Annual Report for the Recycled Water Management Plan

For the

Los Osos Wastewater Project

December 2020

Prepared for:

California Coastal Commission

725 Front Street, Suite 300

Santa Cruz, California CA 95060

Prepared by:

San Luis Obispo County

Public Works Department

Contents

1.0 Introduction 3
1.1 Background 4
2.0 Recycled Water Reuse Program 6
2.1 Infrastructure Summary Including Recommended Improvements 6
2.2 Annual Delivery Summary 6
2.3 Wastewater Treatment Plant Water Quality Summary 10
2.4 Program Changes Implemented in Prior Year 11
2.5 Proposed Changes to the Program for the Upcoming Year 11
2.6 Agricultural Reuse Outreach Process 11
2.7 Amendments to Reuse Contracts 12
3.0 Water Conservation 12
3.1 Water Purveyor Production and Consumption Summary 13
3.2 Status of Conservation Measure Implementation 13
3.3 Program Changes Implemented in Prior Year 13
3.4 Actual Program Savings Compared to Projected Savings 13
3.5 Recommended Program Adjustments or Additional Data Needs 15
3.6 Estimated Water Savings 15
4.0 Monitoring Program 16
4.1 Groundwater Monitoring Results 16
4.2 Summary of Seawater Intrusion Status 17
4.3 Surface Environmental Monitoring Report 17
4.4 Program Changes Implemented in Prior Year 18
4.5 Recommended Program Adjustments or Additional Data Needs 18
5.0 Adaptive Management Program 18

Appendix A - 2019 Annual Water Quality Report prepared for the State Water Resources Control Board

Appendix B - 2019 Annual Groundwater Monitoring Report prepared for the Basin Management Committee

G:\LOWWP\300448.03 Env Permits\300448.03.1. Coastal Development Permit\300448.03.1.5 Basin Recycled Water Mgmt Plan\Annual Report to Coastal\

1.0 Introduction

In June 2010, the Coastal Commission approved the County's Project (Permit No. A-3-SLO-09-055/069) to construct the Los Osos Wastewater Project with various conditions including the development of a Recycled Water Management Plan (RWMP) to satisfy Coastal Condition No. 5 of the Coastal Development Permit (CDP).

The RWMP was approved in May 2012 and updates to the document are an ongoing task. The most recent version of the RWMP was submitted to the Coastal Commission in September 2013. Each year the project operates, the County is required to submit an annual report to the Coastal Commission. The Los Osos Water Recycling Facility (LOWRF) has been operating since 2016. This annual report is the fourth annual report.

The goal of the RWMP is to develop a comprehensive water resources management plan that includes water recycling and conservation to maximize the long term sustainability of groundwater basin and surface waters, combined with a dynamic monitoring, reporting, and adaptive management program that is designed to respond to changes within the system over time.

The Los Osos Groundwater Basin (Basin) for the RWMP is based on the area subject to the Stipulated Judgment and the Updated Basin Plan (January 2015) for the Los Osos Groundwater Basin incorporated therein (Basin Plan or LOBP).

Coastal Condition No. 5 of the CDP reads…

PRIOR TO CONSTRUCTION, the Permittee shall submit two copies of a Los Osos Basin Recycled Water Management Plan (RWMP) to the Executive Director for review and approval. The objective of the RWMP shall be to ensure that implementation of the project, including the sites designated for disposal of the treated effluent, is accomplished in a manner designed to maximize long-term ground and surface water and related resource (including wetlands, streams, creeks, lakes, riparian corridors, marshes, etc.) health and sustainability, including with respect to offsetting seawater intrusion as much as possible, within the Los Osos Groundwater Basin. The RWMP shall be structured so as to allow its programs to be developed, and any physical development underlying the implementation of such programs constructed, concurrent with construction of the approved project, and for it to be implemented concurrent with commencement of operation of the approved project. The RWMP may be structured to allow phasing if necessary, to better achieve RWMP objectives.

Based on the RWMP goals, this Annual Report which covers the monitoring period of January 1st, 2019 through December 31st, 2019, will include an evaluation of the four elements in the RWMP as follows:

- Recycled Water Reuse Program
  The Recycled Water Reuse Program outlines the intended uses for disposing of the treated effluent that provides the Los Osos Groundwater Basin (Basin) with the highest level of benefit. This program relies heavily on the Los Osos Basin Plan's Groundwater Monitoring Program results which are used to continuously update the hydrologic assessment of the Basin.

  The three water purveyors in Los Osos and the County of San Luis Obispo, as part of the adjudication of groundwater resources in the Basin, have prepared a Los Osos Basin Plan (LOBP) designed to balance supplies and demands in the Basin which also included development of a centralized wastewater treatment facility.

- Water Conservation Program
  In 2012, the California Coastal Commission and the County of San Luis Obispo adopted a Water Conservation Implementation Plan (Implementation Plan) that outlines a detailed rebate process and budget for water conservation measures to achieve the goals of the Water Conservation Program.

  A Water conservation program has a goal to reduce indoor water use, and corresponding flows to the wastewater system, to approximately 50 gallons per person per day. To date, the program has reduced the average indoor water demand by almost 40% from an estimated 65 gallons per capita per day in 2010. Approximately 40 gallons per capita per day of influent to the Los Osos Water Recycling Facility was received from the sewer collection system in 2019 which was no change from the prior year in 2018.

- Monitoring Program
  A groundwater monitoring program was developed to help track the water quality impacts as a result of eliminating thousands of onsite wastewater septic systems. Surface water quality will improve as wastewater contaminants from shallow groundwater seeps are no longer a risk to aquatic habitat or public health. The primary benefit, however, will be the gradual reduction of nitrate concentration in the upper aquifer. Nitrate concentrations at several wells had reached almost 20 mg/L prior to project construction, which is two times the drinking water limit. Regular groundwater monitoring of nitrate concentrations will continue to track improvements as conditions are expected to slowly improve over several decades.

- Reporting and Adaptive Management Program
  The Adaptive Management Program section of this report will summarize the reporting results and provide a list of recommended modifications for future implementation.

1.1 Background

The community of Los Osos potable water supply is distributed to the community by three water purveyors: Los Osos Community Services District (LOCSD), Golden State Water Company (GSWC), and S&T Mutual Water Company (S&T).

On August 5, 2008, the Court approved an Interlocutory Stipulated Judgment (ISJ) between LOCSD, GSWC, S&T and the County (Parties). A Working Group comprised of representatives of the Parties undertook technical studies of the Basin's water resources and developed a basin management plan (LOBP). The Working Group completed a public review draft of a basin management plan in August 2013 and the Updated Basin Management Plan was finalized and publicly released in January 2015 (LOBP). On October 14, 2015, Judge Martin J. Tangeman of the San Luis Obispo Superior Court signed an order approving the Stipulated Judgment and Basin Plan (LOBP).

Each of the water purveyors receive 100% of their water supply sources from groundwater wells within the Los Osos Groundwater Basin (Basin). The purveyor wells generally pump from one of the two productive groundwater zones – a lower and an upper aquifer.

The upper aquifer is only usable in limited areas due to nitrate contamination, while the lower aquifer is partially compromised from sea water intrusion. The two aquifers are separated by a reginal clay aquitard. The Upper Aquifer refers to the non-perched aquifer above the regional aquitard. The Lower Aquifer refers to water bearing sediments below the regional aquitard. Historically, the Upper Aquifer was developed as the main water supply for the community and is still the main source of water for rural residential parcels.

The LOBP was designed to balance supplies and demands in the Basin which also included development of a centralized wastewater treatment facility.

The Department of Public Works was responsible for overseeing the construction of the Los Osos Water Recycling Facility (LOWRF) which was substantially completed in September 2016. In 2009, when it was first proposed, the Los Osos Wastewater Project relied on secondary treatment of wastewater followed by spray irrigation on grazing lands as the method for disposal of treated effluent. As the project progressed through the Coastal Development Permit process at the County Planning Commission level, the treatment level was raised from secondary to tertiary at the "unrestricted reuse" level. The treatment facility's ultimate design included tertiary treatment using UV disinfection for treating the effluent before it is disposed to leach fields, or to urban or agriculture irrigation users.

The LOWRF received the first influent flows from the community of Los Osos in the spring of 2016. The community began the one-year phased connection process of decommissioning the septic tanks and connecting to the public sewer system. By the end of the 2019 operating year, the community was about 99.2% connected leaving approximately 45 properties that are still out of compliance. Currently (December 2020), there are 42 properties that are not yet connected to the sewer system.

The task of individually checking non-connected parcels in Los Osos is an ongoing effort. County Municipal Code Section 8.93.020 requires connection to the sewer. The deadline for connection has passed over a year ago.

> In August 2017, the County went to the Board and received specific direction to develop an enforcement approach that included:
>
> a. Processes and procedures requiring connection on sale for all properties within the Service Area of the Los Osos Wastewater Project.
>
> b. Processes and procedures prohibiting issuance of any building permit to any site not in compliance with the County Municipal Code Chapter 8.93, with exceptions for making the required connection and permits to correct health and safety violations.
>
> c. Timed initiation of the Code Enforcement process, including daily fines, ultimately providing the Board the option to issue a Board Order to abate an existing nuisance (i.e., use of an on-site wastewater system).

To date, a list of non-connected properties was transferred to County Code Enforcement. The County of San Luis Obispo, Planning & Building Department (Code Enforcement), are tasked with notifying properties with a Notice of Violation and impending fines. A majority of those letters were sent to households in February 2019.

2.0 Recycled Water Reuse Program

Regarding the permitting of the recycled water discharges from the Los Osos Water Recycling Facility, the County has obtained Notice of Applicability for coverage under the Statewide General Waste Discharge Requirements for Recycled Water, Order No. WQ 2016-0068-DDW. The primary objective for the Recycled Water Reuse Program is to mitigate sea water intrusion by offsetting current pumping and production from the Basin.

This section of the report will cover the following:

- Infrastructure Summary Including Recommended Improvements
- Annual Delivery Summary
- Wastewater Treatment Plant Water Quality Summary
- Program Changes Implemented in Prior Year
- Proposed Changes to the Program for the Upcoming Year
- Amendments to Reuse Contracts

2.1 Infrastructure Summary Including Recommended Improvements

Tertiary treatment enables LOWRF to produce plant effluent that meets the California Water Recycling Criteria (Title 22[1]). LOWRF includes a common effluent pump station and about 7 miles of recycled water distribution pipelines. Due to variations in seasonal deliveries, the County has on-site recycled water storage ponds that holds up to 37 acre-feet of water to allow flexibility of delivery to the reuse sites. Currently, only one reuse site is receiving recycled water for irrigation and the remainder of the treated effluent is being percolated to the Basin via leach fields at both the Broderson and Bayridge Estate sites totaling 8 acres of recycled water infiltration beds. Figure 1 shows all the potential reuse sites as well as the Broderson and Bayridge leach field sites.

2.2 Annual Delivery Summary

Since March 2016, the facility began to receive wastewater influent. Table 1 lists the current estimated amounts of recycled water that is intended to be used for irrigation.

[1] Approved uses of recycled water under Title 22 depend on the level of treatment, disinfection, and potential for public contact. The Division of Drinking Water has categorized recycled water based on treatment and disinfection levels. The treatment level that the Los Osos Recycled Water Facility produces is categorized as Disinfected tertiary recycled water (Cal. Code Regs., tit. 22, § 60301.230).

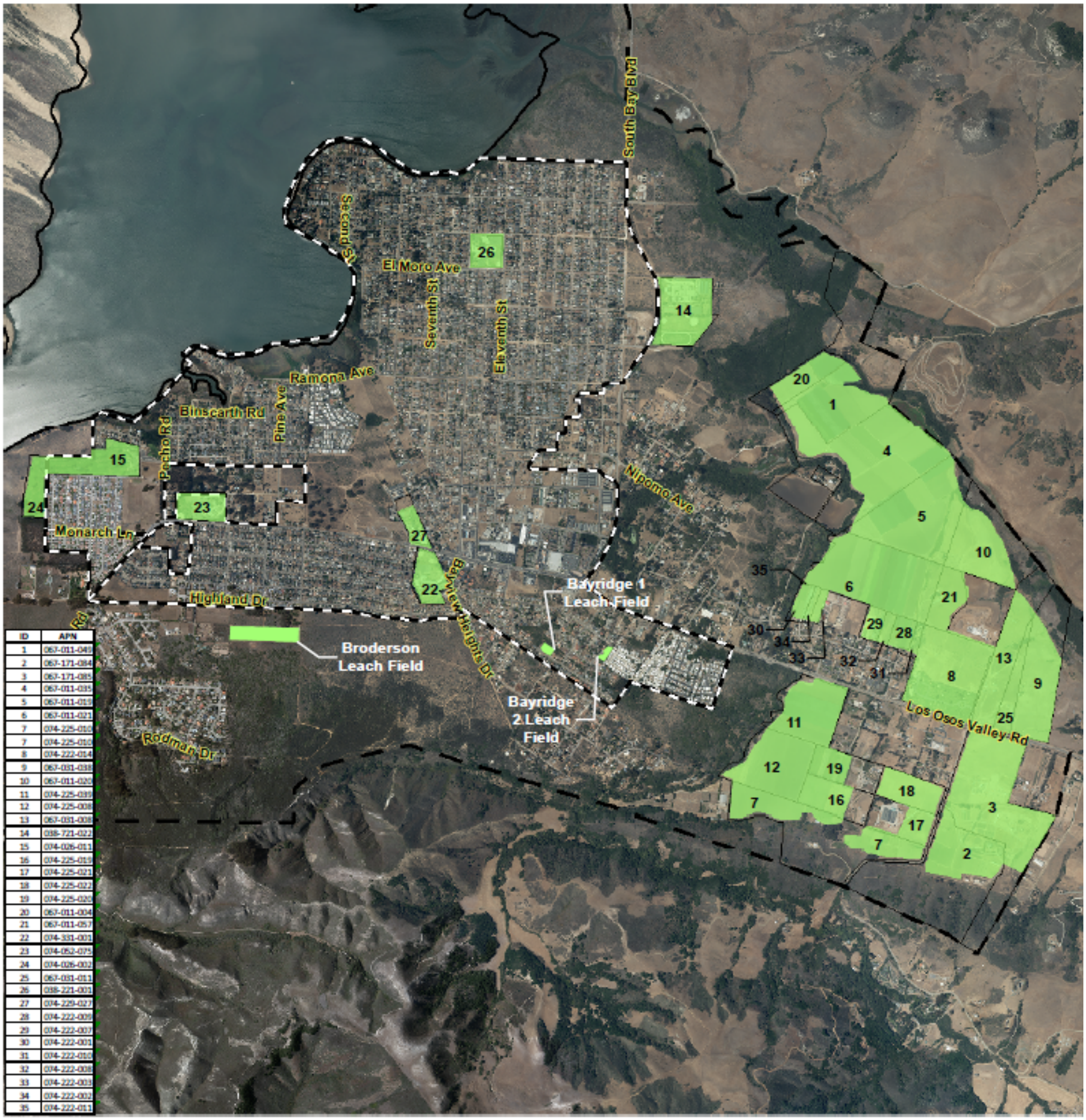


Figure 1 – Potential Recycled Water Reuse Sites

Table 1 – Annual Delivery Summary (AFY)				
Recycled Water Production	**Estimated Usage**	**2018 Actual**	**2019 Actual**	**% of 2019 Flow**
Wastewater Headworks Influent WRF_10_FQI_010.Rtotal	0.50 mgd	511.1	534.8	47.5%
On-site groundwater well WRF_60_FQI_734.Rtotal	0 –40 gpm	2.8	7.4	
Recirculating Plant Water downstream of Headworks Influent Flowmeter	Unaccounted Water	121.3	481.6	
	On-site Storm Drain PS WRF_04_FQI_503.Rtotal	13.0[2]	21.9	
	Plant Water PDPS WRF_04_FQI_603.RTotal	44.5[2]	79.6	
Precipitation on Water Surface Areas (Storage Ponds, Ox-ditch, Clarifiers, sludge storage tanks)	Annual Rainfall 18.0 inches (2018) 25.2 inches (2019)	8.3	11.6	
(-) Storage from previous year	37 AF (max capacity)	-26.6	-24.8	52.5%
(+) Storage at the end of year		24.8	12.9	
	Total Actual Production =	**699.2 AFY**	**1125.1 AFY**	
Recycled Water Deliveries	**Estimated Usage**	**2018 Actual**	**2019 Actual**	**% of 2019 Flow**
Plant Water used for treatment process, WRF_50_FQI_309.Rtotal	180	192.2	608.6	54.1%
Construction Water				
2025 10th Street	Less than 5	0	0	0%
2270 Los Osos Valley Road	Less than 5	0.2	0.5	0%
Broderson leach field	448	487.0	430.5	38.3%
Bayridge leach field	33	19.8	14.4	1.3%
Ag users				
Goodwin	10	0	0	0%
May	5	0	0	0%
Judge	50	0	0	0%
Michener	16	0	0	0%
Giacomazzi	5	0	0	0%
Other Ag Users	60	0	0	0%
Urban Users				
Monarch	5	0	0	0%
Sunnyside	5	0	0	0%
Community Park	5	0	0	0%
Baywood	7	0	0	0%
LOMS	25	0	0	0%
Cemetery	50	0	0	0%
Sea Pines	50	0	71.1	6.3%
	Total Actual Distribution =	**699.2 AFY**	**1125.1 AFY**	

[2] The Storm Drain Pump Station flow meter and the Plant Water Pump Station flow meter was out of service and recorded no flow 42 days during the calendar year of 2018.

A Notice of Applicability for coverage under the General Waste Discharge Requirements (Recycled Water Permit) was obtained from the Regional Water Quality Control Board on 9/5/2018. The Recycled Water Permit allows distribution of recycled water for agricultural, urban, and construction purposes (provided action by the contractors to complete a "Use Site Report" that is submitted to the Division of Drinking Water for review and approval as required by the Recycled Water Permit).

Recycled Water Deliveries

To date, recycled water has been delivered to one reuse site referred to as Sea Pines (golf course). Deliveries to the golf course began on June 10, 2019. The amount of water delivered is dependent on the contracts, contractor needs, and plant operation, and/or storage availability.

The Los Osos Water Recycling Facility must be operated to comply with the conditions of its Waste Discharge/Recycled Water Requirements (WDR) (Order No. R3-2001-0001) issued by the California RWQCB in May 2011. The waste discharge requirements detailed in the WDR order include both effluent water quality for discharge to leach fields and recycled water requirements for production and use of Title 22 recycled water. The first recycled water deliveries occurred in August 2016 to the leach fields.

In 2019, the facility produced 1,125.1 acre-feet of recycled water. Of the total production, 39.6% (444.9 acre-feet) was delivered as treated effluent to the Broderson and Bayridge leach fields (land disposal sites to underground leach fields) that percolate into the Upper Aquifer of the Basin, and less than 0.05% (0.45 acre-feet) was used as construction water. The remaining 54.1% (608.6 acre-feet) was used on-site for irrigation of the facility's trees and landscaping or was stored on-site in the recycled water storage ponds or was recirculated as "Plant Water" side stream treatment processes.

The largest urban consumers of recycled water supply are anticipated to be the schools. There are four schools within the Los Osos Groundwater Basin. Offsetting potable groundwater pumping with recycled water to irrigate the turf areas at the schools will have the highest benefit for use of recycled water.

The Los Osos Wastewater Project also entered into agricultural reuse contracts with four property owners. These individuals have planned their future business operations, and to some degree have invested in on-site infrastructure, and are looking forward to delivery of the contracted recycled water. The total subscribed agriculture recycled water demand is 81 acre-feet, or approximately 16% of the current[4] recycled water output of the water reclamation facility.

Recycled Water Production

Recycled water production was a combination of the wastewater influent from the sewer collection system, on-site groundwater wells, recirculating plant water from side stream treatment processes, storm water that is captured on-site and treated with the wastewater influent, and the on-site recycled water storage ponds.

The Los Osos Water Recycling Facility received an average flowrate of 0.48 mgd and a peak flowrate of 0.55 mgd during 2019 with a cumulative annual influent of 174,259,584 gallons (534.8 AFY) during the

[4] 16% was based on the projected annual influent (500 AFY) to the facility after Monarch Grove Subdivision is connected. Monarch Grove is a 83-lot subdivision connected to the Los Osos sewer collection system in April 2019.

calendar year of 2019. LOWRF has a rated average daily capacity of 1.19 million gallons per day, which refers to plant influent flow capacity.

Wastewater Headworks Influent. All of the wastewater influent to the facility is conveyed from the sewer collection system pump station known as the Mid-Town Pump Station and Sunny Oaks Pump Station. The wastewater influent is metered at the headworks structure at the facility (flow meter 10-FE-010).

On-site Groundwater Wells. Groundwater well pumping, storage, and distribution system for on-site potable water also includes a fire suppression supply. Two wells were constructed on-site in December 2014. The total depths of the groundwater wells constructed range from 230 to 235 feet deep with an estimated yield of 30 to 40 gpm for each well. The water produced by the groundwater wells are metered separately from the influent headworks flow meter. In 2019, the groundwater wells contributed less than 1% of the total water production.

Unaccounted Water. The unaccounted water was estimated to be 42.8% (481.6 AF) of the recycled water produced which is not consistent with industry standard of +/- 0.5 %. For flow meters to achieve +/- 0.5% accuracy, most flowmeter technologies will require a fully developed flow profile. The high amount of unaccounted water is attributed to recirculating plant water downstream of the influent flow meter through the plant recycled water flow meter multiple times.

Recirculating Plant Water. The recirculated plant water from side stream treatment processes which ends up as treated effluent.

On-site Recycled Water Storage Ponds. The on-site storage ponds provide storage of winter flow in excess of the capacity of the leach fields. Stored recycled water is distributed to reuse customers during the irrigation season. The ponds are intended to be seasonally emptied. The volume of the on-site storage ponds has a combined capacity of 37 acre-feet.

2.3 Wastewater Treatment Plant Water Quality Summary

The Los Osos Water Recycling Facility comingles the effluent water directly from the UV disinfection system with the on-site recycled water storage ponds. Both facility operational and compliance analytical data have been uploaded to the State's CIWQS website on a monthly basis.

The Regional Water Board has the authority to enforce the LOWRF Waste Discharge Requirements (WDR Order No. R3-2011-0001). WDR were adopted at its public meeting on May 5, 2011 to establish the water quality permit conditions for any discharges from LOWRF. The effluent requirements for discharge to leach fields include:

- Settable Solids Daily Maximum of 0.5 mL/L; and
- Settable Solids Monthly Average of 0.1 mL/L; and
- BOD, 5-day Daily Maximum of 100 mg/L*; and
- BOD, 5-day Monthly Average of 60 mg/L*; and
- Suspended Solids Daily Maximum of 100 mg/L* ; and

* See Section 2.5 for more stringent Recycled Water Limitations

- Suspended Solids Monthly Average of 60 mg/L* ; and
- Total Nitrogen (as N) Daily Maximum limit of 10 mg/L; and
- Total Nitrogen (as N) Monthly Average limit of 7 mg/L;
- California Code of Regulations for Title 22 standards for tertiary recycled water (Cal. Code Regs., tit. 22, § 60301.230).

There were no violations in the self-monitoring annual report (see Appendix A for annual water quality report).

With flows and process treatment stabilized, the plant is currently (December 2019) producing nitrate levels of 2.0 to 4.0 mg/L. A full Annual Water Quality Report can be found in Appendix A referred to as the 2019 Annual Water Quality Report prepared for the State Water Resources Control Board.

2.4 Program Changes Implemented in Prior Year

Monarch Grove is a 83-lot subdivision and was connected to the Los Osos sewer collection system in April 2019.

2.5 Proposed Changes to the Program for the Upcoming Year

Current sampling and frequency methods are expected to remain the same in the upcoming year.

Recycled Water Limitations

- BOD, 5-day Daily Maximum of 90 mg/L; and
- BOD, 5-day Monthly Average of 30 mg/L; and
- Suspended Solids Daily Maximum of 90 mg/L ; and
- Suspended Solids Monthly Average of 30 mg/L ; and
- pH Monthly Average of 6.5 to 8.4

The Regional Water Quality Control Board issued the facility's Recycled Water Permit "Notice of Applicability for General Waste Discharge Requirements, Order WQ 2016–0068–DDW" on September 5, 2018. However, the Regional Board did indicate they would be re-issuing a revised recycled water permit to include additional sampling and monitoring requirements as it relates to distributing recycled water to agriculture reuse sites.

2.6 Agricultural Reuse Outreach Process

The County continues to meet with users and gather user site information as required by the Recycled Water Permit which is subject to the review of the Division of Drinking Water.

The State Water Resources Control Board (State Water Board) adopted the Recycled Water Policy (Policy) in 2009 which requires that salt and nutrient management plans be developed to manage salts, nutrients, and other significant chemical compounds on a watershed- or basin/subbasin-wide basis. The County has prepared the Los Osos Salt Nutrient Management Plan (SNMP) in accordance with the Recycled Water Policy.

The Los Osos Salt Nutrient Management Plan (SNMP) was developed in a collaborative setting with input from stakeholders and interested parties. The Los Osos SNMP utilized the existing stakeholder infrastructure set up by the Los Osos Basin Management Committee (BMC) Board of Directors established under the Stipulated Judgment for outreach, public meetings, and to receive input. The primary method for engaging the Los Osos SNMP stakeholders was through the BMC meetings, the County's BMC webpage, and email notifications.

The Los Osos SNMP was discussed at three public meetings of the BMC between September 2016 and May 2017, and at the County Board of Supervisors meeting in January 2018.

Participants in the Los Osos SNMP development and/or review process included:

- Water purveyors: Los Osos Community Services District (LOCSD), Golden State Water Company (GSWC), and S&T Mutual Water Company (S&T)
- Environmental resource groups: Morro Bay National Estuary Program (MBNEP)
- Agricultural interests: individual farm owners
- Regulatory/government agencies: County and Regional Water Board
- Others: private well owners

2.7 Amendments to Reuse Contracts

The Los Osos Wastewater Project has entered into four agricultural recycled water delivery agreements (three fully executed and one pending Board of Supervisor's action).

3.0 Water Conservation

A Water Conservation Implementation Plan (Implementation Plan) outlines a detailed process and budget for water conservation measures to achieve the goal of reducing indoor water use, and corresponding flows to the wastewater system, to approximately 50 gallons per person per day.

Retrofitting residential and commercial building's water fixtures to low-flow was a requirement for connecting to the wastewater system. As of December 31, 3019 about 5,531 properties (99.2%) were confirmed to be in compliance with the Project's requirements for having low-flow water fixtures.

This section will cover the following items:

- Water Purveyor Production and Consumption Summary
- Status of Conservation Measure Implementation
- Program Changes Implemented in Prior Year
- Actual Program Savings Compared to Projected Savings
- Recommended Program Adjustments or Additional Data Needs
- Estimated Water Savings

3.1 Water Purveyor Production and Consumption Summary

The water purveyors LOCSD, GSWC and S&T provide metered production records. Groundwater production for calendar year 2019 is summarized in Table 2. Purveyor production has declined by 6.4%[8] compared to 2018.

Table 2 – Groundwater Production for Calendar Year 2019[9]	
Description	**Production (AFY)**
Purveyors	
Los Osos Community Services District	506
Golden State Water Company	454
S&T Mutual Water Company	31
Purveyor Subtotal	**991**
Domestic wells	**220**
Community facilities	**60**
Agricultural wells	**630**
Total Estimated Production	**1,901**

Private wells refer to domestic wells, agricultural irrigation wells, and monitoring wells that are not controlled by BMC member agencies. Production from domestic and agricultural irrigation wells is not metered. Production estimates for these wells are based on water use surveys performed in 2009 with adjustment from aerial review.

3.2 Status of Conservation Measure Implementation

Implementation of the conservation program continues. As of December 31, 2019, 3,347 toilets, 2387 showerheads, 3,226 faucet aerators, and 126 clothes washers were replaced.

3.3 Program Changes Implemented in Prior Year

A community toilet recycling bin which was paid for by the Los Osos Wastewater Project was discontinued and plumbers now have to make their own arrangements for disposal of used toilets, fixtures, and appliances.

3.4 Actual Program Savings Compared to Projected Savings

The County is required to provide $5 million dollars of funding towards the Water Conservation Program. The grants were made available through the Integrated Regional Water Management (IRWM) Grant Program.

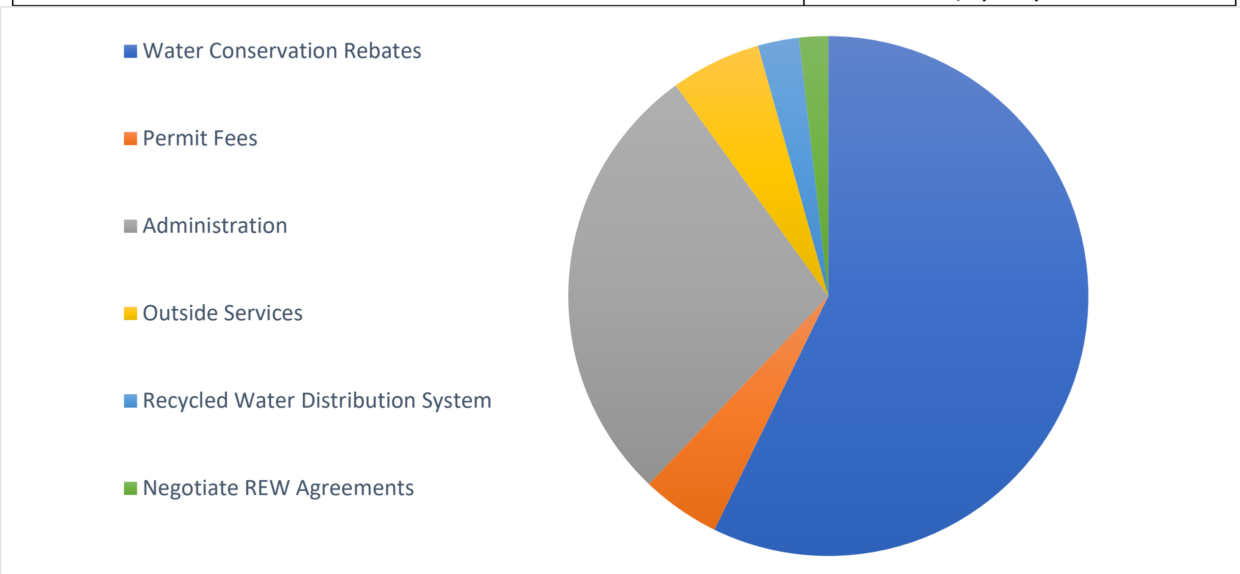
Table 3 summarizes the Water Conservation Program as of December 2019 which was $1.7M.

---

[8] Based on 1,901 AFY of groundwater basin production for the calendar year of 2019 and 2,030 AFY for the calendar year of 2018.

[9] Cleath-Harris Geologists (CHG), June 2019. Los Osos Basin Plan Groundwater Monitoring Program 2019 Annual Monitoring Report. San Luis Obispo, CA (see Appendix B)

Table 3 Summary of Water Conservation Program through December 2019	
Description	**2019 Cumulative Total As of 12/31/2018**
Water Conservation Rebates	$981,794
Permit Fees	$84,222
Administration	$478,954
Outside Services	$96,320
Recycled Water Irrigation Commercial and Institutional	$43,888
Negotiate Recycled Water Agreements	$31,091
Total Value of Provided Rebates	**$1,716,270**



Water Conservation Rebates. These rebates are the replacement of designated fixtures[11] which was a requirement for connecting to the Los Osos Wastewater Project.

Permit Fees. Approximately 25% of the sewer connections in the sewer service area opted to convert their septic tank into a rainwater capture system. The inspections costs associated with conversion of the septic tank were offset to encourage more property owners to repurpose their septic tanks rather than abandon them and fill the void space with sand.

Administration. The administration of the program since fiscal year 13/14 includes travel, staff labor, outreach literature, and overhead.

Outside Services. Outside services were used prior to decommissioning septic tank where a toilet disposal roll-off bin was provided for property owners who opted change out fixtures for low-flow (prior to 2016) in advance of being notified to connect to the sewer collection system.

[11] Category 1 Conservation Measures outlined in the *Water Conservation Implementation Plan for the Los Osos Wastewater Project,* October 2012, p. 8

Recycled Water Distribution System. Retrofits for the recycled water connections were completed in June 2019 for the Sea Pines golf course and were partially completed for Los Osos Middle School.

Negotiate Recycled Water Agreements. There are 14 approved recycled water users and use areas within the Los Osos Recycled Water service area. Prior to 2019, deliveries were limited to the 2 leach fields and construction water use.

A User Agreement is needed to be able to use the recycled water in areas where it is available. Each Use Area has a Recycled Water Site Supervisor who has completed a Site Supervisor Training Program and is responsible for operating and maintaining the On-Site Recycled Water System, in addition to other roles and responsibilities defined in the County's Rules and Regulations of Recycled Water Use.

