistry worksheet.

5. Rinse the pH electrode with deionized water. Measure out the next sample, refill the buret, and titrate the next specimen.

Calculations:

Use the following formula to calculate the alkalinity as mg/L of calcium carbonate.

Exception: For alkalinity below 20 mg/L use low alkalinity calculation procedure (refer to SM2320B part 5)

$$\text{mg/L} = (\text{mL of H}_2\text{SO}_4 - 0.1) \times \text{normality of H}_2\text{SO}_4 \times (50,000 \div \text{ml of sample})$$

Example (for 50 ml sample):

$$(28.6 \text{ mL} - 0.1) \times 0.02 \times (50,000 \div 50 \text{ ml}) = 570 \text{ mg/L of Calcium Carbonate}$$

or

$$(28.6 \text{ ml} - 0.1 \text{ ml}) \times (20) = 570 \text{ mg/L of Calcium Carbonate}$$

Reporting

Report in **whole** numbers; round off to 3 significant figures. Examples:

$$2,902.5 = 2,900; 1,125.9 = 1,130; 23.65 = 24$$

References

Standard Methods for the Examination of Water and Wastewater 18th edition 1992

Written by: David Perez

Date: January 1993

Revised by: G. R. Guibert

Date: August, 1998

Approved by: _____
Principal Analyst

Varian Flame AA Procedure

SM 3111B

For Ca, Mg, Na, K and Fe

Principle:

In flame atomic absorption spectrometry, a sample is aspirated into a flame and atomized. A light beam is directed through the flame, into a monochromator and into a detector that measures the amount of light absorbed. Because each metal has its own characteristic absorption wavelength, a source lamp composed of that element is used. The amount of energy absorbed in the flame is proportional to the concentration of the element in the sample.

Sample Collection/Handling:

Use metal free collection bottle to collect sample. Collect one liter of sample. Smaller volumes (not less than 200 ml) can be used if necessary. On collection, acidify samples to pH <2 with 1:1 nitric acid, usually 3ml per liter. If samples are not acidified at time of collection, add acid upon receipt in lab and hold for minimum of 16 hours before analysis.[40 CFR 141.23(K)].

Sample Preparation:

Samples containing particulate or organic material require pretreatment before analysis. Samples with a turbidity <1 NTU, no odor and single phase may be analyzed directly. Digest all other samples before determining total metals.

Digestion Procedure for total metals:

Drinking water samples with turbidity >1 NTU can be analyzed following digestion with nitric acid. See procedure SM 3030E (Nitric Acid Digestion). Wastewater samples are better digested using method SM 3030F part b (Nitric Acid-Hydrochloric Acid Digestion). Report as total recoverable metal.

Sample criteria:

Except as noted, specimens that do not meet the criteria below should be immediately reported as "no test" with an explanatory note:

1. Samples submitted in improper collection container.
2. Sample inadequately identified. (Sample has no identification, or cannot be matched to a laboratory request form).
3. Sample quantity insufficient
4. Sample container broken or leaked in transit.

Special Instructions:

All glassware and pipettes used in this procedure must be cleaned using glassware-cleaning procedure. See document in kitchen.

Reagents:

1. Nitric Acid (HNO₃). Use high purity nitric acid 1+1.
2. Lanthanum solution (1.11%): Dissolve 58.65 g lanthanum oxide in 250 ml of conc HCL. Add slowly with stirring until dissolved and dilute to about 900 ml. Allow to cool for a few hours then dilute to final 1000 ml volume. Used for Ca, Mg, Na, and K analysis.
3. Calcium solution: Dissolve 630 mg calcium carbonate, CaCO₃, in 50 ml of 1+5 HCL. If necessary, boil gently to obtain complete solution. Cool and dilute to 1000 mL with water. Used for Fe analysis.
4. Standard Metal solutions: Standard metal solutions are prepared from 1000 mg/l AA or ICP-MS standards purchased from Ricca Chemical company, Spex Certiprep, LabChem, Fisher Scientific or VWR. A standard from EM scientific (ICP Multi-element Standard) is very convenient for calibration standards.
5. Deionized Water from Millipore system – metal free water.

Instrument Set-up:

Use the Varian Spectra 300AA operating in the flame mode with Air Acetylene burner.

1. Turn on exhaust hood. Switch is located in the corner by the Chemistry room refrigerator. Note: Turn switch until it clicks on. If you continue turning the switch after it clicks, the airflow will be reduced.
2. Turn on "Acetylene" gas cylinder located outside in the "Safety Storage" shed. The correct door housing the tank is labeled "Acetylene". Pressure should be set at 8-9 PSI.
Note: The cylinder valve is opened by turning the handle only 1/4 turn counterclockwise. Replace cylinder when pressure in tank drops below 100 psi. This prevents acetone from entering instrument.
3. Check the Varian Spectra AA 300A unit to see if the burner is installed.
4. Check to see if the cathode lamp required is in the correct socket position, and it is lined up in the "Operating Lamp"
Note: Lamps are stored in the top drawer located directly across from the GTA 96 Graphite Tube Atomizer (next to hood).
5. Turn on the equipment in the following order (allow a 20 minute warm-up period):
Note: If the computer is already on, turn it off.
 - a. Spectra AA 300A: switch located on lower right front of instrument.
 - b. IBM PC and Printer: Turn surge suppressor on (power supply); hit reset button.

Once the unit has been set-up, program the machine for testing by:

1. Start at the "C:" prompt. Press "M" and "Enter".
2. Press "Spectra Flame"
3. Press "Index" (F10). Enter number 10, "Sequence Selection", press "Enter" key.
4. Select element to be tested
5. Press "Sequence Control" (F6). Enter number of samples to be tested.
6. Press "Index" (F10), enter number 6, "Optimization", press "Enter" key.
7. The Screen will display two signal bar graphs. Check the previous week worksheet for the "Photomultiplier voltage" reading.
8. Maximize the lamp signal of the Cathode tube using the two thumbscrews located on the back of the lamp socket (see figure 5.8).
 - a. Watch the bar graph as you turn one thumbscrew. Once the value reaches .9 or greater press "Rescale" (F1).
 - b. Check the Photomultiplier Voltage display on the screen, after rescaling. If the voltage is higher than the preceding week, continue adjusting and rescaling until the proper voltage is reached. If you are unable to reach the proper voltage, try adjusting the second screw.
 - c. Note: Normally the voltage stays the same from week to week, but as the lamp nears the end of its usefulness, the voltage reading will go up. If a new lamp is installed, the starting voltage may be different than the previous lamp. Record millivolt reading on worksheet.
9. After adjusting for maximum signal, hit "Rescale" (F1). The photomultiplier voltage will be displayed. If the reading matches the previous week, record the voltage on the new worksheet. If it is out of range, readjust lamps. If voltage is still out of range, notify Chemist.

10. Press "Index" (F10) key and select "Standards" (number 7). Verify that the values of the standards are correct (see previous worksheet for standard values). To select a value to change, use the up and down arrows. Enter the correct value with the keyboard.
11. Check to see that drain hose, located below the Spectra 300A, is inserted into the drain bottle. (empty after each use).
12. Press "Index" key, enter number 18 (Signal Graphics), and press "Enter".
13. Press "Shift" and "Instrument Zero" (F10).
14. Light burner by pressing ignite button. Aspirate DI water for about 10 minutes. This will allow burner temperature to stabilize.

Standard and Sample Preparation:

Required sample preparation depends on the metal form being measured.

Procedure for Ca, Mg, Na, and K

1. Label the 10 ml beakers with the standard value; label the sample beakers with the last three numbers of the tiny tab number. Using the adjustable pipette, pipette 1.0 ml of sample or standard into each disposable beakers.
2. Add 9.0 ml of 1.11% lanthanum to each sample or standard using the adjustable pipette.
3. Repeat the process once again by diluting 1 ml of the diluted sample to 10 ml with the 1.11% Lanthanum. The samples have now been diluted 1:10 and 1:100. Alternatively use proportionally smaller volumes (i.e. .5 ml sample and 4.5 ml of 1.11% lanthanum).
4. The standards are prepared from stock solutions that when diluted 1:10 will give the necessary concentrations for calibration. The stock solutions are prepared from 1000 ppm standard metal solutions purchased from Ricca Chemical Co. Record dates of preparation and expiration (3 months) in sample prep manual.
5. The final concentration of calibration standards will be,
 1. Ca: 1.00, 3.00, 5.00 and 10.00 mg/l
 2. Mg 0.10, 0.50, 1.00 and 1.50 mg/l
 3. Na 0.10, 0.50, 1.00, 1.50 and 2.50 mg/l
 4. K 0.10, 0.50, 1.00, 1.50 and 2.50 mg/l
6. Set report format: Go back to index by pressing the "Index" (F10) key, then select the "Report Format" (number 13). Here you can enter the name of the operator, batch name, and date. No other changes are usually necessary.
7. Start program: Press the "Start" (F11). The screen will show the message "Select Lamp 3"; press "Start" (F11). The program will now run to completion.
8. Calibration of other Metals besides Fe/Mn: The other metals tested by flame AA does not require an ionization suppressor and can be directly aspirated. See specific method on computer for required calibration standards.

Standard and Sample Preparation: Procedure for Fe:

1. Label the sample beakers with the last three numbers of the tiny tab number. Using the adjustable pipette, pipette 1.0 ml of Ca solution into each disposable beakers.
2. Add 4.0 ml of sample to each beaker using the adjustable pipette.
3. The standards are prepared from 1000 ppm standard metal solutions purchased from LabChem or Spex Certiprep. Add 20 ml Ca solution and 1 ml conc HNO₃ to each 100 ml of standard prepared. Record dates of preparation and expiration (3 months) in sample prep manual.
4. The final concentration of Fe calibration standards will be: 0.3, 0.5, 1.0, and 3.00 mg/l
5. Set report format: Go back to index by pressing the "Index" (F10) key, then select the "Report Format" (number 13). Here you can enter the name of the operator, batch name, and date. No other changes are usually necessary.
6. Start program: Press the "Start" (F11). The screen will show the message "Select Lamp 3"; press "Start" (F11). The program will now run to completion.

Quality Control:

1. Analyze a Blank after every 10 samples to verify baseline stability. Rezero when necessary.
2. Duplicate Spikes - replicate spikes are to be performed on 10% of samples. Recovery of spike in drinking water should be between 80% and 120% with a precision of 20%. Recovery of spike in wastewater should be between 75-125% with a precision of 25%. Spike level should not exceed MCL for analyte. Spiking solutions are available from Crescent Chemical Co. or SPEX.
3. External Reference Sample - Analyze a known reference sample after initial calibration and after every ten samples to confirm the test is in control.
4. See Table 3111:III in Standard Methods for recommended concentrations of standards to be run, limits of acceptability, and reported single operator precision data.
5. Analyze External Reference Sample on quarterly basis. Solutions available from APG, ERA or SPEX.

CRITERIA FOR ACCEPTABILITY OF RUN

1. Recoveries of spikes and controls are within acceptable range.
2. Blank values below detection levels.
3. Acceptable levels of precision.

NOTE: If any of the acceptance criteria are not met, the analyst must stop the run, correct the problem and retest the samples.

OUT OF CONTROL PLAN

No sample should be reported until the all acceptance criteria have met. Or the out-of-control condition has been corrected and any problems or departure from protocol identified.

Trouble Shooting:

1. PROBLEM - poor precision,
Check alignment of hollow cathode lamp. Check that capillary hose is not clogged. Make sure burner is clean and flame appears smooth and even. Replace pinched or crimped capillary tubing.
2. PROBLEM - error message
Refer to instrument service manual

3. PROBLEM - Contamination

Check supplies associated with sample collection for contamination. Check rinse water, sample diluent, pipettes, sample cups. Make sure work area is free from dust.

Shutdown Procedure:

Turn off acetylene, IBM PC, and AA300, and exhaust hood, in that order.

Calculations:

The results will be printed and should be recorded on a worksheet. The dilution factor must be shown and considered in the calculations.

Reporting:

1. The data from the printout should be transferred to the worksheet. Verify that controls were within acceptable range and that duplicates are within range.
2. The lab clerk enters the results into the computer. Results are reported in units and number of significant figures consistent with MDL of method.

References:

1. "Analytical Methods for Flame Atomic Absorption Spectrometry" Varian Techtron Pty, Limited, 1989.
2. "Standard Methods for the Examination of Water and Wastewater"
18th Edition 1992 by APHA, AWWA, and the WEF.

Written by: David Holland
Date: January 1999

Approved by: _____
Laboratory Director

DETERMINATION OF INORGANIC ANIONS
BY ION CHROMATOGRAPHY (EPA METHOD 300.0)
USING THE DIONEX DX-80 ION ANALYZER

PRINCIPLE

This method determines the following inorganic anions: fluoride, chloride, nitrite, bromide, nitrate, phosphate and sulfate.

A small volume of sample (approx. 1 ml) is loaded into the ion chromatograph. The injection valve injects 10 ul of the sample into the flow of eluent. The eluent (a NaHCO₃ - Na₂CO₃ solution) flows continuously through the IC and serves as a carrier for the 10 ul of sample and facilitates in the separation process.

The anions of interest are separated using suppressed conductivity detection, and are identified and quantified by comparing data to those obtain from a standard solution. The major parts of the system are the liquid eluent, high pressure pump, sample injector, guard column, the separator column, the chemical suppressor and the conductivity detector. The guard column protects the separator column, which separates the anions based on their size and charge. The function of the suppressor is to chemically reduce the background conductivity of the electrolytes in the eluent, and to convert the sample anions into a more conductive form. The detector then detects the conductivity of the solution, which varies depending on the concentrations of the anions (higher conductivity indicates a greater concentration of the anion).

SAMPLE CRITERIA

The holding times for drinking water samples are as follows:

Fl ⁻	28 days
Cl ⁻	28 days
NO ₂ ⁻	48 hours
NO ₃ ⁻	48 hours
SO ₄ ⁻	28 days
Br ⁻	28 days

Samples submitted for IC testing routinely should be run within 48 hours of collection, especially for nitrite and nitrate. If testing needs to be delayed, the sample can be preserved with sulfuric acid; preserved samples can be held for up to 28 days and the nitrate results reported as combined Nitrate/Nitrite. Any samples not tested within specified holding times should be identified on the worksheet.

Samples bottles dedicated for IC testing only are placed on the IC bench. As soon as a sample is setup, place it on the white tray for easier storage. After 6 weeks the containers should be emptied and discarded. Nondedicated samples (i.e. those also submitted for additional testing) should be returned to the designated cart after IC testing.

QUALITY ASSURANCE

Operator competency - Ion chromatography may be performed only by analysts who have been trained and who have demonstrated competency with the procedure. One check consists of preparing the calibration standards and calibrating the I.C. An r-value of 0.995 or higher (correlation coefficient of 99.95%) in the linear fit type must be attained for each analyte of interest. Another way to demonstrate competence is to run a minimum of four replicate analyses of an independently prepared sample. Each analyte of interest in the sample should have a known concentration between 5 and 50 times the MDL.

Blank - A blank consisting of nanopure water should be included at the beginning of each run. The results for the blank must be below the MDL for each analyte.

Control standard(s) - Controls representing two concentration levels for each analyte (ICMIX HIGH & ICMIX LOW) must be analyzed as described below. The source of the analytes used to prepare these controls must be different from the source used to prepare the calibration standards. An ICMIX HIGH stock solution of the 7 anions with the following final concentrations:

<i>Anion</i>	<i>Final Conc</i>	<i>Preparation in 500 ml volumetric flask</i>
Fl ⁻	20 ppm	10 ml of 1000 ppm Fl std
Cl ⁻	100 ppm	50 ml of 1000 ppm Cl std
NO ₂	65.5 ppm	10 ml of 1000 ppm NO ₂ -N std
Br ⁻	20 ppm	10 ml of 1000 ppm Br std
NO ₃	100 ppm	50 ml of 1000 ppm NO ₃ std
PO ₄	100 ppm	50 ml of 1000 ppm PO ₄ std
SO ₄	100 ppm	50 ml of 1000 ppm SO ₄ std

should be kept on hand. Use this undiluted at the beginning of the run and after every tenth sample. Each week, prepare an ICMIX LOW solution from the ICMIX HIGH solution as follows: Using a 100 ml volumetric flask add 1 ml of ICMIX HIGH using the 1 ml volumetric pipet and fill to mark with nanopure water. Record date made in the IC logbook under Quality Control. Run the IC LOW at the beginning of the days run and after every 10th sample after the IC HIGH. The percent recovery for each anion should be between 90 and 110%.

Duplicate spikes – Duplicate spikes should be run after every tenth sample. The spike should not be less than four times the MDL, and it should increase each anion concentration by more than 25% of the background value. A suitable spike can be prepared by adding one part ICMIX HIGH to three parts sample. The average percent recovery for each anion should be between 80 and 120%. The duplicate spikes should be within 10% of each other. Record average percent recovery of spikes and duplicate percent difference on worksheets. Note: if the concentration of the spike is less than 25% of the background concentration, the spike recovery should not be calculated.

If any of the above control criteria are not met, do not report sample results until the problem has been resolved.

External controls & chart analysis - In addition to the control standards tested with each batch of samples, an external reference standard (i.e. SPEX IC standard or WS proficiency sample) should be tested on a quarterly basis; however we like to run one at the end of each run.

CALIBRATION FOR GROUNDWATER (DRINKING WATER AND MONITORING WELLS):

Calibration for groundwater samples is described below. Calibration should be performed whenever: 1) controls are out of range; 2) a new batch/lot of eluent/regenerant is made or 3) when a column, suppressor or detector is changed.

1. Prepare 1/10, 1/100, 1/1000 dilutions of the calibration standard ordered from Dionex, which contains 20 mg/l fluoride, 100mg/l chloride, 100 mg/L nitrite, 100 mg/L bromide, 100 mg/l nitrate, 200 mg/L phosphate and 100 mg/l sulfate.
2. Run calibration standards beginning with the highest dilution (1/1000) first.
3. Create calibration sequence: File – New – Sequence – Standards – Next. Skip section on Choosing Timebase – name the sequence *calibMMDDYEAR* and initials – Next – Done.
4. Add sequence to batch file before starting
5. After all four calibration standards have been ran, check the calibration curve.
 - a) Double click on any of the calibration standards (Cal Std 1). You will get a chromatograph
 - b) Click on Calibration Plot icon, upper right corner or click on VIEW – Calibration Plot. You will see a graph of the first analyte along with the correlation coefficient percentage for each analyte. Only analytes with percentage of 99.5 or greater are acceptable. Generally try for a 99.98% for an average of all seven analytes to pass quality control checks. See the principle analyst if the result is a lesser value.
 - c) The mean retention times and detection range are automatic on the DX-80 Ion Analyzer and can not be changed or edited.

PREPARE MDL STUDY

The Method Detection Limit is the lowest concentration of a substance that can be identified with accuracy and confidence by a certain method or analysis.

- 1) Prepare a Cal Std 1 level each analyte separately using the secondary standards (not Dionex mix)
- 2) Make seven replicates of this dilution and run through the Ion Analyzer under the Unknown Method.
- 3) Collect data and calculate the standard deviation for the seven replicates. Multiply the standard deviation values by 3.143. This number will be the Method Detection Limit.

GENERATE BACKLOG REPORT:

- 1) On a network computer – not the Instrument computer. Double click on LABWORKS icon. Enter password. Click on OK. Click on backlog. Click on analysis code. Click on OK. Type in #ICANION. Click on OK. Click on display report. Click on print. Click on exit until you are out.
- 2) Check the clipboard to see if a worksheet has been initiated listing samples that need repeat testing; if so, append worksheet with samples on backlog report.
 - a) Account for all specimens on backlog report
 - i) Samples may have been tested in a previous run but not recorded. Record these results and give to the clerk.
 - ii) If a sample appears on the backlog but needs to be tested by a different method (i.e. wastewater), inform the clerk so that the analysis ordered can be modified.
 - b) Include any "new" samples on the I.C. bench that have not yet been entered into the computer.

SAMPLE PREPARATION

Groundwater (drinking water and monitoring wells) should be filtered through 0.45 um membrane filters before injection:

- 1) Rinse the syringe once with the sample water. Then fill syringe with about 10 ml of sample water.
- 2) Filter a minimum of 2 ml of sample through the 0.45 membrane into a labeled autosampler vial discarding the first few drops.
- 3) Place autosampler cap on vial and press down using the provided tool. Make sure the cap goes in straight and remove any air bubbles seen in the vial (invert or knock gently).
- 4) Place sample in autosampler rack. The order in the rack must match that on the schedule.
Note: If you suspect the result of a sample to be above that of the calibration standard for an analyte, make an appropriate dilution. Check by measuring conductivity – anything greater than 700 uS will need to be diluted.
- 5) Include duplicate spikes for every 10th sample. Add 1 part ICMIX high to 3 parts filtered sample. Then IC HIGH, LRB, IC LOW. The laboratory reagent blank (LRB) is necessary to minimize carry over as the IC low is 100 times less than the High. Double check any samples where analyte concentrations are low after a high sample to verify analyte is even detected.