3.5 Recommended Program Adjustments or Additional Data Needs

The County has extended indoor water rebates to cover some outdoor water rebates such as gray water systems and laundry to gray water system. In addition, rebates would become available in the future to assist converting the recycled water irrigation at Commercial and Institutional sites such as the schools. It is anticipated that the Water Purveyors will be implementing similar programs within their service areas.

3.6 Estimated Water Savings

The estimated water savings are based on the WaterSense website (https://www.epa.gov/watersense/about-watersense), a voluntary partnership program sponsored by the U.S. Environmental Protection Agency (EPA). This resource was used for providing a list of water-efficient products and for calculating the approximate water savings. WaterSense-labeled products are certified to use at least 20 percent less water compared to regular models. Table 4 outlines the estimated water savings for the fixtures that have been rebated through the Implementation Plan.

Table 4
Summary of Water Conservation Savings Provided through December 2019

Fixture	Estimated Savings per unit (gal/year)	Approximate Savings (AFY)
Toilets	8,200	84.2[12]
Showerheads	1,800	13.2[13]
Faucet Aerators	400	4.0[14]
Clothes Washers	3,000	1.2[15]
Hot Water Recirculating System	4	0.1[16]

[12] Assumes replacing 3.5 gpf toilets with 1.28 gpf or less.

[13] Assumes replacing 2.0 gpm showerheads with 1.5 gpm or less.

[14] Assumes replacing 2.0 gpm faucet aerators with 1.5 gpm or less

[15] Assumes replacing clothes washer is based on a household size of 2.5 people doing 200 loads of laundry per year and saving 15 gallons per load using a water-efficient clothes washer.

[16] Assumes Hot Water Recirculating System has an estimated savings of 40,000 gallons per unit per year.

Table 4 Summary of Water Conservation Savings Provided through December 2019		
Gray Water System	---	0
Laundry only Gray Water System	---	0
Recycled Water Irrigation Commercial and Institutional	Sea Pines Golf Course	30
	Total Approximate Savings (AFY)	132.7

4.0 Monitoring Program

The Regional Water Quality Control Board (RWQCB) has the authority to enforce the waste discharge requirements as defined in WDR Order No. R3-2011-0001. The waste discharge requirements comply with Title 22 standards for tertiary recycled water (Cal. Code Regs., tit. 22, § 60301.230). In addition to effluent and recycled water requirements, the RWQCB included a separate order outlining the Monitoring and Reporting Program.

The Groundwater Monitoring Program is also a source of data for the State Water Board annual reports, and can be found in Appendix B.

This section of the report will discuss the following components of the Monitoring Program:

- Groundwater Monitoring Results
- Summary of Seawater Intrusion Status
- Surface Environmental Monitoring Report
- Program Changes Implemented in Prior Year
- Recommended Program Adjustments or Additional Data Needs

Evaluating the groundwater basin on an annual basis allows the County to:

- Evaluate the trends of the groundwater basin
- Identify any voids in the collected data
- Report the data analysis to the various interested parties (Department of Water Resources, Regional Water Board, Coastal Commission)
- Modify the RWMP based on the current conditions and visible trends of the groundwater basin
- Modify procedures to utilize current best management practices
- Modify pumping, treatment and/or disposal procedures if groundwater basin trends are showing signs of degradation of water quality, including increased levels of contamination and/or increased levels of seawater intrusion

4.1 Groundwater Monitoring Results

The Groundwater Monitoring Program began in 2014 and the information collected includes groundwater level, quality and production data. There are approximately 85 wells in the Los Osos Groundwater Monitoring Program, including 35 monitoring wells, 15 municipal wells (active and inactive) and 23 private wells (pending well owner participation).

The Groundwater Monitoring results can be found in Appendix B referred to as the 2019 Annual Monitoring Report prepared for the Basin Management Committee and are briefly summarized below:

Precipitation. The Basin received above normal rainfall in 2019. The drought condition for San Luis Obispo County ranged from moderate to severe drought conditions to no drought conditions during 2019 (NDMC/USDA/NOAA, 2019).

Seawater intrusion front. The seawater intrusion front was repositioned closer to the coast based on adding a new monitoring well to the contouring data set, but is interpreted to have advanced inland between Fall 2018 and Fall 2019 (a deterioration).

Basin Yield Metric. The Basin Yield Metric decreased between 2018 and 2019 (an improvement) and has met the LOBP goal for four consecutive years.

Water Level Metric. The Water Level Metric decreased between Spring 2018 and Spring 2019 (a deterioration) and has not reached the target value.

Chloride Level Metric. The Chloride Metric increased between Fall 2018 and Fall 2019 (a deterioration) and has not reached the target value.

Nitrate Metric. The Nitrate Metric decreased between Winter 2018 and Winter 2019 (an improvement) but has not reached the target value.

Upper Aquifer Water Level Profile. Water levels in the Upper Aquifer along the bay remain safely above the Protective Elevation.

4.2 Summary of Seawater Intrusion Status

The State Water Resources Control Board (State Water Board) adopted the Recycled Water Policy (Policy) in 2009 which requires that salt and nutrient management plans be developed to manage salts, nutrients, and other significant chemical compounds on a watershed- or basin/subbasin-wide basis. The County has prepared the Los Osos Salt Nutrient Management Plan (SNMP) in accordance with the Policy. The SNMP includes a Groundwater Quality Monitoring Program that will be submitted to the Regional Water Quality Control Board every three years.

The objective of the Los Osos SNMP is to manage salts and nutrients within the Basin in a manner that ensures attainment of water quality objectives and protection of beneficial uses. Known issues in the Basin include seawater intrusion and elevated nitrate concentrations from septic systems. Thus, the primary salt and nutrient indicators for the basin are chloride and nitrate-nitrogen. These two constituents were modeled in the SNMP along with total dissolved solids (TDS), an indicator of total salt loading to the basin. The technical analysis (model) results indicate that with the operation of the LOWRF, removal of septic systems in the wastewater service area, and programs implemented (e.g., water conservation), groundwater quality will improve over time with respect to nitrates. Also, with the operation of the LOWRF, pumping is reduced in the Basin due to the in lieu use of recycled water used for irrigation. Reduced pumping could infer a greater groundwater pressure head with the potential to reduce seawater intrusion in the Basin.

4.3 Surface Environmental Monitoring Report

The most significant sources of recharge for the Basin are direct percolation of precipitation and percolation of surface runoff. The surface water drainage areas within the Basin are described in a baseline report, the "Environmental Monitoring Program for the Los Osos Wastewater Project Recycled Water Management Plan" (SWCA 2012). The focus of the wetland monitoring is to determine if a significant deviance (more than 10%) from baseline conditions has occurred, and if so, why the change may have occurred.

The County is required to implement annual wetlands and wetland vegetation monitoring in the Los Osos area for the life of the Los Osos Wastewater Project. The fourth annual report concludes that, based on survey data, one of the ten sites being monitored is showing a continued reduction in wetland area.

If the 2021 monitoring data shows continued reduction in wetland vegetation cover, and evaluation of the groundwater conditions in the area may be warranted.

4.4 Program Changes Implemented in Prior Year

It is likely to take approximately 30 years[18] for the upper aquifer to equilibrate to a change in nitrate loading, although the nitrate metric target can potentially be achieved within a shorter time frame.

4.5 Recommended Program Adjustments or Additional Data Needs

Appendix B, referred to as the BMC 2019 Annual Report, describes nine potential programs of action, each of which focuses on a different aspect of groundwater basin management in the 2019 Annual BMC Report (attached as Appendix B), Chapter 9.

Monitoring for CECs is a requirement of the Monitoring and Reporting Program Order No. R3-2011-0001 issued by the Regional Water Board for the Los Osos Wastewater Recycling Facility. It is anticipated that the Water Board will eventually enroll LOWRF into a new waste discharge permit as their agency is standardizing all treatment plants in the Central Coast Region. CECs may be removed from the waste discharge monitoring requirements at a later date.

5.0 Adaptive Management Program

The Adaptive Management Program status update found in the 2019 Annual Monitoring Report prepared for the Basin Management Committee cover the following topics (2019 Annual Monitoring Report attached as Appendix B, see Executive Summary section (p.3):

- Potential Adaptation of Urban Water Use Efficiency Program
- Development of Contingency Plan
- Lower Aquifer Nitrate Trends
- Discussion and Development of Metrics for Future Growth

Existing groundwater quality Best Management Practices and Project measures already in place will continue. The adaptive management approach will allow for modifications over time in response to project monitoring to protect and enhance groundwater resources. This approach will allow flexibility to respond to changing conditions in the Basin.

[18] Updated Basin Plan for the Los Osos Groundwater Basin, January 2015, p. 99

References Cited

Updated Basin Plan for the Los Osos Groundwater Basin. Prepared for the Interlocutory Stipulated Judgment (ISJ) between LOCSD, GSWC, S&T and the County. January 2015.

San Luis Obispo County Public Works Department. 2012. *Water Conservation Implementation Plan for the Los Osos Wastewater Project*. Prepared for the San Luis Obispo County Planning Department. October 2012.

SWCA Environmental Consultants (SWCA). 2012. *Environmental Monitoring Program for the Los Osos Wastewater Project Recycled Water Management Plan, San Luis Obispo County, California*. Prepared for County of San Luis Obispo. May 2012.

SWCA . 2020. *Los Osos Wastewater Project, Recycled Water Management Plan Environmental Monitoring Report, First Annual Monitoring Report*. Prepared for County of San Luis Obispo.

Cleath-Harris Geologists (CHG) June 2020*. Los Osos Basin Plan Groundwater Monitoring Program 2019 Annual Monitoring Report.* San Luis Obispo, CA.

Appendix A

2019 Annual Water Quality Report prepared for the State Water Resources Control Board

November 30, 2020

California Regional Water Quality Control Board
Central Coast Region
Attn: Monitoring and Reporting Review Section
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401

Dear Mr. Harris:

Facility Name: Los Osos Water Recycling Facility

Address: 2270 Los Osos Valley Road
Los Osos, CA 93402

Contact Person: Charles Christian
Job Title: Water Systems Chemist II
Phone Number: (805) 781-5111

WDR/NPDES Order Number: WDR R3-2011-0001

Type of Report (circle one): **Monthly** **Quarterly** **Semi-Annual** **Annual**

Month(s) (circle applicable months*): **JAN** **FEB** **MAR** **APR** **MAY** **JUN**
JUL **AUG** **SEP** **OCT** **NOV** **DEC**
*Annual Reports (circle the first month of the reporting period)

Year: 2019

Violation(s): **X_ No** (there are no violations to report) **__ Yes**

A. Data Tables and Graphs:

Attached are both tabular and graphical summaries of monitoring data acquired during 2019.

B. Compliance and Performance:

- Nitrate, and suspended solids concentrations, total coliform organisms, turbidity, biological oxygen demand, remained within the standards set by the State throughout 2019 calendar year.
- The Los Osos Water Recycling Facility, (LOWRF) started delivering recycled water on June 10, 2019 while continuing to discharge effluent water to Broderson and Bayridge leach fields. A small amount of construction water was delivered to the Giacamazzi property in October, November, and December.
- No plant upgrades are anticipated in the coming year.

- Evaluation of groundwater is evaluated on a semiannual basis and the results are available in reports called H2 2019 (GW and Eff) and 2019 (GW and Eff CEC's) on the CIWQS website.

C. Flow Evaluation:

We do not anticipate reaching capacity over the four years; however, flows have been at a steady increase since the plant began accepting influent in March 2016. The average annual flow for 2019 was approximately 500,000 GPD with a maximum annual average limit of 1.2 million gallons (approximately capacity).

D. Operator Certification:

A list of current operators and their certification grades is listed below.

WASTE WATER CERTIFICATIONS					
8807	IV	CPO	Singh-Kaler	Harbans	6/7/2021
10551	V	SWWSW	Hooper	Sarah	12/31/2021
7293	III	SWWSW	Gonzalez	Luis	6/30/2021
28836	IV	WWSW III	Nunez	Joe	5/25/2020
10621	IV	WWSW III	Zatt	Eric	6/30/2020
28808	III	WWSW III	Carroll	Stephen	6/26/2021
43380	II	WWSW I	Valdivia	Devin	5/7/2021
43877	I	WWSW I	Hoag	Greg	7/20/2021
5129	IV	Temp	Ryczek	Walter	12/31/2021
-----	OIT	WWSW T	Adam	Travis	01/16/2022
-----	OIT	WWSW T	Loveridge	Sean	05/16/2022
-----	OIT	WWSW T	Stiles	Matt	Not Available *

E. Facility Operations and Maintenance Manual:

The Operations and Maintenance Manual was first prepared in February 2016 and is reviewed on a regular basis. The manual reflects current operations at this facility.

F. Laboratories:

Analytical results for required monitoring were generated by laboratories certified by the State of California Environmental Laboratory Accreditation Program.

Laboratory	Address	ELAP Certification
County of San Luis Obispo Water Quality Laboratory	1355 C Kansas Ave. San Luis Obispo, CA. 93405	1592
Abalone Coast Analytical Laboratory	141 Suburban Road, Suite C-1, San Luis Obispo, Ca. 93401	2661
Fruit Grower's Laboratory (FGL) Inc.	3442 Empresa Drive, Suite D San Luis Obispo, Ca. 93401	2775
Eurofins Eaton Analytical	750 Royal Oaks Dr. Monrovia, CA 91016	2813
Oilfield Environmental and Compliance Laboratory (OEC)	307 Roemer Way, Suite 300 Santa Maria, Ca. 93454	2438

G. Sludge Management:

Approximately 1513 TONS of wet sludge (229 TONS dry weight) were removed from plant in 2019. The sludge was shipped to:

Coastal Roll Off
4388 Old Santa Fe Road
San Luis Obispo, CA 93401

H. Pretreatment Program Effectiveness:

The County has implemented a fat, oil, and grease program with local communities in the area. This program includes periodic pretreatment compliance inspections of facilities as well as educating the public on the importance of a FOG removal program and its essential role in helping the water recycling facility operating at its greatest potential.

I. Salts and Nutrients Reduction:

The County continues to develop and evaluate an effective salts and nutrients management program.

Ground water monitoring samples are collected and analyzed semiannually from various monitoring wells throughout the basin.

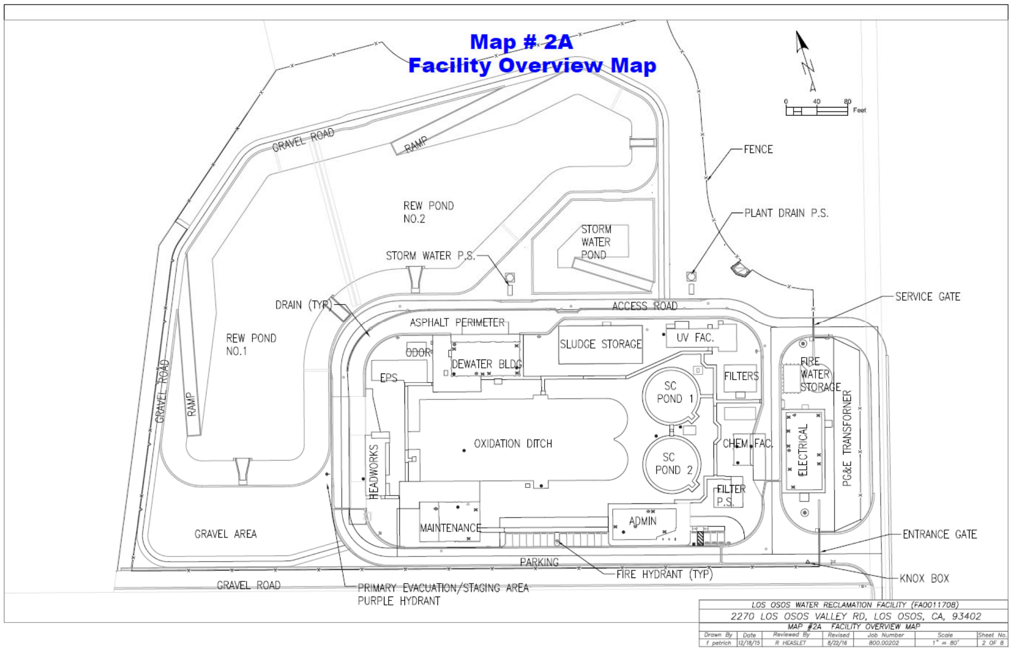
J. Collection System Management Plan:

The County completed its 5-year Sanitary Sewer Management Plan Update for County operated wastewater collection systems in 2019.

K. Mercury Seals:

There are no known mercury seals associated with this facility.

L. Figures:



In accordance with the Standard provisions and Reporting Requirements, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision following a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my knowledge of the person(s) who manage the system or those directly responsible for data gathering, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

If you have any questions or require additional information, please contact me at (805) 781-5111.

Sincerely,

Charles Christian
Water Systems Chemist II

cc: James Bishop, State Water Resources Control Board
Alex Simental
Harbans Singh-Kaler
John Austin

CF 310.87.01

2019 Los Osos Water Recycling Facility Annual Report

County of San Luis Obispo Department of Public Works

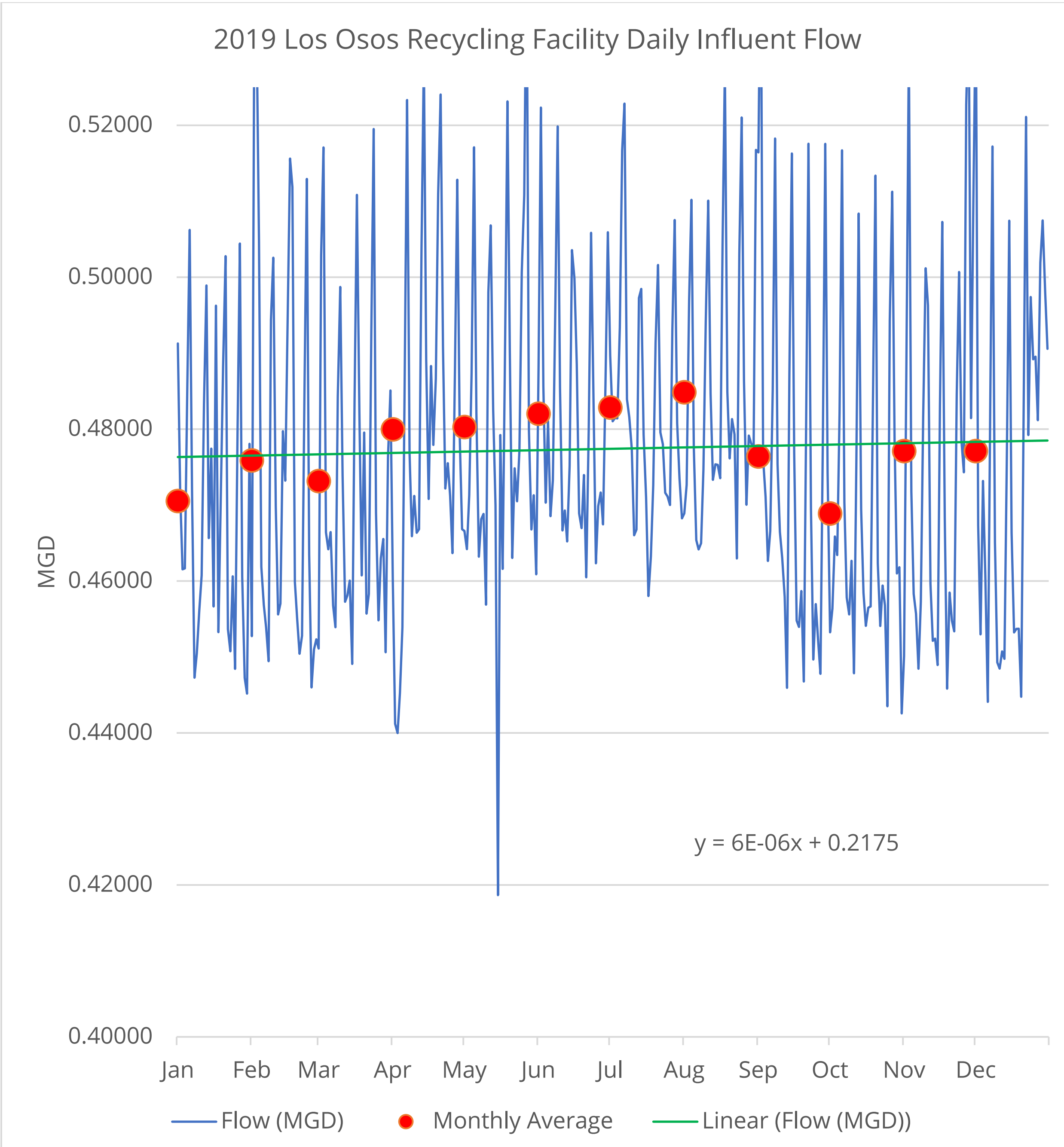
Prepared by Charles Christian

Contents

1) 2019 Daily and Monthly Average Influent Flow 3
2) 2019 Influent Suspended Solids (mg/L) - 24 Hour Composite Sample 5
3) 2019 Influent BOD (mg/L) - 5 Day - 24 Hour Composite Sample 7
4) 2019 Daily and Monthly Average Effluent Flow (MGD) 9
5) 2019 Effluent Suspended Solids (mg/L) - 24 Hour Composite Sample 11
6) 2019 Semi-Annual Effluent Chloride, Sodium, and Total Dissolved Solids (mg/L) 13
7) 2019 Effluent Monthly Total Nitrogen 14
8) 2019 Weekly pH values for Effluent 15
9) 2019 Average Daily Turbidity Values for Effluent 17

1) 2019 Daily and Monthly Average Influent Flow

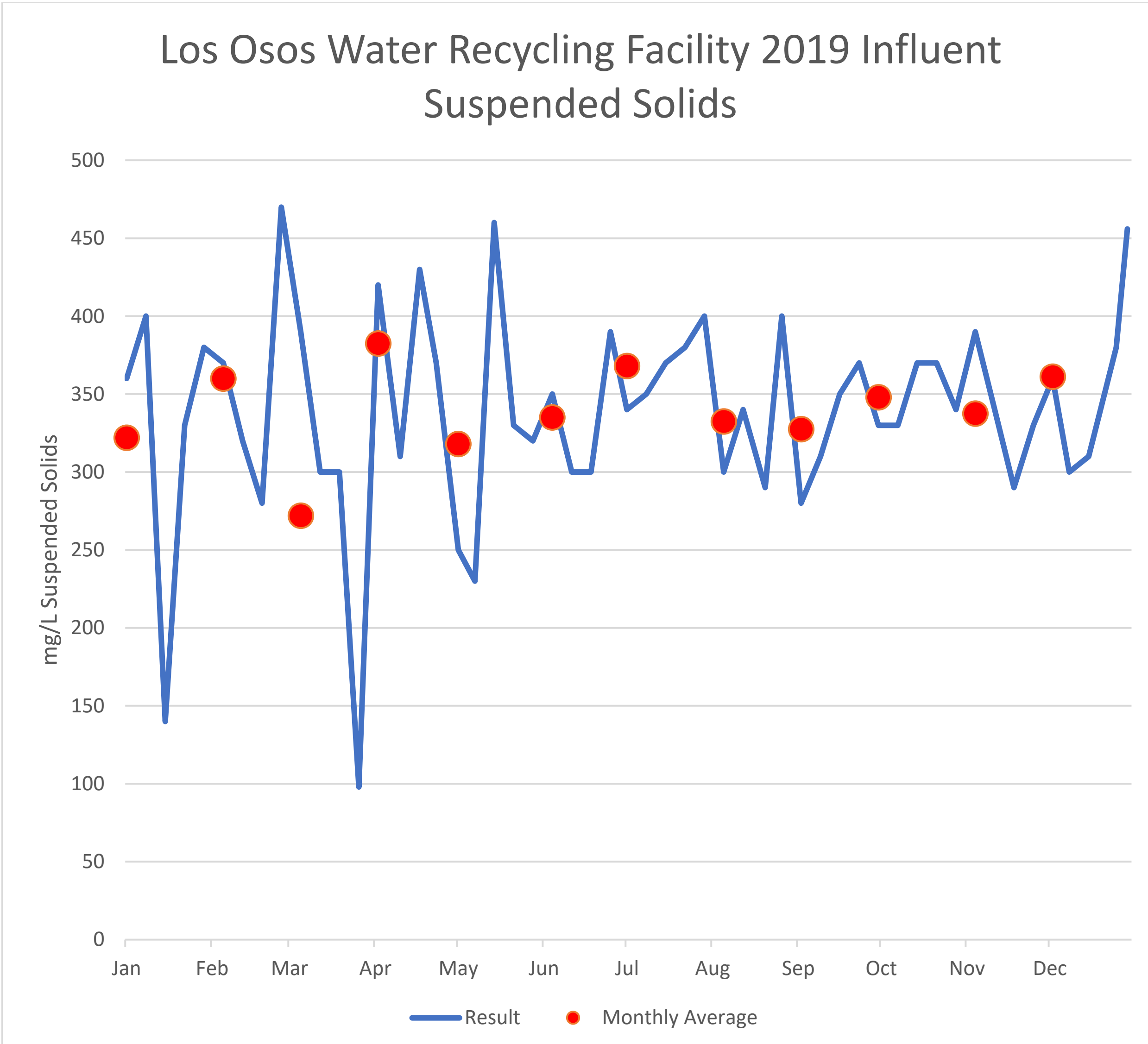
2019 Daily and Monthly Average Influent Flow (MGD)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.4913	0.4528	0.4511	0.4603	0.4666	0.4881	0.4897	0.4689	0.5164	0.4533	0.4501	0.5367
2	0.4716	0.5301	0.5029	0.4412	0.4642	0.5223	0.4810	0.4727	0.5463	0.4564	0.4908	0.4674
3	0.4615	0.5327	0.5171	0.4400	0.4713	0.4856	0.4815	0.4970	0.4762	0.4659	0.5300	0.4530
4	0.4617	0.5048	0.4664	0.4453	0.4873	0.4703	0.4814	0.5102	0.4711	0.4634	0.4718	0.4732
5	0.4859	0.4619	0.4642	0.4539	0.5171	0.4811	0.4934	0.4776	0.4626	0.4821	0.4583	0.4607
6	0.5062	0.4569	0.4664	0.4875	0.4821	0.4685	0.5167	0.4654	0.4666	0.5167	0.4557	0.4441
7	0.4720	0.4538	0.4568	0.5233	0.4632	0.4732	0.5229	0.4642	0.4852	0.4704	0.4485	0.4815
8	0.4473	0.4495	0.4539	0.4768	0.4681	0.4961	0.4839	0.4650	0.5183	0.4578	0.4573	0.5172
9	0.4505	0.4944	0.4843	0.4659	0.4688	0.5199	0.4815	0.4747	0.4754	0.4556	0.4815	0.4651
10	0.4562	0.5026	0.4987	0.4712	0.4569	0.4855	0.4774	0.4942	0.4665	0.4627	0.5012	0.4493
11	0.4608	0.4699	0.4739	0.4664	0.4980	0.4667	0.4660	0.5101	0.4630	0.4479	0.4963	0.4485
12	0.4833	0.4556	0.4573	0.4668	0.5068	0.4693	0.4668	0.4847	0.4579	0.4754	0.4597	0.4507
13	0.4989	0.4570	0.4581	0.5040	0.4826	0.4652	0.4973	0.4733	0.4459	0.5084	0.4521	0.4498
14	0.4656	0.4797	0.4601	0.5291	0.4699	0.4752	0.4985	0.4754	0.4871	0.4694	0.4524	0.4772
15	0.4774	0.4732	0.4491	0.4891	0.4187	0.5036	0.4793	0.4753	0.5163	0.4584	0.4489	0.5074
16	0.4567	0.4951	0.4838	0.4708	0.4792	0.4998	0.4710	0.4735	0.4769	0.4541	0.4830	0.4663
17	0.4962	0.5156	0.5108	0.4883	0.4616	0.4885	0.4580	0.5041	0.4548	0.4565	0.5073	0.4532
18	0.4533	0.5119	0.4823	0.4779	0.4917	0.4689	0.4633	0.5276	0.4540	0.4566	0.4683	0.4537
19	0.4708	0.4599	0.4608	0.4867	0.5231	0.4670	0.4726	0.4849	0.4587	0.4857	0.4458	0.4537
20	0.4883	0.4549	0.4795	0.5110	0.4903	0.4740	0.4914	0.4762	0.4468	0.5134	0.4585	0.4448
21	0.5028	0.4504	0.4557	0.5240	0.4630	0.4605	0.5016	0.4813	0.4809	0.4624	0.4548	0.4810
22	0.4537	0.4528	0.4583	0.4910	0.4748	0.4800	0.4796	0.4793	0.5176	0.4541	0.4534	0.5211
23	0.4508	0.4837	0.4929	0.4722	0.4705	0.5058	0.4780	0.4630	0.4696	0.4594	0.4845	0.4792
24	0.4606	0.5129	0.5195	0.4755	0.4772	0.4834	0.4716	0.5031	0.4497	0.4568	0.5007	0.4974
25	0.4484	0.4635	0.4690	0.4712	0.5007	0.4623	0.4711	0.5210	0.4570	0.4435	0.4786	0.4892
26	0.4796	0.4460	0.4548	0.4637	0.5108	0.4699	0.4700	0.4864	0.4522	0.4943	0.4743	0.4895
27	0.5044	0.4510	0.4630	0.4877	0.5448	0.4717	0.4930	0.4700	0.4478	0.5112	0.5227	0.4812
28	0.4606	0.4523	0.4655	0.5128	0.4799	0.4675	0.5075	0.4791	0.4796	0.4787	0.5358	0.5019
29	0.4473		0.4506	0.4789	0.4668	0.4852	0.4808	0.4781	0.5175	0.4610	0.4814	0.5075
30	0.4452		0.4762	0.4668	0.4713	0.5059	0.4735	0.4774	0.4743	0.4618	0.5099	0.4981
31	0.4781		0.4851		0.4609		0.4683	0.5168		0.4426		0.4906
Monthly Average	0.4705	0.4759	0.4732	0.4800	0.4803	0.4820	0.4829	0.4849	0.4764	0.4689	0.4771	0.4771
Monthly Low	0.4452	0.4460	0.4491	0.4400	0.4187	0.4605	0.4580	0.4630	0.4459	0.4426	0.4458	0.4441
Monthly High	0.5062	0.5327	0.5195	0.5291	0.5448	0.5223	0.5229	0.5276	0.5463	0.5167	0.5358	0.5367
Total Recordings	31	28	31	30	31	30	31	31	30	31	30	31



2019 Los Osos Recycling Facility Daily Influent Flow
MGD
0.52000
0.50000
0.48000
0.46000
0.44000
0.42000
0.40000
y = 6E-06x + 0.2175
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Flow (MGD)
Monthly Average
Linear (Flow (MGD))