Samples which may contain high concentrations of chloride or organic contaminants (Carmel Area Wastewater District and ESF), are run on the DX-100 and require additional filtering through Dionex OnGuard P, Dionex OnGuard Ag, and Dionex OnGuard H filters before injection. See supplemental procedures.

SYSTEM START-UP:

- 1) Ensure the **eluent** bottle is at least ¼ full. If it is less, depending on size of run, prepare new eluent (and regenerant):
 - a) Prepare 2 liters of a final eluent concentration of 8.0 mM Sodium Carbonate and 1.0 mM Sodium Bicarbonate by diluting one Dionex AS 14A Eluent Concentrate bottle (P/N 057060) into two 1L-volumetric flasks. Bring each to volume (1000 ml) with nanopure water. Makes 2 liters.
 - b) Use the designated filter/vacuum flask, a filter funnel, a clean 0.45um membrane filter, and a large magnetic stir bar to degas the eluent. Pour the eluent into the filter funnel and turn on the vacuum. Set the magnetic sticker at medium to high speed. Once all the eluent has been filtered, keep the vacuum and magnetic stirrer on for 15-20 minutes, allowing the eluent to degas.
 - c) Turn off the magnetic stirrer and the vacuum. Remove the filter funnel. Carefully decant the degassed eluent into the eluent bottle, without aerating. Make sure the cap is on tightly, and the tubes are securely attached.
- 2) Whenever new eluent is prepared, new **regenerant** must also be made.
 - a) Prepare 2 liters of a final anion regenerant concentration of 72 mN Sulfuric Acid by adding one Dionex Anion Regenerant Concentrate bottle (P/N 057559) to two liters of nanopure water.
 - b) Mix in the regenerant in the designated filter flask using the stir bar and degas for 15-20 minutes.
 - c) Turn off the magnetic stirrer and the vacuum. Remove the filter funnel. Carefully decant the degassed regenerant into the REGEN bottle, without aerating. Make sure the cap is on tightly, and the tubes are securely attached.

DX-80 OPERATION

- 1) Turn on nitrogen gas cylinder (main knob only), autosampler (rear right hand corner), ion analyzer (rear panel right hand side) and computer.
- 2) Double click on Peaknet to open computer program. **File – Panels\Dionex DX-80 System** for the Control Panel.
- 3) Under the DX-80 Status click on **CONNECT** to connect analyzer to computer
- 4) Turn on the pump by clicking the **ON** button on the DX-80 Control Panel. **Prime** the pump by turning the pump head waste valve knob counter clockwise and leaving it open for about 5 seconds. Close the pump valve knob by turning clockwise until secure. After changing to new eluent, it is a good idea to leave pump valve open until all air bubbles have been purged – look for the air bubbles coming out the eluent bottle until it reaches the waste line at the pump. This will allow any air bubbles to be pumped to waste instead of through the columns.
- 5) Allow the system to **equilibrate** for 30 minutes minimum, generally one hour if new eluent is used. Once ready, the **operating pressure** should be 2000+- 300 psi (usu 2100

psi); and the operating **total conductivity** background should be < 30 uS (usually 25.00uS). You can offset the background and zero the reading by clicking the Autozero button on the Control Panel.

- 6) To begin a run, create a sequence worksheet by clicking on **File – New – Sequence**. (May have to do this twice if worksheet is not already open.)
 - a. It will then prompt you to choose Standard or Unknowns. Choose **Unknowns - Next**
 - b. Skip **next** screen where it prompts you to specify timebase,
 - c. **Estimate** number of unknowns (you can always add or delete samples from sequence when done.
 - d. Fill out file name you wish to save the file. We save under **MMDDYEAR** and **initials**: (05052002tl) and press **enter**.
 - e. Press **Done** when prompted to exit wizard.
 - f. A worksheet will appear where sample identifications can be added after the calibration data (line #5). Follow printed worksheet – first include a *blank, ic low, ic high, lrb*, then the samples. Note for the first set, the lrb is listed as a sample. *Duplicate spikes* are required for every 10th sample or a minimum of 10% of samples. Finish off sequence with a known quality control standard, usually a proficiency standard such as *WS 60* or Ultra QC and another blank (LRB).
 - g. Change *dilution factor* if sample was diluted; default is one. Save by pressing the SAVE icon (floppy disk).
- 7) To start the run – click on **Batch – Edit – Add** – double click on the newly created sequence, or the one you want run – then **Start** to begin.
- 8) Make sure autosampler vials are in order and the green light is on ‘Run’ not ‘Hold’.
- 9) Record date, total conductivity and pressure in the log notebook at which the run has started.
- 10) During or after the run, verify that the blank and QCs (IC HIGH, IC LOW, IC CHECK) are within range. If not stop the run by clicking on **Batch – Stop - after current sample**, and notify principal analyst to investigate and solve the problem before resuming the run.

REPORTING RESULTS

- 1) When run is complete the analyst performing the run is responsible for recording and reporting results. Review each chromatogram to verify that the peaks were properly identified. Retention times may shift if there was a sudden change in pressure. Changes to the peak name can be made by a right click on the peak and choosing the correct analyte then save.
- 2) The results are found on the worksheet next to the sample ID and can be exported to an excel file for accuracy calculation:
 - a) Click on any sample cell – i.e. ic low, cell will be outlined.

- b) Click on **File – Batch Report – Export** (unclick the Printout option- computer is not connected to any printer) – **Excel file format**
 - c) For sheets to be exported, choose only “ **Summary – INJ vs. Area, Ht, Amt.**” Unclick the Integration, Calibration, Peak analysis, Summary-INJ vs. Anion, and Audit Trail options as they are extra and rarely needed for our purpose.
 - d) Click on **Finish** then **OK** on batch menu. Status will appear and when transfer is complete, press **OK** to exit.
- 3) To copy exported file onto a floppy, right click on Start icon on lower left screen and choose EXPLORE for Windows Explorer. Under **C:\Chromel\Export** folders are the files just exported. Highlight the correct sequence and drag to **A:** drive to copy file. (Make sure you have a floppy disk inserted).
- 4) Open exported file under an EXCEL program – the instrument computer does not have one so use a network computer. You will see three types of charts: first- Sample vs. Area, second - Sample vs. Height, and third - Sample vs. Amount. Copy all of the **Sample vs. Amount** table to an old/previous excel file.
- 5) The Excel Results worksheet is permanently saved under **G:\Laboratory\Data\Water\IC Data\2002** under the correct month. It is also saved in Tess’ computer under **C:\My Documents\IC Data** and correct year and month. Easiest way to create the worksheet is to open a previously saved file (of the same year and month) and then cut and paste the data. There are two worksheets in each file, one for the complete results, the other for the raw data (the Sample vs Amount table exported from peaknet).
- a) Before any changes are made, save the file under a new name: MMDDYY and initials
 - b) On RAW worksheet, delete old table and replace with recently ran sequence data. Add a column between Sample ID and Fluoride Amount for the dilution factor.
 - c) Change Date Analyzed and Analyst if applicable. Calibrations are generally done once a month with the most recent noted under Date of Calibration – change if necessary.
 - d) **Copy** and paste data results from raw worksheet onto Results worksheet under correct sample name. Use the **Paste Special option – Values** - to retain similar fonts on results worksheet. **% Recoveries** will be automatically calculated as will **% Differences**, and **Averages** for the duplicate spikes but references to certain cells may need to be changed for the correct result.
 - e) Verify that all QC are accurate before entering into labworks.
- 6) For drinking water, results should be recorded as ND – Not Detected for levels below DLR (Detection Limit for Reporting) as follows:
- a) Fluoride 0.1 mg/L
 - b) Nitrate 2.0 mg/L
 - c) Sulfate 0.5 mg/L
 - d) Bromide 0.1 mg/L
 - e) Chloride, Nitrite, Phosphate 1.0 mg/L
- f) Any samples with readings above the calibration range (20 mg/L fluoride, 100 mg/l chloride, nitrite, bromide, nitrate, sulfate, and 200 mg/l phosphate) needs to be diluted and

repeated in the next run. List these samples on a new worksheet with the appropriate dilution and place the worksheet on the clipboard.

- 7) Do not report results if control/spike values do not fall within limits (refer to section on quality control). If controls, spikes, etc. are out of range, notify the principal analyst. If controls are within limits, date and initial the worksheet and give the worksheet to the clerk for data entry. When the worksheet and backlog are returned place them in the binder.

SHUT DOWN

After the run is complete the Ion Analyzer can be shut down. The IC should be shut down on weekends if the system is not in operation on Friday night so as not to damage the suppressor unit:

- 1) On the Control Panel screen of Peaknet - turn **OFF** pump and **DISCONNECT** DX-80
- 2) Close Peaknet.
- 3) Turn off DX-80, autosampler and close nitrogen cylinder valve.

PREVENTIVE MAINTENANCE:

- 1) Each quarter, replace the bed supports on guard column
- 2) Maintain the following spare parts. These items are considered consumables:
 - a) Anion Refill Kit (Part No. 057069) contains 4 bottles each of AS14A eluent and anion regenerant concentrate.
 - b) AS14A anion separator column, 3 mm (Part No. 056901)
 - c) AS14G anion guard column (Part No. 056899)
 - d) AMMS III suppressor (Part No. 056751)
 - e) DS5 Detection Stabilizer (Part No. 057290T)

DOS AND DON'TS

- * Try to make additions, changes, and deletions to the sequence during the middle of a run and then save immediately. If the changes are not saved immediately, the program may get confused on which sequence to use and will freeze. If this happens, wait until the current sample is completed, turn off all equipment and wait for about 15 minutes before restarting.
- * Be gentle when loading samples onto the autosampler, especially the first rack. If racks are installed too roughly, conveyor belt may get stuck and samples will not be injected in the proper sequence.

REFERENCES:

- 1) DX-80 Ion Chromatograph with SRS Control Operator's Manual, Dionex Corporation, 2002.
- 2) Methods for the Determination of Inorganic Substances in Environmental Samples, Method Number 300.0, Determination of Inorganic Anions by Ion Chromatography, John D. Pfaff, U.S. Environmental Protection Agency, 1993.
- 3) Standard Methods, 18th Edition, 1992. Part 4110.

Originally written by: Johanna Rosen for DX-100

Date: 12-96

Updated by: Theresa Lam for DX-80 Ion Analyzer

Date: 05-02

Approved by: _____
(Lab Director's signature)

Appendix 7C

MCWRA's Chloride Data Contouring Protocols

Monterey County Water Resources Agency



Ara Azhderian, General Manager | 1441 Schilling Pl., Salinas, Ca 93901 | (831) 755-4860

Date: August 19, 2026

To: File

From: Amanda Cusenza, Water Resources Technician

Reviewed by: Amy Woodrow, Senior Water Resources Hydrologist

RE: Seawater Intrusion Contouring Procedures

Overview

Following the annual field data collection and laboratory analysis of samples captured throughout the coastal region of the Salinas Valley, the Monterey County Water Resources Agency (“Agency”) translates this dataset into chloride isocontours to aid in the assessment of current groundwater conditions and provide spatial context to the progression of seawater intrusion, which currently occurs in portions of the 180-Foot Aquifer and the 400-Foot Aquifer.

Summary of Procedures

Background

Most of the water production wells included in this program are sampled in both June and August of each year, in accordance with the Agency’s approved Quality Assurance Project Plan. The samples collected by Agency staff are analyzed by a California certified laboratory (Environmental Laboratory Accreditation Program) to test for calcium, chloride, conductivity, magnesium, nitrate, pH, potassium, sulfate, sodium, total alkalinity, and total dissolved solids. The data undergoes a detailed initial review to identify and investigate outliers and suspicious data points among all analytes.

As seawater intrudes into an aquifer there is a transition zone where seawater and freshwater mix. In the Salinas Valley, the chloride concentrations in this transition zone are between 50 milligrams per liter (“mg/L”), which is the native water quality of the 180-Foot and 400-Foot Aquifers, and 19,000 mg/L, which is the concentration of chloride in Pacific Ocean water.

Chloride is used as an indicator of seawater intrusion because it is stable, or not easily altered by reactions with other chemical substances, and moves through an aquifer at the same rate as groundwater. The Agency uses the 500 mg/L chloride isocontour as the threshold for determining

seawater intrusion into the coastal aquifers. This definition of “seawater intruded” is described in Agency Ordinance No. 03790, Section 1.01.13. A chloride concentration of 500 mg/L is roughly ten times the native concentration of chloride in these aquifers, two times the regulatory limit set by the U.S. Environmental Protection Agency Drinking Water Secondary Maximum Contaminant Level (250 mg/L), and exceeds the U.S. Department of Agriculture concentration (350 mg/L) for water considered to be of “Class III – injurious or unsatisfactory” quality for agricultural irrigation.

ArcGIS Mapping

All of the chloride data from the year being analyzed is brought into ArcGIS Pro as a point layer. Wells sampled in both June and August are represented by an average of the chloride concentration from the two results. The tools used to generate the initial contours rely exclusively on these data points.

First, the Spline tool is used to interpolate a surface that passes through each of the input sample points while minimizing the curvature of the output (Fig. 1). The output is a raster – a grid of pixels, each assigned a value – generated based on the magnitude of the chloride values using a tension spline type with a weight of 0.01. The tension spline creates an output that maintains a range of values close to the sample dataset. The weight of 0.01 indicates lower tension, resulting in a smoother surface.

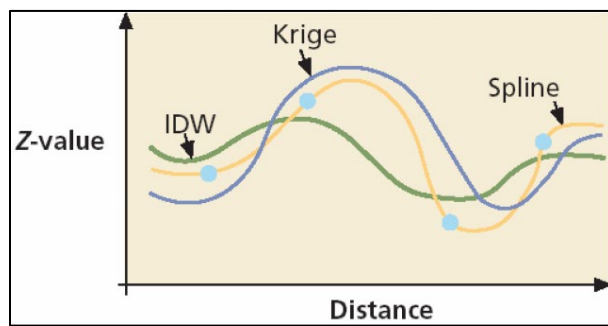


Figure 1: Representation of Spline interpolation (yellow) compared to other interpolation methods with respect to a series of data points.¹

Contour lines are generated based on this raster surface using the Contour tool in the Esri Spatial Analyst toolset. The tool calculates central values (averages) for each group of four adjacent raster cells and maps out a network of intersections based on these calculations. It utilizes linear interpolation within this network to draw the path of each numerical contour line.

The initial isolines generated by these tools are evaluated and edited manually by Agency Hydrology staff to more accurately reflect hydrological processes unique to each aquifer, historical patterns, well-specific factors, and region-specific phenomena (e.g. areas of thin or missing aquitards). A comparison of previous years’ data is conducted to assess how drastic changes have

¹ “Interpolating Surfaces in ArcGIS Spatial Analyst,” by C. Childs, 2004, ArcUser, July–September, p. 35. Copyright 2004 by ESRI.



occurred on a well-by-well basis. Sharp changes may result in a further extended contour line than was interpolated by the Spline and Contour tool. Supporting data from the groundwater level and groundwater extraction monitoring programs are used to provide additional validation of the chloride isocontour locations. The new polygons depicting the areas that increased above the 500 mg/L threshold are added to the Historical Seawater Intrusion maps, which illustrate the current seawater intrusion front while highlighting the changes observed over the period of record. A 250 mg/L isocontour is also included as an indicator of areas where chloride concentrations are approaching, but have not yet surpassed, the 500 mg/L threshold.

Piper Plots and Geochemical Analysis

The result of an evaluation of the geochemical composition of each groundwater sample is also represented in an additional map showing each well's seawater intrusion phase – categorized as Not Intruded, Phase I or Phase II – alongside the associated chloride value for the current year. By depicting each well's seawater intrusion phase and chloride concentration, this version of the seawater intrusion map illustrates the variability of current conditions relative to where the 500 mg/L chloride isocontour has been delineated over time, acknowledging that conditions may change at well sites as well operation or groundwater conditions evolve.

The seawater intrusion phase is determined through the examination of a series of Piper Plots created for all the wells used in the contouring analysis. The plots show the proportions of dissolved constituents in a sample over each well's entire period of record, to illustrate the progression of seawater intrusion in a well over time. The plot consists of two lower triangles – ternary plots – that demonstrate the major cations (left) and anions (right) in the samples. The information from these two ternary plots is projected onto the central diamond plot to show the overall chemical composition.

When analyzing these Piper Plots, Agency staff look for a shift from a primarily freshwater composition, dominated by calcium bicarbonate chemistry, to a primarily seawater composition, dominated by sodium chloride chemistry. Wells that are designated Not Intruded have not yet indicated the progression of intrusion (Fig. 2). Wells that are designated Phase I demonstrate an increase in a calcium-chloride composition brought on by ion exchange between the groundwater and surrounding aquifer materials (Fig. 3). Wells that are designated Phase II begin to exhibit a shift toward increased sodium chloride composition (Fig. 4).

In cases where additional analysis is needed, the Agency also utilizes graphs of the sodium/chloride molar ratio at a well and Stiff diagrams. As seawater encounters fresh groundwater, sodium in the seawater replaces calcium on clay minerals in the aquifer materials, which reduces the sodium/chloride ratio. A sodium/chloride ratio less than 0.86 is a primary indicator of seawater intrusion in coastal aquifers due to these cation exchange processes (Fig. 5).

Stiff diagrams are a way of visually depicting cations and anions. Evaluating changes over time in the shape of the Stiff diagram from a single well, or comparing diagrams from multiple wells, is

one way of assessing change in groundwater chemistry at a given site or making comparisons across a monitored area (Fig. 6).

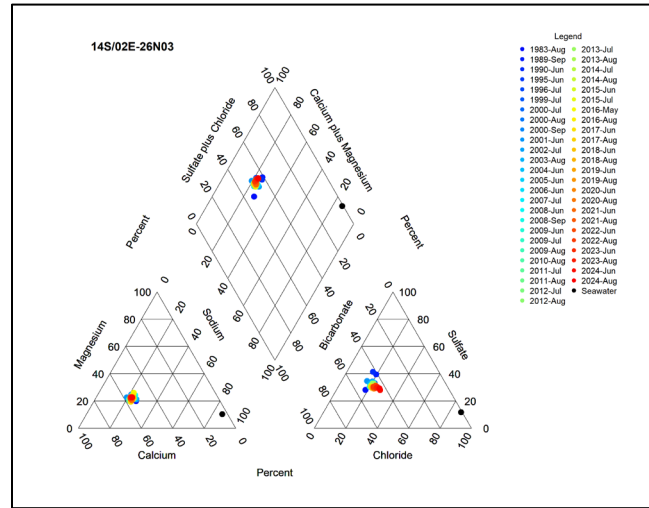


Figure 2: Not Intruded

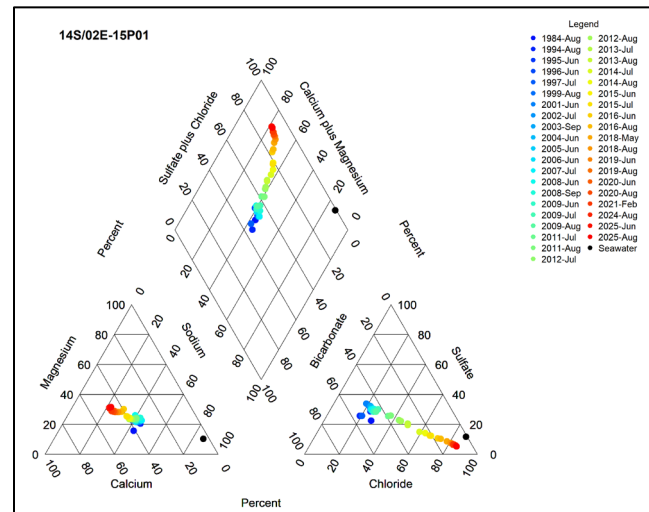


Figure 3: Phase I Intrusion

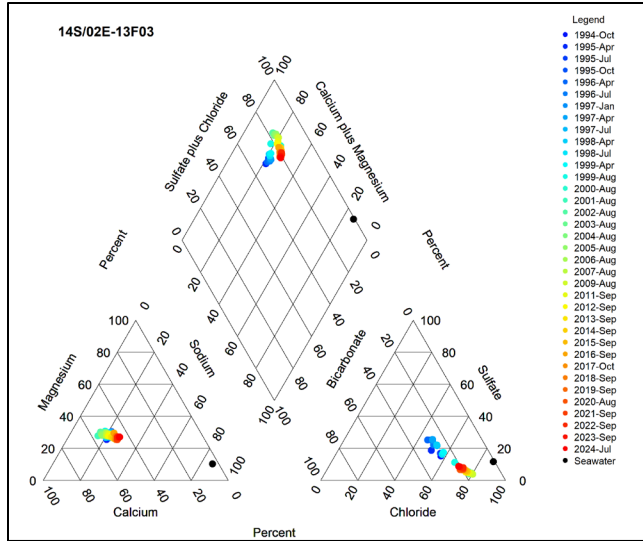


Figure 4: Phase II Intrusion

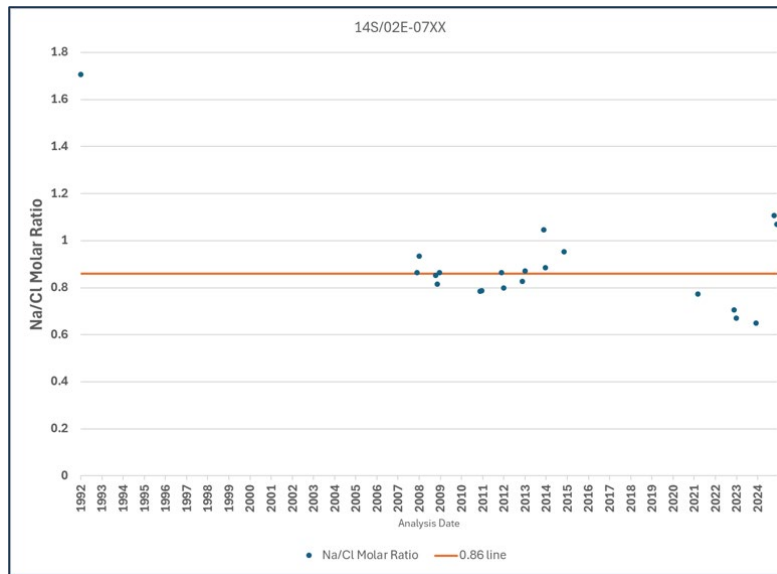


Figure 5: Sodium/Chloride Molar Ratio Graph

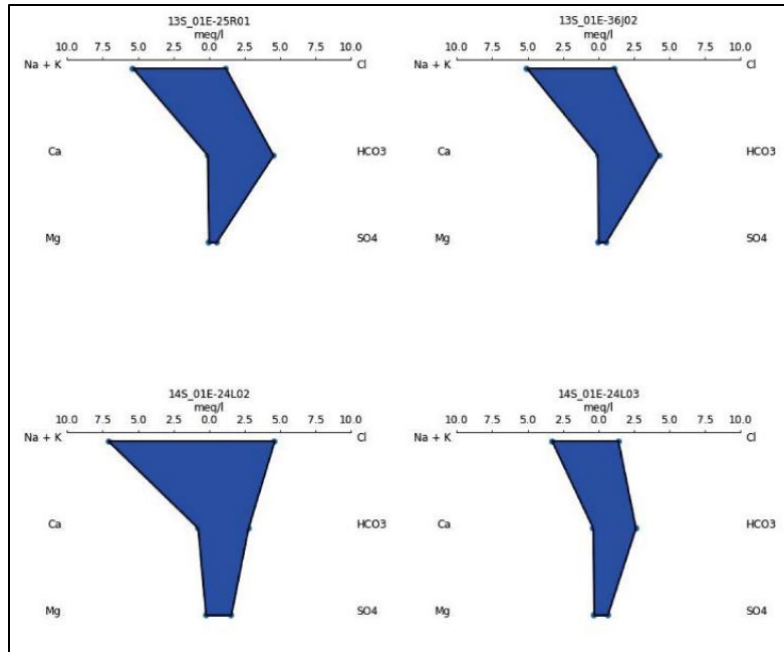


Figure 6: Example of Stiff Diagrams from Non-Seawater Intruded Wells²

² Montgomery & Associates. April 2024. Deep Aquifers Study.

Appendix 7D

Water Quality Monitoring Network Wells

Langley Subbasin Water Quality Network

Well Type	Well Name	Top Perforation	Bottom Perforation	Water System	Latitude	Longitude
DDW Municipal	CA2700503_001_001	300	430	ASSISI MWC	36.75785	-121.66287
DDW Municipal	CA2700509_001_001	0	40	OAK MANOR WS	36.80853	-121.64547
DDW Municipal	CA2700509_004_004			OAK MANOR WS	36.80868	-121.64567
DDW Municipal	CA2700511_001_001			NORMCO WC	36.79087	-121.65761
DDW Municipal	CA2700511_002_002			NORMCO WC	36.78878	-121.66040
DDW Municipal	CA2700511_003_003			NORMCO WC	36.78360	-121.64872
DDW Municipal	CA2700522_001_001	207	565	CABANA HOLIDAY WS	36.79115	-121.67173
DDW Municipal	CA2700522_002_002			CABANA HOLIDAY WS	36.79143	-121.67189
DDW Municipal	CA2700524_001_001			CASTROVILLE BLVD WS #01	36.80000	-121.66000
DDW Municipal	CA2700526_001_001			CASTROVILLE BLVD WS #03	36.80000	-121.67000
DDW Municipal	CA2700534_001_001	0	60	COLONIAL OAK WC INC	36.81766	-121.63998
DDW Municipal	CA2700534_003_003	0	50	COLONIAL OAK WC INC	36.81765	-121.63990
DDW Municipal	CA2700534_004_004	0	100	COLONIAL OAK WC INC	36.81754	-121.63978
DDW Municipal	CA2700534_006_006			COLONIAL OAK WC INC	36.81750	-121.63972
DDW Municipal	CA2700552_003_003			ECHO VALLEY SCHOOL WS	36.82461	-121.66679
DDW Municipal	CA2700553_001_001			ECHO VALLEY RD WS #01	36.82000	-121.64000
DDW Municipal	CA2700555_001_001			ECHO VALLEY RD WS #03	36.82000	-121.66000
DDW Municipal	CA2700574_001_001			EL CAMINO REAL WS #15	36.80000	-121.65000
DDW Municipal	CA2700576_001_001			EL DORO WS #01	36.78000	-121.66000
DDW Municipal	CA2700582_001_001			HOLLY HILLS MOTEL WS #01	36.78000	-121.66000
DDW Municipal	CA2700584_001_001			FRISCH RD WS #01	36.79000	-121.66000
DDW Municipal	CA2700589_001_001	320	380	GLENN AVE WS #01	36.82532	-121.66379
DDW Municipal	CA2700592_001_001	168	200	HARRISON RD WS #01	36.75973	-121.64825
DDW Municipal	CA2700604_001_001			HOLLY HILLS MOTEL WS #02	36.78000	-121.66000
DDW Municipal	CA2700612_001_001			LAGUNA SECA WC	36.82792	-121.67417
DDW Municipal	CA2700616_001_001			PESANTE RD WS #14	36.77000	-121.64000
DDW Municipal	CA2700619_001_001			LANGLEY CANYON WS #03	36.81000	-121.66000
DDW Municipal	CA2700621_001_001			LANGLEY CANYON WS #05	36.80000	-121.66000
DDW Municipal	CA2700623_001_001			LAVENDER LN WS #01	36.80000	-121.65000
DDW Municipal	CA2700634_001_001	254	566	CHETMOORE ACRES WA	36.84390	-121.67583
DDW Municipal	CA2700636_003_003			ROYAL OAKS PARK WS	36.83924	-121.67217
DDW Municipal	CA2700637_001_001			MAHER RD WS #04	36.83000	-121.66000
DDW Municipal	CA2700638_001_001	220	230	MAHER RD WS #05	36.84153	-121.67492
DDW Municipal	CA2700641_001_001			MALLORY CANYON WS #03	36.80000	-121.62000
DDW Municipal	CA2700646_001_001			MERIDIAN RD WS #02	36.78000	-121.68000

Langley Subbasin Water Quality Network

Well Type	Well Name	Top Perforation	Bottom Perforation	Water System	Latitude	Longitude
DDW Municipal	CA2700656_002_002			MORO COJO MWA	36.81439	-121.64244
DDW Municipal	CA2700656_006_006	0	180	MORO COJO MWA	36.81453	-121.64222
DDW Municipal	CA2700656_007_007			MORO COJO MWA	36.81351	-121.64306
DDW Municipal	CA2700658_001_001			MORO RD WS #02	36.81000	-121.63000
DDW Municipal	CA2700659_001_001			MORO RD WS #03	36.81000	-121.64000
DDW Municipal	CA2700665_001_001	0	40	OAK HEIGHTS W & R CO INC	36.81965	-121.63957
DDW Municipal	CA2700665_002_002			OAK HEIGHTS W & R CO INC	36.81954	-121.63921
DDW Municipal	CA2700665_003_003	0	200	OAK HEIGHTS W & R CO INC	36.81936	-121.63889
DDW Municipal	CA2700666_001_001			OAK RD WS #01	36.79000	-121.65000
DDW Municipal	CA2700668_001_001			ORCHARD LN WS #01	36.77000	-121.63000
DDW Municipal	CA2700669_002_002	360	480	ORCHARD LN WS #02	36.77501	-121.66522
DDW Municipal	CA2700670_001_001			ORCHARD LN WS #03	36.77000	-121.66000
DDW Municipal	CA2700675_001_001			PARADISE RD WS #02	36.81000	-121.69000
DDW Municipal	CA2700676_001_001			PARADISE RD WS #03	36.81000	-121.69000
DDW Municipal	CA2700677_001_001			PARADISE RD WS #04	36.81000	-121.69000
DDW Municipal	CA2700678_001_001			PARADISE RD WS #05	36.81853	-121.68702
DDW Municipal	CA2700682_002_002			PARADISE RD WS #09	36.82389	-121.67528
DDW Municipal	CA2700686_003_003			GARLEN COURT WS	36.82076	-121.67475
DDW Municipal	CA2700687_002_002			PESANTE RD WS #02	36.77917	-121.65789
DDW Municipal	CA2700688_001_001			PESANTE RD WS #03	36.77000	-121.68000
DDW Municipal	CA2700689_001_001			PESANTE RD WS #04	36.78000	-121.63000
DDW Municipal	CA2700691_001_001	148	308	PESANTE RD WS #06	36.78565	-121.62741
DDW Municipal	CA2700692_001_001			PESANTE RD WS #07	36.77000	-121.66000
DDW Municipal	CA2700695_001_001			PINE TREE WAY WS #01	36.80000	-121.66000
DDW Municipal	CA2700696_001_001			PINE TREE WAY WS #02	36.80000	-121.66000
DDW Municipal	CA2700697_001_001			POLLOCK LN WS #01	36.78000	-121.65000
DDW Municipal	CA2700699_001_001			POLLOCK LN WS #03	36.78000	-121.66000
DDW Municipal	CA2700702_002_002	312	408	PRUNEDALE MWC	36.81013	-121.65572
DDW Municipal	CA2700702_003_003			PRUNEDALE MWC	36.81017	-121.65804
DDW Municipal	CA2700702_004_004	360	400	PRUNEDALE MWC	36.80990	-121.65881
DDW Municipal	CA2700703_004_004			CALVARY CHURCH INC WS	36.79918	-121.66741
DDW Municipal	CA2700703_006_006			CALVARY CHURCH INC WS	36.79919	-121.66779
DDW Municipal	CA2700704_001_001			PRUNEDALE RD WS #02	36.78000	-121.66000
DDW Municipal	CA2700705_001_001			PRUNEDALE SCHOOL WS	36.77864	-121.66569
DDW Municipal	CA2700709_001_001	200	408	RANCHO BORROMEO MWS	36.77614	-121.67511

Langley Subbasin Water Quality Network

Well Type	Well Name	Top Perforation	Bottom Perforation	Water System	Latitude	Longitude
DDW Municipal	CA2700712_001_001			REESE CIR WS #01	36.77000	-121.66000
DDW Municipal	CA2700713_001_001	0	10	ROLLING HILLS RANCHO WA	36.82719	-121.63086
DDW Municipal	CA2700713_003_003			ROLLING HILLS RANCHO WA	36.82975	-121.63319
DDW Municipal	CA2700713_005_005	0	40	ROLLING HILLS RANCHO WA	36.82724	-121.63090
DDW Municipal	CA2700713_006_006			ROLLING HILLS RANCHO WA	36.82721	-121.63093
DDW Municipal	CA2700713_007_007			ROLLING HILLS RANCHO WA	36.82908	-121.63379
DDW Municipal	CA2700734_001_001			PESANTE RD WS #12	36.78000	-121.64000
DDW Municipal	CA2700738_001_001	291	391	SAN MIGUEL WS #01	36.82879	-121.67695
DDW Municipal	CA2700738_002_002	340	400	SAN MIGUEL WS #01	36.82858	-121.67747
DDW Municipal	CA2700738_003_003			SAN MIGUEL WS #01	36.82987	-121.67381
DDW Municipal	CA2700739_001_001			SAN MIGUEL WS #02	36.82792	-121.67417
DDW Municipal	CA2700745_001_001			SAN MIGUEL WS #08	36.82000	-121.67000
DDW Municipal	CA2700770_001_001			STRAWBERRY RD WS #10	36.83000	-121.68000
DDW Municipal	CA2700777_001_001			TUSTIN RD WS #02	36.81000	-121.64000
DDW Municipal	CA2700778_001_001			TUSTIN RD WS #03	36.82000	-121.68000
DDW Municipal	CA2700780_001_001			VALLE PACIFICO WS #01	36.83000	-121.66000
DDW Municipal	CA2700781_001_001			VALLE PACIFICO WS #02	36.81000	-121.66000
DDW Municipal	CA2700782_001_001			VALLE PACIFICO WS #03	36.81000	-121.66000
DDW Municipal	CA2700784_001_001			VALLE PACIFICO WS #05	36.81000	-121.66000
DDW Municipal	CA2700791_001_001			VIERRA CANYON WS #02	36.79000	-121.65000
DDW Municipal	CA2700792_001_001	440	500	SUMMERHILL MHP WS	36.79704	-121.66190
DDW Municipal	CA2700793_001_001			VIERRA CANYON WS #04	36.79000	-121.65000
DDW Municipal	CA2700794_001_001			VIERRA CANYON WS #05	36.80000	-121.63000
DDW Municipal	CA2700795_001_001			VIERRA CANYON WS #06	36.79000	-121.65000
DDW Municipal	CA2700796_001_001			VIERRA CANYON WS #07	36.79000	-121.65000
DDW Municipal	CA2700814_001_001			VIA DEL SOL WS #02	36.82000	-121.64000
DDW Municipal	CA2700837_001_001	220	312	BLACKIE RD WS #05	36.77200	-121.68497
DDW Municipal	CA2700838_001_001	0	10	SPRING CANYON WA	36.81620	-121.62408
DDW Municipal	CA2700838_002_002	0	10	SPRING CANYON WA	36.81977	-121.62559
DDW Municipal	CA2700843_001_001			BLACKIE RD WS #06	36.77694	-121.67611
DDW Municipal	CA2701083_001_001			PESANTE RD WS #08	36.77000	-121.65000
DDW Municipal	CA2701088_001_001			POLLOCK LN WS #04	36.77000	-121.66000
DDW Municipal	CA2701091_001_001			MERIDIAN RD WS #04	36.78000	-121.69000
DDW Municipal	CA2701127_001_001			SAN MIGUEL WS #14	36.84000	-121.68000
DDW Municipal	CA2701129_001_001			POLLOCK LN WS #02	36.77000	-121.66000

Langley Subbasin Water Quality Network

Well Type	Well Name	Top Perforation	Bottom Perforation	Water System	Latitude	Longitude
DDW Municipal	CA2701134_001_001			PARADISE RD WS #11	36.81000	-121.68000
DDW Municipal	CA2701231_001_001	204	252	PRUNEDALE SHOPPING CENTER WS	36.80268	-121.66569
DDW Municipal	CA2701235_001_001			ECHO VALLEY RD WS #09	36.82514	-121.65486
DDW Municipal	CA2701243_001_001			LANGLEY CANYON WS #08	36.81000	-121.65000
DDW Municipal	CA2701244_001_001			LANGLEY CANYON WS #09	36.81000	-121.65000
DDW Municipal	CA2701380_001_001			TUSTIN RD WS #05	36.82000	-121.64000
DDW Municipal	CA2701382_001_001			EL CAMINO REAL NORTH #25	36.80000	-121.63000
DDW Municipal	CA2701392_001_001			PEZZINI LN WS #01	36.78000	-121.68000
DDW Municipal	CA2701395_001_001			MAHER RD WS #07	36.84000	-121.67000
DDW Municipal	CA2701399_001_001			PESANTE RD WS #13	36.77000	-121.64000
DDW Municipal	CA2701400_001_001			LINDA VISTA MWC	36.81000	-121.64000
DDW Municipal	CA2701423_002_002	280	380	ECHO VALLEY RD WS #05	36.82546	-121.65800
DDW Municipal	CA2701424_001_001			ECHO VALLEY RD WS #08	36.82000	-121.64000
DDW Municipal	CA2701425_001_001			ECHO VALLEY RD WS #10	36.82000	-121.66000
DDW Municipal	CA2701426_001_001			EL CAMINO REAL WS #19	36.80000	-121.64000
DDW Municipal	CA2701429_001_001			EL CAMINO REAL WS #31	36.81000	-121.63000
DDW Municipal	CA2701440_001_001			LANGLEY CANYON WS #06	36.80000	-121.65000
DDW Municipal	CA2701454_001_001			MORO RD WS #07	36.81000	-121.63000
DDW Municipal	CA2701460_001_001			PARADISE RD WS #12	36.82000	-121.67000
DDW Municipal	CA2701474_001_001			SAN MIGUEL WS #26	36.81472	-121.66889
DDW Municipal	CA2701484_001_001			TUSTIN RD WS #04	36.82000	-121.64000
DDW Municipal	CA2701494_001_001			MERIDIAN RD WS #07	36.78000	-121.68000
DDW Municipal	CA2701501_001_001			SAN MIGUEL WS #29	36.80000	-121.67000
DDW Municipal	CA2701514_001_001			ORCHARD LN WS #06	36.77000	-121.66000
DDW Municipal	CA2701530_001_001			SAN MIGUEL WS #31	36.82000	-121.67000
DDW Municipal	CA2701538_001_001			SAN MIGUEL WS #33	36.84000	-121.68000
DDW Municipal	CA2701553_002_002			POND-DEROSA OAKS WC	36.81812	-121.67183
DDW Municipal	CA2701556_001_001			ECHO VALLEY RD WS #11	36.82000	-121.66000
DDW Municipal	CA2701559_001_001			DYER RD WS #03	36.78000	-121.68000
DDW Municipal	CA2701594_001_001			BLACKIE RD WS #09	36.78000	-121.67000
DDW Municipal	CA2701630_001_001			PRUNEDALE CHEVRON WS	36.79102	-121.66848
DDW Municipal	CA2701632_001_001			MCGUFFIE RD WS #09	36.79000	-121.67000
DDW Municipal	CA2701642_001_001			ECHO VALLEY RD WS #13	36.82000	-121.66000
DDW Municipal	CA2701660_001_001			VIERRA CANYON WS #20	36.80000	-121.64000
DDW Municipal	CA2701660_002_002			VIERRA CANYON WS #20	36.80000	-121.64000

Langley Subbasin Water Quality Network

Well Type	Well Name	Top Perforation	Bottom Perforation	Water System	Latitude	Longitude
DDW Municipal	CA2701662_001_001			ECHO VALLEY RD WS #14	36.82000	-121.63000
DDW Municipal	CA2701670_002_002	0	40	LANGLEY/VALLE PACIFICO WS	36.81735	-121.66222
DDW Municipal	CA2701785_001_001			EL CAMINO REAL WS #29	36.80000	-121.64000
DDW Municipal	CA2701787_001_001			SANDY HILL DR WS #01	36.80000	-121.64000
DDW Municipal	CA2701789_001_001	340	660	HOLLY HILLS MWC	36.79580	-121.64103
DDW Municipal	CA2701789_002_002			HOLLY HILLS MWC	36.79660	-121.64048
DDW Municipal	CA2701795_001_001			WILD PINTO WS #01	36.79000	-121.62000
DDW Municipal	CA2701807_001_001			CROSS RD WS #04	36.77000	-121.65000
DDW Municipal	CA2701814_001_001	219	251	PRUNEDALE PLAZA WS	36.80044	-121.66597
DDW Municipal	CA2701844_001_001			HWY 156 WS #01	36.78000	-121.68000
DDW Municipal	CA2701926_002_002	418	428	MORO RD WS #09	36.80400	-121.65983
DDW Municipal	CA2701926_003_003	395	455	MORO RD WS #09	36.80799	-121.65500
DDW Municipal	CA2701926_007_007			MORO RD WS #09	36.80405	-121.65983
DDW Municipal	CA2701929_001_001	252	385	COUNTRY MEADOWS MWC	36.76426	-121.66291
DDW Municipal	CA2701929_002_002	240	438	COUNTRY MEADOWS MWC	36.76544	-121.65619
DDW Municipal	CA2701940_001_001	200	416	MONTEREY MUSHROOMS WS	36.83580	-121.66882
DDW Municipal	CA2701940_002_002	312	576	MONTEREY MUSHROOMS WS	36.76544	-121.65619
DDW Municipal	CA2701940_003_003			MONTEREY MUSHROOMS WS	36.83462	-121.66730
DDW Municipal	CA2701940_004_004	300	380	MONTEREY MUSHROOMS WS	36.83475	-121.66720
DDW Municipal	CA2701942_001_001	360	400	VIERRA CANYON WS #29	36.79128	-121.66649
DDW Municipal	CA2701970_001_001			TUSTIN RD WS #18	36.82000	-121.64000
DDW Municipal	CA2701992_001_001			TUSTIN RD WS #19	36.82556	-121.63819
DDW Municipal	CA2702003_001_001	220	320	VIERRA MEADOWS MWC	36.79706	-121.65344
DDW Municipal	CA2702003_002_002	220	320	VIERRA MEADOWS MWC	36.79715	-121.65442
DDW Municipal	CA2702004_001_001	0	100	CAL AM WATER COMPANY - RALPH LANE	36.76248	-121.66668
DDW Municipal	CA2702007_001_001	280	440	VIERRA ESTATES WS	36.80220	-121.63010
DDW Municipal	CA2702007_007_007	320	360	VIERRA ESTATES WS	36.80227	-121.63013
DDW Municipal	CA2702021_003_003	45	159	SALINAS TRANSPLANT WS	36.77914	-121.58981
DDW Municipal	CA2702073_002_002	394	444	SAN MIGUEL WS #22	36.81286	-121.67082
DDW Municipal	CA2702073_003_003	395	455	SAN MIGUEL WS #22	36.81296	-121.67075
DDW Municipal	CA2702094_001_001	305	365	BLACKIE RD WS #18	36.77283	-121.68261
DDW Municipal	CA2702120_001_001			SAN MIGUEL WS #49	36.83306	-121.67792
DDW Municipal	CA2702165_001_001	150	190	ORCHARD LN WS #09	36.77346	-121.66792
DDW Municipal	CA2702229_001_001			MANZANITA PARK WS	36.80453	-121.67294
DDW Municipal	CA2702368_001_001	320	440	PRUNETREE SHOPPING CENTER WS	36.79505	-121.66340