2) 2019 Influent Suspended Solids (mg/L) - 24 Hour Composite Sample

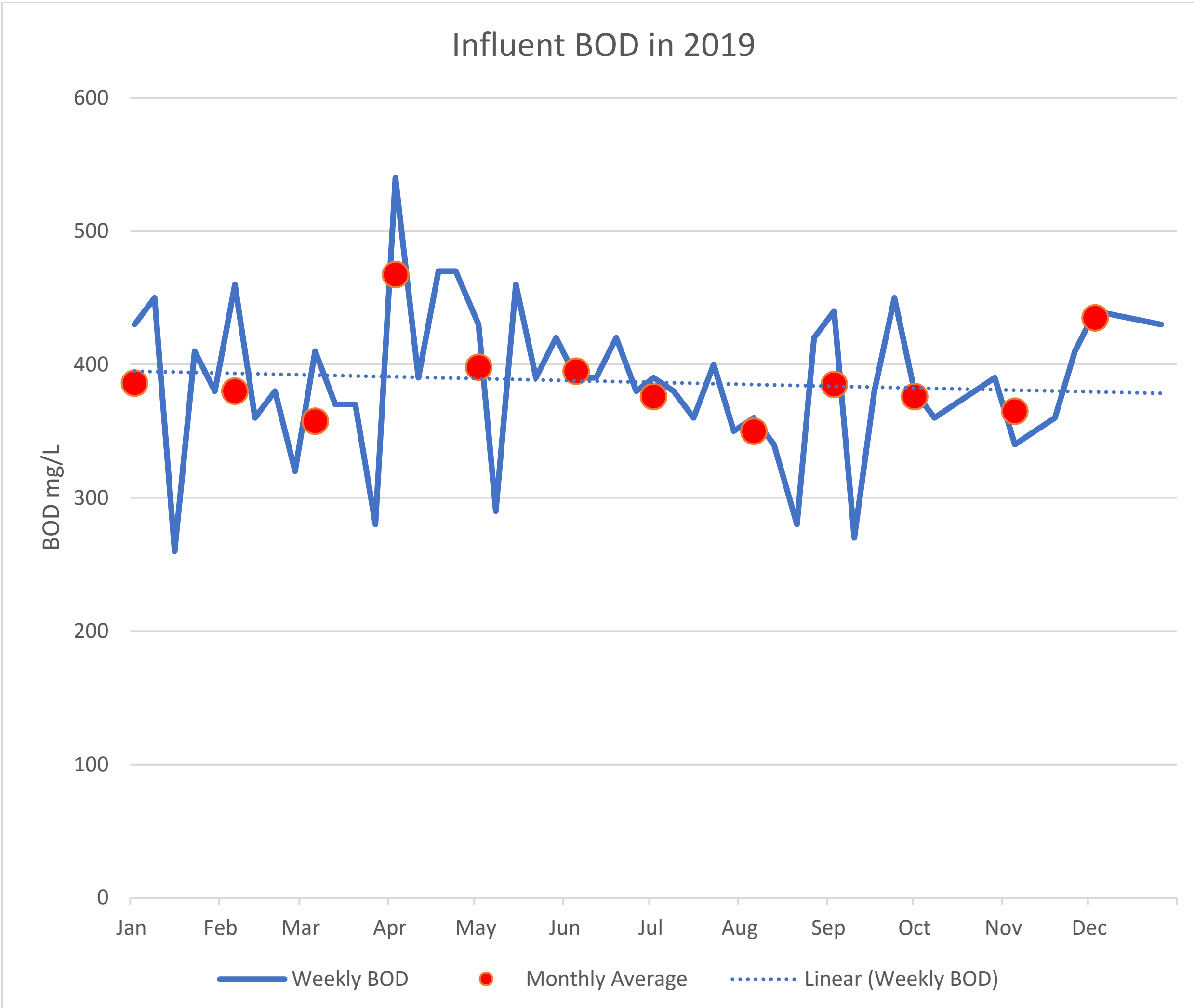
Influent Suspended Solids (mg/L) - 24 Hour Composite Sample												
Day	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1										330		
2	360				250		340					
3									280			360
4				420								
5						350					390	
6		370	390					300				
7										330		
8					230							
9	400						350					300
10									310			
11				310								
12						300					340	
13		320	300					340				
14												
15					460					370		
16	140						370					310
17									350			
18				430								
19						300					290	
20		280	300									
21								290				
22					330					370		
23	330						380					
24				370					370			
25												
26						390					330	380
27		470	98					400				
28												
29					320					340		
30	380						400					
31												456
Monthly Average	322	360	272	383	318	335	368	333	328	348	338	361
Monthly Low	140	280	98	310	230	300	340	290	280	330	290	300
Monthly High	400	470	390	430	460	390	400	400	370	370	390	456
Total Recordings	5	4	4	4	5	4	5	4	4	5	4	5



Los Osos Water Recycling Facility 2019 Influent
Suspended Solids
mg/L Suspended Solids
500
450
400
350
300
250
200
150
100
50
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Result
Monthly Average

3) 2019 Influent BOD (mg/L) - 5 Day - 24 Hour Composite Sample

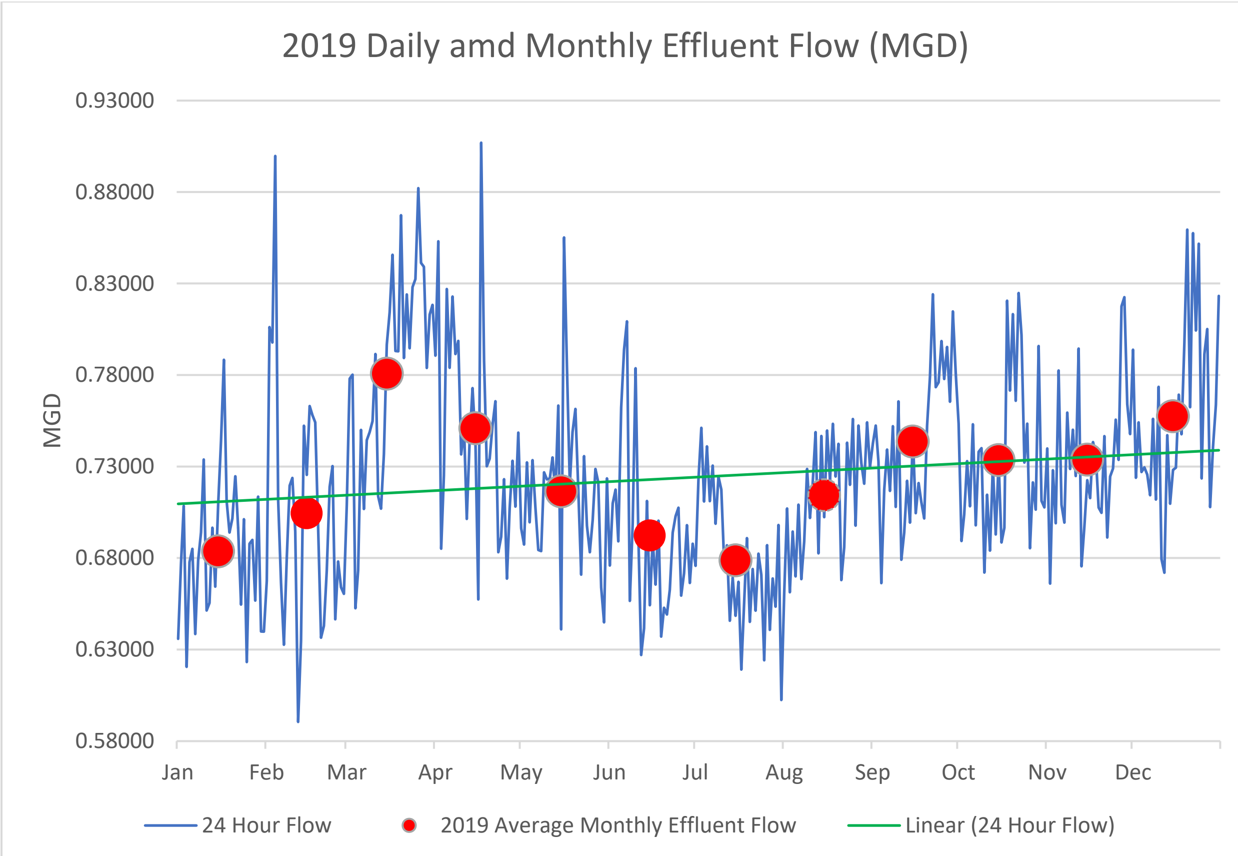
Influent BOD (mg/L) - 5 Day - 24 Hour Composite Sample												
Day	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1										380		
2	430				430		390					
3				540					440			440
4												
5						390					340	
6		460	410					360				
7												
8					290					360		
9	450						380					
10									270			
11				390								
12						390					350	
13		360	370					340				
14												
15					460					370		
16	260						360					
17									380			
18				470								
19						420					360	
20		380	370									
21								280				
22					390					380		
23	410						400					
24				470					450			
25												
26						380					410	430
27		320	280					420				
28												
29	380				420					390		
30							350					
31												
Monthly Average	386	380	358	468	398	395	376	350	385	376	365	435
Monthly Low	260	320	280	390	290	380	350	280	270	360	340	430
Monthly High	450	460	410	540	460	420	400	420	450	390	410	440
Total Recordings	5	4	4	4	5	4	5	4	4	5	4	2



Influent BOD in 2019
600
500
400
300
200
100
0
BOD mg/L
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Weekly BOD
Monthly Average
Linear (Weekly BOD)

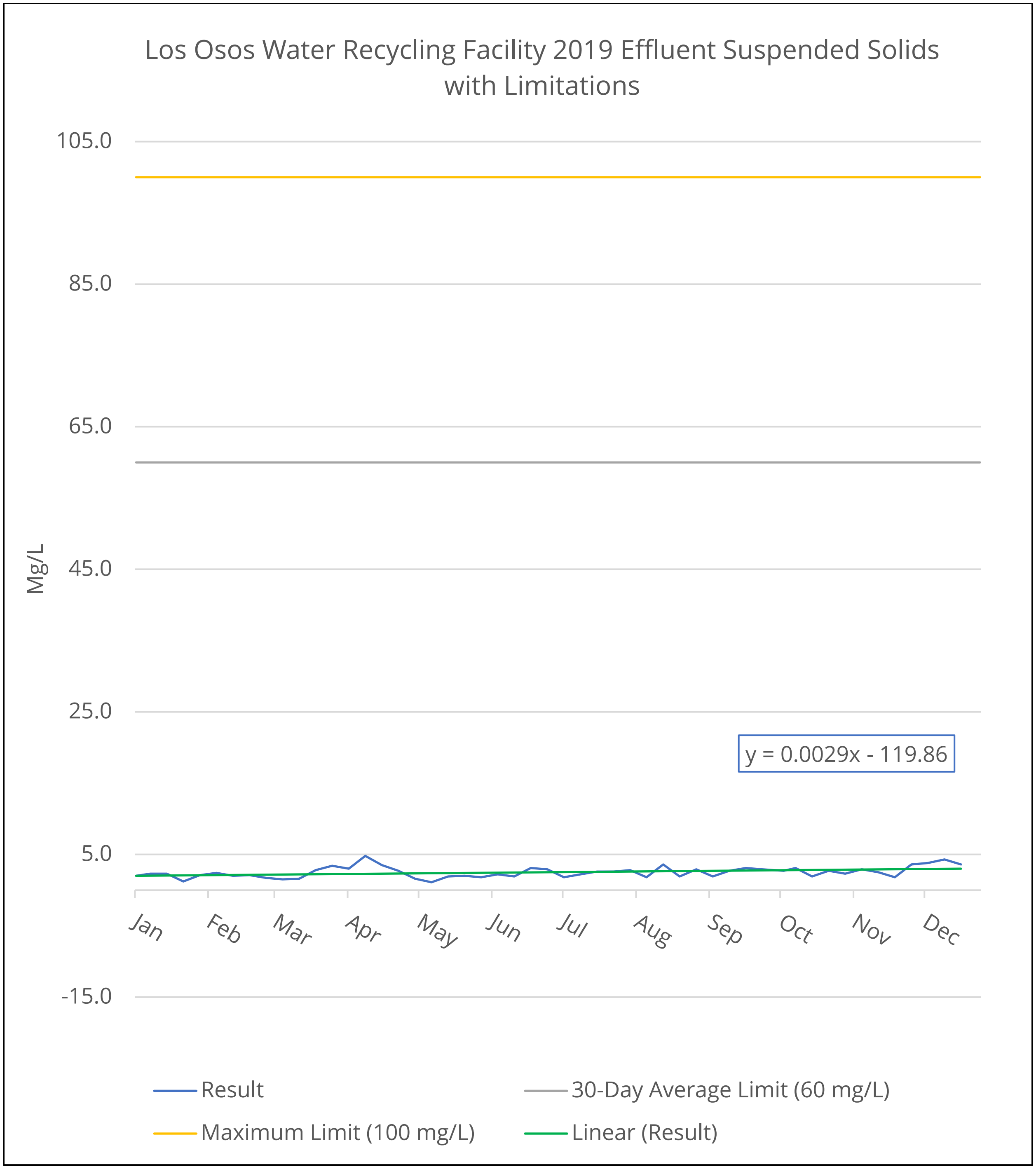
4) 2019 Daily and Monthly Average Effluent Flow (MGD)

2019 Daily and Monthly Average Effluent Flow (MGD)												
Day	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1	0.6359	0.6675	0.7090	0.7906	0.6962	0.6759	0.6758	0.6610	0.7426	0.7535	0.7399	0.7938
2	0.6770	0.8061	0.7780	0.8530	0.6874	0.7098	0.7229	0.7071	0.7524	0.6893	0.6660	0.7239
3	0.7085	0.7978	0.7802	0.6851	0.7323	0.7174	0.7511	0.6613	0.7327	0.7038	0.7280	0.7541
4	0.6206	0.8996	0.6526	0.7252	0.6995	0.6891	0.7109	0.6945	0.6663	0.7329	0.6990	0.7270
5	0.6778	0.7120	0.6732	0.8270	0.7335	0.7622	0.7410	0.6699	0.7173	0.7083	0.7825	0.7295
6	0.6851	0.6665	0.7500	0.7840	0.7076	0.7938	0.7111	0.7092	0.7393	0.7531	0.7091	0.7256
7	0.6385	0.6326	0.7068	0.8229	0.6844	0.8093	0.7305	0.6685	0.7166	0.6979	0.6994	0.7143
8	0.6787	0.6801	0.7444	0.7915	0.6838	0.6566	0.6987	0.6892	0.7520	0.7380	0.7594	0.7561
9	0.6940	0.7195	0.7488	0.7986	0.7268	0.6990	0.7244	0.7286	0.7079	0.7401	0.7286	0.7120
10	0.7338	0.7238	0.7548	0.7366	0.7229	0.7837	0.7174	0.7019	0.7656	0.6721	0.7501	0.7735
11	0.6514	0.6945	0.7915	0.7512	0.7234	0.6937	0.6764	0.7210	0.6790	0.7146	0.7248	0.6794
12	0.6555	0.5905	0.7138	0.7013	0.7350	0.6270	0.6870	0.7488	0.6939	0.6840	0.7945	0.6720
13	0.6966	0.6348	0.7070	0.7445	0.7159	0.6416	0.6457	0.6825	0.7222	0.7305	0.6755	0.7471
14	0.6644	0.7523	0.7367	0.7729	0.7633	0.7112	0.6693	0.7467	0.6994	0.6929	0.6972	0.7097
15	0.7088	0.7254	0.7965	0.7446	0.6410	0.6542	0.6485	0.7024	0.7463	0.7327	0.7225	0.7281
16	0.7440	0.7630	0.8143	0.6574	0.8552	0.6897	0.6670	0.7496	0.7046	0.6885	0.7127	0.7294
17	0.7883	0.7581	0.8457	0.9070	0.7849	0.6655	0.6191	0.7224	0.7210	0.6966	0.7434	0.7693
18	0.7113	0.7542	0.7931	0.7879	0.7201	0.7004	0.6565	0.7534	0.7106	0.8206	0.7369	0.7477
19	0.6939	0.6966	0.7930	0.7301	0.7489	0.6371	0.6909	0.7246	0.7017	0.7716	0.7076	0.7974
20	0.7017	0.6365	0.8673	0.7343	0.7615	0.6529	0.6451	0.7424	0.7525	0.8132	0.7047	0.8594
21	0.7246	0.6429	0.7893	0.7526	0.7172	0.6492	0.6740	0.6680	0.7791	0.7659	0.7466	0.7625
22	0.6965	0.6733	0.8240	0.7657	0.6709	0.6627	0.6512	0.6860	0.8241	0.8248	0.6913	0.8575
23	0.6546	0.7189	0.7946	0.6831	0.7357	0.6938	0.6824	0.7430	0.7733	0.8019	0.7245	0.8043
24	0.7012	0.7302	0.8280	0.6917	0.6977	0.7029	0.6708	0.7200	0.7760	0.7321	0.7289	0.8517
25	0.6232	0.6466	0.8324	0.7231	0.6832	0.7075	0.6242	0.7559	0.7985	0.7534	0.7556	0.7235
26	0.6878	0.6781	0.8821	0.6688	0.7008	0.6595	0.6870	0.6977	0.7778	0.6853	0.7336	0.7914
27	0.6899	0.6640	0.8413	0.7072	0.7286	0.6716	0.6408	0.7523	0.7953	0.7213	0.8175	0.8051
28	0.6568	0.6605	0.8391	0.7331	0.7213	0.6979	0.6688	0.7318	0.7654	0.7064	0.8225	0.7078
29	0.7135		0.7838	0.7081	0.6639	0.6664	0.6534	0.7206	0.8148	0.7958	0.7641	0.7408
30	0.6399		0.8130	0.7485	0.6449	0.6878	0.6980	0.7541	0.7810	0.7113	0.7477	0.7637
31	0.6398		0.8183		0.7235		0.6025	0.7297		0.7077		0.8232
Average Flow for the Month (MGD)	0.6837	0.7045	0.7807	0.7509	0.7165	0.6923	0.6788	0.7143	0.7436	0.7336	0.7338	0.7574
Monthly Minimum (MGD)	0.6206	0.5905	0.6526	0.6574	0.6410	0.6270	0.6025	0.6610	0.6663	0.6721	0.6660	0.6720
Monthly Maximum (MGD)	0.7883	0.8996	0.8821	0.9070	0.8552	0.8093	0.7511	0.7559	0.8241	0.8248	0.8225	0.8594
Total Recordings	31	28	31	30	31	30	31	31	30	31	30	31

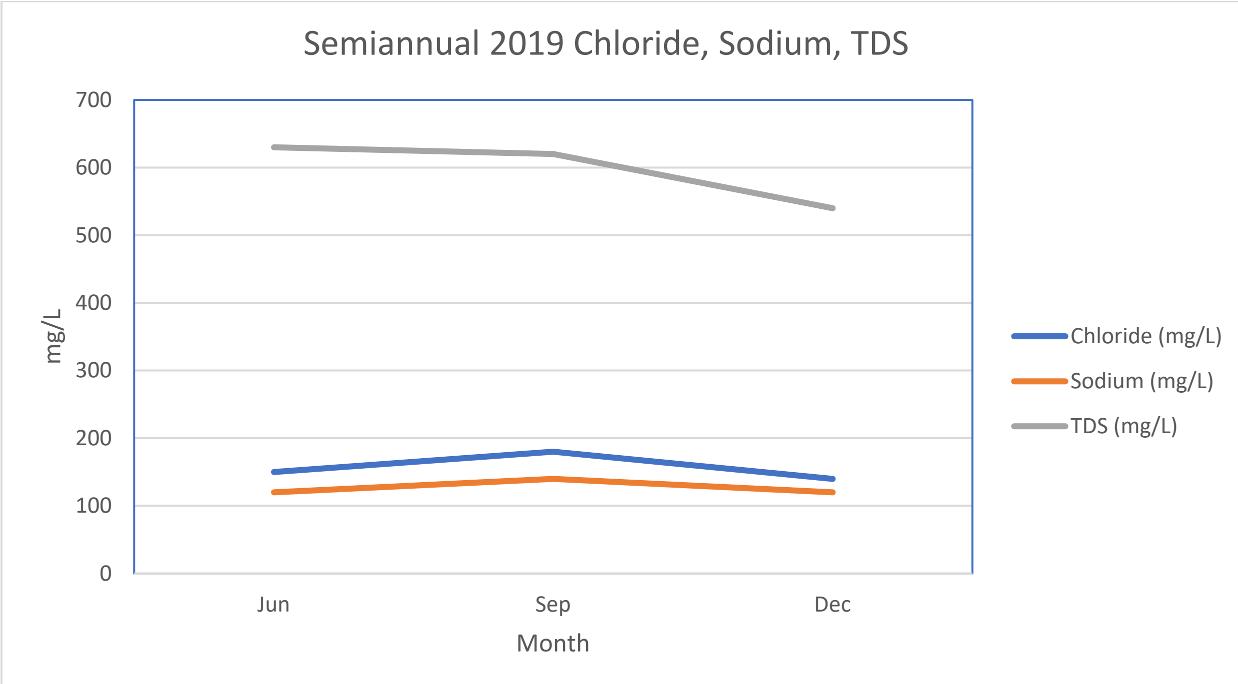

2019 Daily amd Monthly Effluent Flow (MGD)
MGD
0.93000
0.88000
0.83000
0.78000
0.73000
0.68000
0.63000
0.58000
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
24 Hour Flow
2019 Average Monthly Effluent Flow
Linear (24 Hour Flow)

5) 2019 Effluent Suspended Solids (mg/L) - 24 Hour Composite Sample

2019 Effluent Suspended Solids (mg/L) - 24 Hour Composite Sample												
Day	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1					3.5					2.9		
2	2.0						2.9					
3				2.8					9.3			3.6
4												
5						1.8					2.9	
6		2.1	2.1					2.8				3.8
7												
8					2.7							
9	2.3											
10							1.8		1.9			4.3
11				3.4						2.7		
12						2.2					2.5	
13		2.4	1.7					1.8				
14												
15					1.1					3.1		
16	1.9						2.2					
17									2.7			3.6
18				3.0								
19						1.9					1.8	
20		2.0	1.5					3.6				
21												
22					1.9					1.9		
23	2.3						2.6					
24				4.8					3.1			
25										2.7		
26						3.1					2.9	5.2
27		2.6	1.6					1.9				
28												
29					2.0					2.3		
30	1.2						2.6					5.6
31												
Monthly Average	1.9	2.3	1.7	3.5	2.2	2.3	2.4	2.5	4.3	2.6	2.5	4.4
Monthly Low	1.2	2.0	1.5	2.8	1.1	1.8	1.8	1.8	1.9	1.9	1.8	3.6
Monthly High	2.3	2.6	2.1	4.8	3.5	3.1	2.9	3.6	9.3	3.1	2.9	5.6
Total Recordings	5	4	4	4	5	4	5	4	4	6	4	6
Number of Times Exceeded Monthly 30-Day Average (>60)	0	0	0	0	0	0	0	0	0	0	0	0
Number of Times Exceeded Maximum (>100)	0	0	0	0	0	0	0	0	0	0	0	0


Los Osos Water Recycling Facility 2019 Effluent Suspended Solids with Limitations
105.0
85.0
65.0
45.0
25.0
5.0
-15.0
Mg/L
y = 0.0029x - 119.86
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Result
30-Day Average Limit (60 mg/L)
Maximum Limit (100 mg/L)
Linear (Result)

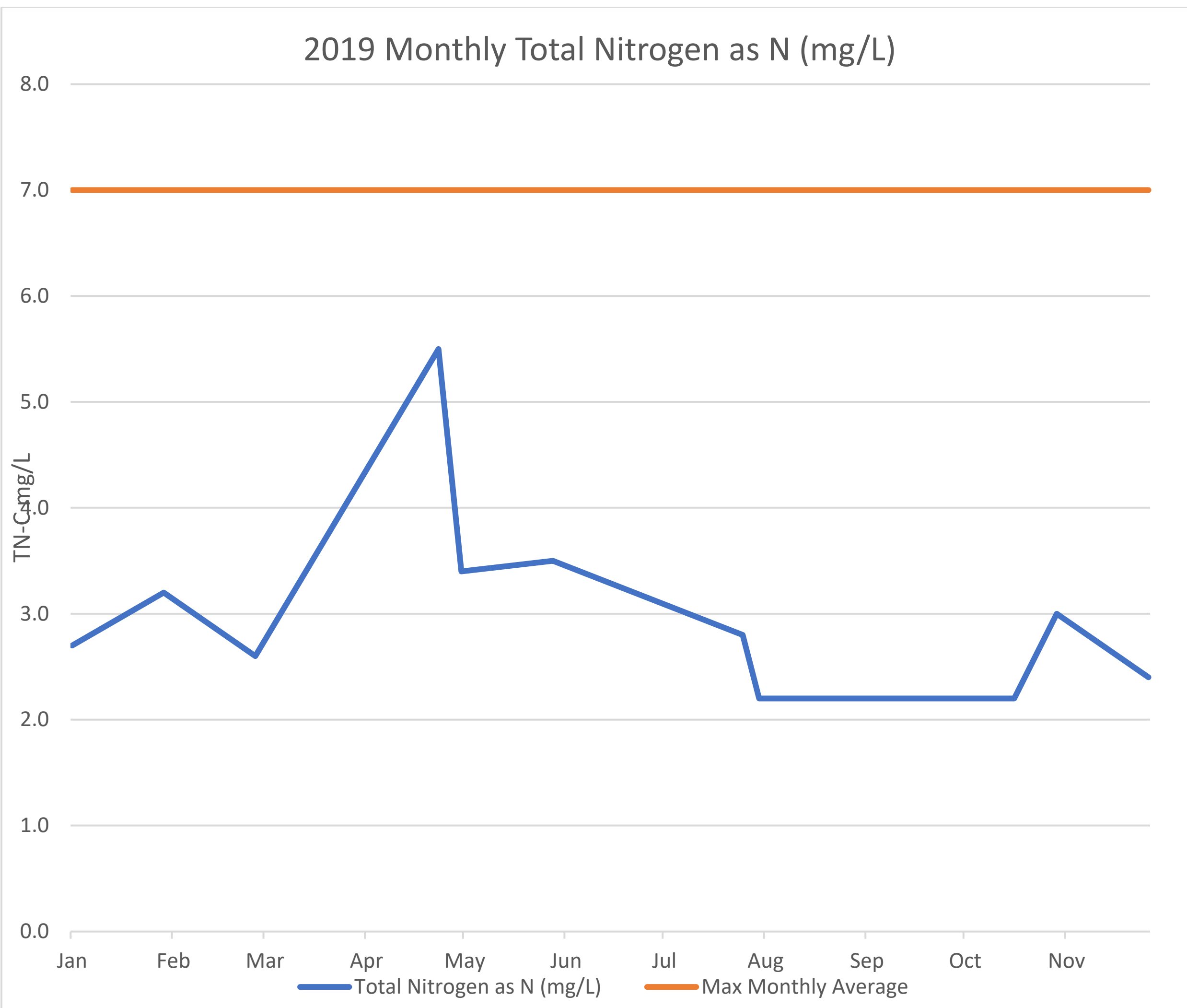
6) 2019 Semi-Annual Effluent Chloride, Sodium, and Total Dissolved Solids (mg/L)



2019 Semi Annual Effluent Chloride, Sodium, and Total Dissolved Solids (mg/L)			
Collected Date	**Chloride (mg/L)**	**Sodium (mg/L)**	**TDS (mg/L)**
Feb	140	NA	530
Jun	150	120	630
Sep	180	140	620
Dec	140	120	540

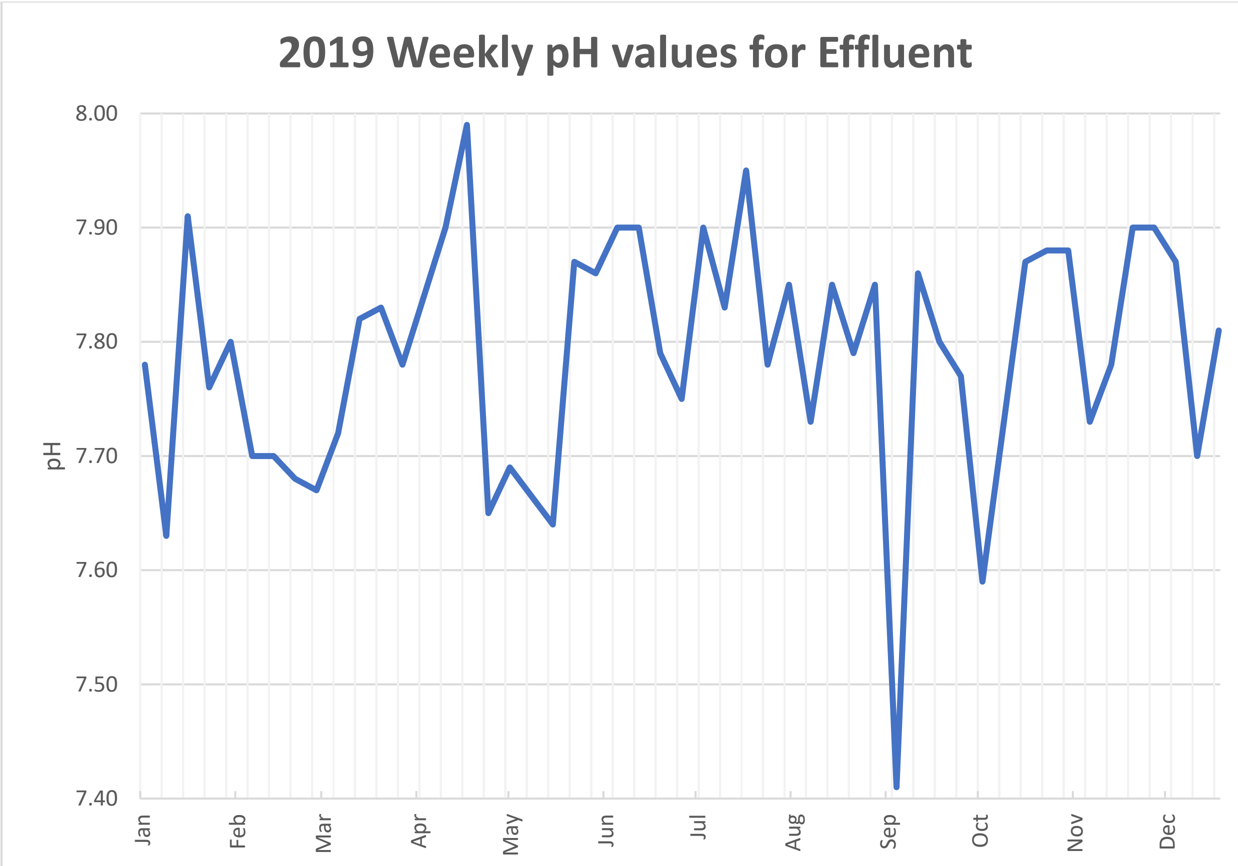
7) 2019 Effluent Monthly Total Nitrogen

Month	Total Nitrogen as N (mg/L)
Jan	2.7
Feb	3.2
Mar	2.6
Apr	5.5
May	3.4
Jun	3.5
Jul	2.8
Aug	2.2
Sep	2.2
Oct	2.2
Nov	3.0
Dec	2.4

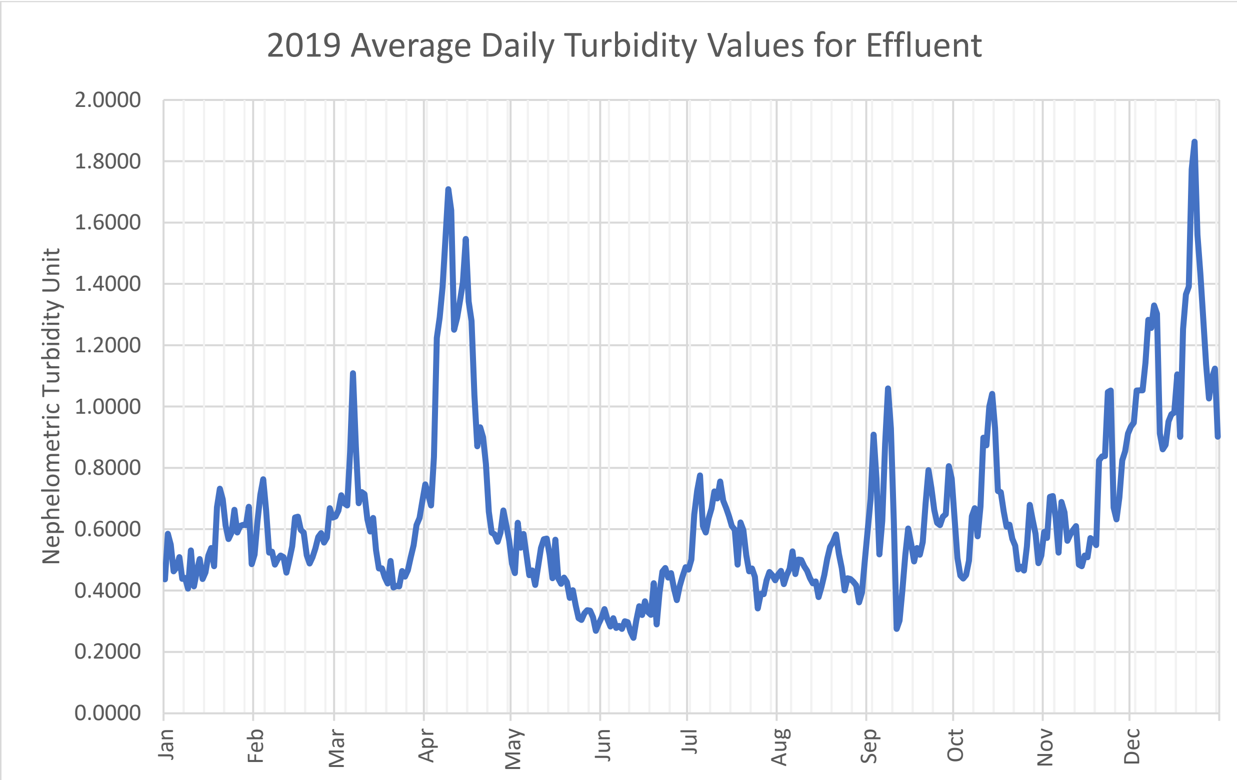


8) 2019 Weekly pH values for Effluent

2019 Effluent Weekly pH												
Day	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1					7.69							
2	7.78									7.59		
3							7.90					
4									7.41			7.78
5						7.90						
6		7.70	7.72								7.73	
7								7.73				
8												
9	7.63									7.73		
10				7.90			7.83					
11									7.86			7.70
12						7.90						
13		7.70	7.82								7.78	
14								7.85				
15					7.64							
16	7.91									7.87		
17				7.99			7.95					
18									7.80			7.81
19						7.79						
20		7.68	7.83								7.90	
21								7.79				
22					7.87							
23	7.76									7.88		
24				7.65			7.78					
25												
26						7.75			7.77			
27		7.67	7.78								7.90	
28								7.85				
29					7.86							
30	7.80									7.88		
31							7.85					
Monthly Average	7.78	7.69	7.79	7.85	7.77	7.84	7.86	7.81	7.71	7.79	7.83	7.76
Monthly Low	7.63	7.67	7.72	7.65	7.64	7.75	7.78	7.73	7.41	7.59	7.73	7.70
Monthly High	7.91	7.70	7.83	7.99	7.87	7.90	7.95	7.85	7.86	7.88	7.90	7.81
Total Recordings	5	4	4	3	4	4	5	4	4	5	4	3