Langley Subbasin Water Quality Network

Well Type	Well Name	Top Perforation	Bottom Perforation	Water System	Latitude	Longitude
DDW Municipal	CA2702368_002_002	320	440	PRUNETREE SHOPPING CENTER WS	36.79508	-121.66355
DDW Municipal	CA2702374_001_001	330	390	COUNTRYSIDE ESTATES MWC	36.79525	-121.66767
DDW Municipal	CA2702382_001_001	228	260	LA TAPATIA TAQUERIA WS	36.80344	-121.66700
DDW Municipal	CA2702388_001_001	420	480	ROYAL OAK PLACE WS	36.83519	-121.67353
DDW Municipal	CA2702388_002_002	0	10	ROYAL OAK PLACE WS	36.83506	-121.67387
DDW Municipal	CA2702439_001_001	240	440	WOODLAND HEIGHTS MWC	36.78931	-121.63408
DDW Municipal	CA2702439_002_002			WOODLAND HEIGHTS MWC	36.78399	-121.63445
DDW Municipal	CA2702490_001_001	260	260	CENTRAL BAY HIGH SCHOOL WS	36.77506	-121.66797
DDW Municipal	CA2702554_001_001			HIDDEN CANYON RANCH MWC	36.78173	-121.62241
DDW Municipal	CA2702554_002_002			HIDDEN CANYON RANCH MWC	36.78659	-121.61967
DDW Municipal	CA2702554_006_006			HIDDEN CANYON RANCH MWC	36.78516	-121.62436
DDW Municipal	CA2702608_001_001	500	550	THIMIO MWC	36.83013	-121.68032
DDW Municipal	CA2702679_001_001			AMERICAN LEGION #593 WS	36.79704	-121.66805
DDW Municipal	CA2710010_136_136			CWSC SALINAS	36.76426	-121.66290
DDW Municipal	CA2710010_137_137			CWSC SALINAS	36.76549	-121.65622
ILRP On-Farm Domestic	AGL020003494-CCGC_0129			N/A	36.77915	-121.58981
ILRP On-Farm Domestic	AGL020028433-DOM WELL			N/A	36.79884	-121.69334
ILRP Irrigation	AGL020002105-AG_HAYMORE			N/A	36.77321	-121.69043
ILRP Irrigation	AGL020003494-WELL 1			N/A	36.77840	-121.59405
ILRP Irrigation	AGL020003494-WELL 2			N/A	36.77800	-121.59276
ILRP Irrigation	AGL020004723-80-2			N/A	36.76738	-121.60537
ILRP Irrigation	AGL020007572-RYAN_AG			N/A	36.78364	-121.68382
ILRP Irrigation	AGL020025522-156_RANCH			N/A	36.78108	-121.69036
ILRP Irrigation	AGL020028433-WELL1			N/A	36.79850	-121.69400
ILRP Irrigation	AGL020028551-BERMUDEZ			N/A	36.79833	-121.69658
ILRP Irrigation	AGL020035716-SUGAR LOAF			N/A	36.77577	-121.59017
ILRP Irrigation	AGL020038230-BOTTOMWELL			N/A	36.76654	-121.67431
ILRP Irrigation	AGL020038230-WELL 1			N/A	36.77186	-121.67747
ILRP Irrigation	AGL020039201-AUX_WELL			N/A	36.76016	-121.64138
ILRP Irrigation	AGL020039992-BALLIN_WELL			N/A	36.76731	-121.65354

Appendix 7E

Central Coast Ag Order 4.0 Monitoring and Reporting Program

**STATE OF CALIFORNIA
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION**

**GENERAL WASTE DISCHARGE REQUIREMENTS
FOR
DISCHARGES FROM IRRIGATED LANDS**

ORDER NO. R3-2021-0040

April 15, 2021

ATTACHMENT B

Monitoring and Reporting Program

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Section A. General Monitoring and Reporting Requirements

1. This Monitoring and Reporting Program (MRP) is issued pursuant to California Water Code section 13267, which authorizes the Central Coast Regional Water Quality Control Board (Central Coast Water Board) to require preparation and submittal of technical and monitoring reports.
2. The Central Coast Water Board needs the information required by this MRP to determine compliance with Order No. R3-2021-0040. The evidence supporting the need for and benefits of to be obtained from these monitoring and reporting requirements is included in the findings the Order.
3. Pursuant to Water Code section 13268, a violation of a request made pursuant to section 13267 may subject the Discharger to civil liability of up to \$1000 per day. Pursuant to Water Code section 13350, a violation of a request made pursuant to section 13350 may subject the Discharger to civil liability of up to \$5000 per day.
4. Dischargers must submit reports in the format specified by the Executive Officer. Reports must be submitted electronically, unless otherwise specified by the Executive Officer. A transmittal letter must accompany each report, containing the following penalty of perjury statement signed by the Discharger or the Discharger's authorized agent:

"In compliance with Water Code section 13267, I certify under penalty of perjury that this document and all attachments were prepared by me, or under my direction or supervision, following a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. To the best of my knowledge and belief, this document and all attachments are true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

5. All technical and monitoring reports submitted in compliance with this MRP must be complete and accurate. The submittal of an incomplete or inaccurate report does not constitute compliance with the requirement.
6. Unless otherwise noted¹, all water quality analyses must be conducted at a laboratory certified for such analysis through a California Environmental Laboratory Accreditation Program (ELAP) and in accordance with approved standard and United States Environmental Protection Agency (USEPA) methods.² Unless otherwise noted, all sampling, sample preservation, and analyses must be performed in accordance with the latest edition of Test

¹ As noted in paragraph 12.c, below, it is acceptable for a Discharger to use either laboratory analysis or a portable measuring device to obtain precise measurements of nitrogen in irrigation wells for total nitrogen applied and irrigation and nutrient management plan summary reporting purposes

² Certified laboratories can be found online in the [List of Qualified Laboratories for Groundwater Monitoring](#).

Methods for Evaluating Solid Waste, SW-846, USEPA, and analyzed as specified herein by the above analytical methods and reporting limits indicated.

7. Any laboratory data submitted to the Central Coast Water Board must be submitted by, or under the direction of, a state registered professional engineer, registered geologist, state certified laboratory, or other similarly qualified professional. Surface water quality data must be submitted electronically, in a format that is compatible with the California Environmental Data Exchange Network (CEDEN), or as directed by the Executive Officer. Groundwater quality data must be submitted in a format compatible with the electronic deliverable format (EDF) electronic data deliverable (EDD) criteria and protocols used by the State Water Board's GeoTracker data management system, or as directed by the Executive Officer.
8. Dischargers must provide the geographic information necessary to determine the Groundwater Phase Area and Surface Water Priority Area that applies to each individual ranch when they enroll or update their electronic Notice of Intent (eNOI).
9. Dischargers with wells on their ranch must indicate on their eNOI the number of domestic and irrigation wells that are in use on their ranch. Dischargers must also update their eNOI within 60 days when a new well is put in service, when a previously reported well is taken out of service (e.g., a well is either destroyed or becomes inactive) or when use of a previously inactive well resumes.
10. The Central Coast Water Board encourages Dischargers to participate in third-party monitoring programs to comply with monitoring and reporting requirements contained herein. Dischargers not participating in a third-party monitoring program must conduct required monitoring and reporting individually. Participation in a third-party monitoring program does not relieve Dischargers of the responsibility to comply with these requirements or of the requirement to have their ranch-level data reported to the Central Coast Water Board.
11. Dischargers must report on CEQA mitigation measure implementation electronically in the ACF.

Section B. Irrigation and Nutrient Management Monitoring and Reporting Requirements

1. **By March 1 of each year**, all Dischargers, including those participating in a third-party alternative compliance pathway, must provide the Central Coast Water Board with either:
 - a. A Total Nitrogen Applied (TNA) report, which includes applied nitrogen and irrigation information, or
 - b. An Irrigation and Nutrient Management Plan (INMP) Summary report, which includes information from the TNA report, total nitrogen removed,

and additional specific irrigation management information noted in paragraph 15 below.

2. A comparison of information required in TNA reporting versus INMP Summary reporting is included in [Table MRP-1](#). TNA reports will be used to determine the relative contribution of nitrogen applied to a ranch from all sources. INMP Summary reports will be used to determine compliance with the nitrogen discharge targets and limits established in the Order. Required information for both reports must be recorded for the calendar year prior to the report due date (for example, if a report is due March 1, 2024, the monitoring information must be recorded from January 1 through December 31, 2023). The physical area reported on in each report form must represent no more than 640 acres; if a ranch is greater than 640 acres in size then multiple reports must be submitted.
3. Eventually, all Dischargers must submit an INMP Summary report; however, the timeframe for when Dischargers transition from TNA reporting to the more comprehensive INMP Summary reporting is phased in over time, as shown in [Table MRP-2](#). With the exception of Dischargers who were enrolled in Order No. R3-2017-0002 (Ag Order 3.0) and required to submit TNA reports under Ag Order 3.0, the timeframe for when a Discharger must begin conducting expanded INMP monitoring and INMP Summary reporting is based on a Discharger's Groundwater Phase area.
4. For the first two years the Order is in effect (2021 and 2022), all Dischargers (regardless of Groundwater Phase area) who were required to submit TNA reports under Ag Order 3.0 must continue to conduct monitoring, recordkeeping, and reporting as described below for submittal of a complete and accurate TNA report **by March 1, 2022 and 2023**. This Ag Order 3.0 requirement for specific Dischargers will be superseded by requirements summarized in [Table MRP-2](#) (i.e., according to Dischargers' ranch locations within specific Groundwater Phase areas).
5. Beginning in 2023, Dischargers in Groundwater Phase 1,³ 2, and 3 areas must conduct monitoring and reporting associated with required TNA and/or INMP Summary reporting requirements in accordance with [Table MRP-2](#).

TNA Report Requirements

6. On an annual basis, Dischargers required to submit the TNA report must monitor and report the total amount of nitrogen applied from all sources, as described below, including fertilizer nitrogen (**A_{FER}**), compost nitrogen (**A_{COMP}**), organic fertilizer nitrogen (**A_{ORG}**), irrigation water nitrogen (**A_{IRR}**), nitrogen present in the

³ Dischargers in Groundwater Phase 1 areas are not required to submit a stand-alone TNA report; rather, due to the prioritization of Phase 1 areas, Dischargers in portions of the Gilroy-Hollister Valley (Llagas Area) groundwater basin, the Forebay Aquifer and Upper Valley subbasins of the Salinas Valley basin, the Santa Maria area of the Santa Maria River Valley basin, and the Santa Ynez River Valley basin must conduct the expanded monitoring and reporting associated with INMP Summary reporting before Dischargers in Groundwater Phase areas 2 and 3.

soil, nitrogen concentration of the irrigation water, volume of irrigation water applied to the ranch, and additional information described, below.

7. Fertilizer nitrogen (**A_{FER}**) for each specific crop.

Dischargers must monitor and report the total amount of nitrogen applied to the ranch from fertilizers during the reporting period. **A_{FER}** includes nitrogen applied from fertilizers and all other materials or products containing nitrogen excepting compost and organic fertilizer nitrogen (both tracked and reported separately), including but not limited to, inorganic fertilizers, fertilizers applied through the irrigation water (i.e., fertigation), foliar fertilizers, slow release products, compost teas, manure, and compost or manure extracts.

8. Compost nitrogen (**A_{COMP}**) by specific crop or for the entire ranch.

- a. Dischargers must monitor and report the total amount of compost nitrogen applied to the ranch during the report period.
- b. Dischargers have the option of using a compost discount factor (**C**) to calculate the amount of compost nitrogen mineralized during the report year the compost was applied to the ranch. The compost discount factor can only be applied to compost reported as **A_{COMP}**. If compost is reported under **A_{FER}** then the compost discount factor cannot be applied.
- c. The Central Coast Water Board's standard compost discount factors (**C**) are defined below. Different compost discount factors are applied based on the carbon to nitrogen (C:N) ratio of the product.⁴
 - i. For C:N ratio > 11:1, C = 0.05. That is, 5 percent of the nitrogen in the compost will be counted in the A-R compliance calculation.
 - ii. For C:N ratio ≤ 11:1, C = 0.10. That is, 10 percent of the nitrogen in the compost will be counted in the A-R compliance calculation.
- d. Only a final product (or stabilized compost) can receive the compost discount factors defined above. Other materials containing nitrogen that are not final products are not eligible for the compost discount factor. Vegetative food materials include the crop residues left on the field after harvest and are not considered to be a final product. A final product is a material that has been composted and completed the curing composting phase.
- e. Dischargers who elect to use their own compost discount factor (**C**) to determine the amount of compost nitrogen mineralized during the report year must report their C value. Records detailing the rationale and sampling methods used to determine the C value must be maintained in the Farm Plan and must be submitted to the Central Coast Water Board upon request.

⁴ **Attachment A, Section C.1** includes information on the source of the standard compost discount factors.

- f. If compost nitrogen is reported as **A_{COMP}** it should not also be included in the **A_{FER}** calculation (i.e., it should not be reported twice in the same report form).
9. Organic fertilizer nitrogen (**A_{ORG}**) by specific crop.
- a. Dischargers must monitor and report the total amount of organic fertilizer nitrogen applied to the ranch during the report period.
 - b. Dischargers have the option of using an organic fertilizer discount factor (O) to calculate the amount of organic fertilizer nitrogen mineralized during the first 12 weeks the organic fertilizer was applied to the ranch. The organic fertilizer discount factor can only be applied to organic fertilizer reported as **A_{ORG}**. If organic fertilizer is reported under **A_{FER}** then the organic fertilizer discount factor cannot be used.
 - c. The Central Coast Water Board's organic fertilizer discount factors (O) are defined in [Table MRP-3](#). Different organic fertilizer discount factors can be applied based on the carbon to nitrogen (C:N) ratio of an organic product.
 - d. If organic fertilizer nitrogen is reported as **A_{ORG}** it should be calculated and reported separately from **A_{FER}** (i.e., it should not be reported as part of **A_{FER}** to avoid double counting in the same report).
 - e. The following products are not eligible to receive the organic fertilizer discount: a) products with no organic compounds (long chain carbon) molecules, such as conventional fertilizer, slow release fertilizers, b) products that do not depend on microbial mineralization to release nitrogen to mineral form to make it available for crop uptake, c) products without C:N ratio information available, and d) organic liquid fertilizers that are in the liquid and/or emulsified form.
10. Irrigation water nitrogen (**A_{IRR}**) for the entire ranch.
- a. The amount of irrigation water nitrogen applied, **A_{IRR}**, is calculated using the nitrogen concentration of the irrigation water and the volume of water applied to the ranch during the reporting period.
 - b. **A_{IRR}** does not include liquid fertilizers applied during fertigation (i.e., fertigation nitrogen is accounted for in **A_{FER}** as noted above).
 - c. The volume of water used in this calculation must include all water applied, including water applied for irrigation, leaching, runoff, backflush, operational spills, etc. Rainwater should not be included in this calculation.
11. Nitrogen present in the soil.
- a. Dischargers must conduct soil nitrogen monitoring to inform fertilizer application decisions for their ranch. Dischargers must measure and report the amount of soil nitrogen present in the soil at least once per

reporting period. Soil nitrogen monitoring locations and frequencies should be representative of cropping patterns and soil types as needed to inform nitrogen management decisions.

- b. Dischargers should take a soil sample for laboratory analysis, use a nitrate quick test, or use an alternative method to evaluate nitrogen content in the soil prior to each crop planting, prior to seeding the field, prior to pre-side dressing, or when appropriate to determine nitrogen available in the soil for the current or following crop, prior to applying fertilizer nitrogen. These records must be maintained in the Farm Plan and submitted to the Central Coast Water Board upon request.
- c. Soil nitrogen content must be measured at the time of year or the stage during the crop cycle when soil nitrogen content is high and therefore should be accounted for as a source of nitrogen. Records describing the timing of the soil nitrogen monitoring and the rationale used to determine the timing must be maintained in the Farm Plan and must be submitted to the Central Coast Water Board upon request.

12. Nitrogen concentration of the irrigation water.

- a. Dischargers must, at a minimum, obtain and report a precise⁵ nitrogen concentration from the primary source of irrigation water (e.g., primary irrigation well, municipal supply water, recycled water, etc.) during the report period. If Dischargers obtain multiple precise nitrogen samples from their primary irrigation well, they must compute and report the average nitrogen concentration based on all samples taken.
- b. Dischargers using an irrigation source for their ranch that is not located on their ranch property (e.g., sharing an irrigation well with a neighbor) are still responsible for obtaining a precise nitrogen concentration from the primary source of irrigation water.
- c. Examples of methods used to obtain precise values include laboratory analyses and portable measuring devices. A method that produces a concentration range, such as a nitrate quick test strip, cannot be used to satisfy this requirement unless additional technology or methods are used to obtain a precise value from the test strip.
- d. Where possible, Dischargers are encouraged to obtain precise nitrogen samples from all sources of irrigation water and compute a weighted average irrigation water nitrogen concentration. The weighted average is calculated using volume and concentration information from each water source. The methodology for calculating the weighted average is described below.

⁵ For the purposes of this MRP, a “precise” represents an exact measurement (e.g., 2.5 mg/L or 4 mg/L), as opposed to a measurement expressed as a range (e.g. 1-5 mg/L).

13. Volume of irrigation water applied to the ranch.

- a. Dischargers must, at a minimum, estimate and report the total volume of irrigation water applied to the ranch during the report period. Where possible, Dischargers are encouraged to measure the volume of irrigation water applied to the ranch or to each specific crop grown. Records describing the method used to estimate the volume of irrigation water applied must be maintained in the Farm Plan and must be submitted to the Central Coast Water Board upon request.

14. Additional information.

- a. Dischargers must report additional information required in the TNA report form, including acres of each specific crop grown, whether each specific crop was grown using organic or conventional methods, irrigation system type(s), and information describing the basis for the amount of nitrogen applied (e.g., University of California (UC) Farm Advisor consultation, on-farm research trials, trade publication, etc.).

INMP Summary Report Requirements

15. On an annual basis, Dischargers required to submit the INMP Summary report must monitor and report all nitrogen applied information noted in the TNA Report Requirements paragraphs above, in addition to the following specific irrigation management information and total nitrogen removed requirements:

- a. **Nitrogen concentration of irrigation water:** Dischargers must obtain sufficient samples to calculate the amount of nitrogen applied with the irrigation water to be used in determining compliance with nitrogen discharge targets and limits. At a minimum, Dischargers must obtain and report a precise nitrogen concentration from **all** sources of irrigation water used for their ranch during the reporting period (i.e., all irrigation wells, rather than only the primary irrigation well for TNA reporting). Dischargers may obtain multiple samples per well to increase the accuracy of their reporting and improve their ability to utilize irrigation water nitrogen in place of fertilizer nitrogen. If Dischargers obtain multiple precise nitrogen samples from a given well, they must compute and report the given well's average nitrogen concentration based on all samples taken from that well.
- b. **Weighted average irrigation water nitrogen concentration for the ranch:** Dischargers **must** calculate and report a weighted average irrigation water nitrogen concentration for their ranch. The weighted average is calculated using volume and concentration information from each water source. The following equation must be used to compute the

weighted average nitrogen concentration of irrigation water:

$$\text{Weighted Average Concentration} = \frac{((C1 * V1) + (C2 * V2) + (C3 * V3) + \dots)}{(V1 + V2 + V3 + \dots)}$$

where C1 is the nitrogen concentration of well 1, V1 is the volume of well 1, C2 is the concentration of well 2, etc.

- c. **Volume of irrigation water applied to the ranch:** Dischargers **must measure** and report the total volume of irrigation water applied to the ranch during the reporting period. Dischargers must estimate, and are encouraged to measure, the volume of irrigation water applied to each specific crop.
- d. **Recordkeeping:** Dischargers must maintain records of all irrigation water sampling and all weighted average nitrogen calculations. Dischargers must also maintain records describing the method used to measure the volume of irrigation water applied to the ranch and/or to estimate or measure the irrigation water volume applied to each specific crop. These records must be maintained in the Farm Plan and must be submitted to the Central Coast Water Board upon request.

16. Dischargers must monitor and report information associated with all nitrogen removed in annual INMP Summary reports.

- a. **Total nitrogen removed from the field (R) for each specific crop:**
Dischargers must monitor and report the total amount of nitrogen removed from the field through harvest (**R_{HARV}**), sequestration (**R_{SEQ}**), scavenging (**R_{SCAVENGE}**), treatment (**R_{TREAT}**), or other removal methods (**R_{OTHER}**).

$$R = R_{HARV} + R_{SEQ} + R_{SCAVENGE} + R_{TREAT} + R_{OTHER}$$

- b. **R_{HARV} = Conversion Coefficient x Material Removed**
 - i. All Dischargers must monitor the total mass of each specific crop in pounds per acre removed from the field during the reporting period.
 - ii. To calculate the amount of nitrogen removed from the field, Dischargers must either use a conversion coefficient provided by the Central Coast Water Board in [Table MRP-4](#) or develop and use their own conversion coefficient. Dischargers who elect to develop their own conversion coefficient must do so by obtaining a laboratory result from samples collected from their operation, or similar operation, following standard protocols to be developed by the Water Board in coordination with UCCE and CDFA and approved by the Executive Officer within 12 months of order adoption, to determine the nitrogen concentration in the crop material. Dischargers must maintain any data collected and rationale used in determining their individual conversion coefficient in the Farm Plan.

This information must be submitted to the Central Coast Water Board upon request.

- iii. For crops that do not yet have approved conversion coefficients in **Table MRP-4**, Dischargers must either select a conversion coefficient for a crop that is similar to their crop or develop their own conversion coefficient, individually or cooperatively, following the approved standard protocol described above. Dischargers must maintain records detailing how and why they selected a particular conversion coefficient for their crop and, if applicable, information on the method used to obtain the conversion coefficient in the Farm Plan. These records must be submitted to the Central Coast Water Board upon request.

c. R_{SEQ}

- i. Dischargers with permanent or semi-permanent crops may determine the amount of nitrogen sequestered in their crops during the reporting year and quantify and report this as **R_{SEQ}** for use in their nitrogen applied minus nitrogen removed reporting. Dischargers must maintain any data collected and rationale used in determining the amount of sequestered nitrogen in the Farm Plan. This information must be submitted to the Central Coast Water Board upon request.

d. $R_{SCAVERAGE}$

- i. Dischargers may claim a nitrogen scavenging credit (**$R_{SCAVERAGE}$**) one time per year for each ranch acre by utilizing any of the four options described below.
- ii. The total acres receiving the nitrogen scavenging credit may not exceed total ranch acres. Substantiating records for this credit must be maintained in the Farm Plan and submitted to the Central Coast Water Board upon request.
- iii. Dischargers electing to claim the nitrogen scavenging credit must ensure that their cover crop, high carbon amendment, or high carbon woody materials meets the definition of a nitrogen scavenging cover crop, nitrogen scavenging high carbon amendment, or high carbon woody materials as outlined below and also in Attachment A and Attachment C of this Order.
 - 1. **Option 1: Cover Crop.**
 - i. Maximum allowable nitrogen scavenging credit is 30 pounds of nitrogen per acre per year.
 - ii. A cover crop grown on a ranch to prevent leaching of nitrogen during the wet/rainy season. The cover crop must not contain nitrogen fixing plants. The cover crop must be

grown for a minimum of three months during the wet/rainy season. The cover crop must have a minimum estimated biomass of 4,500 pounds of oven-dry matter per acre. Substantiating records must be retained in the farm plan and include dated photo documentation, locations of implemented practice, date(s) of seeding, estimated cover crop biomass and method to estimate, and type of cover crop seed.

2. Option 2: Cover Crop – Calculated Credit.

- i. A cover crop grown on a ranch to prevent leaching of nitrogen during the wet/rainy season. The cover crop must not contain nitrogen fixing plants. The cover crop must be grown for a minimum of three months during the wet/rainy season. The cover crop must have a minimum biomass of 4,500 pounds of oven dry shoot matter per acre. Substantiating records must be retained in the farm plan and include dated photo documentation, locations of implemented practice, date(s) of seeding, cover crop biomass, and type of cover crop seed.
- ii. The cover crop must have a carbon to nitrogen ratio (C:N) greater than or equal to 20:1.
- iii. Standard protocols will be developed by the Water Board in coordination with UCCE and approved by the Executive Officer within 18 months of order adoption, to determine the nitrogen concentration in the crop material.
- iv. The Cover Crop - Calculated Credit is the difference between the nitrogen contained in the cover crop and the amount mineralized based on the organic fertilizer discount factor (O)⁶ of [Table MRP-3](#).⁷
- v. Vegetative food materials (crop residues) left on the field are not considered cover crops and the credit may not be applied to such vegetative food materials.

3. Option 3: High Carbon Amendments.

- i. Maximum allowable nitrogen scavenging credit is 30 pounds of nitrogen per acre per year.
- ii. High carbon material (e.g., almond shells, glycerol) added to the ranch to reduce nitrogen leaching in the wet/rainy season. The high carbon amendment must have a carbon to nitrogen ratio (C:N) greater than 30:1. The high carbon

⁶ The cover crop credit is calculated similarly to the organic fertilizer discount and is based on the predicted mineralization rate, which depends on the C:N ratio.

⁷ The credit amount for cover crops with for a C:N ratio greater than or equal to 20:1, will be based on [Table MRP-3](#), for products with a C:N ratio of greater than or equal to 15:1.

amendment must be finely ground to less than a quarter of an inch in diameter. The high carbon amendment must be incorporated into the top foot of soil. The high carbon amendment must be retained for a minimum of three months during the wet/rainy season. The high carbon amendment must have a minimum application rate of 10,000 pounds per acre. If glycerol is used as a high carbon amendment it must have a minimum application rate of 5,000 pounds per acre. Substantiating records must be retained in the farm plan and include dated photo documentation, locations of implemented practice, material and material size, confirmation that the material was incorporated in to the first foot of soil, material application rate per acre, and testing or documentation to confirm the materials C:N ratio.

4. Option 4: High Carbon Woody Mulch Materials.

- i. Maximum allowable nitrogen scavenging credit is 30 pounds of nitrogen per acre per year.
- ii. Woody mulch materials from crops producing semi-permanent or permanent woody plant tissue, from crops of at least 6 months of age and with a carbon nitrogen ratio (C:N) greater than 30:1. Mulch must be applied at a minimum 2-inch thickness of particles and achieve a minimum 70-percent ground cover, or at a minimum of 3,000 pounds per acre woody mulch application. Crop mulching practices should follow recommendations outlined in NRCS Conservation Practice Standard for Mulching (Code 484).

e. R_{TREAT}

- i. Dischargers using treatment systems on their ranch or by participating in collective treatment programs or systems may monitor the inflow and outflow nitrate concentration and volume of the treatment systems and quantify and report this as R_{TREAT} for use in their nitrogen applied minus nitrogen removed reporting. Dischargers must maintain any data collected and rationale used in determining the amount of nitrogen removed through treatment in the Farm Plan. This information must be submitted to the Central Coast Water Board upon request.

f. R_{OTHER}

- i. If Dischargers remove nitrogen from their ranch in ways not quantified above, they may monitor this nitrogen removed and

report this as **R**OTHER for use in their nitrogen applied minus nitrogen removed reporting. Dischargers must maintain any data collected and rationale used in determining any other methods of nitrogen removal in the Farm Plan. This information must be submitted to the Central Coast Water Board upon request.

17. Dischargers must monitor and report information associated with irrigation management in annual INMP Summary reports

a. **Crop evapotranspiration.**

- i. Dischargers must calculate and report the evapotranspiration for each specific crop. Acceptable methods include, but are not limited to, using reference evapotranspiration data from a local weather station (e.g., California Irrigation Management Information System (CIMIS)⁸ or an on-farm station) with a crop coefficient conversion value, and direct measurement.

b. **Irrigation discharge to surface water.**

- i. Dischargers must estimate and report the volume of water discharged through surface outflows, including tile drains.

Section C. Groundwater Monitoring and Reporting

This section contains four types of monitoring and reporting related to the evaluation of groundwater and drinking water quality: **On-Farm Domestic Wells, Irrigation Wells Prior to Start of Groundwater Quality Trend Monitoring**, and **Groundwater Quality Trends** which are required of all Dischargers and **Ranch-Level Groundwater Discharge** that must be completed when required by the Executive Officer.

1. All groundwater monitoring data sampled to meet the minimum groundwater monitoring requirements of the Order must be submitted electronically to the State Water Board's GeoTracker database by the testing laboratory. Submitted data must include the ranch AGL, the well coordinates (latitude and longitude), the well name (i.e., Location Identifier (LOCID)/Field Point Name) that is consistently and repeatedly used to refer to the same well each time the well is sampled, and the well type (i.e., Field Point Class; PRIW for Domestic/Private Drinking Water Well or AGIR for Agricultural/Irrigation Well). It is recommended the well name be affixed to the well to eliminate confusion during sample collection and labeling and laboratory reporting.
2. All groundwater samples must be collected by a qualified third party (e.g., consultant, technician, person conducting third-party monitoring) using proper

⁸ CIMIS station data can be found online at the California Irrigation Management Information Services, Department of Water Resources website: [CIMIS Station Reports](#).

sample collection and handling method, chain-of-custody, and quality assurance/quality control protocols associated with monitoring and reporting.

3. To ensure the collection of representative groundwater samples, all groundwater samples must be collected once field parameters stabilize (i.e., pH: ± 0.1 , specific conductance: $\pm 3 - 5\%$, and temperature: $\pm 3\%$).

On-Farm Domestic Wells

4. Monitoring of on-farm domestic supply wells and the reporting requirements described below are necessary to protect public health by identifying domestic water wells that do not meet drinking water standards, providing timely health risk notifications, and verifying well users have alternative replacement water as may be appropriate
5. **Beginning in 2022, all Dischargers, must conduct annual sampling of all on-farm domestic drinking water supply wells (see definition in **Attachment C**) between March 1 and May 31. Dischargers must report monitoring results by **July 31 each year.****
6. To ensure the collected samples are representative of the as-produced water from the domestic well, groundwater samples must be collected at or near the well head (before the pressure tank and prior to any well head treatment). If this is not possible, the water sample must be collected from a sampling point as close to the pressure tank as possible, or from a cold-water spigot located before any filters or water treatment devices or systems.
7. At a minimum, samples must be analyzed for nitrate as nitrogen or nitrate + nitrite as nitrogen, 1,2,3-trichloropropane (1,2,3-TCP), and field parameters as specified in **Table MRP-5**.
8. If a domestic supply well noted on the Discharger's electronic Notice of Intent (eNOI) becomes inactive (i.e., is taken out of service) or is abandoned (i.e., destroyed per local and state well standards), sampling may cease until such time as the domestic supply well is returned to service or a new well is installed. The Discharger must keep any records establishing that a well is not being used for domestic purposes.
9. The Discharger must ensure an inactive domestic supply well is properly maintained as follows and in accordance with local well and drinking water program requirements:
 - a. The well or well plumbing is physically disconnected from any water distribution system plumbing serving a residential residence.
 - b. The top of the well or well casing must be provided with a cover that is secured by a lock or other means to prevent its removal without the use of

- equipment or tools. A pump, motor, or other surface feature of a supply well are considered examples of acceptable domestic supply well covers.
- c. The cover must be adequate to prevent unauthorized access, a safety hazard to humans and animals, or the entrance of foreign material, pollutants, or contaminants into the well.
 - d. The Discharger must immediately update their eNOI when a domestic well is taken out of service, returned to service, or replaced by a new well to indicate the accurate number of operating domestic supply wells on the ranch.
 - e. If a domestic supply well is permanently taken out of service, the Discharger must destroy the well in accordance with California Department of Water Resources (DWR) and local requirements for well destruction (including obtaining well destruction permits).

Notification to On-Farm Domestic Well Users

10. On an annual basis, Dischargers must provide well users with a summary of laboratory analytical results within **3 business days** of receiving results from the laboratory. Dischargers must also provide a summary of the most recent laboratory analytical results to any new well users (e.g., tenants and employees with access to the sampled well) within **3 business days** whenever there is a change in the population using the well. Dischargers may use the Drinking Water Notification template on the Central Coast Water Board website for provision of the analytical results summary, or an alternative notification form approved by the Executive Officer.
11. Notification of annual laboratory analytical result summaries to well users must include information regarding health risks associated with the following:
 - a. Consuming, boiling, and/or cooking with well water containing nitrate in excess of the Maximum Contaminant Level (MCL:10 mg/L nitrate [or nitrate plus nitrite] as nitrogen).
 - b. Consuming and/or showering with well water containing 1,2,3-TCP in excess of the MCL (0.005 µg/L).
12. All notification materials must be provided in appropriate languages to sufficiently inform well users
13. Dischargers must update their electronic Notice of Intent (eNOI) within **30 days** of receiving results from the laboratory to confirm the following:
 - a. Well users have been provided with a summary of laboratory analytical results.
 - b. Well users have been provided with information regarding health risks associated with well water containing nitrate and/or 1,2,3-TCP in excess of

their respective public health drinking water standards (i.e., maximum contaminant levels (MCLs)).

- c. Well users have an alternate source of water for domestic purposes if the sampled well contains nitrate and/or 1,2,3-TCP in excess of their respective MCLs.
- d. If there has been a change in the population using the well in the past year (e.g., new tenants or residents), confirm that new well users have been provided with the information and resources described above.

Irrigation Wells Prior to the Start of Groundwater Quality Trend Monitoring

- 14. The objectives of sampling on-farm irrigation wells during the period between the effective date of this Order and the initiation of groundwater quality trend monitoring are as follows:
 - a. To evaluate groundwater conditions in agricultural areas.
 - b. To inform establishment of a groundwater quality trend monitoring network.
- 15. **Beginning in 2022**, all Dischargers must conduct annual sampling of the primary irrigation well **between March 1 and May 31**. Dischargers must report monitoring results by **July 31 each year**. This annual monitoring and reporting requirement will cease upon initiation of an Executive Officer-approved groundwater quality trend monitoring and reporting work plan.
- 16. At a minimum, samples must be analyzed for nitrate as nitrogen or nitrate + nitrite as nitrogen, total dissolved solids (TDS), and field parameters as specified in [Table MRP-6](#).

Groundwater Quality Trend Monitoring

- 17. The objectives of groundwater quality trend monitoring and reporting are as follows:
 - a. To evaluate the status of groundwater quality over time, including whether groundwater quality objectives are attained, and beneficial uses are protected.
 - b. To quantitatively evaluate the impact of irrigated agricultural waste discharges to groundwater.
 - c. To evaluate short-term patterns and long-term trends (five to ten years or more) in groundwater quality.
- 18. Dischargers must conduct groundwater quality trend monitoring and reporting, either individually or via membership in a third party that is approved by the Executive Officer.

Third Party Approach

19. An approved third-party representing Dischargers must develop and submit a regional groundwater trend monitoring and reporting work plan,⁹ by the dates specified below or by an alternative schedule approved by the Executive Officer. Alternatively, Dischargers may elect to participate in the Third Party Alternative Compliance Pathway for Groundwater Protection (see **Order Part 2, Section C.2** and **Section D** in this MRP). The work plan must be prepared by a qualified professional and designed to quantitatively evaluate groundwater quality trends and quantitatively assess the impacts of agricultural discharges on groundwater quality over time.
- a. **September 1, 2023** for groundwater basins within Groundwater Phase 1 areas;
 - b. **September 1, 2025** for groundwater basins within Groundwater Phase 2 areas;
 - c. **September 1, 2027** for all other areas.
20. At a minimum, the work plan must include the following:
- a. Description of the geographic and hydrogeologic area(s) in which the groundwater quality trend monitoring program will be established, including identification of groundwater basins and subbasins, recharge and discharge areas, as well as supporting data and maps.
 - b. Rationale for a sufficiently representative monitoring well network and sampling schedule to monitor discrete depth intervals with an emphasis on shallow or first encountered groundwater, including supporting soils, geologic, and hydrogeologic information such as cross-sections and groundwater depth and flow characteristics.
 - c. Proposal for obtaining well completion reports and/or well driller's logs and maintain such data.
 - d. Location and construction details associated with proposed wells composing the monitoring network, including existing and new wells.
 - e. If applicable, a description of how data from existing monitoring networks will be incorporated into the groundwater quality trend monitoring program and how those data will be uploaded to GeoTracker.
 - f. Table showing proposed monitoring parameters that will be evaluated to assess water quality changes over time. At a minimum, groundwater quality trend monitoring wells must be sampled for monitoring parameters included in **Table MRP-7**.

⁹ Examples of acceptable scales covered by "regional" work plans could be at the groundwater basin or subbasin scale, the entire central coast region, or an area smaller than a groundwater subbasin with specific hydrogeologic conditions, such as recharge or discharge areas.

- g. Proposed protocol used to evaluate trends in groundwater quality data, including statistical methods and data depiction.
 - h. Proposed reporting schedule for water quality and depth the groundwater data and trend analysis.
 - i. SAP and QAPP (see [Section G](#) below).
21. The third party is responsible for implementing a groundwater quality trend monitoring and reporting work plan on behalf of Dischargers who are third party members. Work plan implementation shall not begin until the Executive Officer has approved the work plan.
22. If one or more wells from an ongoing, established non-agricultural monitoring program are incorporated into the groundwater quality trend monitoring network, monitoring data from these wells must also be uploaded to the GeoTracker database and must comply with GeoTracker EDF and EDD criteria and protocols. Incorporation of such data must occur as described in the work plan approved by the Executive Officer.

Individual Approach

23. Dischargers electing to perform groundwater quality trend monitoring and reporting individually must submit an individual groundwater quality trend monitoring work plan to the Executive Officer for approval prior to implementation. Dischargers must submit the work plan by the following dates:
- a. **September 1, 2023** for ranches groundwater basins with Groundwater Phase 1 areas;
 - b. **September 1, 2025** for ranches groundwater basins with Groundwater Phase 2 areas;
 - c. **September 1, 2027** for ranches in all other areas.
24. At a minimum, the work plan must include the following:
- a. Identification and description of wells used for groundwater quality trend monitoring (in narrative form and in map view) with supporting technical rationale justifying the effectiveness of the well(s) in assessing ranch level groundwater quality trends over time.¹⁰
 - b. Identification of the water-bearing zone monitored by each well used for groundwater quality trend monitoring.

¹⁰ Acceptable justification for well inclusion in individual trend monitoring is well construction information typically included on well driller logs, also known as well completion reports. Dischargers are encouraged to locate all such well completion reports and submit the reports to the GeoTracker database as a Bore Log File (i.e., GEO_BORE) in pdf format. DWR is a repository for well completion reports, and Dischargers are encouraged to contact DWR or local well permitting authority to obtain these reports as necessary.

- c. Proposed location(s) and well construction characteristics for any proposed new purpose-built monitoring wells to be used in groundwater quality trend monitoring if existing wells are not adequate for long-term monitoring.
 - d. Determination of the statistical method that will be used for groundwater quality trend evaluation.
25. The monitoring and reporting schedule and minimum list of testing parameters is shown in [Table MRP-8](#).¹¹
26. Dischargers must monitor wells used in groundwater quality trend monitoring on a semi-annual basis during the **first and third quarters of each calendar year**. Monitoring data must be reported to GeoTracker **by May 31 for sampling occurring in the first quarter and by November 30 for sampling occurring in the third quarter**.
27. Dischargers must submit a groundwater quality trend evaluation report by January 31 each year. The groundwater quality trend evaluation report must be provided in a format specified by the Executive Officer.
28. At a minimum, the groundwater quality trend evaluation report must include the following:
- a. For each well used in groundwater quality trend monitoring, plots of concentration versus time for each monitoring parameter, except for field parameters pH, temperature, and specific conductance. The groundwater quality trend plots must reflect concentrations detected during each sampling event and are expected to expand over time.
 - b. Discussion of groundwater quality trends represented in the trend plots (i.e., increasing or decreasing groundwater quality trends, implications associated with farm management practices, etc.).
29. Dischargers who do not have a well on their property and do not choose to join a third-party program must still perform groundwater quality trend monitoring and reporting in accordance with [Table MRP-8](#). Dischargers who do not have a well on their property may choose one of the following options for groundwater quality trend monitoring and reporting:
- a. Install a monitoring well or wells as needed to sufficiently characterize groundwater quality trends.

¹¹ To the extent practicable, the depth to groundwater (in feet below ground surface) must also be measured and reported for wells used in individual groundwater trend determination. Measurements must be made from the same location at the top of the well that is accessible ("x"), and the height of that measuring location above the ground surface must also be measured ("y") for an accurate depth to water calculation (i.e., $x - y$ = depth to groundwater below the ground surface).