2019 Weekly pH values for Effluent
pH
8.00
7.90
7.80
7.70
7.60
7.50
7.40
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

9) 2019 Average Daily Turbidity Values for Effluent



Appendix B

2019 Annual Groundwater Monitoring Report prepared for the Basin Management Committee

FINAL

LOS OSOS BASIN PLAN
GROUNDWATER MONITORING PROGRAM
2019 ANNUAL MONITORING REPORT

Prepared for the

BASIN MANAGEMENT COMMITTEE

June 2020

CLEATH-HARRIS GEOLOGISTS
75 Zaca Lane, Suite 110
San Luis Obispo, California 93401

TABLE OF CONTENTS

SECTION PAGE

EXECUTIVE SUMMARY 1
1. INTRODUCTION 8
2. BACKGROUND 9
2.1 Groundwater Monitoring History 9
2.2 LOBP Groundwater Monitoring Program Design 9
2.2.1 Water Level Monitoring 11
2.2.2 Groundwater Quality Monitoring 17
2.2.3 Monitoring Frequency 19
2.2.4 SGMA Activities 20
2.2.5 Additional Basin Studies 20
3. CONDUCT OF WORK 21
3.1 Services Provided 21
3.2 Field Methods 21
3.2.1 Elevation Datum 21
3.2.2 Water Level Monitoring Procedures 22
3.2.3 Groundwater Sampling Procedures 22
3.3 Monitoring Staff Affiliations 22
4. MONITORING RESULTS 23
4.1 Water Level Monitoring Results 23
4.2 Water Quality Results 30
4.2.1 Nitrate and Chloride Results 30
4.2.2 CEC Results 30
4.3 Geophysics 36
4.4 New Monitoring Well 36
5. GROUNDWATER PRODUCTION 36
6. PRECIPITATION AND STREAMFLOW 40
7. DATA INTERPRETATION 42
7.1 Water Level Contour Maps 43
7.2 Water Level Hydrographs 50
7.3 Seawater Intrusion 54

7.4 Groundwater in Storage 58
7.5 Basin Metrics 61
7.5.1 Basin Yield Metric 61
7.5.2 Basin Development Metric 62
7.5.3 Water Level, Chloride, and Nitrate Metrics 64
7.5.4 Upper Aquifer Water Level Profile 70
8. BASIN STATUS 73
9. RECOMMENDATIONS 74
10. ADAPTIVE MANAGEMENT PROGRAM AND STATUS OF LOBP PROGRAM IMPLEMENTATION 75
10.1 Basin Metrics 75
10.2 Adaptations to LOBP Programs 75
10.3 LOBP Programs 77
10.3.1 Groundwater Monitoring Program 78
10.3.2 Urban Water Use Efficiency Program 78
10.3.3 Urban Water Reinvestment Program 84
10.3.4 Basin Infrastructure Programs 85
10.3.5 Wellhead Protection Program 85
11. REFERENCES 89

List of Tables

Table ES-1 – Groundwater Production
Table ES-2 – LOBP Metric Summary
Table ES-3 – Basin Infrastructure Projects
Table 1 – Water Quality Monitoring Constituents
Table 2 – CEC Monitoring Constituents
Table 3 – Spring 2019 Water Levels - First Water
Table 4 – Spring 2019 Water Levels - Upper Aquifer
Table 5 – Spring 2019 Water Levels - Lower Aquifer
Table 6 – Fall 2019 Water Levels - First Water
Table 7 – Fall 2019 Water Levels - Upper Aquifer
Table 8 – Fall 2019 Water Levels - Lower Aquifer
Table 9 – Fall 2019 Water Quality Results - First Water and Upper Aquifer
Table 10 – Spring 2019 Water Quality Results - Lower Aquifer
Table 11 – Fall 2019 Water Quality Results - Lower Aquifer
Table 12 –CEC Monitoring Results
Table 13– Municipal Groundwater Production (2013-2019)
Table 14 – Basin Groundwater Production (2013-2019)
Table 15 – Active and Former Precipitation Stations
Table 16 – Maximum Stream Stage for Los Osos Creek, 2019 Water Year
Table 17 – Estimated Specific Yield Values
Table 18 – Groundwater in Storage Spring and Fall 2019 (<250 mg/L Chloride)
Table 19 – Change in Storage Spring 2018 to Spring 2019 (<250 mg/L Chloride)
Table 20 – 2019 Water Level Metric
Table 21 – 2019 Chloride Metric
Table 22 – 2019 Nitrate Metric
Table 23 – LOBP Metric Summary
Table 24 – Basin Groundwater Monitoring Program Status
Table 25 – Summary from Adopted 2012 County Water Conservation Plan
Table 26 – Summary of Conservation Rebates Provided through December 2019
Table 27 – BMC Water Conservation Measures
Table 28 – Updated County Water Conservation Proposed Rebate Program
Table 29 – Planned Recycled Water Uses in the Urban Water Reinvestment Program
Table 30 – Basin Infrastructure Projects

List of Figures

Figure 1 - Basin Location and Plan Areas
Figure 2 - Groundwater Monitoring Program - First Water Wells
Figure 3 - Groundwater Monitoring Program - Upper Aquifer Wells
Figure 4 - Groundwater Monitoring Program - Lower Aquifer Wells
Figure 5 - Basin Aquifers
Figure 6 - Basin Production (1971-2019) - Basin Total and Western Area
Figure 7 - Basin Production (1971-2019) - Central and Eastern Areas
Figure 8 - Cumulative Departure from Mean Rainfall at Morro Bay Fire Department
Figure 9 - Spring 2019 Water Level Contours - Perched Aquifer
Figure 10 - Spring 2019 Water Level Contours - Upper Aquifer and Alluvial Aquifer
Figure 11 - Spring 2019 Water Level Contours - Lower Aquifer
Figure 12 - Fall 2019 Water Level Contours - Perched Aquifer
Figure 13 - Fall 2019 Water Level Contours - Upper Aquifer and Alluvial Aquifer
Figure 14 - Fall 2019 Water Level Contours - Lower Aquifer
Figure 15 - Water Level Hydrographs - Perched Aquifer / First Water
Figure 16 - Water Level Hydrographs - Upper Aquifer
Figure 17 - Water Level Hydrographs - Lower Aquifer
Figure 18 - Seawater Intrusion Front - Western Area Lower Aquifer Zone D
Figure 19 - Basin Storage Compartments
Figure 20 - Basin Yield Metric Comparison
Figure 21 - Chloride and Water Level Metric
Figure 22 - Nitrate Metric
Figure 23 - Upper Aquifer Water Level Profile Orientation
Figure 24 - Upper Aquifer Water Level Profile

List of Appendices

Appendix A –Groundwater Monitoring History
Appendix B – Los Osos Basin Plan Groundwater Monitoring Program Well Information
Appendix C – Field Logs and Laboratory Analytical Reports for 2019 BMC Monitoring
Appendix D – Lupine Avenue Monitoring Well Documentation
Appendix E – Field Methods
Appendix F – Land Use and Water Use Areas
Appendix G – 2019 Agricultural Water Use Estimate
Appendix H – Precipitation and Streamflow Data
Appendix I – Transducer Hydrographs
Appendix J – Groundwater Storage Calculation Example and Specific Yield Estimates

EXECUTIVE SUMMARY

The Los Osos Basin Plan Groundwater Monitoring Program - 2019 Annual Report (Annual Report) describes activities related to the Los Osos Basin Plan (LOBP) Groundwater Monitoring Program, and provides results and interpretation of these activities in calendar year 2019. The LOBP Groundwater Monitoring Program is necessary to accomplish the following continuing goals set forth in Section 2.4 of the LOBP (ISJ Group, 2015):

1. Provide for a continuously updated hydrologic assessment of the Basin, its water resources and sustainable yield.

2. Create a water resource accounting which is able to meet the information needs for planning, monitoring, trading, environmental management, utility operations, land development and agricultural operations.

The LOBP Groundwater Monitoring Program is also necessary to support other goals of the LOBP, including prevention of seawater intrusion, establishing a long-term environmentally and economically sustainable and beneficial use of the Basin, and the equitable allocation of costs associated with Basin management.

Groundwater Production

Groundwater production for calendar year 2019 is summarized in Table ES-1 below. Purveyor production has decreased by three percent compared to 2018, while total Basin production has decreased by six percent compared to 2018.

Table ES-1. Groundwater Production

Description	2018 Production in Acre-Feet	2019 Production in Acre-Feet
Los Osos Community Services District	522	506
Golden State Water Company	464	454
S&T Mutual Water Company	32	31
Purveyor Subtotal	**1018**	**991**
Domestic wells	220	220
Community facilities	120	60
Agricultural wells	670	630
Total Estimated Production[1]	**2,030**	**1,900**

[1] Rounded to the nearest 10 acre-feet

Basin Status

The status of the Basin in terms of key parameters and metrics are listed below, along with the page reference for definitions and additional details on each key parameter:

> **Precipitation (p. 40)**. The Basin received above average rainfall in 2019. The drought condition for San Luis Obispo County ranged from moderate to severe drought conditions to no drought conditions during 2019 (NDMC/USDA/NOAA, 2019).
>
> **Seawater intrusion front (p. 54)**. The seawater intrusion front was repositioned closer to the coast based on adding a new monitoring well to the contouring data set, but is interpreted to have advanced inland between Fall 2018 and Fall 2019 (a deterioration).
>
> **Basin Yield Metric (p. 61)**. The Basin Yield Metric decreased between 2018 and 2019 (an improvement) and has met the LOBP goal for four consecutive years.
>
> **Water Level Metric (p. 64)**. The Water Level Metric decreased between Spring 2018 and Spring 2019 (a deterioration) and has not reached the target value.
>
> **Chloride Metric (p. 66)**. The Chloride Metric increased between Fall 2018 and Fall 2019 (a deterioration) and has not reached the target value.
>
> **Nitrate Metric (p. 67)**. The Nitrate Metric decreased between Winter 2018 and Winter 2019 (an improvement) but has not reached the target value.
>
> **Upper Aquifer Water Level Profile (p. 70)**. Water levels in the Upper Aquifer along the bay remain safely above the Protective Elevation.

The Chloride Metric is influenced by variations in pumping prior to sampling at metric well LA10, and a protocol for monitoring has been established to help standardize sampling conditions at that well. The decline in the Basin Water Level Metric is interpreted to be due to differences in the timing of measurements relative to seasonal fluctuations and the Spring high water level. Where continuous water level transducer data is available in the Central Area, Lower Aquifer water levels rose by two feet from Spring 2018 to Spring 2019. Recommendations for improving the quality and availability of data are contained in Section 9 of the Annual Report. The recommendations include developing a rating curve for the stream gage on Los Osos Creek, re-evaluating the Water Level Metric target following a wellhead survey, expanding the Lower Aquifer transducer network, and evaluating the feasibility of modifying up to four existing program wells for dedicated Zone E water quality monitoring.

LOBP Metrics

As described in Section 7.5 ("Basin Metrics") of this Annual Report, the LOBP established several metrics to measure nitrate impacts to the Upper Aquifer, seawater intrusion into the Lower Aquifer, and the effect of management efforts of the Basin Management Committee (BMC). These metrics allow the BMC, regulatory agencies, and the public to evaluate the status of nitrate levels and seawater intrusion, and the impact of implementation of the LOBP programs in the Basin through objective, numerical criteria that can be tracked over time. The status of key Basin metrics is summarized in Table ES-2.

Table ES-2. LOBP Metric Summary			
Metric	**LOBP Goal**	**Calculated Value from 2019 Data**	**Recommended Actions in Addition to LOBP Programs**
Basin Yield Metric	80 or less	69	Implement additional conservation measures to reduce indoor and outdoor demands (See Section 10.3.2)
Water Level Metric	8 feet above mean sea level or higher	1.8 feet above mean sea level	Implement additional conservation measures to reduce indoor and outdoor demands (See Section 10.3.2)
Chloride Metric	100 mg/L or lower	162 mg/L	Implement additional conservation measures to reduce indoor and outdoor demands (See Section 10.3.2)
Nitrate Metric	10 mg/L or lower	22 mg/L (NO_3-N)	None recommended

Adaptive Management Program

In addition to the programs described in the LOBP, the following additional measures are recommended in the context of adaptive management. Details regarding each program are provided in Section 10 of this Annual Report:

Potential Adaptation of Urban Water Use Efficiency Program. The BMC plans to evaluate the status and the effectiveness of the program throughout the year. The County has implemented a series of rebates as described in Section 10.

Development of Contingency Plan. The BMC plans to develop a contingency plan and related actions in the event Basin Metric trends fail to demonstrate progress toward LOBP goals, including defined schedules and milestones.

Lower Aquifer Nitrate Trends. The BMC will continue to monitor the leakage of groundwater with elevated nitrate concentrations from the Upper Aquifer through the regional aquitard into the Lower Aquifer. Trends of increasing nitrate concentrations at some Lower Aquifer community supply wells are projected to exceed State drinking water standards, possibly within the next 10 years, as reported in the 2019 Adaptive Management TM (CHG, 2019a). The BMC will address this issue as part of strategic planning.

Discussion and Development of Metrics for Future Growth. The BMC plans to provide input into the Los Osos Community Plan, including consideration of Basin Metrics and defined goals as they relate to the timing of future growth.

Additional Water Quality Metrics. The BMC intends to consider developing additional metrics and/or numerical goals as appropriate to protect the upper aquifer from water quality threats, such as seawater intrusion and chromium-6 contamination. An Upper Aquifer Water Level Profile was introduced in 2017, as described in Section 7.5 of this Annual Report.

LOBP Infrastructure Programs

The status of LOBP infrastructure programs is summarized Table ES- 3.

Table ES-3. Basin Infrastructure Projects

Project Name	Parties Involved	Funding Status	Capital Cost	Status
Program A				
Water Systems Interconnection	LOCSD/ GSWC	Fully Funded	LOCSD/GSWC $103,550	Completed
Upper Aquifer Well (8th Street)	LOCSD	Fully Funded	$250,000	Well was drilled and cased in December 2016. Budget remaining $250,000 to equip the well. Design is 100% complete and project has been included in an IRWM Grant Application. If awarded, funding is anticipated to be available in late 2020/early 2021.
South Bay Well Nitrate Removal	LOCSD			Completed
Palisades Well Modifications	LOCSD			Completed
Blending Project (Skyline Well)	GSWC	Fully Funded	$1.15 mil	Completed
Water Meters	S&T			Completed
Program B				
LOCSD Wells	LOCSD	Not Funded	BMP: $2.7 mil	Project not initiated
GSWC Wells	GSWC	Not Funded	BMP: $3.2 mil	Project not initiated
Community Nitrate Removal Facility	LOCSD/GSWC/S&T	GSWC Portion Funded	GSWC: $1.23 mil	GSWC's Program A Blending Project can be considered a first phase of the Program B Community Nitrate Removal Facility.

Project Name	Parties Involved	Funding Status	Capital Cost	Status
Program C				
Expansion Well No. 1 (Los Olivos)	GSWC	Fully Funded	$1.76 mil	Completed
Expansion Well No. 2	LOCSD is currently leading the project with potential GSWC and S&T involvement, depending on final location	LOCSD is currently leading the project with respect to funding	BMP: $2.0 mil	Property acquisition phase is on-going through efforts of LOCSD. Test hole at Site A (Los Osos Middle School) completed January 2020 and showed location was not suitable for Expansion Well. Alternative sites are being considered and plans for environmental review to identify preferred site are expected to begin in Q2 of 2020.
Expansion Well 3 and LOVR Water Main Upgrade	GSWC/LOCSD	Cooperative Funding	BMP: $1.6 mil	This project has been deferred under Adaptive Management.
LOVR Water Main Upgrade	GSWC	May be deferred	BMP: $1.53 mil	Project may not be required, depending on the pumping capacity of the drilled Program C wells. It may be deferred to Program D.
S&T/GSWC Interconnection	S&T/ GSWC	Pending	BMP: $30,000	In conceptual design

Project Name	Parties Involved	Funding Status	Capital Cost	Status
Program M				
New Zone D/E Lower Aquifer monitoring well in Cuesta by the Sea	All Parties	Funded through BMC Budget	$115,000	Completed
Program U				
Creek Discharge Program	All Parties	$50k included and approved in the CY 2019 BMC Budget	Anticipated cost of $582,000 through feasibility phase	The 2019 budget includes funding for Soil Aquifer Treatment evaluation in the amount of $50,000. BMC authorized completion of the Soil Aquifer Testing to support implementation of the Creek Discharge Program. These activities are currently on hold pending outcome of the CY 2020 BMC Budget discussion.
8th and El Moro Urban Storm Water Recovery Project	All Parties	$15k included in CY 2019 BMC Budget for initial study	NA	On hold, pending outcome of the CY 2020 BMC Budget discussion.

1. INTRODUCTION

The Los Osos Groundwater Basin (the Basin) was adjudicated in October 2015 (*Los Osos Community Services District v. Southern California Water Company [Golden State Water Company] et al.* (San Luis Obispo County Superior Court Case No. CV 040126) and is managed by the Los Osos Groundwater Basin Management Committee (BMC), consisting of representatives from Los Osos Community Services District (LOCSD), Golden State Water Company (GSWC), S&T Mutual Water Company (S&T), and the County of San Luis Obispo (County). This is the fifth Annual Report for the Basin.

The 2019 Annual Report (Annual Report) describes Basin activities related to the Los Osos Basin Plan (LOBP) Groundwater Monitoring Program and provides results and interpretation of these activities. The LOBP Groundwater Monitoring Program is necessary to accomplish the following continuing goals set forth in Section 2.4 of the LOBP (ISJ Group, 2015):

1. Provide for a continuously updated hydrologic assessment of the Basin, its water resources and sustainable yield.

2. Create a water resource accounting which is able to meet the information needs for planning, monitoring, trading, environmental management, utility operations, land development and agricultural operations.

The LOBP Groundwater Monitoring Program is also necessary to support other LOBP goals, including prevention of seawater intrusion, establishing a long-term environmentally and economically sustainable and beneficial use of the Basin, and the equitable allocation of costs associated with Basin management (ISJ Group, 2015). The program will provide significant overlap with several regulatory requirements, including:

- The Sustainable Groundwater Management Act (SGMA)

- California Statewide Groundwater Elevation Monitoring (CASGEM) Program

- State Water Resource Control Board's (SWRCB) salt and nutrient monitoring guidelines as adopted in the state Recycled Water Policy. The County Board of Supervisors adopted the Salt and Nutrient Management Plan (SNMP) for the Los Osos Groundwater Basin on January 23, 2018. The SNMP has been reviewed by the Regional Water Quality Control Board.

- Recycled Water Management Plan requirements for the Los Osos Water Recycling Facility (LOWRF)

This report was prepared by Cleath-Harris Geologists (CHG). Water Systems Consulting contributed to the Executive Summary and Section 10 (Adaptive Management).

2. BACKGROUND

In August 2008, the Superior Court of the State of California for the County of San Luis Obispo (Court) approved an Interlocutory Stipulated Judgment (ISJ) between LOCSD, GSWC, S&T, and the County. Under the ISJ, these Parties formed a working group, undertaking technical studies and management discussions that produced the LOBP in January 2015. The LOBP presents a comprehensive groundwater management strategy and serves as the cornerstone of a physical solution to address the significant problems facing the Basin, including seawater intrusion and elevated nitrate concentrations, and for restoration of Basin water resources, while respecting existing water rights. The LOBP Groundwater Monitoring Program is a key component of the LOBP, providing water level and water quality data that serve as measures of effectiveness for LOBP programs and activities with respect to the restoration of Basin water resources. A Stipulated Judgment was approved by the Court on October 14, 2015 and covers the plan areas shown in Figure 1.

In 2019, the Department of Water Resources (DWR) separated the Los Osos Valley groundwater basin (Bulletin 118 basin 3-08) into two jurisdictional subbasins, the Los Osos Area Subbasin and the Warden Creek Subbasin (DWR, 2019). The Los Osos Area Subbasin lies within the LOBP plan area and overlaps with the LOBP Basin, but does not replace or update the scientific boundary defined in the 2015 Basin adjudication (see Section 2.2.4 for details). A figure showing the DWR Los Osos Subbasin boundary and the LOBP Basin boundary is included in Appendix A.

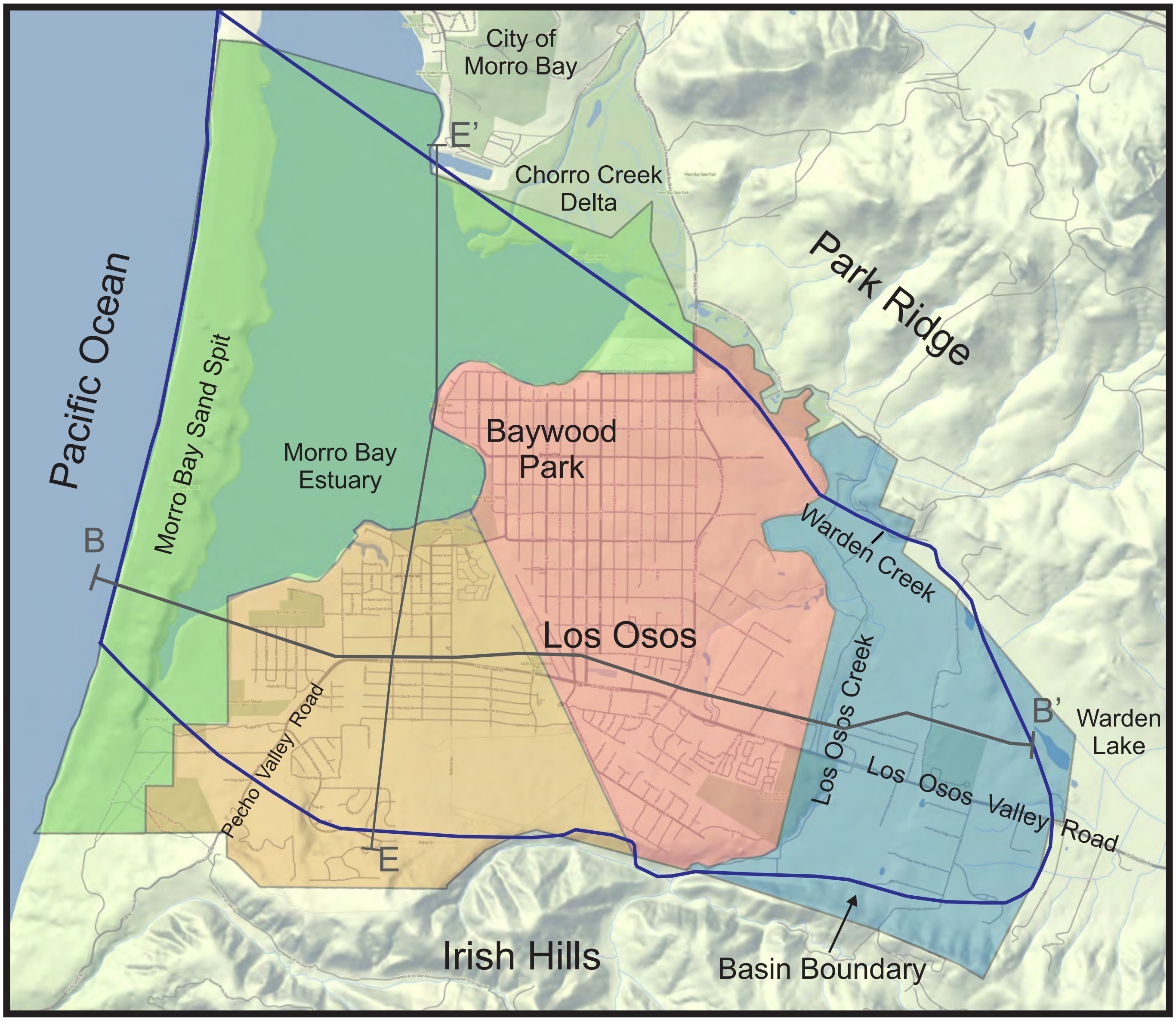
2.1 Groundwater Monitoring History

Groundwater monitoring has been performed by public agencies, water purveyors, and consultants for various Basin studies and programs over several decades. A list of historical investigations, monitoring reports, and monitoring programs with a major focus on Basin water levels and water quality through 2019 is included in Appendix A.

2.2 LOBP Groundwater Monitoring Program Design

The purpose of the LOBP Groundwater Monitoring Program is to collect and organize groundwater data on a regular basis for use in management of the Basin. Design of the LOBP Groundwater Monitoring Program is detailed in Section 7 of the LOBP. The basic elements of the program are as follows:

- Monitor long-term groundwater level trends in a network of wells for three monitoring groups within the Basin: First Water (FW), Upper Aquifer (UA), and Lower Aquifer (LA). These terms are defined in Section 2.2.1 below. The abbreviations are only used for network well numbering purposes (e.g. Lower Aquifer well 41 is LA41).



Base Image: Stamen-Terrain

0 2000 4000 6000 8000 ft

Scale: 1 inch ≈ 4,000 feet

Explanation

Basin Plan Areas:

Dunes and Bay Area

Western Area

Central Area

Eastern Area

Cross-section alignments (Figures 5, 19 and D4). Labeled B-B' and E-E' to be consistent with Basin Plan.

Basin Boundary from Los Osos Plan

Figure 1
Basin Location and Plan Areas
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

- Monitor seasonal fluctuations and long-term water quality trends at selected wells in each of the three monitoring groups.

- Compare hydrologic data pertinent to Basin management, including groundwater production from the two principal water supply aquifers (Upper Aquifer and Lower Aquifer), wastewater disposal and recycled water use, local precipitation data and County stream gage records for Los Osos Creek.

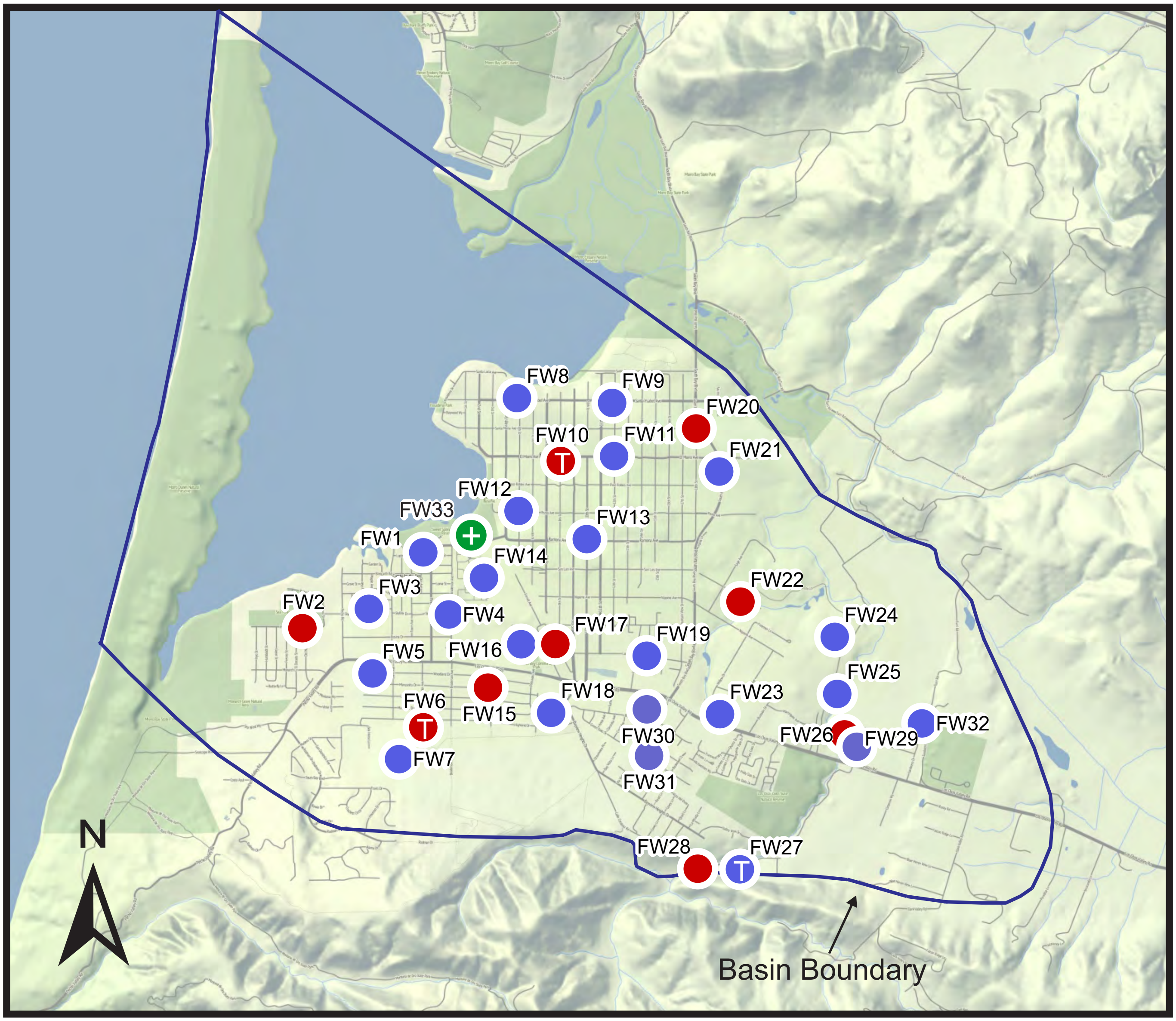
- Collect data sufficient to evaluate the effectiveness of Basin management strategies adopted in the LOBP via established metrics.

There were a total of 88 wells in the LOBP Groundwater Monitoring Program in 2018, including 38 BMC member agency monitoring wells, 17 municipal wells (active and inactive) and 33 private wells (CHG, 2017a). Four new wells were added to the program in 2019, for a total of 92 wells. Private well participation in the monitoring program during 2019 was 73 percent (25 out of 34 wells). "Private" wells refer to domestic wells, agricultural irrigation wells, and monitoring wells that are not controlled by BMC member agencies.

Existing groundwater monitoring wells were selected to achieve, to the degree possible, horizontal and vertical coverage throughout the Basin. The LOBP Groundwater Monitoring Program coverage within the Basin is shown in Figures 2, 3, and 4. Correlation between LOBP Groundwater Monitoring Program well numbers and state well numbers, along with well construction information and monitoring tasks are included in Appendix B. Construction of a Lower Aquifer monitoring well near the bay, as recommended in the LOBP, was approved in 2017 and completed in 2019. The nested monitoring well on Lupine Avenue monitors Lower Aquifer Zone D and Zone E (monitoring program wells LA41 and LA40, respectively). Access was also granted to monitor a private Zone C well near the bay (FW33). The fourth new well added to the monitoring network is the LOBP Program C well completed by GSWC and activated in 2017 (LA39).

2.2.1 Water Level Monitoring

Water level monitoring is a fundamental tool in characterizing Basin hydrology and is performed at LOBP Groundwater Monitoring Program locations. Groundwater elevations in wells are measures of hydraulic head in an aquifer. Groundwater moves in the direction of decreasing head, and groundwater elevation contours can be used to show the general direction and hydraulic gradient associated with groundwater movement. Changes in the amount of groundwater in storage within an aquifer can also be estimated based on changes in hydraulic head, along with other parameters. Seven of the monitoring network wells have been equipped with transducers to provide an efficient and high level of resolution for tracking dynamic changes in Basin groundwater levels (see Section 7.2).



Base Image: Stamen-Terrain

0 2000 4000 6000 8000 ft

Scale: 1 inch ≈ 4,000 feet

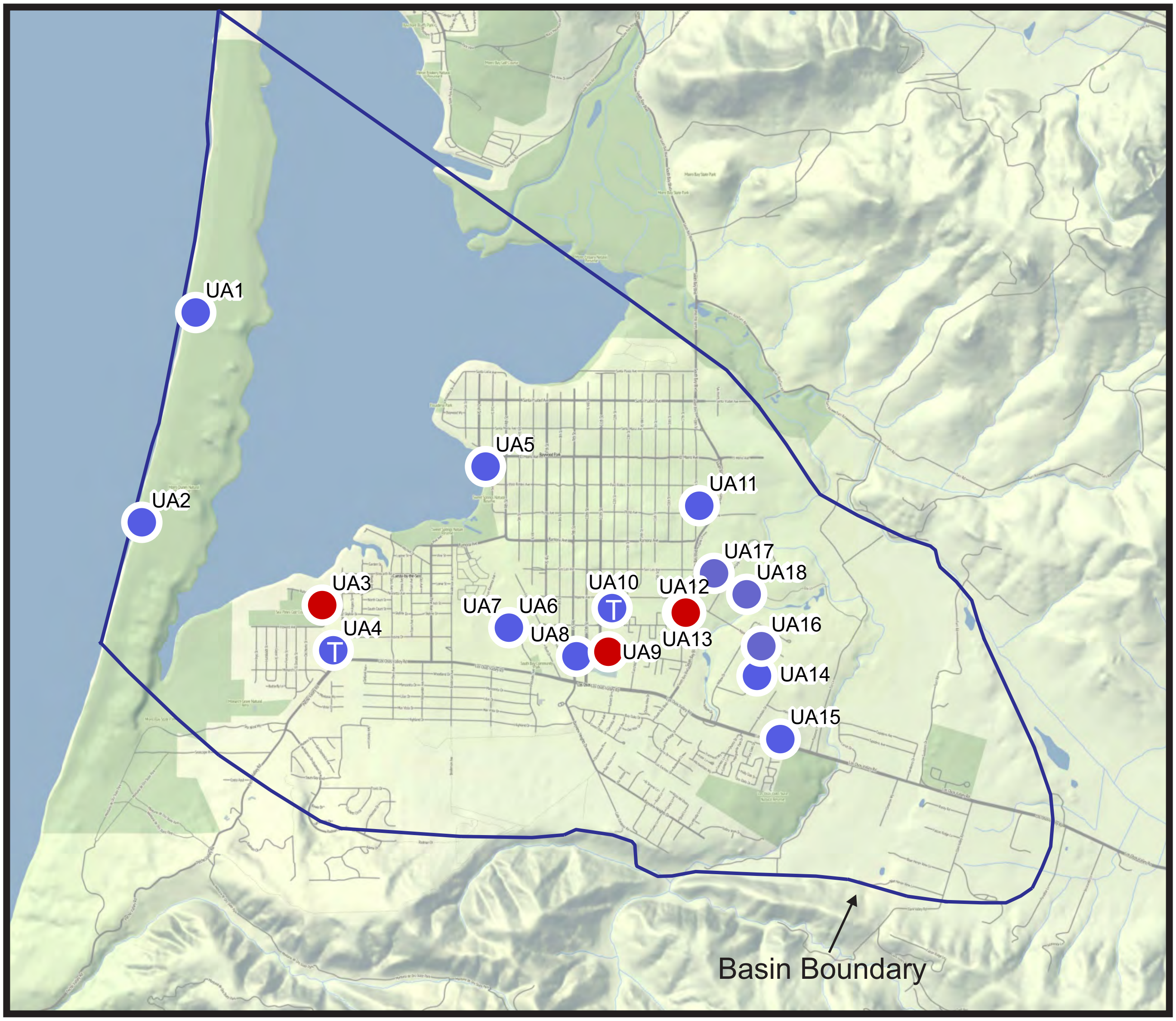
Explanation

- LOBP Water Level Monitoring Well
- Water Level Monitoring Well Addition (existing well)
- Water Level Transducer
- Water Level and Water Quality Monitoring Well
- Water Level Transducer and Water Quality Monitoring Well

Note: First Water wells refers to wells screened within the first 50 feet of saturated sediments across the basin, regardless of the aquifer.

Figure 2
Groundwater Monitoring Program
First Water Wells
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists



Base Image: Stamen-Terrain

0 2000 4000 6000 8000 ft

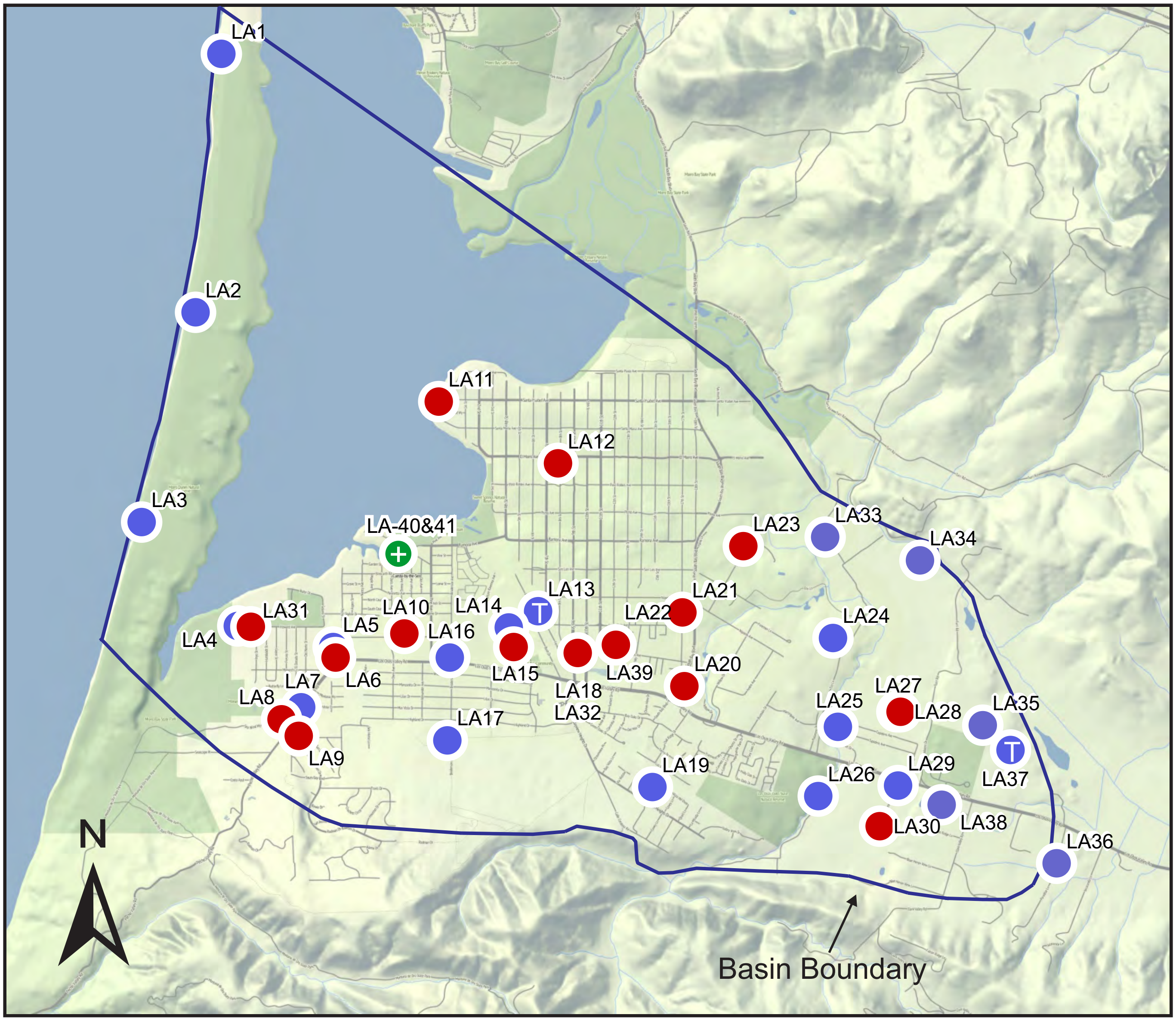
Scale: 1 inch ≈ 4,000 feet

Explanation

- LOBP Water Level Monitoring Well
- Water Level Monitoring Well Addition (existing well)
- Water Level Transducer
- Water Level and Water Quality Monitoring Well
- Water Level Transducer and Water Quality Monitoring Well

Figure 3
Groundwater Monitoring Program
Upper Aquifer Wells
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists



Base Image: Stamen-Terrain

0 2000 4000 6000 8000 ft

Scale: 1 inch ≈ 4,000 feet

Explanation

- LOBP Water Level Monitoring Well
- Water Level and Quality Monitoring Well Addition
- Water Level Transducer
- Water Level and Water Quality Monitoring Well
- Water Level Transducer and Water Quality Monitoring Well

Note: LA24 & FW24 and LA 40 & 41 are nested wells (same borehole)

LA18 and LA32 at same site (two symbols used in 2016 Annual Report figure to indicate LA32 was a program addition).

Figure 4
Groundwater Monitoring Program
Lower Aquifer Wells
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

Of the 92 wells currently in the LOBP Groundwater Monitoring Program, 33 are representative of First Water, 18 are representative of the Upper Aquifer, and 41 wells are representative of the Lower Aquifer. Spatially, five water level monitoring wells are located in the Dunes and Bay Area, 29 wells are located in the Western Area, 38 wells are located in the Central Area, and 20 wells are located in the Eastern Area.

First Water

The First Water group refers to wells screened within the first 50 feet of saturated sediments across the Basin, regardless of the aquifer (Figure 5). First Water is the interface where percolating waters, including precipitation and return flows from irrigation and wastewater, mix with Basin waters. This 50-foot thick interface occurs within unconfined sediments and generally rises and falls seasonally with water level fluctuations. Where First Water is close to ground surface, it also impacts drainage and is associated with flooding issues in low-lying areas. First Water extends across the Basin, and may be present in dune sands, Paso Robles Formation deposits, or Los Osos Creek alluvium (Figure 5). Selected First Water wells, including those in downtown Los Osos are used to represent the perched aquifer (Zones A and B), Zone C, and Alluvial Aquifer for water level contouring.

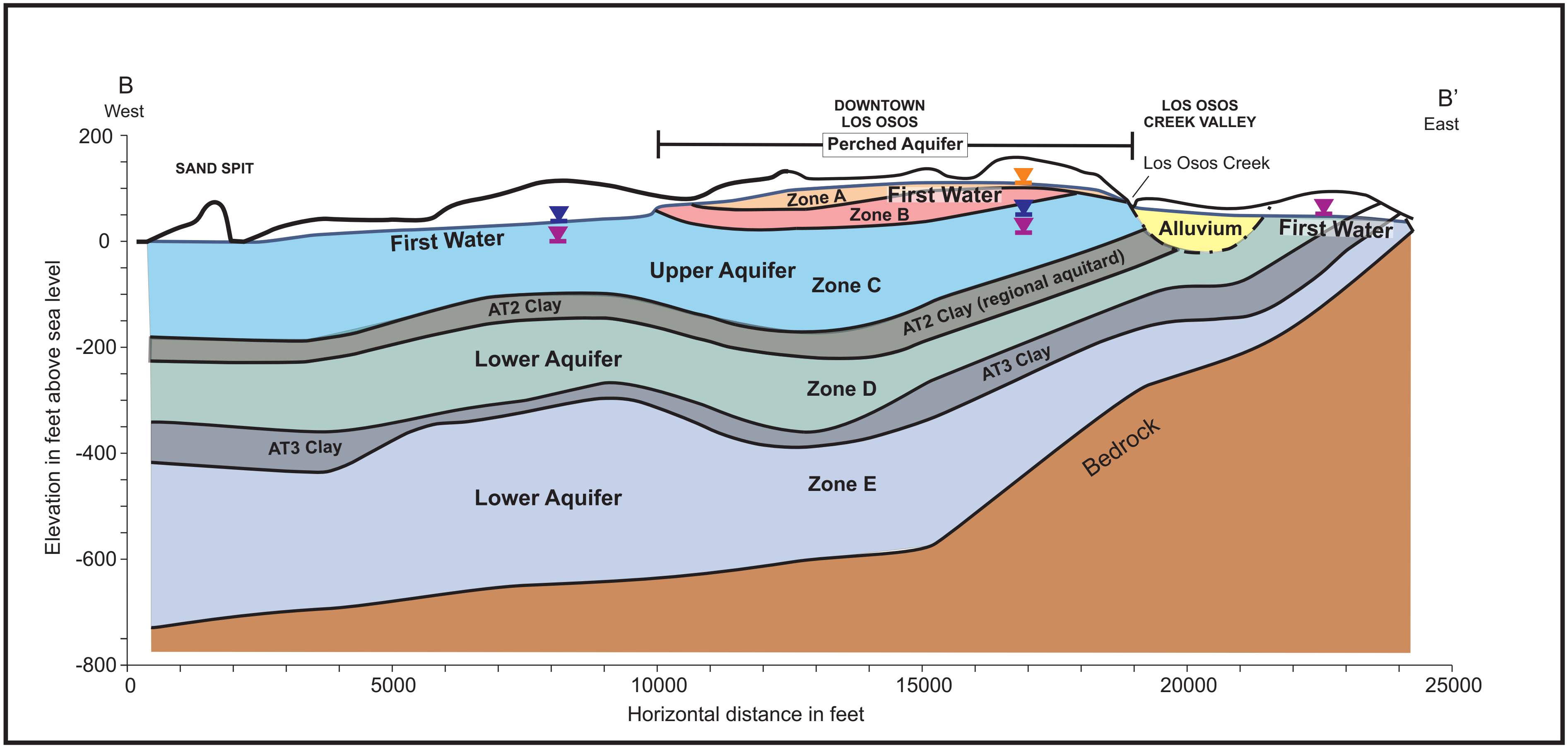
Upper Aquifer

The Upper Aquifer (Zone C) refers to the non-perched aquifer above the regional aquitard (Figure 5). As noted above, a portion of the Upper Aquifer may also be considered First Water in certain Basin areas. Historically, the Upper Aquifer was developed as the main water supply for the community and is still the main source of water for rural residential parcels. A significant increase in Upper Aquifer production is planned under infrastructure Program B. Monitoring the Upper Aquifer in the urban area (properties contained within the Urban Reserve Line as shown in Figure 10 of the LOBP) is important to both local purveyors and rural residential parcels.

Lower Aquifer

The Lower Aquifer refers to water bearing sediments below the regional aquitard. There are both Paso Robles Formation and Careaga Formation deposits in the Lower Aquifer. The base of the Lower Aquifer is claystone and sandstone bedrock, although the effective base of fresh water lies above bedrock at the western edge of the Basin. There are two generalized aquifer zones within the Lower Aquifer. Zone D lies between the regional aquitard (AT2 clay) and a deeper aquitard (AT3 clay). Zone E is below the AT3 clay (Figure 5).

Lower Aquifer Zone D is currently the main water supply source for the community. The seawater intrusion front corresponds to the position of the 250 mg/L chloride concentration isopleth, and has been advancing inland at increasing rates over time. A significant reduction in Lower Aquifer production, together with other LOBP programs, is necessary to halt, slow and/or reverse intrusion.



Cross-section alignment shown in Figure 1

Explanation

Perched Aquifer Water level

Upper Aquifer Water level

Lower Aquifer Water level

Figure 5
Basin Aquifers
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

2.2.2 Groundwater Quality Monitoring

Groundwater quality monitoring refers to the periodic collection and chemical or physical analysis of groundwater from wells. The analytical requirements are highly variable, depending on the purpose of monitoring. General minerals and nitrate are common water quality constituents of analysis for groundwater basin investigations. There are many other classes of water quality constituents of concern, however, such as volatile organic compounds, inorganic compounds (metals), petroleum hydrocarbons or emerging contaminants. Chromium-6 has also been a concern in several shallow wells as described in the 2015 Annual Groundwater Monitoring Report (CHG, 2015). Many water quality constituents are regulated and have drinking water standards.

Monitoring Constituents

Constituents of analysis for the LOBP Groundwater Monitoring Program have been selected to evaluate salt loading and associated nitrate impacts, seawater intrusion, and wastewater disposal. Table 1 lists the general mineral constituents, including nitrate, which will be monitored as part of the program, although additional constituents are quantified in the general mineral suite performed by the analytical laboratory (See Appendix C). Total Dissolved Solids (TDS) and specific conductance are standard measures for groundwater mineralization and salinity. Temperature and pH are parameters that are routinely measured during sampling to confirm that the groundwater samples represent the aquifer. Table 1 presents constituents to be tested in the wells designated for water quality monitoring, which are distributed laterally and vertically across the Basin (Figures 2, 3 and 4).

The Lower Aquifer (via wells LA4, LA14, and LA40) will also be monitored using down hole geophysics once every three years (natural gamma and induction logs) to provide a unique measure of seawater intrusion over time in one location within the Basin. Vertical movement of the freshwater-seawater interface has historically averaged two to three feet per year between 1985 and 2015 (CHG, 2015). The practical resolution of the methodology for measuring vertical interface movement is close to five feet, so a three-year monitoring frequency provides sufficient time to identify movement, based on the historical data. LA4 is located at Sea Pines Golf Course in the Western Area, LA14 is located at the north end of Palisades Avenue, and LA40 is on Lupine Avenue. Seawater is highly conductive, compared to fresh water, and an induction log performed in a borehole penetrating the fresh water/seawater interface shows the vertical transition from fresh water to seawater. The next scheduled induction logging will be performed in the Fall of 2021.

Table 1. Water Quality Monitoring Constituents[1]		
Constituent	**Reporting Limit**	**Units**
Specific Conductance	1.0	µS/cm
pH (field)	0.01	pH units
Temperature (field)	0.1	°F
TDS	20	mg/L
Carbonate Alkalinity	10	mg/L
Bicarbonate Alkalinity	10	mg/L
Total Alkalinity as $CaCO_3$	10	mg/L
Chloride	1.0	mg/L
Nitrate - Nitrogen	0.1	mg/L
Sulfate	2.0	mg/L
Boron	0.1	mg/L
Calcium	1.0	mg/L
Magnesium	1.0	mg/L
Potassium	1.0	mg/L
Sodium	1.0	mg/L

[1]From LOBP (ISJ Group, 2015)

Constituents of Emerging Concern

Monitoring Constituents of Emerging Concern (CECs) is a requirement of salt and nutrient management plans adopted pursuant to the SWRCB Recycled Water Policy (SWRCB, 2009). Such monitoring can measure potential dilution and soil-aquifer treatment of recycled water constituents, and travel time and movement of recycled water. As part of LOWRF operation, the County is also required by the Regional Water Quality Control Board Monitoring and Reporting Program (MRP) Order No. R3-2011-0001 to monitor recycled water for CECs on an annual basis.

The initial CECs to be monitored are listed in Table 2, and were selected based on the SWRCB Recycled Water Policy. There are three types of CECs, each of which has a different function. Health-based indicators directly monitor the presence of classes of constituents in groundwater, while performance-based and surrogate indicators measure the effectiveness of the wastewater treatment process. The list of CECs is not intended to be comprehensive, but meant to be representative. CECs may be added to (or removed from) the monitoring list once data has been collected and analyzed, subject to approval by the BMC.

Table 2. CEC Monitoring Constituents[1]			
Constituent or Parameter	**Type of Constituent**	**Type of Indicator**	**Reporting Limit (µg/L)**
17β-estradiol	Steroid Hormones	Health	0.001
Triclosan	Antimicrobial		0.050
Caffeine	Stimulant		0.050
NDMA (Nitroso-dimethylamine)	Disinfection Byproduct		0.002
Gemfibrozil	Pharmaceutical Residue	Performance	0.010
DEET (Diethyl-meta-toluamide)	Personal Care Product		0.050
Iopromide	Pharmaceutical Residue		0.050
Sucralose	Food additive		0.100
Ammonia	N/A	Surrogate	N/A
Nitrate-Nitrogen	N/A		N/A
Total Organic Carbon	N/A		N/A
UV Light Absorption	N/A		N/A
Specific Conductance	N/A		N/A

[1]From LOBP (ISJ Group, 2015)

2.2.3 Monitoring Frequency

Monitoring frequency is the time interval between data collection. Seasonal fluctuations relating to groundwater levels or quality are typically on quarterly or semi-annual cycles, correlating with seasonal precipitation, recharge, water levels, and often well production. The monitoring schedule for groundwater levels collected under the LOBP Groundwater Monitoring Program will coincide with seasonal water level fluctuations, with higher levels (i.e. elevations) in April (Spring) and lower levels in October (Fall). The LOWRF Groundwater Monitoring Program (First Water and Upper Aquifer groups) is conducted in June and December, although water levels at many of these wells are also measured under the LOBP program in April and October for use in water level contouring and groundwater storage calculations. A semi-annual monitoring frequency provides a measure of seasonal cycles, which can then be distinguishable from the long-term trends. At the transducer-monitored locations, water level measurements are recorded automatically on a daily basis and downloaded during the regular semi-annual water level monitoring events.

The monitoring frequency for water quality sampling and analyses performed under the LOBP Groundwater Monitoring Program will generally be once per year in October (Fall), when groundwater levels (i.e. elevations) are seasonally low and many water quality constituents have historically been at a higher concentration than their corresponding Spring measurement. Lower Aquifer groundwater monitoring will also be performed in April (Spring) as a means of tracking seawater intrusion in greater detail. The schedule for water quality testing performed under the LOWRF Groundwater Monitoring Program (First Water and Upper Aquifer) is in June and December.

2.2.4 SGMA Activities

SGMA took effect on January 1, 2015 and requires that certain actions be taken in groundwater basins designated as either high or medium priority by DWR, including the Basin. Until last year, DWR had identified the Los Osos Valley groundwater basin as a high priority basin subject to critical conditions of overdraft due to seawater intrusion and nitrate impairment (DWR, 2014, 2016, 2018a). The majority of SGMA requirements, however, including formation of a Groundwater Sustainability Agency (GSA) and development and implementation of a Groundwater Sustainability Plan, did not apply to the LOBP plan areas covered by the Stipulated Judgment, since this portion of the DWR Basin is adjudicated.

In order to comply with SGMA, the County formed the Los Osos Fringe Areas GSA to cover Basin areas between the 2016 Bulletin 118 Los Osos Valley Groundwater Basin boundaries (Basin 3-8) and the LOBP adjudicated area boundary, which were designated as "fringe areas". A Basin Boundary Modification Request (BBMR) was initiated in 2018 (DWR, 2018b). The Los Osos BBMR included scientific external and jurisdictional subdivision modifications intended to improve the community's ability to sustainably manage the Basin. The proposed boundary modifications would better align DWR's Bulletin 118 Basin boundary with current scientific data as well as existing management boundaries in the Basin.

In 2019, DWR published the final basin boundary modifications updating Bulletin 118 and reassessing groundwater basin prioritizations (DWR, 2019). The Los Osos Valley Groundwater Basin was separated into two jurisdictional subbasins, the Los Osos Area Subbasin (3-08.01) and the Warden Creek Subbasin (3-08.02). Both subbasins are designated as very low priority for SGMA. The Los Osos Area Subbasin, with the exception of minor fringe areas, lies within the LOBP plan area and overlaps with the LOBP Basin, but does not replace or update the scientific boundary defined in the 2015 Basin adjudication. A figure showing the DWR Los Osos Subbasin boundary and the LOBP Basin boundary is included in Appendix A.

2.2.5 Additional Basin Studies

Several additional Basin studies were authorized or completed in 2019, including:

- A study was completed that reviews LOBP metric trends and performs a Program C infrastructure evaluation (CHG, 2019b).

- A study was authorized and a draft completed in 2019 that reviews Lower Aquifer nitrate concentration trends and evaluates seawater intrusion at LA11 (CHG, 2019a).

- The Lower Aquifer nested monitoring well at Lupine Avenue was constructed and tested in 2019. Results are summarized in this Annual Report (Section 4.4).

- LOCSD, a BMC member, authorized a test hole at Program C expansion well Site A, with field work beginning in 2020. The test hole results indicated Site A is not suitable for a public supply well, and evaluations of alternative sites are in progress.

3. CONDUCT OF WORK

This Annual Report covers monitoring activities performed during the 2019 calendar year. While information from prior years is included in data presentation and interpretation, the conduct of work and detailed groundwater monitoring results are reported for 2019.

3.1 Services Provided

All 2019 groundwater monitoring data compiled for this report, unless described otherwise, comes from the following monitoring programs:

- San Luis Obispo County Public Works, Semi-Annual Water Level Monitoring Program: water level data.

- Purveyor water supply well monitoring: water level, water quality and production data.

- LOWRF Waste Discharge Order R3-2011-0001 Groundwater Monitoring Program (CCRWQCB, 2011): water level and water quality data.

- LOBP Groundwater Monitoring Program: water level and water quality data.

3.2 Field Methods

Groundwater level measurement and groundwater sampling are the primary field activities performed for the LOBP Groundwater Monitoring Program. Field activities include measuring and recording water levels in wells and collecting groundwater samples for laboratory analytical testing. The field methods approved for use in the LOBP Groundwater Monitoring Program are presented in Appendix E. These methods are recommended for services performed directly for the BMC and for other monitoring programs that contribute data to the LOBP Groundwater Monitoring Program.

3.2.1 Elevation Datum

The original survey for wells in the County's Semi-Annual Water Level Monitoring Program was likely based on the National Geodetic Vertical Datum of 1929 (NGVD 29), which has been replaced in land surveying practice by the North American Vertical Datum of 1988 (NAVD 88). Several wells were re-surveyed in 2003 and 2005 using NAVD 88, but there are still wells with elevations based on NGVD 29, along with wells with no known elevation survey. For the Annual Report, wellhead elevations reported in Table 3 through Table 8 are from the latest available survey or estimated from topographic maps (with datum given). For water level contouring and storage calculations, the NGVD 29 reference point elevation have been adjusted to NAVD 88 datum using a 2.8 feet upward shift, based on North American Vertical Datum Conversion (VERTCON) data reviewed for the Basin, as published by the National Geodetic Society. A review of all reference points by a licensed surveyor was scheduled for 2019 but not performed. When the surveyor review is completed, all data will be expressed in the current NAVD 88 standard, including the Water Level Metric (Section 7.5.3), which will allow direct comparison of all water elevation data and remove incorrect datum assumptions.

3.2.2 Water Level Monitoring Procedures

Groundwater level monitoring typically uses an electric sounder or steel tape. If the well is equipped and active, monitoring would take place when the pump is off, and the water level is relatively static. Seven monitoring network wells are currently equipped with a pressure transducer, allowing for automatic water level data collection between regular (manual) monitoring events. These devices are placed below the water surface in a well and record changes in pressure that occur in response to changes in the height of the water column above the transducer. Detailed water level monitoring procedures are included in Appendix E.

3.2.3 Groundwater Sampling Procedures

Groundwater sampling procedures ensure collection of a representative groundwater sample from an aquifer for water quality analysis. Unused or unequipped wells are purged of standing or stagnant water prior to sampling. Stabilization of field measurements for conductivity, pH, and temperature, along with minimum purge volumes, are included in the approved methods. Sampling procedures for general mineral and nitrate sampling (with additional procedures for wastewater indicator compounds) are presented in Appendix E.

3.3 Monitoring Staff Affiliations

Monitoring services that contributed data to the 2019 Annual Report were performed by staff or consultants affiliated with the following agencies:

- San Luis Obispo County Department of Public Works, Water Resources Division. County staff performed semi-annual water level monitoring, collected and maintained precipitation and stream gage records. Rincon Consultants performed semi-annual (June and December) water level monitoring and water quality sampling at selected private wells and monitoring wells for the LOWRF Groundwater Monitoring Program (data from this program is used in the LOBP Groundwater Monitoring Program).

- Los Osos Water Purveyors (LOCSD, GSWC, S&T). Water agency staff performed semi-annual water level monitoring and water quality sampling at municipal water supply wells.

- Los Osos BMC (LOCSD, GSWC, S&T, and County). CHG performed semi-annual (April and October) water level monitoring, water quality sampling at private wells, monitoring wells, and municipal supply wells for the LOBP Groundwater Monitoring Program.

4. MONITORING RESULTS

The results of groundwater monitoring activities performed in 2019 for the various Basin monitoring programs are summarized below. Overlap between the LOBP Groundwater Monitoring Program and other ongoing monitoring programs are shown in Appendix B. Laboratory analytical reports of groundwater samples collected for the LOWRF Groundwater Monitoring Program are contained in their respective June and December 2019 monitoring program reports (Rincon Consultants, 2019, 2020).

4.1 Water Level Monitoring Results

Tables 3 through 8 present the results of groundwater level measurements at LOBP Groundwater Monitoring Program wells, as reported by the various monitoring programs. Available water levels for wells labeled "private" are not reported herein, but those listed as measured have been used for aggregated water level contour maps. Private wells refer to domestic wells, agricultural irrigation wells, and monitoring wells that are not controlled by BMC member agencies.

Most of the Spring and Fall water levels were measured in April and October 2019, respectively, for the County Semi-Annual Water Level Monitoring Program and the LOBP Groundwater Monitoring Program. The LOWRF Groundwater Monitoring Program schedule moved from April to June and from October to December beginning in Fall 2016. For consistency with the LOBP Groundwater Monitoring Program, however, CHG also monitored water levels at selected LOWRF monitoring program wells in April and October 2019, rather than using the June and December 2019 LOWRF monitoring event values.