- b. Develop a coordinated groundwater quality trend monitoring and reporting program by partnering with adjacent property owner(s) with wells to sufficiently characterize groundwater quality trends.
- c. Obtain authorization from adjacent property owners with one or more wells to collect water quality samples from their well or wells.
- d. Obtain authorization from individual property owners or a third-party groundwater quality trend monitoring and reporting program to utilize their water quality data.

The conditions of “authorization” will be up to the negotiating parties, and documentation of the authorization will be a condition of the individual trend monitoring program work plan approval process.

30. Dischargers who obtain authorization from individual property owners (including adjacent property owners) or a third-party program for use of water quality data must document in the annual groundwater quality trend evaluation report how data obtained from wells not on the Discharger’s property are representative of groundwater conditions at the Discharger’s property.

Ranch-Level Groundwater Discharge

31. Based on groundwater quality data or significant and repeated exceedance of the nitrogen discharge targets or limits, the Executive Officer may require a Discharger to conduct ranch-level groundwater discharge monitoring and reporting¹². Such monitoring and reporting efforts, including planning, must be explicitly designed and implemented to achieve the following objectives:

- a. Assess and quantify the Discharger’s contribution to the exceedance of the nitrogen discharge targets or limits and the discharge of nitrogen below the root zone.
- b. Assess the timeframe over which discharge below the root zone occurs.
- c. Assess management practice implementation to identify management practices that can be implemented on the ranch to control or eliminate discharges below the root zone.
- d. Evaluate effects of the discharge on groundwater quality and beneficial uses with respect to applicable water quality objectives.
- e. Demonstrate compliance with applicable nitrogen discharge targets or limits and water quality objectives over time.

¹² Dischargers that are members in good standing with a third-party alternative compliance pathway program are exempt from ranch-level groundwater discharge monitoring and reporting, as noted in [Section D](#).

32. **Within 120 days**¹³ of being required by the Executive Officer to conduct ranch-level groundwater discharge monitoring, Dischargers must submit a work plan to the Executive Officer for approval prior to implementation. The workplan will be in a format specified by the Executive Officer. The Discharger may choose to submit and implement the work plan either individually or through participation in an approved third-party program. The work plan must include a SAP and QAPP (see [Section G](#) below) and the minimum following elements:

- a. Schedule for work plan implementation.
- b. Description of monitoring methodologies, frequencies and analytical methods to measure the concentration of nitrate and other relevant parameters in discharge water (i.e., percolation below the root zone).
- c. Description of monitoring methodologies and frequencies to measure the volume of water that percolates below the root zone.
- d. Proposal and justification for the reporting frequency for Ranch-Level Discharge Monitoring Reports.
- e. Description of how the Discharger's impact on groundwater quality will be quantified.
- f. Description of how ranch-level groundwater discharge monitoring data will be used to assess and improve management practices.
- g. Description of how nitrogen discharge targets/limits will be achieved over time.

33. **Within 90 days** of receiving Executive Officer approval of the work plan, or in accordance with an alternative schedule approved in the work plan, the Discharger must implement the work plan either individually or through participation in an approved third-party program.

34. Dischargers must select appropriate monitoring locations and methodologies to effectively characterize the concentration of nitrate and other relevant parameters in discharge water.

35. Dischargers must report ranch-level groundwater discharge monitoring data and information in Ranch-Level Discharge Monitoring Reports, in a format specified by the Executive Officer. Reported data and information must contain the items listed below, unless approved otherwise by the Executive Officer:

- a. The Discharger's ranch name and AGL number, site/test plot name(s), project contact, and report date.
- b. Map(s) depicting the location of monitoring sites/test plots.

¹³ Central Coast Water Board staff will inform the Discharger and/or the third party representing the Discharger **90** days before the Executive Officer intends to require ranch-level discharge monitoring. The purpose of this advance notice is to provide flexibility to Dischargers in the event that circumstances beyond their control have adversely impacted the ability to achieve nitrogen discharge targets/limits by prescribed timeframes.

- c. In tabular format, all monitoring data and information obtained over time, including field-measured and laboratory analytical results¹⁴.
- d. Calculations of pollutant loading, including equations used in the calculation.
- e. Photographs of monitoring sites/test plots, including labels indicating photograph location and date.

Section D. Third-Party Alternative Compliance Pathway for Groundwater Protection

This section contains monitoring and reporting requirements associated with the development and implementation of the third-party alternative compliance pathway program for groundwater protection and the effectiveness assessment and evaluation outlined in **Order, Part 2, Section C.2**.

1. Members in good standing with the third-party alternative compliance pathway program are referred to as “participating Dischargers.”
2. An approved third-party alternative compliance pathway program administrator, on behalf of its participating Dischargers, must develop and submit incremental draft and final work plans by the timeframes specified below.
 - a. Submit the **first draft (35%) work plan** within 24 months of Order adoption.
 - b. Submit the **second draft (70%) work plan** within 18 months of a first draft work plan conditional approval by the Executive Officer.
 - c. Submit the **final (100%) work plan** within 10 months of a second draft work plan conditional approval by the Executive Officer.
3. The **first draft (35%) work plan** must include the following, at a minimum:
 - a. Proposed groundwater protection (GWP) areas and supporting scientific justification,
 - b. Proposed GWP formulas, objectives, and supporting scientific justification,
 - c. GWP value methodology and objectives,
 - d. GWP target methodology and objectives,
 - e. Follow-up action and consequence concepts if targets are not achieved, and
 - f. Assessment and evaluation program outline, methodology, and objectives.
4. The **second draft (70%) work plan** must include the following, at a minimum:
 - a. Conditionally approved GWP areas,

¹⁴ Chain-of-custody forms do not need to be submitted but must be made available to Central Coast Water Board staff upon request.

- b. Conditionally approved GWP formulas,
 - c. Proposed GWP values, objectives, and supporting scientific justification,
 - d. Proposed GWP targets and supporting scientific justification,
 - e. Proposed follow-up actions and consequences if targets are not achieved, and
 - f. Draft assessment and evaluation program and associated objectives and rationale.
5. The **final (100%) work plan** must include the following, at a minimum:
- a. Conditionally approved GWP areas,
 - b. Conditionally approved GWP formulas,
 - c. Conditionally approved GWP values,
 - d. Conditionally approved GWP targets,
 - e. Conditionally approved follow-up actions and consequences if targets are not achieved, and
 - f. Final assessment and evaluation program.

Monitoring and Reporting

- 6. Participating Dischargers must submit ACF, TNA, and INMP Summary information according to requirements outlined in the **Order, Part 2, Section C.1** and as described in this MRP in **Section B**.
- 7. Participating Dischargers must submit Groundwater Monitoring and Reporting information according to requirements outlined in the **Order, Part 2, Section C.1** and as described in this MRP in **Section C**.
- 8. Participating Dischargers are not required to conduct ranch-level groundwater discharge monitoring and reporting.

Section E. Surface Water Monitoring and Reporting

This section contains three types of monitoring and reporting related to surface water quality: **Surface Receiving Water Quality Trends** and **Follow-Up Surface Receiving Water Implementation** that are required of all Dischargers and **Ranch-Level Surface Discharge** that must be completed when required by the Executive Officer.

Surface Receiving Water Quality Trends

- 1. Surface receiving water refers to water flowing in creeks and other surface waters of the state. Surface receiving water monitoring and reporting must be conducted through either a monitoring program on behalf of Dischargers, or Dischargers may choose to conduct surface receiving water monitoring and reporting individually. Key monitoring and reporting requirements for surface receiving water monitoring are shown in **Table MRP-9** and **Table MRP-10**.

2. Dischargers, either individually or as part of a third-party program, must conduct surface receiving water monitoring and reporting to achieve the following:
 - a. Evaluate the impact of irrigated agricultural waste discharges on receiving waters;
 - b. Evaluate compliance with the numeric limits described in the Order;
 - c. Evaluate the status of receiving water quality, including whether water quality objectives are attained, and beneficial uses are protected;
 - d. Evaluate short-term patterns and long-term trends (five to ten years or more) in receiving water quality;
 - e. Evaluate water quality impacts of tile drain discharges from irrigated agricultural operations;
 - f. Evaluate water quality impacts of stormwater discharges from irrigated agricultural operations;
 - g. Evaluate the condition of existing perennial, intermittent, and ephemeral streams and riparian and wetland areas, including degradation resulting from erosion or irrigated agricultural discharges of waste; and
 - h. Assist in the identification of specific sources of water quality problems.
3. Prior to the initiation of the work plan process outlined below, entities wishing to implement a third-party program must submit a third-party program proposal consistent with the third-party program requirements outlined in Order, Part 2, Section A as well as the request for proposal process and associated third-party program expectations document forthcoming after Order adoption.”
4. **By July 1, 2022**, Dischargers, either individually or as part of a third-party program, must submit a surface receiving water quality trends work plan including a Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP; see [Section G](#) below). The SAP must be developed to describe how the proposed monitoring will achieve the objectives of the MRP and evaluate compliance with the Order. The SAP may propose alternative monitoring and reporting site locations, adjusted monitoring parameters, and other changes as necessary to assess the impacts of irrigated agricultural waste discharges to receiving water. The Executive Officer must approve the work plan, SAP, and QAPP prior to implementation.
5. Dischargers, either individually or as part of a third-party program, must perform surface receiving water quality trend monitoring and reporting in accordance with the work plan, SAP, and QAPP approved by the Executive Officer.
6. The work plan must, at a minimum, include monitoring sites to evaluate waterbodies identified in [Table MRP-9](#), unless otherwise approved by the Executive Officer. The SAP must include sites to evaluate receiving water quality impacts most directly resulting from areas of irrigated agricultural discharge (including areas receiving tile drain discharges). Site selection must take into consideration the existence of any long-term monitoring sites included in related

monitoring programs (e.g., Central Coast Ambient Monitoring Program (CCAMP) and the existing third-party monitoring program). Sites may be added or modified, subject to prior approval by the Executive Officer, to better assess the pollutant loading from individual sources or the impacts to receiving waters caused by individual discharges. Any modifications must consider sampling consistency for purposes of trend evaluation.

7. The work plan must, at a minimum, include the types of monitoring and evaluation parameters listed below and identified in **Table MRP-10**.
 - a. Flow monitoring;
 - b. Water quality (physical parameters, metals, nutrients, pesticides);
 - c. Toxicity (water and sediment);
 - d. Assessment of benthic invertebrates, physical habitat monitoring, and Riparian Rapid Assessment Method (RipRAM) monitoring.
8. The work plan must include a schedule for sampling. Timing, duration, and frequency of monitoring must be based on the land use, complexity, hydrology, and size of the waterbody. **Table MRP-10** includes minimum monitoring frequency and parameter lists. Agricultural parameters that are less common may be monitored less frequently. Modifications to the receiving water quality monitoring parameters, frequency, and schedule must be submitted for Executive Officer consideration and approval. At a minimum, the SAP schedule must consist of monthly monitoring of common agricultural parameters, including two major storm events during the wet season (October 1 – April 30).
9. Water column toxicity analyses must be conducted on 100% (undiluted) samples. At sites where persistent unresolved toxicity is found, the Executive Officer may require concurrent toxicity and chemical analyses and a Toxicity Identification Evaluation (TIE) to identify the individual discharges causing the toxicity.
10. Stormwater monitoring must be conducted within 18 hours of storm events, preferably including the first flush run-off event (see definition in Attachment C) that results in significant increase in stream flow. For the purposes of this MRP, a storm event is defined as precipitation producing onsite runoff (surface water flow) capable of creating significant ponding, erosion, or other water quality problems. A significant storm event will generally result in greater than a half-inch of rain within a 24-hour period.
11. **By January 1, April 1, July 1, and October 1 of each year**, Dischargers, either individually or as part of a third-party program, must submit water quality monitoring data electronically to CEDEN, according to CEDEN submittal guidelines, or in a format specified by the Executive Officer.
12. **By July 1 annually**, Dischargers, either individually or as part of a third-party program, must submit an Annual Report for the previous year of collected data,

electronically, in a format specified by the Executive Officer. The Annual Report must include the following minimum elements:

- a. Signed transmittal letter;
- b. Title page;
- c. Table of contents;
- d. Executive summary;
- e. Monitoring objectives and design;
- f. Monitoring site descriptions and rainfall records for the time period covered;
- g. Location of monitoring sites and map(s);
- h. Results of all analyses arranged in tabular form so that the required information is readily discernible;
- i. Summary of water quality data for any sites monitored as part of related monitoring programs and used to evaluate receiving water as described in the SAP;
- j. Discussion of data to clearly illustrate compliance with the Order, water quality standards, and surface water limits required by the Order, including watershed-level data analysis for each hydrologic subarea in **Table MRP-9** (for example data analysis and discussion for sub-watersheds 30510, 30530, etc.);
- k. Discussion of short-term patterns and long-term trends in receiving water quality and beneficial use protection;
- l. Evaluation of pesticide and toxicity analyses results, and recommendation of candidate sites for TIEs;
- m. Sampling and analytical methods used;
- n. Copy of chain-of-custody forms;
- o. Field data sheets, signed laboratory reports, laboratory raw data;
- p. Associated laboratory and field quality control samples results;
- q. Summary of Quality Assurance Evaluation results;
- r. The method used to obtain flow at each monitoring site during each monitoring event;
- s. Electronic or hard copies of photos obtained from all monitoring sites, clearly labeled with site ID and date;
- t. Potential follow-up actions to correct any observed exceedances of the surface water limits;
- u. Conclusions.

Follow-Up Surface Receiving Water Implementation

13. Dischargers, either individually or as party of a third-party program, must develop a follow-up surface receiving water implementation work plan to achieve the following:

- a. Identify and abate source of water quality impacts;
 - b. Evaluate the impact of irrigated agricultural waste discharges on receiving waters;
 - c. Evaluate the condition of existing perennial, intermittent, and ephemeral streams and riparian and wetland areas, including degradation resulting from erosion or irrigated agricultural discharges of waste;
 - d. Evaluate compliance with the numeric limits described in the Order; and
 - e. Identify follow-up actions, including outreach, education, additional monitoring and reporting, and management practice implementation that will be implemented to achieve compliance with the numeric limits described in the Order.
14. Prior to the initiation of the work plan process outlined below, entities wishing to implement a third-party program must submit a third-party program proposal consistent with the third-party program requirements outlined in **Order, Part 2, Section A** as well as the request for proposal process and associated third-party program expectations document forthcoming after Order adoption. Ranches that are enrolled as part of an approved third-party follow-up surface receiving water implementation program are assigned the Surface Water Priority of high priority, medium priority, or low priority of the drainage unit where the ranch is located, as shown in **Table C.3-1.3P** and the map shown in **Figure C-3.1.3P**.
15. The work plan must include the following minimum components:
 - a. Description of implementation measures that will be taken to reduce the discharge of relevant constituents and comply with the limits established in the Order.
 - b. Numeric interim quantifiable milestones to confirm progress is being made to reduce the discharge of relevant constituents and achieved the numeric limits established in the Order, consistent with their time schedule. Numeric quantifiable milestones include numeric interim quantifiable milestones for relevant constituents (e.g., pollutant load or concentration) and numeric interim quantifiable milestones for management practices implemented that confirm progress towards reducing the discharge of relevant constituents (e.g., volume of discharge water diverted to treatment systems, treatment system pollutant reduction, distance of riparian area improvements, acres no longer receiving conventional pesticide applications).
 - c. Consideration of the level of water quality impairment identified through surface receiving water monitoring. Work plans for areas with persistent exceedances of the surface water limits in the Order must identify follow-up actions to restore the degraded areas (e.g., outreach, education, management practice implementation) and additional surface receiving water monitoring locations for pollutant source identification and

abatement. Work plans for areas that are already achieving the surface water limits in the Order must identify actions to be taken to protect the high-quality areas (e.g., outreach and education).

- d. Where appropriate based on water quality data, follow-up monitoring sites to further evaluate the waterbody(s) specified by the Executive Officer. The work plan must include sites to evaluate receiving water quality impacts most directly resulting from areas of irrigated agricultural discharge (including areas receiving tile drain discharges). Site selection must take into consideration the existence of any long-term monitoring sites included in related monitoring programs (e.g., CCAMP and the existing third-party monitoring program). Sites may be added or modified, subject to prior approval by the Executive Officer, to better assess the pollutant loading from individual sources or the impacts to receiving waters caused by individual discharges.
 - e. SAP and QAPP (see [Section G](#) below). The SAP must be developed to describe how the proposed monitoring will achieve the objectives of the MRP, identify additional follow-up monitoring sites upstream of observed exceedances to identify sources of the exceedances, and evaluate compliance with the limits established in the Order.
16. The parameters to be monitored through follow-up monitoring may vary based on the water quality exceedances observed at downstream sites through the surface receiving water trend monitoring. The work plan must, at a minimum, include the types of monitoring and evaluation of parameters identified by the Executive Officer as requiring follow-up monitoring, such as the parameters listed below and identified in [Table MRP-10](#).
- a. Flow monitoring;
 - b. Water quality (physical parameters, metals, nutrients, pesticides); and
 - c. Toxicity (water and sediment).
17. The work plan must include a schedule for sampling. Timing, duration, and frequency of monitoring must be based on the land use, complexity, hydrology, and size of the waterbody. [Table MRP-10](#) includes minimum monitoring frequency for parameters requiring follow-up monitoring by the Executive Officer. Agricultural parameters that are less common may be monitored less frequently. Modifications to the follow-up receiving water quality monitoring parameters, frequency, and schedule may be submitted for Executive Officer consideration and approval. At a minimum, the work plan schedule must consist of monthly monitoring of common agricultural parameters, including two major storm events during the wet season (October 1 – April 30).
18. If water column toxicity analyses must be conducted to comply with follow-up monitoring requirement, the analyses must be performed on 100% (undiluted) samples. At sites where persistent unresolved toxicity is found, the Executive

Officer may require concurrent toxicity and chemical analyses and a TIE to identify the individual discharges causing the toxicity.

19. Stormwater monitoring must be conducted within 18 hours of storm events, preferably including the first flush run-off event (see definition in **Attachment C**) that results in significant increase in stream flow. For the purposes of this MRP, a storm event is defined as precipitation producing onsite runoff (surface water flow) capable of creating significant ponding, erosion, or other water quality problems. A significant storm event will generally result in greater than half-inch of rain within a 24-hour period.
20. **By January 1, April 1, July 1, and October 1 of each year**, Dischargers, either individually or as part of a third-party program, must submit follow-up surface receiving water quality monitoring data electronically to CEDEN, according to CEDEN submittal guidelines, or in a format specified by the Executive Officer.
21. **By July 1 annually**, Dischargers, either individually or as part of a third-party program, must submit an Annual Report, electronically, in a format specified by the Executive Officer. The Annual Report must include the following minimum elements:
 - a. Signed transmittal letter;
 - b. Title page;
 - c. Table of contents;
 - d. Executive summary;
 - e. Monitoring objectives and design;
 - f. Monitoring site descriptions and rainfall records for the time period covered;
 - g. Location of monitoring sites and map(s);
 - h. Results of all analyses arranged in tabular form so that the required information is readily discernible;
 - i. Summary of water quality data for any sites monitored as part of related monitoring programs and used to evaluate receiving water as described in the work plan;
 - j. Discussion of data to clearly illustrate compliance with the Order, water quality standards, and surface water limits required by the Order;
 - k. Discussion of specific information about the identified sources of water quality impairment;
 - l. Discussion of management practice implementation and other follow-up activities performed to correct the persistent water quality impairment;
 - m. Sampling and analytical methods used;
 - n. Copy of chain-of-custody forms;
 - o. Field data sheets, signed laboratory reports, laboratory raw data;
 - p. Associated laboratory and field quality control samples results;
 - q. Summary of Quality Assurance Evaluation results;

- r. The method used to obtain flow at each monitoring site during each monitoring event;
- s. Electronic or hard copies of photos obtained from all monitoring sites, clearly labeled with site ID and date; and
- t. Conclusions.

Ranch-Level Surface Discharge

22. Based on exceedances of applicable surface water quality limits, including concentration and loading for all applicable parameters in their discharge, the Executive Officer, may require a Discharger to conduct ranch-level surface discharge monitoring and reporting. Such monitoring and reporting efforts, including planning, must be explicitly designed and implemented to achieve the following objectives:

- a. Assess and quantify the Discharger's contribution to the exceedance of applicable surface water quality limits, including concentration and loading for all applicable parameters in their discharge;
- b. Evaluate effects of the discharge on receiving water quality and beneficial uses; and
- c. Demonstrate compliance with applicable surface water limits and water quality objectives over time.

23. **Within 120 days¹⁵** of being required to conduct ranch-level surface discharge monitoring, Dischargers must submit a ranch-level surface discharge work plan, to the Executive Officer for approval prior to implementation. The workplan will be in a format specified by the Executive Officer. The Discharger may choose to submit and implement the work plan either individually or through participation in an approved third party. The work plan must include a SAP and QAPP (see [Section G](#)) designed to monitor individual discharges of irrigation water and stormwater that leave the ranch from an outfall location, including tile drain discharge points, and the minimum following elements.