Table 3. Spring 2019 Water Levels - First Water					
Well ID	State Well Number	R. P. Elevation and Datum (feet)	Date	Water Level (feet)	
				Depth	Elevation
FW1	30S/10E-13A7	PRIVATE (not measured)			
FW2	30S/10E-13L8	32.63 [1]	4/4/2019	21.96	10.7
FW3	30S/10E-13G	50.95 [1]	4/4/2019	40.05	10.9
FW4	30S/10E-13H	49.33 [1]	4/4/2019	23.14	26.2
FW5	30S/10E-13Q2	101.27 [1]	4/4/2019	82.7	18.6
FW6	30S/10E-24A	193.04 [1]	4/5/2019	150.28	42.8
FW7	30S/10E-24Ab	Not measured (damaged)			
FW8	30S/11E-7L4	45.76 [1]	4/4/2019	36.91	8.9
FW9	30S/11E-7K3	90.71 [1]	4/4/2019	53.73	37.0
FW10	30S/11E-7Q1	25.29 [1]	4/5/2019	7.95	17.3
FW11	30S/11E-7R2	61.93 [1]	4/4/2019	23.03	38.9
FW12	30S/11E-18C2	34.55 [1]	4/4/2019	19.36	15.2
FW13	30S/11E-18B2	79.89 [1]	4/4/2019	20.89	59.0
FW14	30S/11E-18E1	PRIVATE (not measured - destroyed)			
FW15	30S/11E-18N2	125.53 [1]	4/4/2019	80.76	44.8
FW16	30S/11E-18L11	88.02 [1]	4/4/2019	45.68	42.3
FW17	30S/11E-18L12	103.85 [1]	4/4/2019	20.39	83.5
FW18	30S/11E-18P	150 [2]	4/3/2019	24.36	125.6
FW19	30S/11E-18J7	125.74 [1]	4/4/2019	23.79	102.0
FW20	30S/11E-8Mb	95 [2]	4/4/2019	45.00	50
FW21	30S/11E-8N4	95.99[1]	4/4/2019	39.00	57.0
FW22	30S/11E-17F4	PRIVATE (measured)			
FW23	30S/11E-17N4	PRIVATE (measured)			
FW24	30S/11E-17J2	PRIVATE (measured)			
FW25	30S/11E-17R1	PRIVATE (not measured)			
FW26	30S/11E-20A2	PRIVATE (measured)			
FW27	30S/11E-20L1	PRIVATE (measured)			
FW28	30S/11E-20M2	PRIVATE (measured)			
FW29	30S/11E-20A1	PRIVATE (measured)			
FW30	30S/11E-18R1	PRIVATE (measured)			
FW31	30S/11E-19A	213 [2]	4/5/2019	27.95	185.1
FW32	30S/11E-21D14	PRIVATE (measured)			
FW33+	30S/11E-18D1S	PRIVATE (measured)			

NOTES: 1 NAVD88 elevation as reported by licensed land surveyor
2 estimated elevation (NAVD 88)

Table 4. Spring 2019 Water Levels - Upper Aquifer					
Well ID	**State Well Number**	**R. P. Elevation and Datum (feet)**	**Date**	**Water Level (feet)**	
				Depth	**Elevation**
UA1	30S/10E-11A1[4]	16.01 [1]	2/21/2019	10.5	5.5
UA2	30S/10E-14B1[4]	23.90 [1]	2/21/2019	19.12	4.7
UA3	30S/10E-13F4	19 [2]	4/11/2019	9.3	9.7
UA4	30S/10E-13L1	38.68 [3]	4/5/2019	30.2	8.5
UA5	30S/11E-7N1	9.13 [3]	4/12/2019	4.2	4.9
UA6	30S/11E-18L8	79.18 [1]	3/25/2019	55.68	23.5
UA7	30S/11E-18L7	79.16 [1]	3/25/2019	63.76	15.4
UA8	30S/11E-18K7	135.65 [3]	4/10/2019	117.71	17.9
UA9	30S/11E-18K3	121.18 [3]	4/8/2019	111	10.2
UA10	30S/11E-18H1	107.10 [3]	4/5/2019	91.53	15.6
UA11	30S/11E-17D	PRIVATE (not measured)			
UA12	30S/11E-17E9	105.85 [3]	4/10/2019	85.2	20.7
UA13	30S/11E-17E10	106[2]	4/12/2019	87.9	18.1
UA14	30S/11E-17P4	PRIVATE (not measured)			
UA15	30S/11E-20B7	PRIVATE (not measured)			
UA16	30S/11E-17L4	PRIVATE (measured)			
UA17	30S/11E-17E1	PRIVATE (measured)			
UA18	30S/11E-17F2	PRIVATE (not measured)			

NOTES:
1 NAVD88 elevation as reported by licensed land surveyor
2 estimated elevation (assume NAVD 88)
3 reported elevation by County (datum unknown, likely NGVD 29)
4 measured in February (Winter)
All NGVD 29 elevations are converted to NAVD 88 prior to contouring

Table 5. Spring 2019 Water Levels - Lower Aquifer					
Well ID	State Well Number	R. P. Elevation and Datum (feet)	Date	Water Level (feet)	
				Depth	Elevation
LA1	30S/10E-2A1[4]	23.13 [1]	2/21/2019	16.03	7.1
LA2	30S/10E-11A2[4]	16.07 [1]	2/21/2019	11.7	4.4
LA3	30S/10E-14B2[4]	23.89 [1]	2/21/2019	21.9	2.0
LA4	30S/10E-13M1	41.20 [3]	4/3/2019	43.46	-2.3
LA5	30S/10E-13L7	37 [2]	4/26/2019	31.7	5.3
LA6	30S/10E-13L4	68 [2]	4/25/2019	64	4.0
LA7	30S/10E-13P2	PRIVATE (not measured)			
LA8	30S/10E-13N	138.50 [2]	4/3/2019	133.5	5.0
LA9	30S/10E-24C1	178.32 [3]	4/11/2019	172.1	6.2
LA10	30S/10E-13J1	95.31 [3]	4/11/2019	94	1.3
LA11	30S/10E-12J1	8.43 [1]	4/9/2019	5.34	3.1
LA12	30S/11E-7Q3	24.30 [3]	4/12/2019	36.2	-11.9
LA13	30S/11E-18F2	100 [3]	4/5/2019	101.14	-1.1
LA14	30S/11E-18L6	79.36 [1]	3/25/2019	75.95	3.4
LA15	30S/11E-18L2	85 [2]	4/12/2019	105.8	-20.8
LA16	30S/11E-18M1	106.82 [3]	3/25/2019	99.6	7.2
LA17	30S/11E-24A2	210.40 [3]	3/26/2019	169.02	41.4
LA18	30S/11E-18K8	135.74 [3]	4/10/2019	134.5	1.2
LA19	30S/11E-19H2	256.20 [3]	3/26/2019	265.81	-9.6
LA20	30S/11E-17N10	140 [2]	4/12/2019	145	-5.0
LA21	30S/11E-17E7	105.85 [3]	3/22/2019	105.6	0.3
LA22	30S/11E-17E8	105.85 [3]	3/22/2019	96.8	9.1
LA23 to LA30		PRIVATE (measured LA 24 - LA30, LA 23 not measured)			
LA31	30S/10E-13M2	(Mixed aquifer - used for water quality only)			
LA32	30S/11E-18K9	(Mixed aquifer - used for water quality only)			
LA33	30S/11E-17A1	PRIVATE (measured)			
LA34	30S/11E-8F	26.15 [1]	4/22/2019	3.81	22.3
LA35	30S/11E-21Bb	86.8[1]	4/5/2019	63	23.8
LA36	30S/11E-21Ja	PRIVATE (measured)			
LA37	30S/11E-21B1	81.4[2]	4/5/2019	57.66	23.7
LA38	30S/11E-21E	PRIVATE (measured)			
LA39+	30S/11E-18K	121.7[2]	4/11/2019	138.5	-16.8

NOTES: 1 NAVD88 elevation as reported by licensed land surveyor

2 estimated elevation (assume NAVD 88)

3 reported elevation by County (datum unknown, likely NGVD 29)

4 measured in February (Winter)

All NGVD 29 elevations are converted to NAVD 88 prior to contouring

\+ added for current reporting year

Table 6. Fall 2019 Water Levels - First Water					
Well ID	State Well Number	R. P. Elevation and Datum (feet)	Date	Water Level (feet)	
				Depth	Elevation
FW1	30S/10E-13A7	PRIVATE (not measured)			
FW2	30S/10E-13L8	32.63 [1]	10/3/2019	22.02	10.6
FW3	30S/10E-13G	50.95 [1]	10/3/2019	40.22	10.7
FW4	30S/10E-13H	49.33 [1]	10/3/2019	25.2	24.1
FW5	30S/10E-13Q2	101.27 [1]	10/16/2019	81.87	19.4
FW6	30S/10E-24A	193.04 [1]	10/4/2019	147.56	45.5
FW7	30S/10E-24Ab	Not measured (damaged)			
FW8	30S/11E-7L4	45.76 [1]	10/4/2019	37.95	7.8
FW9	30S/11E-7K3	90.71 [1]	10/2/2019	54.56	36.2
FW10	30S/11E-7Q1	25.29 [1]	10/4/2019	9.2	16.1
FW11	30S/11E-7R2	61.93 [1]	10/2/2019	24.51	37.4
FW12	30S/11E-18C2	34.55 [1]	10/4/2019	20.25	14.3
FW13	30S/11E-18B2	79.89 [1]	10/4/2019	22.98	56.9
FW14	30S/11E-18E1	PRIVATE (not measured - destroyed)			
FW15	30S/11E-18N2	125.53 [1]	10/3/2019	78.85	46.7
FW16	30S/11E-18L11	88.02 [1]	10/3/2019	45.01	43.0
FW17	30S/11E-18L12	103.85 [1]	10/3/2019	22.2	81.7
FW18	30S/11E-18P	150 [2]	10/4/2019	25.85	124.2
FW19	30S/11E-18J7	125.74 [1]	10/3/2019	25.88	99.9
FW20	30S/11E-8Mb	95 [2]	10/2/2019	45.87	49.1
FW21	30S/11E-8N4	95.99 [1]	10/2/2019	40.05	55.9
FW22	30S/11E-17F4	PRIVATE (measured)			
FW23	30S/11E-17N4	PRIVATE (measured)			
FW24	30S/11E-17J2	PRIVATE (measured)			
FW25	30S/11E-17R1	PRIVATE (not measured)			
FW26	30S/11E-20A2	PRIVATE (measured)			
FW27	30S/11E-20L1	PRIVATE (measured)			
FW28	30S/11E-20M2	PRIVATE (measured)			
FW29	30S/11E-20A1	PRIVATE (measured)			
FW30	30S/11E-18R1	PRIVATE (measured)			
FW31	30S/11E-19A	213 [2]	10/4/2019	26.8	186.2
FW32	30S/11E-21D14	PRIVATE (measured)			
FW33+	30S/11E-18D1S	PRIVATE (measured)			

NOTES: 1 NAVD88 elevation as reported by licensed land surveyor

2 estimated elevation (NAVD 88)

+ added for current reporting year

Table 7. Fall 2019 Water Levels - Upper Aquifer					
Well ID	State Well Number	R. P. Elevation and Datum (feet)	Date	Water Level (feet)	
				Depth	Elevation
UA1	30S/10E-11A1	16.01 [1]	10/31/2019	12.7	3.3
UA2	30S/10E-14B1	23.9 [1]	10/31/2019	19.9	4.0
UA3	30S/10E-13F4	19 [2]	10/1/2019	10	9
UA4	30S/10E-13L1	38.68 [3]	10/4/2019	30.34	8.3
UA5	30S/11E-7N1	9.1 [2]	10/11/2019	3.7	5.4
UA6	30S/11E-18L8	79.18 [1]	10/1/2019	56.4	22.8
UA7	30S/11E-18L7	79.16 [1]	10/1/2019	65.8	13.4
UA8	30S/11E-18K7	135.65 [3]	10/9/2019	122.25	13.4
UA9	30S/11E-18K3	121.18 [3]	10/1/2019	115	6.2
UA10	30S/11E-18H1	107.10 [3]	10/4/2019	95.04	12.1
UA11	30S/11E-17D	PRIVATE (not measured)			
UA12	30S/11E-17E9	105.85 [3]	10/9/2019	92.84	13.0
UA13	30S/11E-17E10	106 [2]	10/11/2019	94.3	11.7
UA14	30S/11E-17P4	PRIVATE (not measured)			
UA15	30S/11E-20B7	PRIVATE (not measured)			
UA16	30S/11E-17L4	PRIVATE (measured)			
UA17	30S/11E-17E1	PRIVATE (measured)			
UA18	30S/11E-17F2	PRIVATE (not measured)			

NOTES:
1 NAVD88 elevation as reported by licensed land surveyor
2 estimated elevation (assume NAVD 88)
3 reported elevation by County (datum unknown, likely NGVD 29)
All NGVD 29 elevations are converted to the NAVD 88 prior to contouring.

Table 8. Fall 2019 Water Levels - Lower Aquifer

Well ID	State Well Number	R. P. Elevation and Datum (feet)	Date	Water Level (feet)	
				Depth	Elevation
LA1	30S/10E-2A1	23.13 [1]	10/31/2019	15.65	7.5
LA2	30S/10E-11A2	16.07 [1]	10/31/2019	11.45	4.6
LA3	30S/10E-14B2	23.89 [1]	10/31/2019	21.79	2.1
LA4	30S/10E-13M1	41.20 [3]	10/3/2019	44.35	-3.2
LA5	30S/10E-13L7	37 [2]	10/17/2019	31.7	5.3
LA6	30S/10E-13L4	68 [2]	11/15/2019	64.5	3.5
LA7	30S/10E-13P2	PRIVATE (not measured)			
LA8	30S/10E-13N	138.50 [2]	10/17/2019	133.9	4.6
LA9	30S/10E-24C1	178.32 [3]	9/23/2019	175	3.3
LA10	30S/10E-13J1	95.31 [3]	10/1/2019	93	2.3
LA11	30S/10E-12J1	8.43 [1]	10/2/2019	6.93	1.5
LA12	30S/11E-7Q3	24.30 [3]	10/11/2019	35.7	-11.4
LA13	30S/11E-18F2	100 [3]	10/4/2019	106.32	-6.3
LA14	30S/11E-18L6	79.36 [1]	10/1/2019	79.8	-0.4
LA15	30S/11E-18L2	85 [2]	10/11/2019	98.1	-13.1
LA16	30S/11E-18M1	106.82 [3]	10/1/2019	100.6	6.2
LA17	30S/11E-24A2	210.40 [3]	10/3/2019	201	9.4
LA18	30S/11E-18K8	135.74 [3]	10/9/2019	139.12	-3.4
LA19	30S/11E-19H2	256.20 [3]	10/2/2019	266.9	-10.7
LA20	30S/11E-17N10	140 [2]	10/1/2019	169	-29
LA21	30S/11E-17E7	105.85 [3]	10/2/2019	115.8	-10.0
LA22	30S/11E-17E8	105.85 [3]	10/2/2019	125.6	-19.8
LA23 to LA30		PRIVATE (measured LA 24 - LA30, LA 23 not measured)			
LA31	30S/10E-13M2	(Mixed aquifer - used for water quality only)			
LA32	30S/11E-18K9	(Mixed aquifer - used for water quality only)			
LA33	30S/11E-17A1	PRIVATE (measured)			
LA34	30S/11E-8F	26.15 [1]	10/1/19	6.2	20
LA35	30S/11E-21Bb	86.8 [1]	10/4/2019	85	1.8
LA36	30S/11E-21Ja	PRIVATE (not measured)			
LA37	30S/11E-21B1	81.4 [2]	10/4/2019	63.62	17.8
LA38	30S/11E-21E	PRIVATE (measured)			
LA39+	30S/11E-18K	121.7 [2]	10/1/2019	146	-24.3
LA40+	30S/10E-13Ba	12.3 [2]	11/5/2019	9.64	2.7
LA41+	30S/10E-13Bb	12.3 [2]	11/6/2019	8.92	3.4

NOTES: 1 NAVD88 elevation as reported by licensed land surveyor

2 estimated elevation (assume NAVD 88)

3 reported elevation by County (datum unknown, likely NGVD 29)

All NGVD 29 elevations are converted to the NAVD 88 prior to contouring.

+ added for current reporting year

4.2 Water Quality Results

Available Fall 2019 water quality results for First Water and Upper Aquifer monitoring wells designated for water quality reporting in the LOBP Groundwater Monitoring Program are presented in Table 9. The LOBP Groundwater Monitoring Program does not include Spring 2019 water quality monitoring at First Water or Upper Aquifer Wells. Available Spring and Fall 2019 water quality for Lower Aquifer monitoring wells designated for water quality reporting in the LOBP Groundwater Monitoring Program are presented in Tables 10 and 11. Groundwater monitoring field logs and laboratory analytical reports for the 2019 LOBP Groundwater Monitoring Program are included in Appendix C.

Some of the constituents of analysis that are part of the LOBP Groundwater Monitoring Program listed in Table 1 are not included in the LOWRF Groundwater Monitoring Program. The missing constituents include specific conductance, alkalinity (bicarbonate, carbonate, and total), calcium, magnesium, and potassium.

Lower Aquifer wells LA2 and LA3 were not sampled in 2019. These are Morro Bay sand spit wells that are scheduled for water quality monitoring every five years to track changes in salinity at the coast (2015 LOBP). The next scheduled water quality sampling event on the sand spit will be in 2020.

4.2.1 Nitrate and Chloride Results

Results for First Water wells indicate elevated nitrate concentrations across much of the central and western areas, which are attributed to historical septic system discharges in high-density residential areas (LOBP, 2015). A more extensive compilation of shallow water quality, including nitrate and TDS concentration maps, are presented for June and December 2019 in the County's LOWRF Groundwater Monitoring Program reports (Rincon Consultants, 2019, 2020). Nitrate concentration trends are tracked using the Nitrate Metric (see Section 7.5.3).

Lower Aquifer water quality results for 2019 show one well (LA31) impacted by seawater intrusion, based on chloride concentrations over 250 mg/L. The overall trend in chloride concentration and seawater intrusion is tracked using the Chloride Metric (see Section 7.5.3).

4.2.2 CEC Results

CEC sampling was conducted at well FW5 and FW26 in October 2019 (Table 2). Well FW5 is hydraulically downgradient of the Broderson leach field site, where most of the recycled water from LOWRF is discharged into the Basin, and where high-density (>1 per acre) septic systems were active prior to being connected to the sewer. Well FW26 is located in the Los Osos Creek Valley, where there are low-density (<1 per acre) septic systems (Figure 2). CEC results are presented in Table 12, with laboratory reports included in Appendix C. As discussed below, CEC testing results are interpreted to indicate wastewater influence at FW5, based on sucralose and nitrate concentrations, but not likely at FW26.

Table 9. Fall 2019 Water Quality Results - First Water and Upper Aquifer

LOBP Well	State Well Number	Date	SC	pH (field)	TDS	Alkalinity			Cl	NO3-N	SO4	B	Ca	Mg	K	Na	T (field)
						CO3	HCO3	Total as CaCO3									
			µS/cm	pH units	------------------------------------- mg/L -------------------------------------												°F
FW2*	30S/10E-13L8	12/10/2019	*751*	6.29	680	--	--	--	130	29	30	0.17	--	--	--	130	68.0
FW6*	30S/10E-24A	12/11/2019	*674*	6.55	570	--	--	--	150	2.3	54	0.15	--	--	--	91	64.4
FW10*	30S/11E-7Q1	NOT SAMPLED															
FW15*	30S/11E-18N2	12/11/2019	*580*	6.67	530	--	--	--	89	27	46	0.24	--	--	--	66	66.7
FW17*	30S/11E-18L12	12/12/2019	*485*	6.78	450	--	--	--	57	23	46	0.10	--	--	--	50	65.5
FW20*	30S/11E-8Mb	NOT SAMPLED															
FW22*	30S/11E-17F4	12/12/2019	*537*	7.37	410	--	--	--	120	1.1	27	<0.05	--	--	--	66	60.6
FW26	30S/11E-20A2	10/16/2019	675	7.13	370	<10	220	180	80	<0.1	29.4	<0.1	35	35	1	36	62.6
FW28	30S/11E-20M2	10/3/2019	965	7.37	600	<10	380	310	64	<0.1	102	0.1	67	55	1	38	63.0
UA3	30S/10E-13F1	10/14/2019	527	7.01	370	<10	70	60	63	17.8	24.2	<0.1	20	15	1	49	64.5
UA9	30S/11E-18K3	10/14/2019	333	7.2	240	<10	60	50	42	9.3	8.2	<0.1	15	11	1	27	65.7
UA13	30S/11E-17E10	10/2/2019	559	7.73	360	<10	120	100	60	15.7	25.5	0.10	25	25	1	42	67.8

NOTES: "--" = no result available; SC = specific conductance; TDS = total dissolved solids; CO3 = carbonate; HCO3= bicarbonate; CaCO3 = total alkalinity as calcium carbonate; Cl = chloride; NO3-N = nitrate as nitrogen;SO4 = sulfate; B = boron; Ca = calcium; Mg = magnesium; K = potassium; Na = sodium; T = temperature; µS/cm = microsiemens per centimeter; mg/L = milligrams per liter; °F = degrees Fahrenheit; < indicates less than Practical Quantitation Limit as listed in laboratory report.
* = readings from LOWRF Groundwater Monitoring Program sampling event in December 2019 (Rincon Consultants, 2019)
Only field reading available

LOBP Well	State Well Number	Date	SC	pH (field)	TDS	Alkalinity			Cl	NO3-N	SO4	B	Ca	Mg	K	Na	T (field)
						CO3	HCO3	CaCO3									
			µS/cm	pH units	--------------------------------------- mg/L ---------------------------------------												°F
LA8	30S/10E-13N	4/3/2019	434	8.73	250	<10	50	40	75	7.2	12.7	<0.1	17	14	1	36	65.1
LA9	30S/10E-24C1	4/15/2019	488	7.17	310	<10	70	60	92	5.7	15.6	<0.1	17	17	2	45	65.6
LA10	30S/10E-13J1	4/15/2019	744	7.17	600	<10	80	70	174	1.9	10.4	<0.1	38	38	2	31	68.1
LA11	30S/10E-12J1	4/9/2019	1430	7.28	860	<10	350	290	196	<0.1	189	0.2	76	85	4	85	67.1
LA12	30S/10E-7Q3	4/9/2019	844	7.37	480	<10	300	240	94	<0.1	49.7	0.2	48	44	2	53	70.0
LA15	30S/11E-18L2	4/9/2019	774	7.11	460	<10	250	200	102	0.8	29.2	<0.1	48	44	1	38	68.9
LA18	30S/11E-18K8	4/10/2019	620	7.94	380	<10	290	240	32	<0.1	37.4	<0.1	52	28	2	25	73.2
LA20	30S/11E-17N10	4/15/2019	559	7.41	310	<10	200	160	42	3.1	21.7	0.1	28	27	2	34	68.1
LA22	30S/11E-17E8	4/10/2019	466	7.55	290	<10	180	150	46	5.8	13.6	<0.1	25	22	1	28	67.8
LA23,28	PRIVATE (not sampled)																
LA30	30S/11E-20H1	4/3/2019	903	7.85	540	<10	390	320	52	<0.1	92.8	0.1	68	55	1	36	64.4
LA31	30S/10E-13M2	4/3/2019	3290	7.96	2010	<10	70	50	940	0.6	179	0.2	103	93	4	641	65.7
LA32	30S/11E-18K9	4/9/2019	474	7.42	270	<10	200	160	34	1.6	21.5	<0.1	26	26	1	33	69.1
LA39+	30S/11E-18K	4/15/2019	619	7.22	350	<10	290	240	38	<0.1	27.4	<0.1	33	36	2	41	70.3

Table 10. Spring 2019 Water Quality Results - Lower Aquifer

NOTES:"--" = no result available; SC = specific conductance; TDS = total dissolved solids; CO3 = carbonate; HCO3= bicarbonate; CaCO3 = total alkalinity as calcium carbonate; Cl = chloride; NO3-N = nitrate as nitrogen;SO4 = sulfate; B = boron; Ca = calcium; Mg = magnesium; K = potassium; Na = sodium; T = temperature; µS/cm = microsiemens per centimeter; mg/L = milligrams per liter; °C = Celsius (some values converted from degrees Fahrenheit as reported on field logs); + indicates addition to monitoring program; < indicates less than Practical Quantitation Limit as listed in laboratory report, + indicates addition to monitoring program.

Table 11. Fall 2019 Water Quality Results - Lower Aquifer

LOBP Well	State Well Number	Date	SC	pH (field)	TDS	Alkalinity CO3	Alkalinity HCO3	Alkalinity Total as CaCO3	Cl	NO3-N	SO4	B	Ca	Mg	K	Na	T (field)
			µS/cm	pH units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	°F
LA8	30S/10E-13N	10/7/2019	446	7.62	250	<10	60	50	77	7.7	14.4	<0.1	15	14	1	37	65.3
LA9	30S/10E-24C1	Well Out of Service															
LA10	30S/10E-13J1	10/14/2019	961	7.24	830	<10	80	70	229	2	12.7	<0.1	54	48	1	33	68.1
LA11	30S/10E-12J1	10/2/2019	1520	7.49	1000	50	250	290	187	<0.1	189	0.3	80	90	5	91	70.34
LA12	30S10E-7Q3	10/2/2019	877	7.55	530	20	290	280	91	<0.1	50.9	0.2	49	46	2	56	71.24
LA15	30S/11E-18L2	11/14/2019	806	7.43	430	<10	250	210	107	0.7	32.9	<0.1	49	44	2	39	69.26
LA18	30S/11E-18K8	10/9/2019	647	7.72	390	<10	290	240	33	<0.1	40.5	<0.1	52	30	2	26	72.86
LA20	30S/11E-17N10	10/14/2019	626	7.42	380	<10	290	240	41	0.7	29	<0.1	34	33	2	40	68.9
LA22	30S/11E-17E8	10/9/2019	485	7.31	270	<10	150	120	49	7	14.9	<0.1	24	23	1	28	69.26
LA23,28	PRIVATE (not sampled)																
LA30	30S/11E-20H1	10/3/2019	981	7.51	530	<10	380	310	59	<0.1	82.3	0.1	63	50	2	37	68
LA31	30S/10E-13M2	10/3/2019	3120	7.61	2120	<10	70	50	827	0.7	169	0.2	90	85	4	340	64.58
LA32	30S/11E-18K9	10/2/2019	531	7.95	310	<10	200	180	36	1.4	24.7	0.1	28	28	1	35	71.06
LA39+	30S/11E-18K	10/14/2019	628	7.36	370	<10	300	240	37	<0.1	28.6	<0.1	34	34	1	41	72.2
LA40+	30S/10E-13Ba	11/6/2019	5330	6.85	4750	<10	210	170	1460	1.3	224	<0.1	388	272	6	182	70.5
LA41+	30S/10E-13Bb	11/7/2019	1310	7.46	760	<10	210	170	136	3.1	188	<0.1	69	34	4	140	69.4

NOTES: "--" = no result available; SC = specific conductance; TDS = total dissolved solids; CO3 = carbonate; HCO3= bicarbonate; CaCO3 = total alkalinity as calcium carbonate; Cl = chloride; NO3-N = nitrate as nitrogen; SO4 = sulfate; B = boron; Ca = calcium; Mg = magnesium; K = potassium; Na = sodium; T = temperature; µS/cm = microsiemens per centimeter; mg/L = milligrams per liter; °F = degrees Fahrenheit, + indicates addition to monitoring program.

Table 12. CEC Monitoring Results						
Constituent or Parameter	**Units**	**FW5**	**FW26**	**QA1 Travel Blank**	**QA2 Equipment Blank**	**LOWRF Recycled Water[1]**
		October 16, 2019				**November 6, 2019**
Health-based						
17β-estradiol	ng/L	ND (<1)	ND (<1)	ND (<1)	ND (<1)	ND (<10)[2]
Triclosan	ng/L	ND (<2)	ND (<2)	ND (<2)	ND (<2)	ND (<200)
Caffeine[3]	ng/L	ND (<1)	ND (<1)	ND (<1)	1.8	ND (<10)
NDMA	ng/L	ND (<2)	ND (<2)	--	--	ND (<2.2)
Performance-based						
Gemfibrozil	ng/L	ND (<1)	ND (<1)	ND (<1)	ND (<1)	ND (<5)
DEET[3]	ng/L	2.3	12	1.9	2.4	33
Iopromide	ng/L	ND (<5)	ND (<5)	ND (<5)	ND (<5)	ND (<5)
Sucralose	ng/L	190	21	ND (<65)	ND (<5)	76,000
Surrogate						
Ammonia	mg/L	ND (<0.10)	0.21	--	--	--
Nitrate-Nitrogen	mg/L	33	ND (<0.2)	--	--	2.2[4]
Total Organic Carbon	mg/L	1.2	1.8	--	--	--
UV Light Absorption	1/cm	0.016	0.035	--	--	--
Specific Conductance	µmhos/cm	1100	650	--	--	--

[1]2019 LOWRF CEC Blue Ribbon Report and 2019 LOWRF Annual Report (SLO Co. 2019a, 2019b).

[2] As 17-alpha Ethinyl Estradiol

[3] Blank Contamination. Analyte also detected in the laboratory method blank.

[4] October 2019 average for Total Nitrogen.

ng/L = nanograms per liter; mg/L = milligrams per liter, µmhos/cm = micromhos per centimeter; :"--" = no result available

ND (<) = indicates less than Method Reporting Limit as listed in laboratory report ("not detected")

Caffeine, one of the health-based class indicators of CEC indicators, was detected in one field blank, QA2, and in the laboratory blank (CEC laboratory results in Appendix C).

DEET (Diethyl-meta-toluamide), a personal care product used for insect repellent, was also detected in the groundwater samples and field blanks at concentrations close to the method reporting limit, as well as in the laboratory blank. The exception is in well FW26, with a result six times higher than the other samples or the blanks. DEET, however, was reported in the 2018 equipment blank at levels similar to the Fall 2019 result at FW26 (CHG, 2019c).

Sucralose, an artificial sweetener, was detected at 190 nanograms per liter (ng/L) in groundwater from FW5 and is an indicator of wastewater influence (i.e. originating from sources of wastewater including septic discharges or recycled water discharges). Sucralose was detected in groundwater from FW26 at 21 ng/L, which is a considered a trace amount (close to the detection limit of 5 µg/L).

Total ammonia was detected at FW26 in 2017, 2018 and 2019 at concentrations close to the laboratory detection limit. Total ammonia includes NH_3 (ammonia) and its ionized form, NH_4^+ (ammonium). Ammonium is the principal form of dissolved nitrogen discharged from septic systems, and is typically converted to nitrate (NO_3^-) under aerobic conditions. The presence of trace amounts of total ammonia concentrations in groundwater at FW26, along with DEET and sucralose, suggests a potential for low level influence from septic tank discharges, although no nitrate has been detected at FW26 in since CEC monitoring began in 2017.

Nitrate-nitrogen was reported at 33 mg/L in groundwater from FW5, and not detected in groundwater from FW26. Available CEC-constituent quality of recycled water from LOWRF is also provided in Table 12 for comparison.

Results of the CEC testing are interpreted to indicate wastewater influence at FW5, based on sucralose and nitrate concentrations, but not likely at FW26. The sucralose detection at FW26 is within the 10-20 ng/L range of common laboratory equipment contamination as observed in 2017 and 2018 (CHG, 2018a, 2019b), DEET was detected at similar levels in a 2018 equipment blank, and no nitrate was detected.

Wastewater influence at FW5 is interpreted to be a residual from septic tank discharges, rather than from recycled water discharges at the Broderson leach field. A greater concentration of caffeine was detected at FW5 in 2018 (20 ng/L) compared to 2019, and there was a decrease in sucralose, which would be the opposite to be expected given the high concentrations in LOWRF discharges (Table 12).

FW6, which is the first monitoring well hydraulically downgradient of the Broderson Site, was originally designated in the LOBP (along with FW26) as a CEC monitoring well. Due to drought conditions, there was insufficient water for representative CEC testing at FW6, so FW5 was used as a replacement (CHG, 2017a). Now that the drought is over and groundwater mounding from the Broderson Site has reached FW6, there is sufficient water column to allow CEC testing. CHG has scheduled CEC testing at FW6 in Fall 2020. A comparison between CECs in LOWRF recycled water and in groundwater from FW5 and FW6 will help characterize the influence of recycled water on groundwater downgradient of the disposal site and help identify those compounds most useful for tracking recycled water as it moves into the Basin.

4.3 Geophysics

Induction and natural gamma logging were last performed at Lower Aquifer monitoring well LA4 (30S/10E-13M1) and LA14 (30S/11E-18L6) in October 2018. Seawater is highly conductive, compared to fresh water, and an induction log performed in a borehole penetrating the fresh water/seawater interface will show the vertical transition from fresh water to seawater. Because natural gamma emissions are not affected by changes in water quality, the gamma ray log can be used as a depth calibration tool when comparing induction logs from different monitoring events.

Geophysical monitoring events have been performed in 1985, 2004, 2009, 2014, 2015, and 2018. The next scheduled geophysical logging will be in October of 2021.

4.4 New Monitoring Well

In October 2019, a new monitoring well was constructed near the bay along Lupine Avenue in the Western Area of the basin. The well consists of a pair of nested, 2.5-inch diameter PVC wells that are screened in Zone D and Zone E of the Lower Aquifer (program wells LA41 and LA40, respectively). Both LA40 and LA41 were monitored in Fall 2019, and results are incorporated into this Annual Report. Well construction, lithology, and a basin cross-section showing the new monitoring well are provided in Appendix D. Monitoring LA40 and LA41 will fill a data gap identified in the LOBP and will contribute to tracking the movement of the seawater intrusion front.

5. GROUNDWATER PRODUCTION

Annual Basin groundwater production between 1970 and 2013 was reported in the LOBP (ISJ Group, 2015). Tables 13 and 14 present municipal and Basin production beginning in calendar year 2013.

Table 13. Municipal Groundwater Production (2013-2019)				
Year	LOCSD	GSWC	S&T	Total
	Acre-Feet[1]			
2013	726	689	55	1,470
2014	634	564	48	1,246
2015	506	469	32	1,007
2016	519	453	31	1,003
2017	568	450	32	1,050
2018	522	464	32	1,018
2019	506	454	31	991

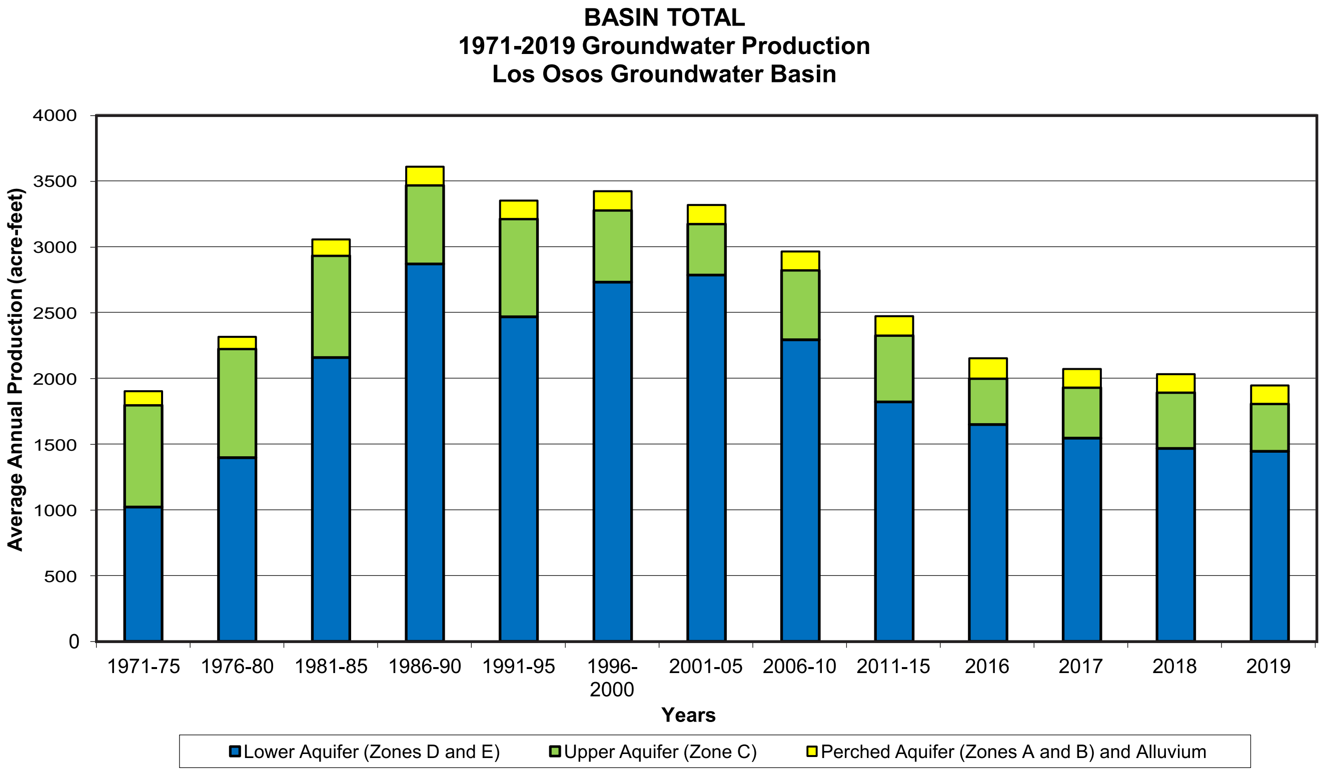
Note: [1]Metered production

Table 14. Basin Groundwater Production (2013-2019)					
Year	Purveyors	Domestic	Community	Agriculture	Total
	Acre-Feet[1]				
2013	1,470	200	140	750	2,560
2014	1,250	220	130	800	2,400
2015	1,010	220	140	800	2,170
2016	1,000	220	140	800	2,160
2017	1,050	220	130	670	2,070
2018	1,020	220	120	670	2,030
2019	990	220	60	630	1,900

Note: [1]All figures rounded to the nearest 10 acre-feet

Figure 6 shows the historical pumping distribution between Basin aquifers since 1970, along with the pumping distribution in the Western Area. Figure 7 show the historical pumping distribution for the Central and Eastern Areas. There has been a 35 percent reduction in Basin production over the last 10 years, with current production similar to the values reported for the early 1970s. The largest reduction in pumping has occurred in the Lower Aquifer Western Area (Figure 6).

Land use and water use areas overlying the Basin, including purveyor service areas, agricultural parcels, domestic parcels, and community facilities are included in Appendix F. Purveyor municipal production data are based on meter readings. Domestic groundwater production estimates are based on the last reported water use estimates for 2013 from the LOBP, with minor adjustments in 2016 for the inclusion of additional residences in the Eastern Area (CHG, 2017a). Production estimates for community facilities and agricultural wells are based on a soil-moisture budget using local precipitation, land use, and evapotranspiration data (Appendix G). Basin groundwater production estimates are reported to closest 10 acre-feet, which is considered within the accuracy of metered production, but not unmetered production. Unmetered production estimates account for approximately half of the total production in the Basin, of which agricultural irrigation is the greatest unmetered component. Potential uncertainty in Basin production has been estimated at five percent of the sustainable yield of the Basin (LOBP page 47; ISJ Group, 2015).



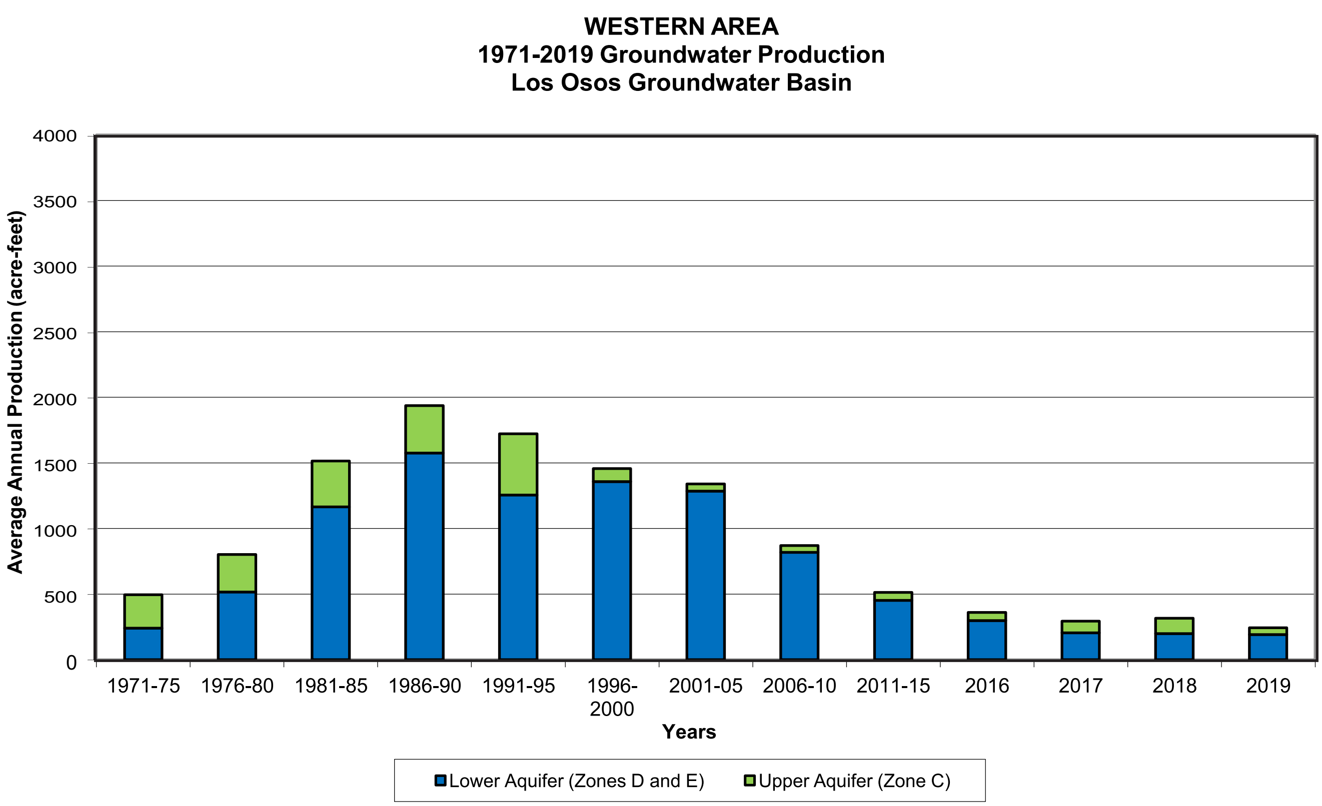
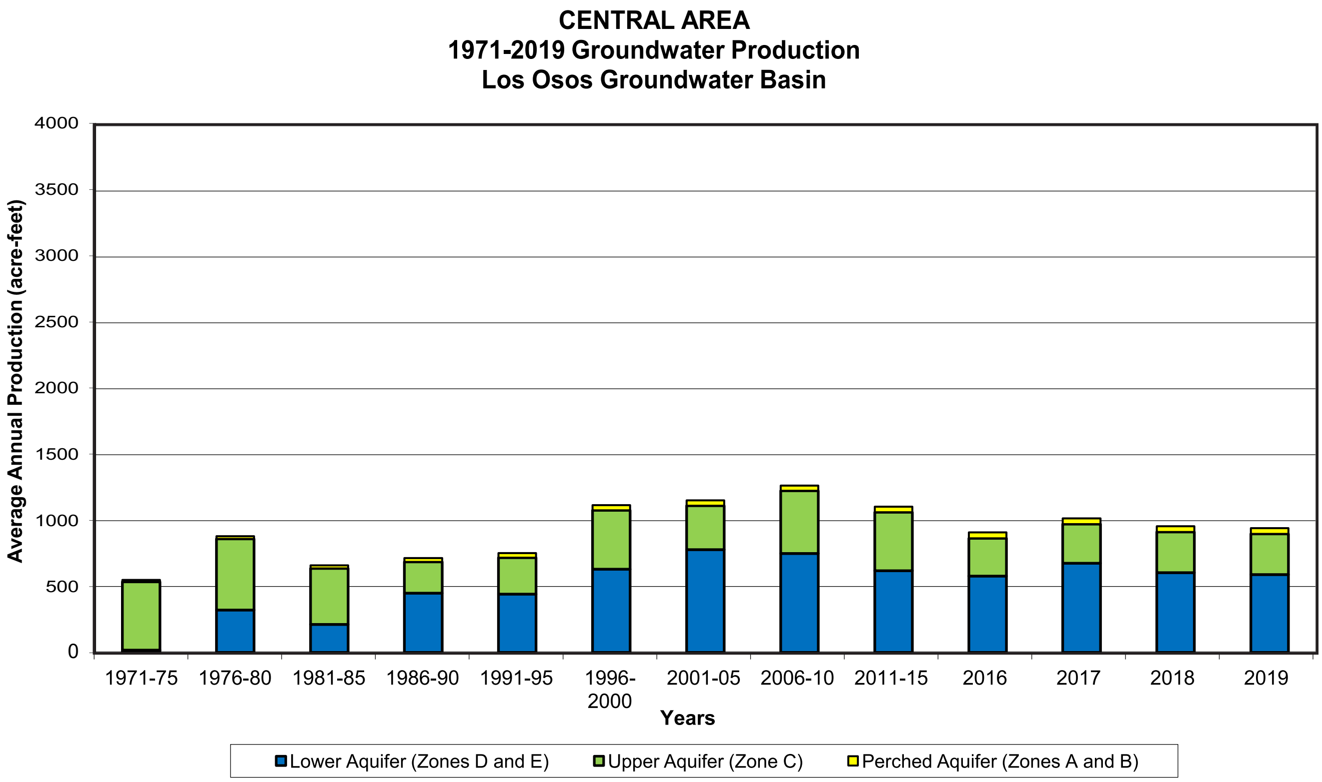


Figure 6
Basin Production 1971-2019
Basin Total and Western Area
Los Osos Goundwater Basin
2019 Annual Report

Cleath-Harris Geologists



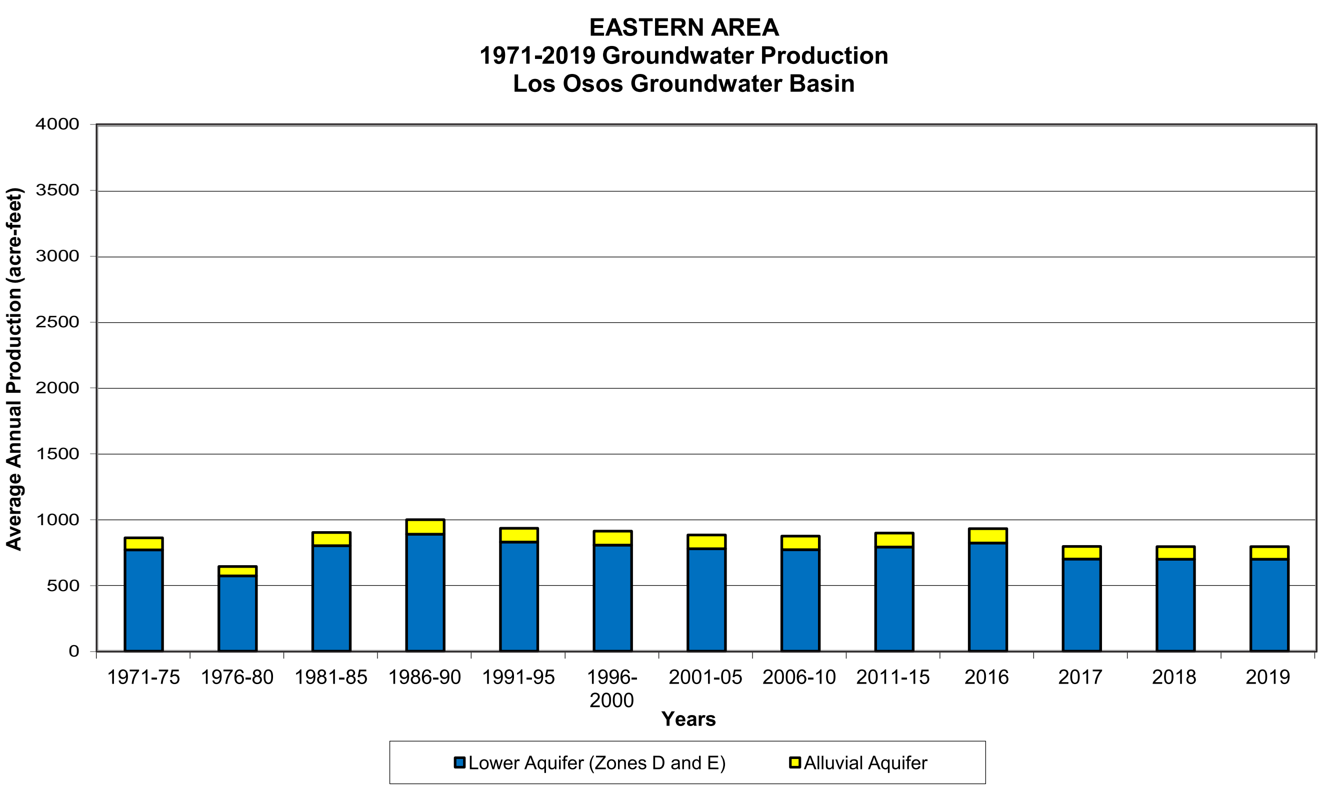


Figure 7
Basin Production 1971-2019
Central and Eastern Areas
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

6. PRECIPITATION AND STREAMFLOW

Precipitation data are currently available from a County gage located at the former Los Osos landfill (Station #727). Continuous precipitation records for Station #727 are available beginning with the 2006 rainfall year (July 2005 through June 2006), and show that rainfall has averaged 16.22 inches, with a minimum of 6.81 inches in the 2014 rainfall year and a maximum of 31.77 inches in the 2011 rainfall year. Precipitation for the 2019 rainfall year was reported at 23.9 inches (above average). Records for Station #727 through the calendar year 2019 are included in Appendix H. The average rainfall at Station #727 is lower compared to other Los Osos rain gages due to a relatively short period of record that includes multiple drought years.

Historically, precipitation records at rain gage stations were compiled by the County for the LOCSD maintenance yard on 8th Street (Station #177), at the South Bay fire station on 9th Street (Station #197), and at two private volunteer stations (Station #144.1 in the Los Osos Creek Valley and Station #201.1 on Broderson Avenue). The longest active period of record in the vicinity is at the Morro Bay fire department (Station #152). A summary of precipitation data for these stations is presented in Table 15.

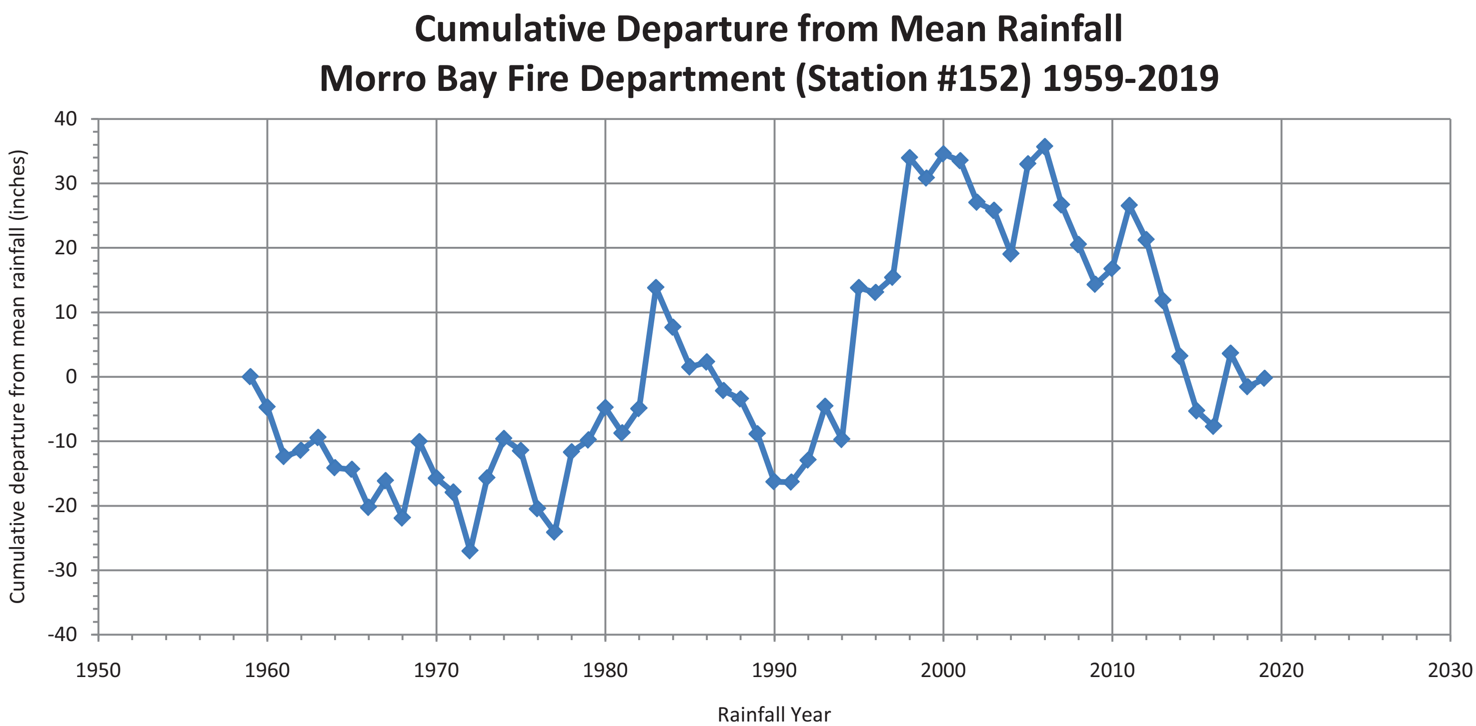
Table 15. Active and Former Precipitation Stations

Station No.	Name	Period of Record (rainfall years)	Average Annual Precipitation (inches)
144.1	Bender	1955-1987	19.17
152	Morro Bay Fire Dept.	1959-2019 (active)	16.23
177	CSA9 Baywood Park	1967-1980	17.49
197	South Bay Fire	1975-2001	19.52
201.1	Simas	1976-1983	21.16
727	Los Osos Landfill	2006-2019 (active)	16.22*

NOTE: *lower average due to short period of record that includes seven years of below normal rainfall.

Figure 8 shows the long-term cumulative departure from mean precipitation at Station #152. Note that between 2006 and 2019 (the period of record for Station #727), rainfall at Station #152 was averaging more than two inches per year below normal. Once data for Los Osos Landfill Station #727 becomes more representative of long-term climatic conditions, it would be appropriate to use the gage in the cumulative departure from mean precipitation graph.

The U.S. Drought Monitor, a partnership of federal agencies, monitors drought conditions across the country based on various climatological indexes and data inputs. San Luis Obispo County started 2019 with moderate to severe drought conditions in January (two middle levels of drought intensity). There were no drought conditions reported at the end of the calendar year in December 2019 (NDMC/USDA/NOAA, 2019).



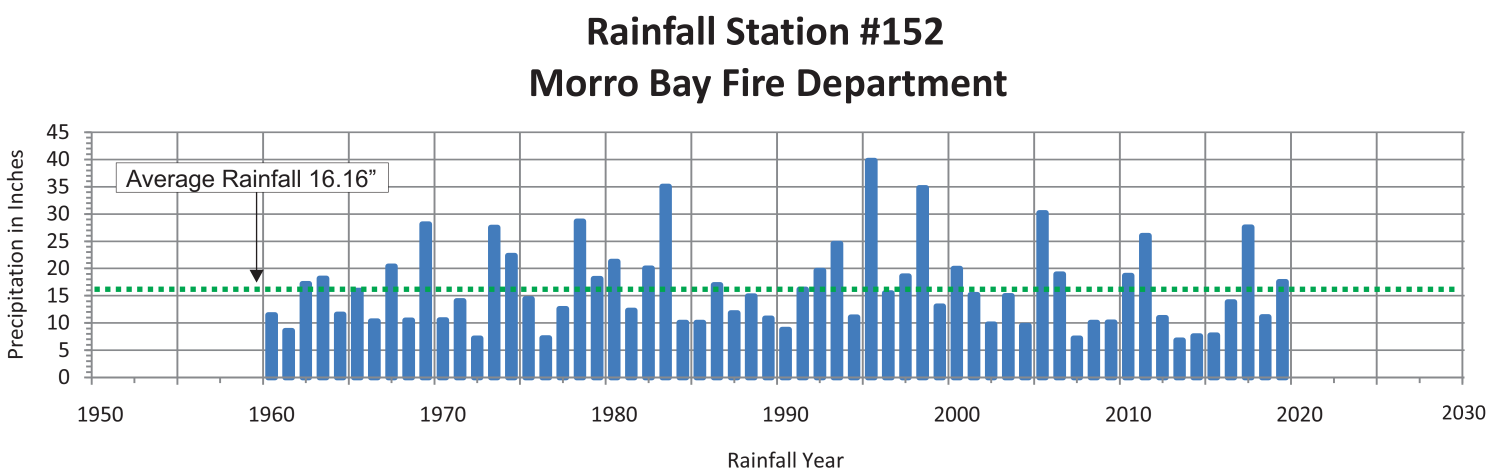


Figure 8
Cumulative Departure from
Mean Rainfall at Morro Bay Fire Department
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

Los Osos Creek drains the Clark Valley watershed. Streamflow on Los Osos Creek is monitored by a County gage (formerly Gage #6, now Sensor 751) at the Los Osos Valley Road bridge. The location has been gaged intermittently since 1976, with 18 years of flow records through 2001. The average measured flow on Los Osos Creek at the gage (drainage area of 7.6 square miles) was 3,769 acre-feet per year between 1976 and 2001 (San Luis Obispo County, 2005). A summary of the available annual streamflow data is in Appendix H.

Streamflow was recorded at the gage for 146 individual days during the 2019 water year (October 1, 2018 to September 30, 2019), including 114 days of continuous flow between January 31 and May 24, 2019. The dates and maximum stage value from Station #727 for the peak flow days in each month are listed below in Table 16.

Table 16. Maximum Stream Stage for Los Osos Creek, 2019 Water Year

Date	Maximum Stream Stage County Sensor #751 (feet)
1/17/2019	5.14
2/4/2019	3.93
3/2/2019	3.80
4/1/2019	2.25
5/16/2019	2.22

There is no current rating curve for Sensor 751, which measures flow stage above the natural stream bed as it enters a box culvert beneath the bridge. A rating curve is needed to correlate stage records to streamflow volume records; therefore, no streamflow volumes are reported. Development of a rating curve for Sensor 751 is recommended. Los Osos Creek stream flow records are useful for Basin water balance and sustainable yield interpretation, for the analysis of potential benefits from recycled water discharges to the creek, and for Basin model calibration. Graphs of the available stream stage data over time for water years 2011 through 2019 are included in Appendix H.

Warden Creek (Figure 1) drains approximately nine square miles of the eastern Los Osos Valley. This creek flows along 3,700 feet of the northern Basin boundary, at low invert elevations (less than 20 feet above sea level) in an area underlain by shallow bedrock. The U.S. Geological Survey reported winter flows in Warden Creek similar to Los Osos Creek, but with greater baseflow during the summer, because Warden Creek serves as a drain (point of groundwater discharge) for shallow groundwater at the north end of the Los Osos Creek floodplain (Yates and Wiese, 1988).

7. DATA INTERPRETATION

Groundwater level and groundwater quality data for 2019, together with selected historical data, have been used to develop the following information:

- Groundwater elevation contour maps for the Perched Aquifer, Upper Aquifer (with Alluvial Aquifer), and Lower Aquifer for both Spring and Fall 2019 conditions.

- Water level hydrographs for wells representative of aquifers in the Western, Central, and Eastern Areas of the Basin.

- The lateral extent of seawater intrusion and the Fall 2019 position of the seawater intrusion front.

- Estimates of groundwater in storage for Spring and Fall 2019, including amount above mean sea level.

- Estimates of changes to groundwater in storage from Spring 2018 to Spring 2019, including the volume of seawater intrusion.

- Basin Yield Metric, Basin Development Metric, Water Level Metric, Chloride Metric, and Nitrate Metric.

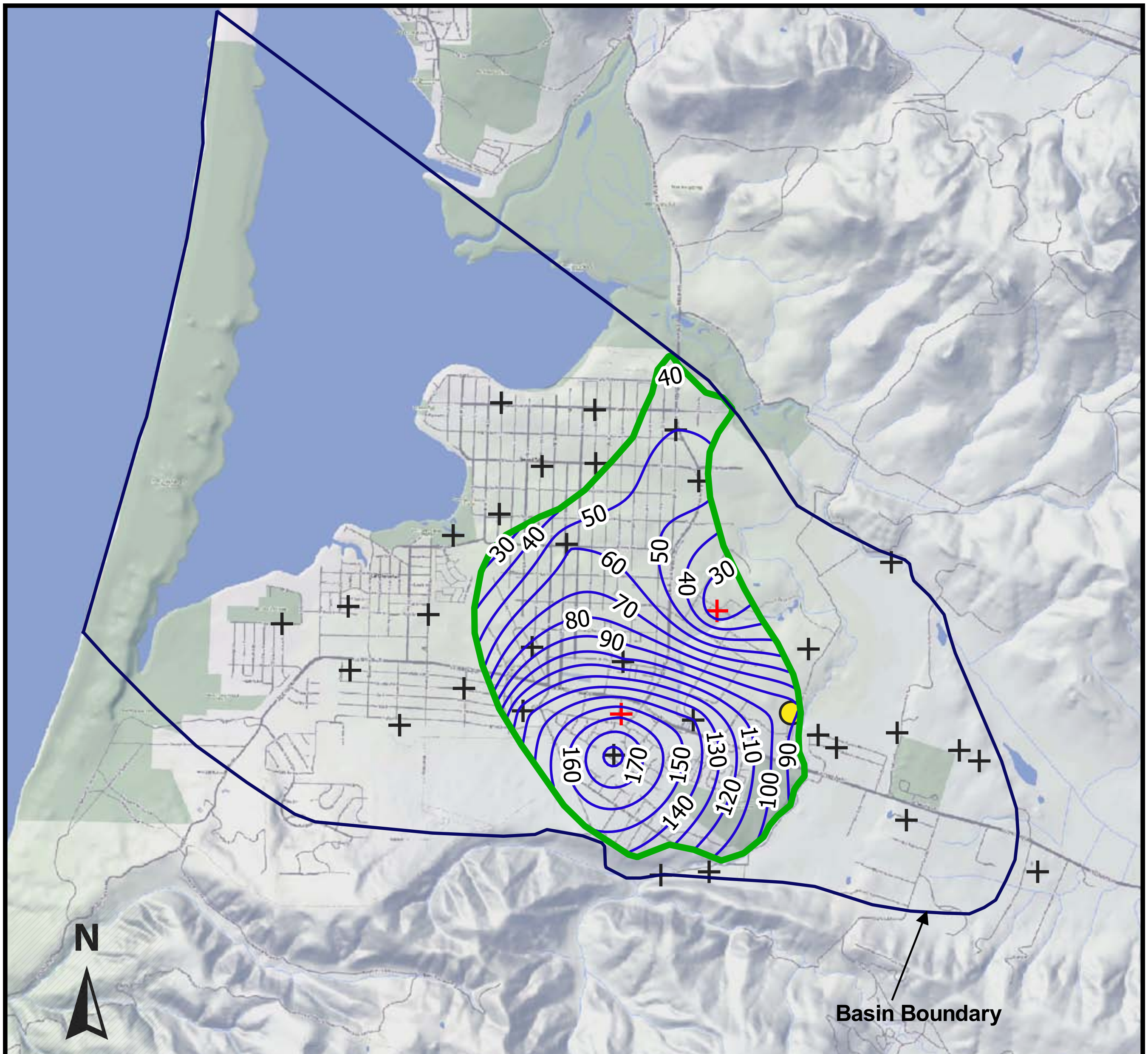
- Upper Aquifer Water Level Profile

7.1 Water Level Contour Maps

Water level contour maps for Spring 2019 are presented in Figures 9, 10, and 11 for the Perched Aquifer, Upper Aquifer with Alluvial Aquifer, and Lower Aquifer, respectively. Corresponding water level contour maps for Fall 2019 are presented in Figures 12, 13, and 14. The water level elevations are shown at a 5-foot contour interval for the Upper and Lower Aquifers, and a 10-foot contour interval for the perched aquifer, based on the ordinary kriging interpolation method, which provides a best (least-squares) estimate of values at unmeasured points based on the mapped values.

Water level data available from private irrigation and domestic wells were used in the development of the water level contour maps, although these water levels are not listed in the data tables in this report (Table 3 through 8). All groundwater elevations were adjusted to a common datum (NAVD 88) prior to contouring and groundwater storage calculations. These adjustments are approximate, pending a review of all reference point elevations by a licensed land surveyor.

Perched Aquifer water level contour maps (Figures 9 and 12) show the highest groundwater elevations at Well FW31 in the Bayridge Estates (at the Bayridge Estates recycled water disposal field), with a radial direction of groundwater flow from the higher topographic elevations to lower elevations. Although the Fall 2019 measurement at FW31 was slightly higher elevation than the Spring measurement due to recycled water discharge operations, overall Perched Aquifer groundwater levels declined approximately 0.14 feet from Spring to Fall 2019.