- a. A schedule for work plan implementation;
- b. Description of monitoring methodologies, frequencies, and analytical methods of all applicable parameters where exceedances have occurred or are occurring;
- c. Description of monitoring methodologies and frequencies to measure flow volumes;
- d. Quantification of the Discharger's impact on surface water quality;

¹⁵ Central Coast Water Board staff will inform the Discharger and/or the third party representing the Discharger **90** days before the Executive Officer intends to require ranch-level surface discharge monitoring. The purpose of this advance notice is to provide flexibility to Dischargers in the event that circumstances beyond their control have adversely impacted the ability to achieve surface receiving water limits by the compliance dates.

- e. Description of how ranch-level surface discharge monitoring data will be used to assess and improve management practices; and
 - f. Description of how surface water quality limits and water quality objectives will be achieved over time.
24. **Within 90 days** of receiving Executive Officer approval, or in accordance with an alternate schedule approved in the work plan, the work plan must be implemented.
25. Dischargers must select monitoring sites that characterize both irrigation and stormwater discharges. For irrigation discharge, Dischargers must select monitoring points to characterize at least 80 percent of the estimated maximum irrigation discharge volume, based on the typical discharge patterns of the ranch, and must include points of tailwater and tile drain (if present) discharges. The SAP must be designed such that monitoring must occur when it is highly probable that the irrigation discharge volume is the greatest during an irrigation event. Stormwater discharge sites must be selected to characterize the majority of stormwater discharge and must include first-flush monitoring. All selected monitoring sites must characterize discharge from the required farm/ranch, i.e., the discharge is not comingled with discharge from adjacent farms.
26. Dischargers must conduct monitoring for all parameters necessary to achieve the goals described for individual discharge monitoring.
27. Analytical methods, maximum practical quantitation limits (PQL), and reporting limits (RL) must be consistent with those outlined in Section G, or as approved by the Executive Officer.
28. Individual surface discharge sampling must occur at each site a minimum of four times per year, with one sample drawn during each of the following calendar quarters: **January to March, April to June, July to September, October to December**, or as approved by the Executive Officer.
29. **By March 1 and September 1 of each year**, Dischargers must submit individual surface discharge monitoring data and information. The information must be submitted electronically, in a format specified by the Executive Officer and must contain the items listed below, unless otherwise approved by the Executive Officer.
- a. All data and information from monitoring occurring in the preceding two calendar quarters and data not yet reported on previous semi-annual reports.
 - b. Data in a tabular format, showing all data for each parameter and each monitoring event.
 - c. Electronic laboratory data.
 - d. All reports of results must contain the ranch name and Global ID, site name(s), project contact, and date.

- e. Electronic laboratory data reports of chemical results must include analytical results, as well as associated quality assurance data including method detection limits, reporting limits, matrix spikes, matrix spike duplicates, laboratory blanks, and other quality assurance results required by the analysis method.
- f. Electronic laboratory data reports of toxicity results shall include summary results comparable to those required in a CEDEN file delivery, including test and control results. For each test result, the mean, associated control performance, calculated percent of control, statistical test results and determination of toxicity, must be included. Test results must specify the control ID used to calculate statistical outcomes.
- g. Field data results, including temperature, pH, conductivity, turbidity and flow measurements, any field duplicates or blanks, and field observations.
- h. Calculations of un-ionized ammonia concentrations (based on total ammonia value and field measurements for pH and water temperature).
- i. Calculations of total flow and pollutant loading (for nitrate, pesticides if sampled, total ammonia, and turbidity) (include formulas).
- j. Location of sampling sites and map(s).
- k. Sampling and analytical methods used.
- l. Specify the method used to obtain flow at each monitoring site during each monitoring event.
- m. Photos obtained from all monitoring sites, clearly labeled with location and date.
- n. Sample chain-of-custody forms do not need to be submitted but must be made available to Central Coast Water Board staff, upon request.

Section F. Annual Compliance Form (ACF)

1. **By March 1, 2022, and annually thereafter by March 1**, all Dischargers must submit an ACF electronically, in a format specified by the Executive Officer. The ACF includes, but is not limited to, the items listed below.
 - a. Irrigation, stormwater, and tile drain discharge characteristics (e.g., number of discharge points, estimated flow and volume, and number of tailwater days).
 - b. Status of Farm Plan development and implementation.
 - c. Identification of specific water quality management practices implemented and assessed for effectiveness on the ranch to reduce water quality impacts, including:
 - i. Irrigation management practices;
 - ii. Nutrient management practices;
 - iii. Salinity management practices;
 - iv. Pesticide management practices;
 - v. Sediment and erosion management practices; and

- vi. Stormwater management practices.
- d. Reporting an estimation of riparian area (average width and length, in feet) for dischargers with waterbodies within or bordering their ranch.¹⁶
- e. Reporting on water quality and management practice education obtained.

Section G. Sampling and Analysis Plan and Quality Assurance Project Plan

1. The Sampling and Analysis Plan (SAP) must include the following minimum components as applicable depending on the monitoring requirement:
 - a. Monitoring strategy to achieve objectives of the Order and MRP;
 - b. Map and Global Positioning System (GPS) coordinates of monitoring sites (e.g., well, receiving water locations, outfall locations etc.);
 - c. Monitoring parameters;
 - d. Monitoring schedule, including description and frequencies of monitoring events;
 - e. Identification of beneficial uses and applicable water quality standards (with the following as appropriate for surface water monitoring);
 - f. Identification of known water quality impairments and impaired waterbodies per the most recent USEPA approved Clean Water Act 303(d) List of Impaired Waterbodies (List of Impaired Waterbodies);
 - g. Identification of applicable Total Maximum Daily Loads (TMDLs);
 - h. Sample collection and handling procedures (e.g., preservation, storage, transport, holding times, etc.);
 - i. Chain of custody procedures;
 - j. Quality Assurance and Quality Control (QA/QC) sampling and analysis criteria and procedures;
 - k. Data management and reporting procedures; and
 - l. Description of data analytical methods, specifications, and limits (e.g., PQL and RL).
2. The QAPP must include site-specific information, project organization and responsibilities, and quality assurance components of the MRP. The QAPP must also include the laboratory and field requirements to be used for analysis and data evaluation. The QAPP must contain adequate detail for project and Water Board staff to identify and assess the technical and quality objectives, measurement and data acquisition methods, and limitations of the data generated under the monitoring program. All sampling and laboratory methodologies and QAPP content must be consistent with USEPA methods. Following USEPA guidelines,¹⁷ the monitoring QAPP must include the following minimum required components:

¹⁶ Staff guidance on how to measure and report riparian areas will be included on the Annual Compliance Form.

¹⁷ USEPA. 2001 (2006) USEPA Requirements for Quality Assurance Project Plans (QA/R-5) Office of Environmental Information, Washington, D.C. USEPA QA/R-5.

- a. **Project Management:** Address basic project management, including the project history and objectives, roles and responsibilities of the participants, and other aspects.
 - b. **Data Generation and Acquisition:** Address all aspects of project design and implementation. Implementation of these elements ensures that appropriate methods for sampling, measurement and analysis, data collection or generation, data handling, and quality control activities are employed and are properly documented. Quality control requirements are applicable to all the constituents sampled as part of the MRP, as described in the appropriate method.
 - c. **Assessment and Oversight:** Address the activities for assessing the effectiveness of the implementation of the project and associated quality assurance (QA) and quality control (QC) activities. The purpose of the assessment is to provide project oversight that will ensure that the QAPP is implemented as prescribed.
 - d. **Data Validation and Usability:** Address the quality assurance activities that occur after the data collection, laboratory analysis and data generation phase of the project is completed. Implementation of these elements ensures that the data conform to the specified criteria, thus achieving the MRP objectives. The Executive Officer may conduct an audit of contracted laboratories at any time in order to evaluate compliance with the SAP and QAPP.
3. The SAP and QAPP, and any proposed revisions, are subject to approval by the Executive Officer. The Executive Officer may also revise the SAP, including adding, removing, or changing monitoring site locations, changing monitoring parameters, and other changes as necessary to assess the impacts of irrigated agricultural discharges on water quality.

Tables related to Monitoring and Reporting Requirements

Tables related to Section B: Irrigation and Nutrient Management Plan Monitoring and Reporting Requirements

Table MRP-1. Comparison of TNA and INMP Summary Monitoring and Reporting

Required Information	TNA Monitoring & Reporting	INMP Monitoring & Reporting
Nitrogen applied	X	X
Nitrogen removed		X
Irrigation management information	X	X

Table MRP-2. Monitoring and Reporting Schedule for Irrigation and Nutrient Management

Ranches	TNA ¹ Monitoring Period ²	TNA Report Due March 1	<u>Annual</u> INMP ³ Monitoring Period ²	<u>Annual</u> INMP Summary Report Due March 1
Required per Ag Order 3.0	2021 2022	2022 2023	-	-
Groundwater Phase Area 1 ⁴	-	-	Beginning 2023	Beginning 2024
Groundwater Phase Area 2	2023 2024	2024 2025	Beginning 2025	Beginning 2026
Groundwater Phase Area 3	2023 2024 2025 2026	2024 2025 2026 2027	Beginning 2027	Beginning 2028

¹ Only the primary irrigation well must be monitored for TNA monitoring and reporting.

² Monitoring period = calendar year (Jan. 1 – Dec. 31).

³ All irrigation wells must be monitored for INMP monitoring and INMP Summary reporting.

⁴ Dischargers in Groundwater Phase 1 areas are not required to submit a stand-alone TNA report; rather, due to the prioritization of Phase 1 areas, Dischargers in portions of the Gilroy-Hollister Valley (Llagas Area) groundwater basin, the Forebay Aquifer and Upper Valley subbasins of the Salinas Valley basin, the Santa Maria area of the Santa Maria River Valley basin, and the Santa Ynez River Valley basin must conduct the expanded nitrogen applied and removed monitoring and reporting associated with INMP Summary reporting before Dischargers in Groundwater Phase areas 2 and 3.

Table MRP-3. Organic Fertilizer Discount Factor

C to N Ratio of Organic Product	Discount Factor Based on Predicted Mineralization Rate (O)
< 1.5	1.00
1.5	0.904
2.0	0.852
2.5	0.802
3.0	0.754
3.5	0.707
4.0	0.661
4.5	0.617
5.0	0.574
5.5	0.533
6.0	0.493
6.5	0.455
7.0	0.418
7.5	0.383
8.0	0.349
8.5	0.317
9.0	0.285
9.5	0.256
10.0	0.228
10.5	0.202
11.0	0.177
11.5	0.153
12.0	0.131
12.5	0.111
13.0	0.091
13.5	0.074
14.0	0.058
14.5	0.043
15.0	0.030

Note: Refer to **Attachment A, Section C.1** for a discussion of the source of these discount factors.

Table MRP-4. Nitrogen Removal Conversion Coefficients

Crop	Conversion Coefficient	Crop	Conversion Coefficient
Alfalfa - Hay	0.03115	Lemons	0.00154
Alfalfa - Silage	0.01200	Lettuce, Baby	0.00376
Apples	0.00050	Lettuce, Iceberg	0.00132
Apricots	0.00280	Lettuce, Romaine	0.00181
Asparagus	0.00293	Melon, Cantaloupe	0.00240
Avocados	0.00220	Melon, Watermelon	0.00070
Barley - Grain	0.01680	Mixed Greens	0.00405
Barley - Straw	0.00770	Mizuna	0.00405
Beans, dry - Blackeye	0.03650	Oat Hay	0.01085
Beans, dry - Garbanzo	0.03360	Olives	0.00314
Beans, dry - Lima	0.03615	Onions, dry	0.00197
Beans, green (snap beans)	0.00289	Oranges	0.00150
Broccoli	0.00460	Peaches	0.00113
Brussels Sprouts	0.00649	Pears	0.00065
Cabbage Green	0.00218	Peppers, Bell	0.00185
Cabbage Red	0.00224	Pistachios	0.02800
Carrots	0.00160	Plums	0.00142
Cauliflower	0.00288	Potatoes	0.00310
Celery	0.00120	Pumpkin	0.00368
Cherries - Sweet	0.00220	Ryegrass, Perennial - Hay	0.02745
Cilantro	0.00605	Safflower	0.02840
Corn - Grain	0.01200	Spinach, Bunch	0.00371
Corn - Silage	0.00378	Spinach, Clip	0.00427
Corn - Sweet	0.003585	Spring Mix	0.00405
Cucumbers	0.00108	Squash, Winter	0.001835
Figs	0.00127	Strawberry	0.00133
Garlic	0.00760	Tangerines	0.00127
Grapefruit	0.00150	Tomatoes, Fresh Market	0.00130
Grapes - Table	0.00113	Walnuts, English	0.01590
Grapes - Wine	0.00131	Wheat, Common - Grain	0.00690
Kale, Baby	0.00504		

Note: Refer to **Attachment A, Section C.1** for a discussion of the source of these coefficients.

Tables related to Section C: Groundwater Monitoring and Reporting

Table MRP-5. On-Farm Domestic Drinking Water Supply Well Monitoring and Reporting Requirements

Parameter	RL ¹	Analytical Method ²	Units	Frequency	Due Date
pH	0.1	Field Measurement ³	pH Units	Annual (beginning 2022)	Monitoring March 1 – May 31 Reported by July 31
Specific conductance	2.5	Field Measurement ³	µS/cm	Annual (beginning 2022)	Monitoring March 1 – May 31 Reported by July 31
Temperature	0.1	Field Measurement ³	°C	Annual (beginning 2022)	Monitoring March 1 – May 31 Reported by July 31
Nitrate + nitrite (as N) ⁴ or Nitrate as N	0.1	USEPA Method 300 or SM 4500NO ₃	mg/L	Annual (beginning 2022)	Monitoring March 1 – May 31 Reported by July 31

Parameter	RL ¹	Analytical Method ²	Units	Frequency	Due Date
1,2,3-Trichloropropane (1,2,3-TCP)	0.005	SRL-524M	µg/L	Annual per above for first 2 years (2022 & 2023). Continue annual monitoring and reporting until 2 consecutive samples = non-detect; then resample 3 years since last non-detect. If non-detect 3 years after last 2 consecutive non-detects, no further monitoring. If detected 3 years after last 2 consecutive non-detects, annual sampling resumes.	Monitoring March 1 – May 31 Reported by July 31

¹ Reporting limit, or level of quantification, defined as the level that can be reliably detected and quantified within acceptable limits of precision and bias for a given method.

² Dischargers may use alternative analytical methods approved by USEPA after obtaining Executive Officer approval.

³ To ensure the collection of representative groundwater samples, all groundwater samples must be collected once field parameters stabilize (i.e., pH: ± 0.1 , specific conductance: $\pm 3 - 5\%$, and temperature: $\pm 3\%$).

⁴ This MRP allows analysis of “nitrate plus nitrite” to represent nitrate concentrations (as N). The “nitrate plus nitrite” analysis allows for extended laboratory holding times and relieves the Discharger of meeting the short sample holding time required for nitrate as N.

Table MRP-6. Primary Irrigation Well Monitoring and Reporting Requirements Until Groundwater Quality Trend Monitoring Program Starts (“Pre-Trend”)

Parameter	RL ¹	Analytical Method ²	Units	Frequency	Due Date
pH	0.1	Field Measurement ³	pH Units	Annual until Groundwater Quality Trend Monitoring Program starts (beginning 2022)	Monitoring March 1 – May 31 Reported by July 31
Specific conductance	2.5	Field Measurement ³	µS/cm	Annual until Groundwater Quality Trend Monitoring Program starts (beginning 2022)	Monitoring March 1 – May 31 Reported by July 31
Temperature	0.1	Field Measurement ³	°C	Annual until Groundwater Quality Trend Monitoring Program starts (beginning 2022)	Monitoring March 1 – May 31 Reported by July 31
Total dissolved solids (TDS)	10	SM 2540-D	mg/L	Annual until Groundwater Quality Trend Monitoring Program starts (beginning 2022)	Monitoring March 1 – May 31 Reported by July 31
Nitrate + nitrite (as N) ⁴ or Nitrate as N	0.1	USEPA Method 300 or SM 4500NO3	mg/L	Annual until Groundwater Quality Trend Monitoring Program starts (beginning 2022)	Monitoring March 1 – May 31 Reported by July 31

¹ Reporting limit, or level of quantification, defined as the level that can be reliably detected and quantified within acceptable limits of precision and bias for a given method.

² Dischargers may use alternative analytical methods approved by USEPA after obtaining Executive Officer approval.

³ To ensure the collection of representative groundwater samples, all groundwater samples must be collected once field parameters stabilize (i.e., pH: ± 0.1, specific conductance: ± 3 – 5%, and temperature: ± 3%).

⁴ This MRP allows analysis of “nitrate plus nitrite” to represent nitrate concentrations (as N). The “nitrate plus nitrite” analysis allows for extended laboratory holding times and relieves the Discharger of meeting the short sample holding time required for nitrate as N.

Table MRP-7. Minimum Groundwater Quality Trend Monitoring and Reporting Requirements (Third-Party Option)

Parameter	RL ¹	Analytical Method ²	Units	Frequency	Due Date
Depth to groundwater	±0.01	Field Measurement	Feet	In accordance with approved Work Plan	In accordance with approved Work Plan
pH	0.1	Field ³ or Laboratory Measurement or USEPA General Methods	pH Units	In accordance with approved Work Plan	In accordance with approved Work Plan
Specific conductance	2.5	Field ³ or Laboratory Measurement or USEPA General Methods	µS/cm	In accordance with approved Work Plan	In accordance with approved Work Plan
Temperature	0.1	Field ³ or Laboratory Measurement or USEPA General Methods	°C	In accordance with approved Work Plan	In accordance with approved Work Plan
Total dissolved solids (TDS)	10	SM 2540-D	mg/L	In accordance with approved Work Plan	In accordance with approved Work Plan
Total alkalinity as CaCO ₃	-	USEPA Method 310.1 or 310.2	mg/L	In accordance with approved Work Plan	In accordance with approved Work Plan
Calcium	0.05	General Cations USEPA Method 200.7, 200.8, 200.9	mg/L	In accordance with approved Work Plan	In accordance with approved Work Plan
Magnesium	0.02	General Cations USEPA Method 200.7, 200.8, 200.9	mg/L	In accordance with approved Work Plan	In accordance with approved Work Plan
Sodium	0.1	General Cations USEPA Method 200.7, 200.8, 200.9	mg/L	In accordance with approved Work Plan	In accordance with approved Work Plan
Potassium	0.1	General Cations USEPA Method 200.7, 200.8, 200.9	mg/L	In accordance with approved Work Plan	In accordance with approved Work Plan

Parameter	RL ¹	Analytical Method ²	Units	Frequency	Due Date
Sulfate (SO ₄)	1.0	General Anions USEPA Method 300	mg/L	In accordance with approved Work Plan	In accordance with approved Work Plan
Chloride	0.1	General Anions USEPA Method 300	mg/L	In accordance with approved Work Plan	In accordance with approved Work Plan
Nitrate + Nitrite (as N) ³ or Nitrate as N	0.1	General Anions USEPA Method 300 or SM 4500NO ₃	mg/L	In accordance with approved Work Plan	In accordance with approved Work Plan

¹ Reporting limit, or level of quantification, defined as the level that can be reliably detected and quantified within acceptable limits of precision and bias for a given method.

² Dischargers may use alternative analytical methods approved by USEPA after obtaining Executive Officer approval.

³ To ensure the collection of representative groundwater samples, all groundwater samples must be collected once field parameters stabilize (i.e., pH: ± 0.1 , specific conductance: $\pm 3 - 5\%$, and temperature: $\pm 3\%$).

⁴ This MRP allows analysis of “nitrate plus nitrite” to represent nitrate concentrations (as N). The “nitrate plus nitrite” analysis allows for extended laboratory holding times and relieves the Discharger of meeting the short sample holding time required for nitrate as N.

Table MRP-8. Minimum Groundwater Quality Trend Monitoring and Reporting Requirements (Individual Option)

Parameter	RL ¹	Analytical Method ²	Units	Frequency	Due Date
pH	0.1	Field ³ or Laboratory Measurement or USEPA General Methods	pH Units	Semi-annual monitoring in 1 st and 3 rd quarters Semi-annual data reporting Annual Groundwater Quality Trend Reporting	1 st Q semi-annual monitoring: January 1 – March 31 1 st Q data reported by May 30 3 rd Q semi-annual monitoring: July 1 – September 30 3 rd Q data reported by November 30 Annual Groundwater Trend Report by January 31
Specific conductance	2.5	Field ³ or Laboratory Measurement or USEPA General Methods	µS/cm	Semi-annual monitoring in 1 st and 3 rd quarters Semi-annual data reporting Annual Groundwater Quality Trend Reporting	1 st Q semi-annual monitoring: January 1 – March 31 1 st Q data reported by May 30 3 rd Q semi-annual monitoring: July 1 – September 30 3 rd Q data reported by November 30 Annual Groundwater Trend Report by January 31

Parameter	RL ¹	Analytical Method ²	Units	Frequency	Due Date
Temperature	0.1	Field ³ or Laboratory Measurement or USEPA General Methods	°C	Semi-annual monitoring in 1 st and 3 rd quarters Semi-annual data reporting Annual Groundwater Quality Trend Reporting	1 st Q semi-annual monitoring: January 1 – March 31 1 st Q data reported by May 30 3 rd Q semi-annual monitoring: July 1 – September 30 3 rd Q data reported by November 30 Annual Groundwater Trend Report by January 31
Total dissolved solids (TDS)	10	SM 2540-D	mg/L	Semi-annual monitoring in 1 st and 3 rd quarters Semi-annual data reporting Annual Groundwater Quality Trend Reporting	1 st Q semi-annual monitoring: January 1 – March 31 1 st Q data reported by May 30 3 rd Q semi-annual monitoring: July 1 – September 30 3 rd Q data reported by November 30 Annual Groundwater Trend Report by January 31

Parameter	RL ¹	Analytical Method ²	Units	Frequency	Due Date
Total alkalinity as CaCO ₃	-	USEPA Method 310.1 or 310.2	mg/L	Semi-annual monitoring in 1 st and 3 rd quarters Semi-annual data reporting Annual Groundwater Quality Trend Reporting	1 st Q semi-annual monitoring: January 1 – March 31 1 st Q data reported by May 30 3 rd Q semi-annual monitoring: July 1 – September 30 3 rd Q data reported by November 30 Annual Groundwater Trend Report by January 31
Calcium	0.05	General Cations USEPA Method 200.7, 200.8, 200.9	mg/L	Semi-annual monitoring in 1 st and 3 rd quarters Semi-annual data reporting Annual Groundwater Quality Trend Reporting	1 st Q semi-annual monitoring: January 1 – March 31 1 st Q data reported by May 30 3 rd Q semi-annual monitoring: July 1 – September 30 3 rd Q data reported by November 30 Annual Groundwater Trend Report by January 31

Parameter	RL ¹	Analytical Method ²	Units	Frequency	Due Date
Magnesium	0.02	General Cations USEPA Method 200.7, 200.8, 200.9	mg/L	Semi-annual monitoring in 1 st and 3 rd quarters Semi-annual data reporting Annual Groundwater Quality Trend Reporting	1 st Q semi-annual monitoring: January 1 – March 31 1 st Q data reported by May 30 3 rd Q semi-annual monitoring: July 1 – September 30 3 rd Q data reported by November 30 Annual Groundwater Trend Report by January 31
Sodium	0.1	General Cations USEPA Method 200.7, 200.8, 200.9	mg/L	Semi-annual monitoring in 1 st and 3 rd quarters Semi-annual data reporting Annual Groundwater Quality Trend Reporting	1 st Q semi-annual monitoring: January 1 – March 31 1 st Q data reported by May 30 3 rd Q semi-annual monitoring: July 1 – September 30 3 rd Q data reported by November 30 Annual Groundwater Trend Report by January 31

Parameter	RL ¹	Analytical Method ²	Units	Frequency	Due Date
Potassium	0.1	General Cations USEPA Method 200.7, 200.8, 200.9	mg/L	Semi-annual monitoring in 1 st and 3 rd quarters Semi-annual data reporting Annual Groundwater Quality Trend Reporting	1 st Q semi-annual monitoring: January 1 – March 31 1 st Q data reported by May 30 3 rd Q semi-annual monitoring: July 1 – September 30 3 rd Q data reported by November 30 Annual Groundwater Trend Report by January 31
Sulfate (SO ₄)	1.0	General Anions USEPA Method 300	mg/L	Semi-annual monitoring in 1 st and 3 rd quarters Semi-annual data reporting Annual Groundwater Quality Trend Reporting	1 st Q semi-annual monitoring: January 1 – March 31 1 st Q data reported by May 30 3 rd Q semi-annual monitoring: July 1 – September 30 3 rd Q data reported by November 30 Annual Groundwater Trend Report by January 31

Parameter	RL ¹	Analytical Method ²	Units	Frequency	Due Date
Chloride	0.1	General Anions USEPA Method 300	mg/L	Semi-annual monitoring in 1 st and 3 rd quarters Semi-annual data reporting Annual Groundwater Quality Trend Reporting	1 st Q semi-annual monitoring: January 1 – March 31 1 st Q data reported by May 30 3 rd Q semi-annual monitoring: July 1 – September 30 3 rd Q data reported by November 30 Annual Groundwater Trend Report by January 31
Nitrate + Nitrite (as N) ⁴ or Nitrate as N	0.1	General Anions USEPA Method 300 or SM 4500NO3	mg/L	Semi-annual monitoring in 1 st and 3 rd quarters Semi-annual data reporting Annual Groundwater Quality Trend Reporting	1 st Q semi-annual monitoring: January 1 – March 31 1 st Q data reported by May 30 3 rd Q semi-annual monitoring: July 1 – September 30 3 rd Q data reported by November 30 Annual Groundwater Trend Report by January 31

¹ Reporting limit, or level of quantification, defined as the level that can be reliably detected and quantified within acceptable limits of precision and bias for a given method.

² Dischargers may use alternative analytical methods approved by USEPA after obtaining Executive Officer approval.³ This MRP allows analysis of “nitrate plus nitrite” to represent nitrate concentrations (as N).

³ The “nitrate plus nitrite” analysis allows for extended laboratory holding times and relieves the Discharger of meeting the short sample holding time required for nitrate as N.

⁴ To ensure the collection of representative groundwater samples, all groundwater samples must be collected once field parameters stabilize (i.e., pH: ± 0.1 , specific conductance: $\pm 3 - 5\%$, and temperature: $\pm 3\%$).

Tables related to Section E: Surface Water Monitoring and Reporting

Table MRP-9. Major Waterbodies in Agricultural Areas

Hydrologic SubArea	Waterbody Name	Hydrologic SubArea	Waterbody Name
30510	Pajaro River	30920	Quail Creek
30510	Salsipuedes Creek	30920	Salinas Reclamation Canal
30510	Watsonville Slough	31022	Chorro Creek
30510	Watsonville Creek	31023	Los Osos Creek
30510	Beach Road Ditch	31023	Warden Creek
30530	Carnadero Creek	31024	San Luis Obispo Creek
30530	Furlong Creek	31024	Prefumo Creek
30530	Llagas Creek	31031	Arroyo Grande Creek
30530	Miller's Canal	31031	Los Berros Creek
30530	San Juan Creek	31210	Bradley Canyon Creek
30530	Tesquisquita Slough	31210	Bradley Channel
30600	Moro Cojo Slough	31210	Green Valley Creek
30910	Alisal Slough	31210	Main Street Canal
30910	Blanco Drain	31210	Orcutt Solomon Creek
30910	Old Salinas River	31210	Oso Flaco Creek
30910	Salinas River (below Gonzales Rd.)	31210	Little Oso Flaco Creek
30920	Salinas River (above Gonzales Rd. and below Nacimiento R.)	31210	Santa Maria River
30910	Santa Rita Creek	31310	San Antonio Creek
30910	Tembladero Slough	31410	Santa Ynez River
30920	Alisal Creek	31531	Bell Creek
30920	Chualar Creek	31531	Glenn Annie Creek
30920	Espinosa Slough	31531	Los Carneros Creek
30920	Gabilan Creek	31534	Arroyo Paredon Creek
30920	Natividad Creek	31534	Franklin Creek

Note: At a minimum, monitoring sites must be included for these waterbodies in agricultural areas, unless otherwise approved by the Executive Officer. Monitoring sites may be proposed for addition or modification to better assess the impacts of waste discharges from irrigated lands to surface water. These waterbodies are included because they are listed waterbodies on the most recent USEPA approved 303(d) List of Impaired Waters that are associated with areas of agricultural discharge. The list is subject to change based on most recent USEPA approved 303(d) List of Impaired Waters and/or other changes approved by the Executive Officer.

Table MRP-10. Surface Receiving Water Quality Monitoring Parameters

Parameters and Tests	RL ³	Monitoring Frequency ¹
Photo Monitoring		
Upstream and downstream photographs at monitoring location	-	With every monitoring event
RipRAM		
RipRAM assessment and score at each monitoring location collected in accordance with the CCWG SOP	-	Annually beginning the first full calendar year following adoption of the Agricultural Order
Bioassessment		
Benthic invertebrate and associated physical habitat assessment collected in accordance with the SWAMP SOP. Data reported with CSCI numeric values for each monitoring location on Santa Ynez, Salinas, Santa Maria and Pajaro Rivers	-	Every five years beginning in 2023 from April-June
<u>WATER COLUMN SAMPLING</u>		
Physical Parameters and General Chemistry		
Flow (field measure) (CFS) following SWAMP field SOP ⁹	0.25	Monthly, including 2 stormwater events
pH (field measure)	0.1	Monthly, including 2 stormwater events
Electrical Conductivity (field measure) (µS/cm)	2.5	Monthly, including 2 stormwater events
Dissolved Oxygen (field measure) (mg/L)	0.1	Monthly, including 2 stormwater events
Temperature (field measure) (°C)	0.1	Monthly, including 2 stormwater events

Parameters and Tests	RL ³	Monitoring Frequency ¹
Turbidity (NTU)	0.5	Monthly, including 2 stormwater events
Total Dissolved Solids (mg/L)	10	Monthly, including 2 stormwater events
Total Suspended Solids (mg/L)	0.5	Monthly, including 2 stormwater events
Total Alkalinity (as CaCO ₃)	EPA 310.1 or 310.2	4 times each year; once from each of the following calendar quarters: January – March, April – June, July – September, October – December.
Calcium	0.05	4 times each year; once from each of the following calendar quarters: January – March, April – June, July – September, October – December.
Magnesium	0.02	4 times each year; once from each of the following calendar quarters: January – March, April – June, July – September, October – December.
Sodium	0.1	4 times each year; once from each of the following calendar quarters: January – March, April – June, July – September, October – December
Potassium	0.1	4 times each year; once from each of the following calendar quarters: January – March, April – June, July – September, October – December.
Sulfate (SO ₄)	1.0	4 times each year; once from each of the following calendar quarters: January – March, April – June, July – September, October – December.
Chloride	0.1	4 times each year; once from each of the following calendar quarters: January – March, April – June, July – September, October – December.
Nutrients		
Total Nitrogen (mg/L)	0.5	Monthly, including 2 stormwater events

Parameters and Tests	RL ³	Monitoring Frequency ¹
Nitrate + Nitrite (mg/L as nitrogen)	0.1	Monthly, including 2 stormwater events
Total Ammonia (mg/L)	0.1	Monthly, including 2 stormwater events
Unionized Ammonia (calculated value including total ammonia and field measures of water temperature and pH, mg/L as nitrogen)	-	Monthly, including 2 stormwater events
Total Phosphorus (as P) (mg/L)	0.02	Monthly, including 2 stormwater events
Soluble Orthophosphate (mg/L)	0.01	Monthly, including 2 stormwater events
Water column chlorophyll a (µg/L)	1.0	Monthly, including 2 stormwater events
Algae cover, Floating Mats, % coverage	-	Monthly, including 2 stormwater events
Algae cover, Attached, % coverage	-	Monthly, including 2 stormwater events
Water Column Toxicity Test		
Algae - <i>Selenastrum capricornutum</i> (96-hour chronic; Method 1003.0 in EPA/821/R-02/013)	-	4 times each year; once from each of the following calendar quarters: January – March, April – June, July – September, October – December.
Water Flea – <i>Ceriodaphnia dubia</i> (7-day chronic; Method 1002.0 in EPA/821/R-02/013)	-	4 times each year; once from each of the following calendar quarters: January – March, April – June, July – September, October – December.
Midge - <i>Chironomus spp.</i> (96- hour acute; Alternate test species in EPA 821-R-02-012)	-	4 times each year; once from each of the following calendar quarters: January – March, April – June, July – September, October – December.
Toxicity Identification Evaluation (TIE)	-	As directed by Executive Officer

Parameters and Tests	RL ³	Monitoring Frequency ¹
Pesticides² (Insecticides and Herbicides) (µg/L)		
Organophosphate Pesticides		
Azinphos-methyl	0.02	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Chlorpyrifos	0.005	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.

Parameters and Tests	RL ³	Monitoring Frequency ¹
Diazinon	0.005	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Dichlorvos	0.01	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Dimethoate	0.01	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.

Parameters and Tests	RL ³	Monitoring Frequency ¹
Dimeton-s	0.005	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Disulfoton (Disyton)	0.005	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Malathion	0.005	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.

Parameters and Tests	RL ³	Monitoring Frequency ¹
Methamidophos	0.02	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Methidathion	0.02	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Parathion-methyl	0.02	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.

Parameters and Tests	RL ³	Monitoring Frequency ¹
Phorate	0.01	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Phosmet	0.02	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Neonicotinoids		
Thiamethoxam	0.002	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.

Parameters and Tests	RL ³	Monitoring Frequency ¹
Imidacloprid	0.002	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Thiacloprid	0.002	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Dinotefuran	0.006	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.

Parameters and Tests	RL ³	Monitoring Frequency ¹
Acetamiprid	0.01	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Clothianidin	0.02	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Carbamates		
Aldicarb	0.05	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.

Parameters and Tests	RL ³	Monitoring Frequency ¹
Carbaryl	0.05	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Carbofuran	0.05	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Methiocarb	0.05	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.

Parameters and Tests	RL ³	Monitoring Frequency ¹
Methomyl	0.05	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Oxamyl	0.05	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.

Parameters and Tests	RL ³	Monitoring Frequency ¹
Herbicides		
Atrazine	0.05	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Cyanazine	0.20	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.

Parameters and Tests	RL ³	Monitoring Frequency ¹
Diuron	0.05	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Glyphosate	2.0	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Linuron	0.10	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.

Parameters and Tests	RL ³	Monitoring Frequency ¹
Paraquat	0.20	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Simazine	0.05	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.
Trifluralin	0.05	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September, and October – December.

Parameters and Tests	RL ³	Monitoring Frequency ¹
Metals (µg/L)		
Arsenic (total) ^{5,7}	0.3	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September and October – December.
Boron (total) ^{6,7}	10	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September and October – December.
Cadmium (total & dissolved) ^{4,5,7}	0.01	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September and October – December.

Parameters and Tests	RL ³	Monitoring Frequency ¹
Copper (total and dissolved) ^{4,7}	0.01	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September and October – December.
Lead (total and dissolved) ^{4,7}	0.01	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September and October – December.
Nickel (total and dissolved) ^{4,7}	0.02	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September and October – December.

Parameters and Tests	RL ³	Monitoring Frequency ¹
Molybdenum (total) ⁷	1	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September and October – December.
Selenium (total) ⁷	0.30	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September and October – December.
Zinc (total and dissolved) ^{4,5,7}	0.10	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters: January – March, April – June, July – September and October – December.

Parameters and Tests	RL ³	Monitoring Frequency ¹
Other (µg/L)		
Total Phenolic Compounds ⁸	5	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters concurrent with water toxicity monitoring: January – March, April – June, July – September and October – December.
Hardness (mg/L as CaCO ₃)	1	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters concurrent with water toxicity monitoring: January – March, April – June, July – September and October – December.
Total Organic Carbon (ug/L)	0.6	2 times in 2021 concurrent with water toxicity monitoring; once from July – September and once from October – December. 2 times in 2022 concurrent with water toxicity monitoring; once from January – March and once from April – June. Then, 4 times every fourth year beginning in 2026 concurrent with water toxicity monitoring from each of the following calendar quarters concurrent with water toxicity monitoring: January – March, April – June, July – September and October – December.

Parameters and Tests	RL ³	Monitoring Frequency ¹
<u>SEDIMENT SAMPLING</u>		
Sediment Toxicity - <i>Hyalella azteca</i> 10-day static renewal (EPA, 2000)	-	2 times in 2021; once from April – June and once from August – October. Then once per year in calendar quarter April – June.
Pyrethroid Pesticides in Sediment (µg/kg)		
Gamma-cyhalothrin	2	1 time in 2021 from August – October concurrent with sediment toxicity sampling and 1 time in 2022 from April – June concurrent with sediment toxicity sampling. Then, once every fourth year beginning in 2026 concurrent with sediment toxicity monitoring, in calendar quarter April – June
Lambda-cyhalothrin	2	1 time in 2021 from August – October concurrent with sediment toxicity sampling and 1 time in 2022 from April – June concurrent with sediment toxicity sampling. Then, once every fourth year beginning in 2026 concurrent with sediment toxicity monitoring, in calendar quarter April – June “
Bifenthrin	2	1 time in 2021 from August – October concurrent with sediment toxicity sampling and 1 time in 2022 from April – June concurrent with sediment toxicity sampling. Then, once every fourth year beginning in 2026 concurrent with sediment toxicity monitoring, in calendar quarter April – June

Parameters and Tests	RL ³	Monitoring Frequency ¹
Beta-cyfluthrin	2	1 time in 2021 from August – October concurrent with sediment toxicity sampling and 1 time in 2022 from April – June concurrent with sediment toxicity sampling. Then, once every fourth year beginning in 2026 concurrent with sediment toxicity monitoring, in calendar quarter April – June
Cyfluthrin	2	1 time in 2021 from August – October concurrent with sediment toxicity sampling and 1 time in 2022 from April – June concurrent with sediment toxicity sampling. Then, once every fourth year beginning in 2026 concurrent with sediment toxicity monitoring, in calendar quarter April – June
Esfenvalerate	2	1 time in 2021 from August – October concurrent with sediment toxicity sampling and 1 time in 2022 from April – June concurrent with sediment toxicity sampling. Then, once every fourth year beginning in 2026 concurrent with sediment toxicity monitoring, in calendar quarter April – June
Permethrin	2	1 time in 2021 from August – October concurrent with sediment toxicity sampling and 1 time in 2022 from April – June concurrent with sediment toxicity sampling. Then, once every fourth year beginning in 2026 concurrent with sediment toxicity monitoring, in calendar quarter April – June
Cypermethrin	2	1 time in 2021 from August – October concurrent with sediment toxicity sampling and 1 time in 2022 from April – June concurrent with sediment toxicity sampling. Then, once every fourth year beginning in 2026 concurrent with sediment toxicity monitoring, in calendar quarter April – June

Parameters and Tests	RL ³	Monitoring Frequency ¹
Danitol	2	1 time in 2021 from August – October concurrent with sediment toxicity sampling and 1 time in 2022 from April – June concurrent with sediment toxicity sampling. Then, once every fourth year beginning in 2026 concurrent with sediment toxicity monitoring, in calendar quarter April – June
Fenvalerate	2	1 time in 2021 from August – October concurrent with sediment toxicity sampling and 1 time in 2022 from April – June concurrent with sediment toxicity sampling. Then, once every fourth year beginning in 2026 concurrent with sediment toxicity monitoring, in calendar quarter April – June
Fluvalinate	2	1 time in 2021 from August – October concurrent with sediment toxicity sampling and 1 time in 2022 from April – June concurrent with sediment toxicity sampling. Then, once every fourth year beginning in 2026 concurrent with sediment toxicity monitoring, in calendar quarter April – June
Other Monitoring in Sediment		
Chlorpyrifos (µg/kg)	2	1 time in 2021 from August – October concurrent with sediment toxicity sampling and 1 time in 2022 from April – June concurrent with sediment toxicity sampling. Then, once every fourth year beginning in 2026 concurrent with sediment toxicity monitoring, in calendar quarter April – June

Parameters and Tests	RL ³	Monitoring Frequency ¹
Total Organic Carbon	0.01%	1 time in 2021 from August – October concurrent with sediment toxicity sampling and 1 time in 2022 from April – June concurrent with sediment toxicity sampling. Then, once every fourth year beginning in 2026 concurrent with sediment toxicity monitoring, in calendar quarter April – June
Sediment Grain Size Analysis	1%	1 time in 2021 from August – October concurrent with sediment toxicity sampling and 1 time in 2022 from April – June concurrent with sediment toxicity sampling. Then, once every fourth year beginning in 2026 concurrent with sediment toxicity monitoring, in calendar quarter April – June

¹Minimum monitoring frequency may be used as a guide for developing alternative Sampling and Analysis Plans implemented by individual growers.

²Pesticide list may be modified based on specific pesticide use in Central Coast Region. Analytes on this list must be reported, at a minimum.

³ Reporting Limit, taken from SWAMP where applicable.

⁴ Holmgren, Meyer, Cheney, and Daniels. 1993. Cadmium, Lead, Zinc, Copper and Nickel in Agricultural Soils of the United States. J. of Environ. Quality 22:335-348.

⁵Sax and Lewis, ed. 1987. Hawley's Condensed Chemical Dictionary. 11th ed. New York: Van Nostrand Reinhold Co., 1987. Zinc arsenate is an insecticide.

⁶Boron is applied directly or as a component of fertilizers as a plant nutrient.

⁷Madramootoo, Johnston, Willardson, eds. 1997. Management of Agricultural Drainage Water Quality. International Commission on Irrigation and Drainage. U.N. FAO. SBN 92-6-104058.3.

⁸ Include Nonylphenol. Phenols are breakdown products of herbicides and pesticides. Phenols can be directly toxic and cause endocrine disruption. Requirement may be removed or modified based on 2019-2020 monitoring results.

⁹See SWAMP field measures SOP, p. 17

mg/L – milligrams per liter; ug/L – micrograms per liter; ug/kg – micrograms per kilogram;

NTU – Nephelometric Turbidity Units; CFS – cubic feet per second.