Base Image: Stamen-Terrain

0 2,000 4,000 6,000 8,000 ft

Scale: 1 inch ≈ 4,000 feet

Explanation

Approximate limits of Perched Aquifer

Groundwater elevation contour in feet above sea level (NAVD 88 datum)

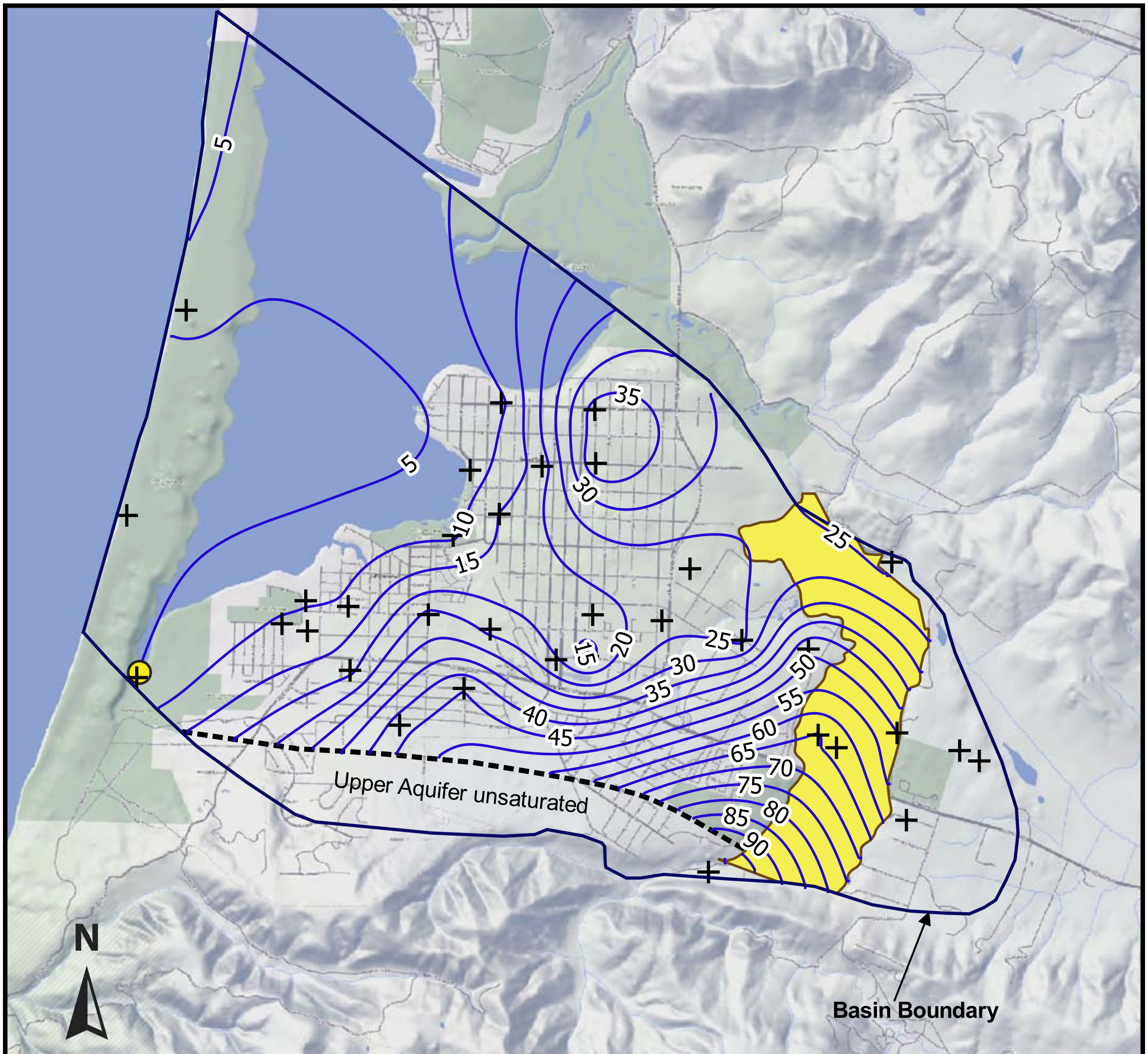
Spring 2019 groundwater elevation data point (contours not applicable outside of Perched Aquifer limits

Alternate date groundwater elevation data point

Spring seep used for groundwater elevation

Figure 9
Spring 2019 Water Level Contours
Perched Aquifer
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists



Base Image: Stamen-Terrain

0 2,000 4,000 6,000 8,000 ft

Scale: 1 inch ≈ 4,000 feet

Explanation

Groundwater elevation contour
in feet above sea level (NAVD 88 datum)

Limits of Alluvial Aquifer

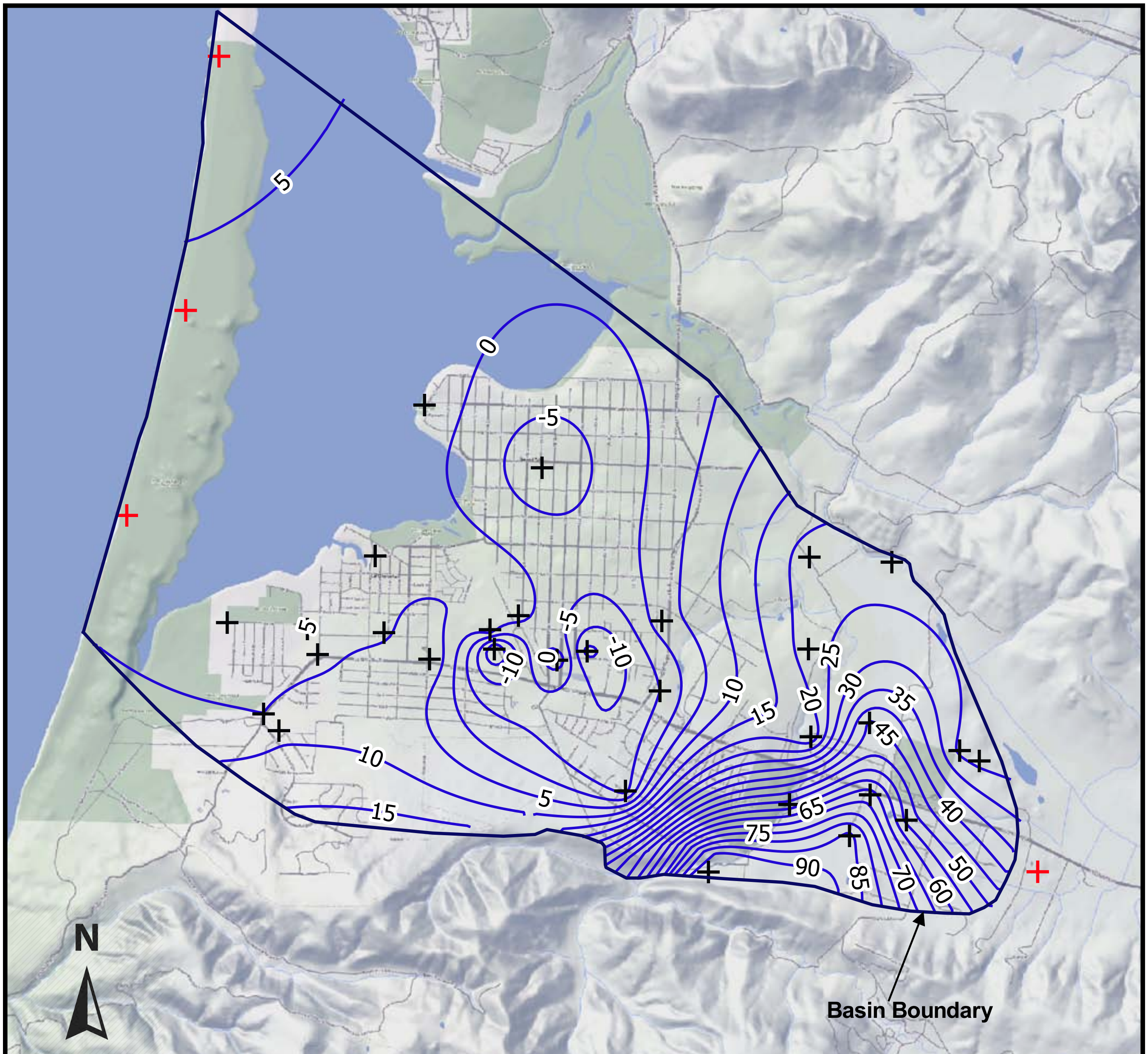
Spring 2019 groundwater elevation data point
(contours not applicable outside of Perched Aquifer limits

Alternate date groundwater elevation data point

Spring seep used for groundwater elevation

Figure 10
Spring 2019 Water Level Contours
Upper Aquifer
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists



Base Image: Stamen-Terrain

0 2,000 4,000 6,000 8,000 ft

Scale: 1 inch ≈ 4,000 feet

Explanation

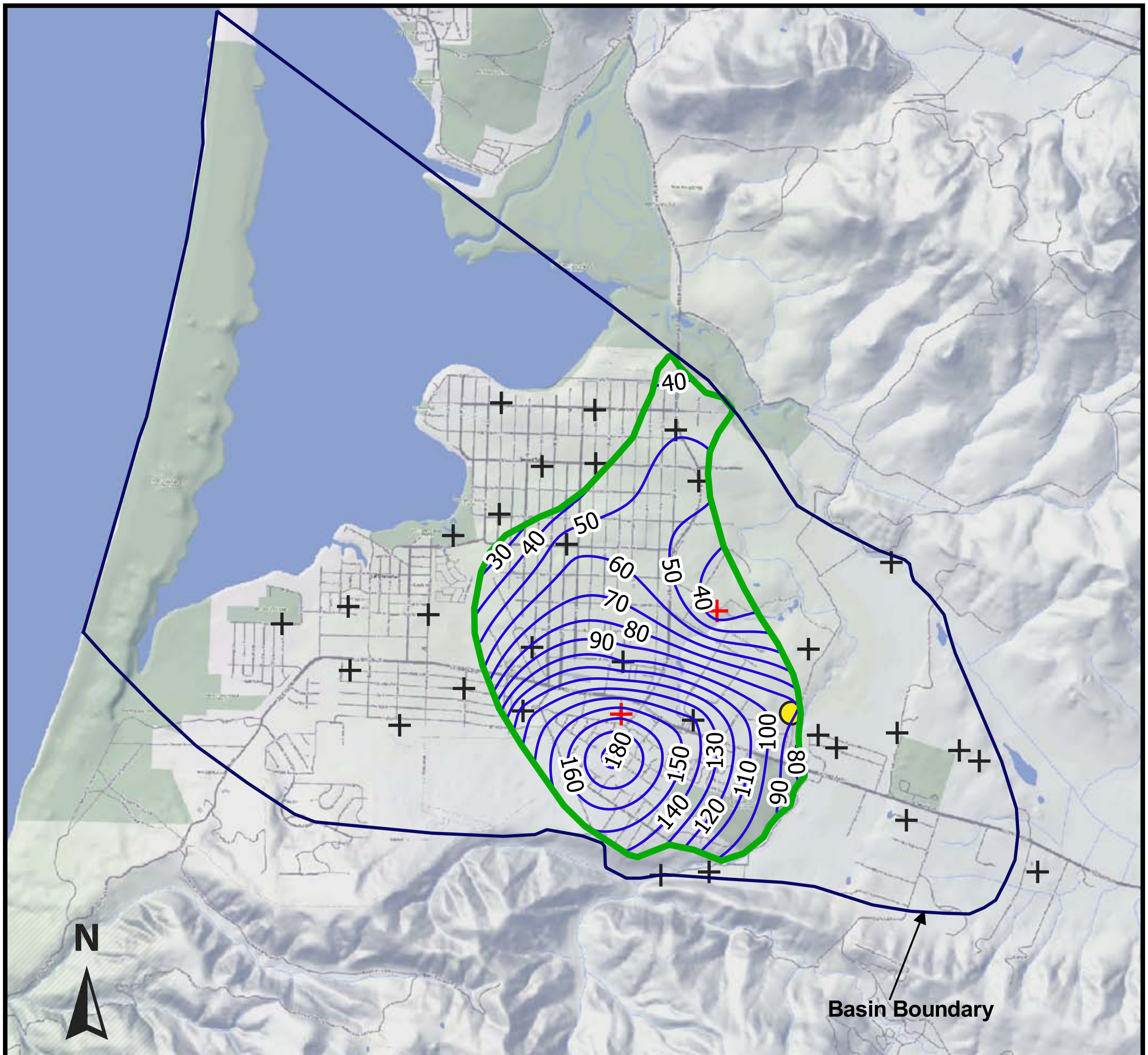
Groundwater elevation contour
in feet above sea level (NAVD 88 datum)

+ Spring 2019 groundwater elevation data point
(contours not applicable outside of Perched Aquifer limits

+ Alternate date groundwater elevation data point

Figure 11
Spring 2019 Water Level Contours
Lower Aquifer
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists



Base Image: Stamen-Terrain

0 2,000 4,000 6,000 8,000 ft

Scale: 1 inch ≈ 4,000 feet

Explanation

Approximate limits of Perched Aquifer

Groundwater elevation contour in feet above sea level (NAVD 88 datum)

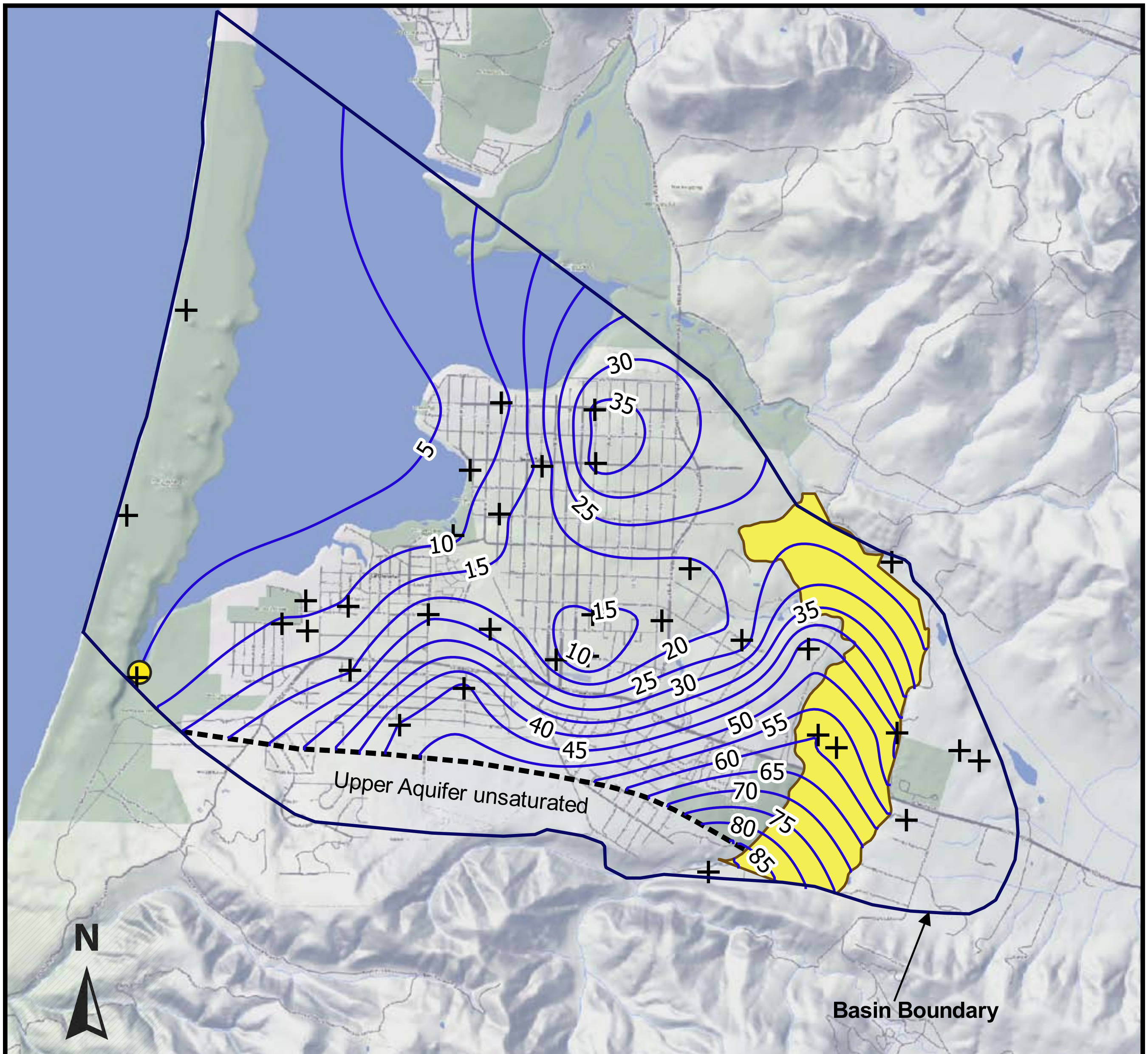
+ Fall 2019 groundwater elevation data point (contours not applicable outside of Perched Aquifer limits

+ Alternate date groundwater elevation data point

Spring seep used for groundwater elevation

Figure 12
Fall 2019 Water Level Contours
Perched Aquifer
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists



Base Image: Stamen-Terrain

0 2,000 4,000 6,000 8,000 ft

Scale: 1 inch ≈ 4,000 feet

Explanation

Groundwater elevation contour
in feet above sea level (NAVD 88 datum)

Limits of Alluvial Aquifer

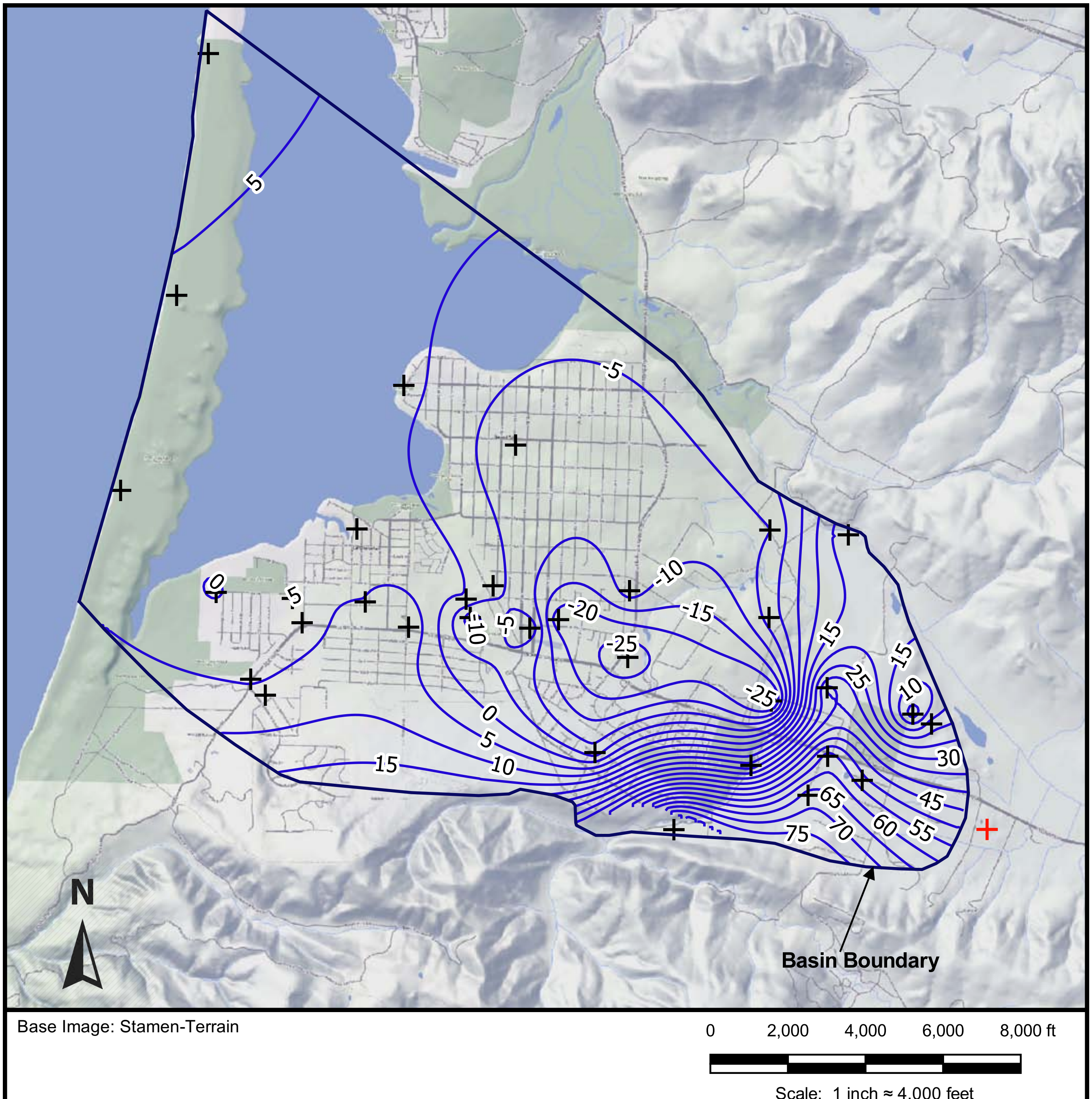
Fall 2019 groundwater elevation data point
(contours not applicable outside of Perched Aquifer limits

Alternate date groundwater elevation data point

Spring seep used for groundwater elevation

Figure 13
Fall 2019 Water Level Contours
Upper Aquifer
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists



Explanation

Groundwater elevation contour
in feet above sea level (NAVD 88 datum)

+ Fall 2019 groundwater elevation data point
(contours not applicable outside of Perched Aquifer limits

+ Alternate date groundwater elevation data point

Figure 14
Fall 2019 Water Level Contours
Lower Aquifer
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

Contour maps for the Upper Aquifer and Alluvial Aquifer (Figures 10 and 13) show the highest groundwater elevations are at the southern edge of the Los Osos Creek alluvial valley. The general direction of groundwater flow is to the northeast along the creek valley and to the northwest toward the Morro Bay estuary. Significant features include a pumping depression interpreted to be present in the area of downtown Los Osos, and a groundwater high interpreted to be present beneath dune sand ridges in Baywood Park. Upper Aquifer groundwater elevation contours averaged approximately 1.8 feet of water level decline from Spring 2019 to Fall 2019.

Contour maps for the Lower Aquifer (Figures 11 and 14) show the highest groundwater elevations are at the southern edge of the Los Osos Creek alluvial valley and near the eastern Basin boundary. The steep hydraulic gradient between the Upper Creek Valley and downtown Los Osos suggests significant permeability restrictions between these two areas, possibly fault related (Yates and Weise, 1988; Cleath &Associates, 2005). Groundwater flow in the Lower Aquifer is generally toward Central Area pumping depressions which are below sea level. Lower Aquifer groundwater elevations averaged approximately 5.8 feet of water level decline from Spring 2019 to Fall 2019.

7.2 Water Level Hydrographs

Water levels hydrographs for representative First Water, Upper Aquifer, and Lower Aquifer wells have been compiled for the Western and Central Basin Areas, including one of the Lower Aquifer wells in the Dunes and Bay Area. These wells present the general water level trends. The hydrographs are shown in Figures 15, 16, and 17, respectively.

In previous reports, trends for the First Water wells have been analyzed in ten-year spans. There was a lapse in monitoring between 2006 and 2012 for three of the five representative First Water wells, however, so beginning in 2017 a five-year trend was analyzed, increasing by one year with each subsequent report until the First Water trend analysis returns to a ten-year span. A seven-year trend is reported for 2019.

The Spring to Spring water level trend for the last seven years (2012-2019), based on First Water hydrographs in Western and Central Area wells was 0.15 feet of decline per year (Figure 15). For Upper and Lower Aquifer wells, the Spring to Spring water level trend over the last ten years (2009-2019), based on Central and Western wells was an increase of 0.35 feet per year in the Upper Aquifer, and 0.60 feet of rise per year in Lower Aquifer water levels (Figures 16 and 17, respectively).

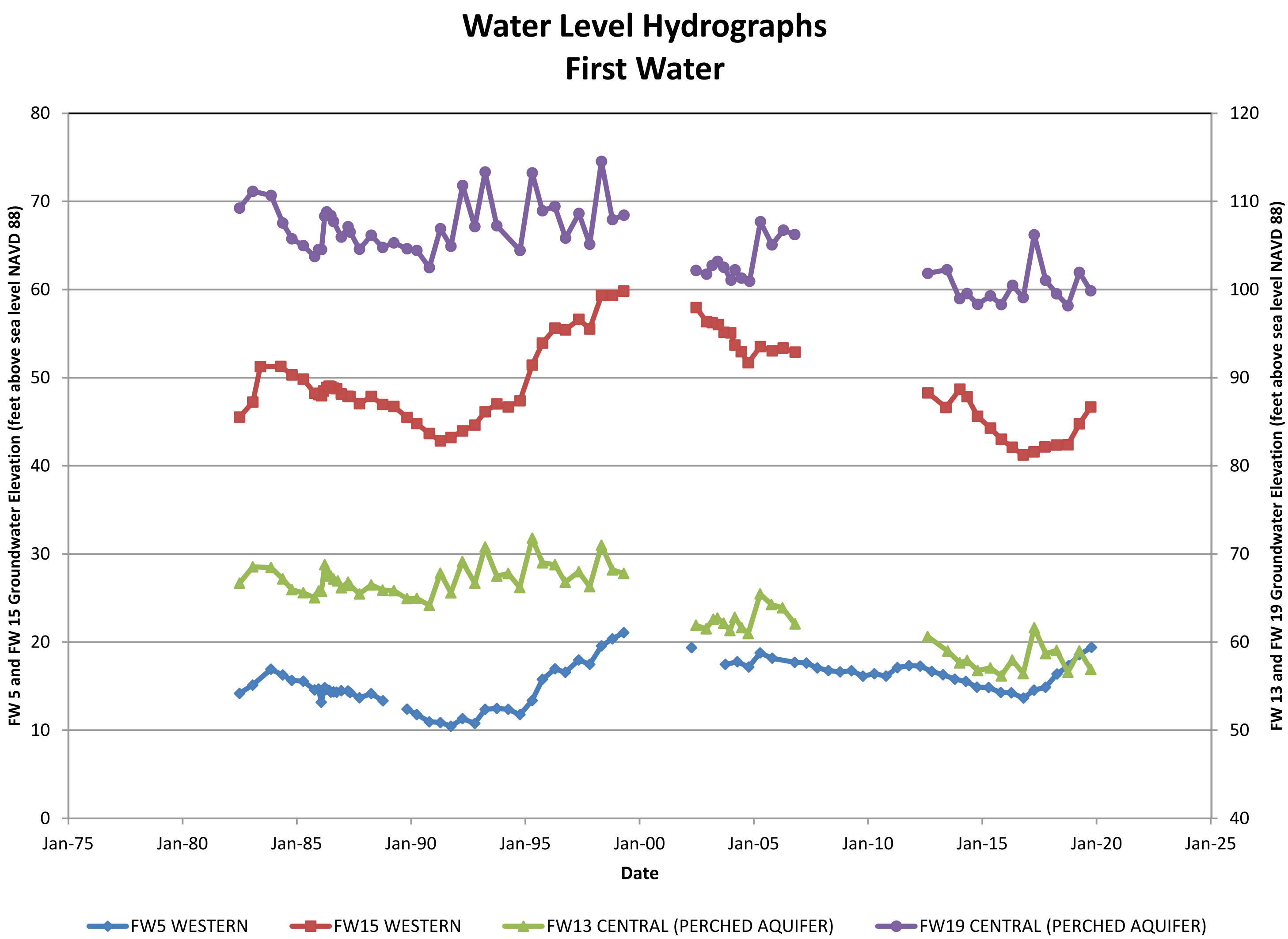


Figure 15
Water Level Hydrographs
Perched Aquifer / First Water
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

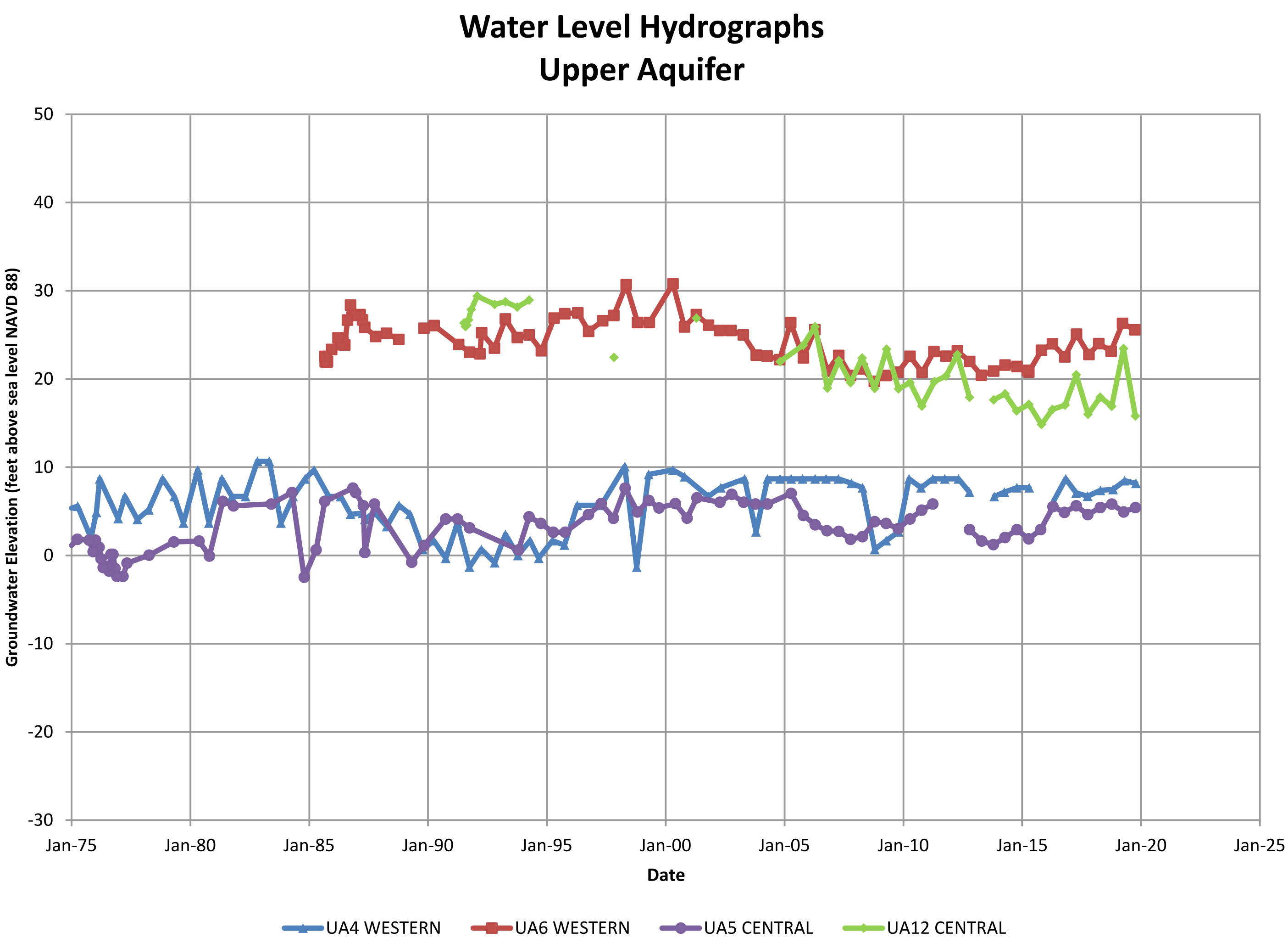


Figure 16
Water Level Hydrographs
Upper Aquifer
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

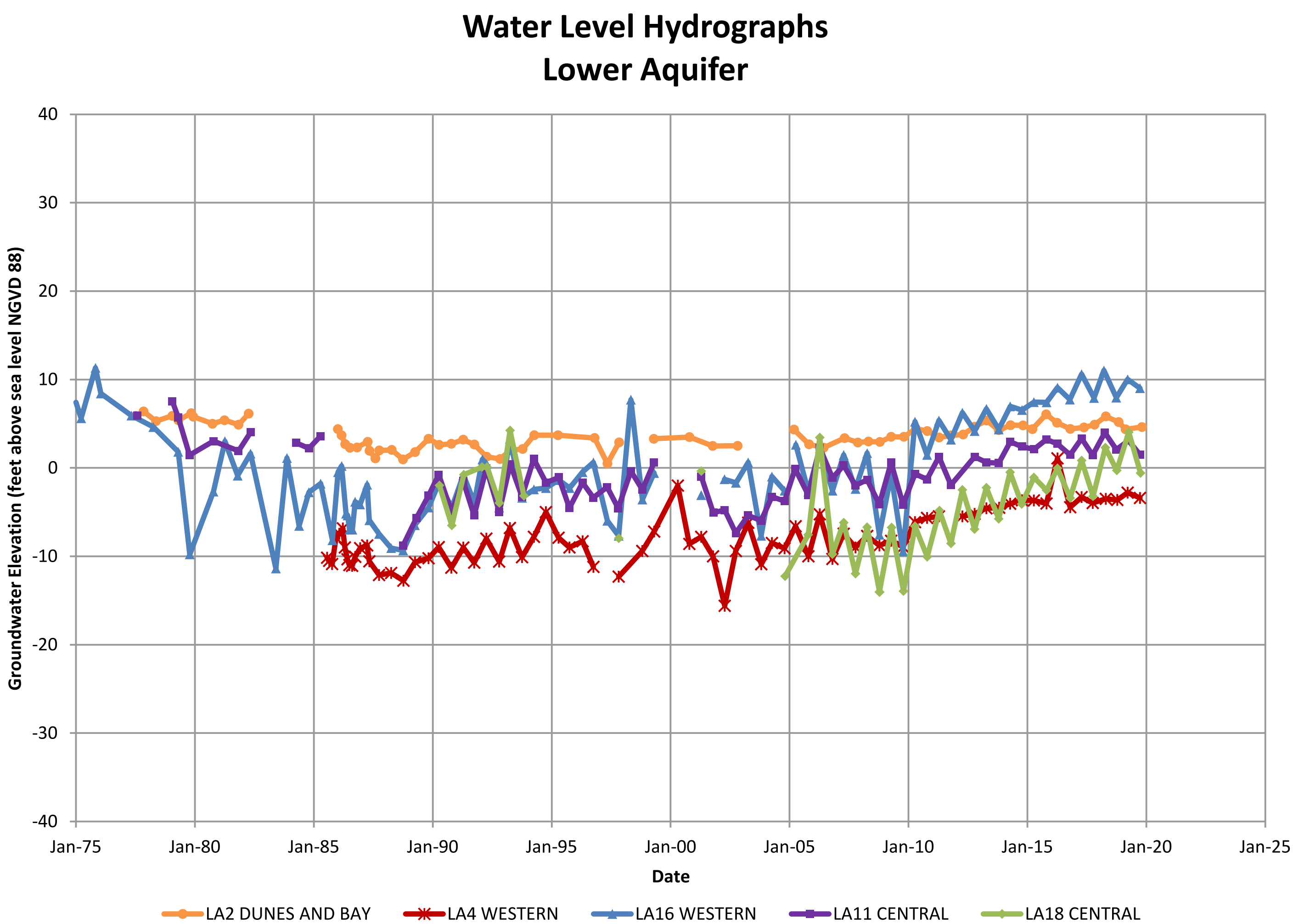


Figure 17
Water Level Hydrographs
Lower Aquifer
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

Hydrographs for seven wells equipped with pressure transducers are shown in Appendix I. The transducers have been installed to provide greater detail of water level trends and fluctuations. There are three First Water wells, two Upper Aquifer wells, and two Lower Aquifer wells equipped with transducers.

The transducer hydrographs have been interpreted to show the following short-term trends:

- FW6 is screened in the top of the Upper Aquifer near the Broderson leach field in the Western Area of the Basin. The hydrograph shows a relatively flat water level trend until June of 2017, followed by a steady rise of over 15 feet before reaching a plateau in December 2019. The rise in water level is credited to groundwater mounding on the regional aquitard beneath the Broderson leach field. The apparent stall in water level rise is likely temporary and may be related to the start of recycled water deliveries to Sea Pines during the summer. This mounding is expected to increase the downward hydraulic gradient and promote leakage through the regional aquitard, which will help to mitigate seawater intrusion in the Western Area.

- FW10 is screened at the top of the Upper Aquifer in the Central Area of the Basin, while UA4 and UA10 are screened at the bottom of the Upper Aquifer in the Western Area and Central Area of the Basin respectively. These wells displayed seasonal fluctuations of two to five feet (i.e., lower elevations during the summer and higher elevations during the winter and spring), including one to two feet of interference related to nearby pumping wells.

- FW27 is screened in the Alluvial Aquifer in the Eastern Area of the Basin. The well was equipped with a transducer in April of 2017, near the seasonal high water period, and has shown seasonal fluctuations since then between 20 and 36 feet. The relatively large seasonal fluctuation is attributable to the well's location in the upper Los Osos Creek alluvial valley (Figure 2), where the majority of seasonal recharge from stream seepage in the Basin occurs.

- LA13 and LA37 are screened in Lower Aquifer in the Central Area and Eastern Area of the Basin, respectively. These wells displayed a seasonal fluctuation of approximately six to seven feet, including interference related to nearby pumping wells.

7.3 Seawater Intrusion

The position of the Fall 2019 seawater intrusion front in Lower Aquifer Zone D is shown in Figure 18, along with the positions of the seawater intrusion front in 2015-2019 and 2005. The seawater intrusion front corresponds to the position of the 250 mg/L chloride concentration isopleth, based on water quality samples from six Lower Aquifer wells: LA8, LA10, LA11, LA12, LA15, and LA31, with a seventh well, LA41, added in 2019.

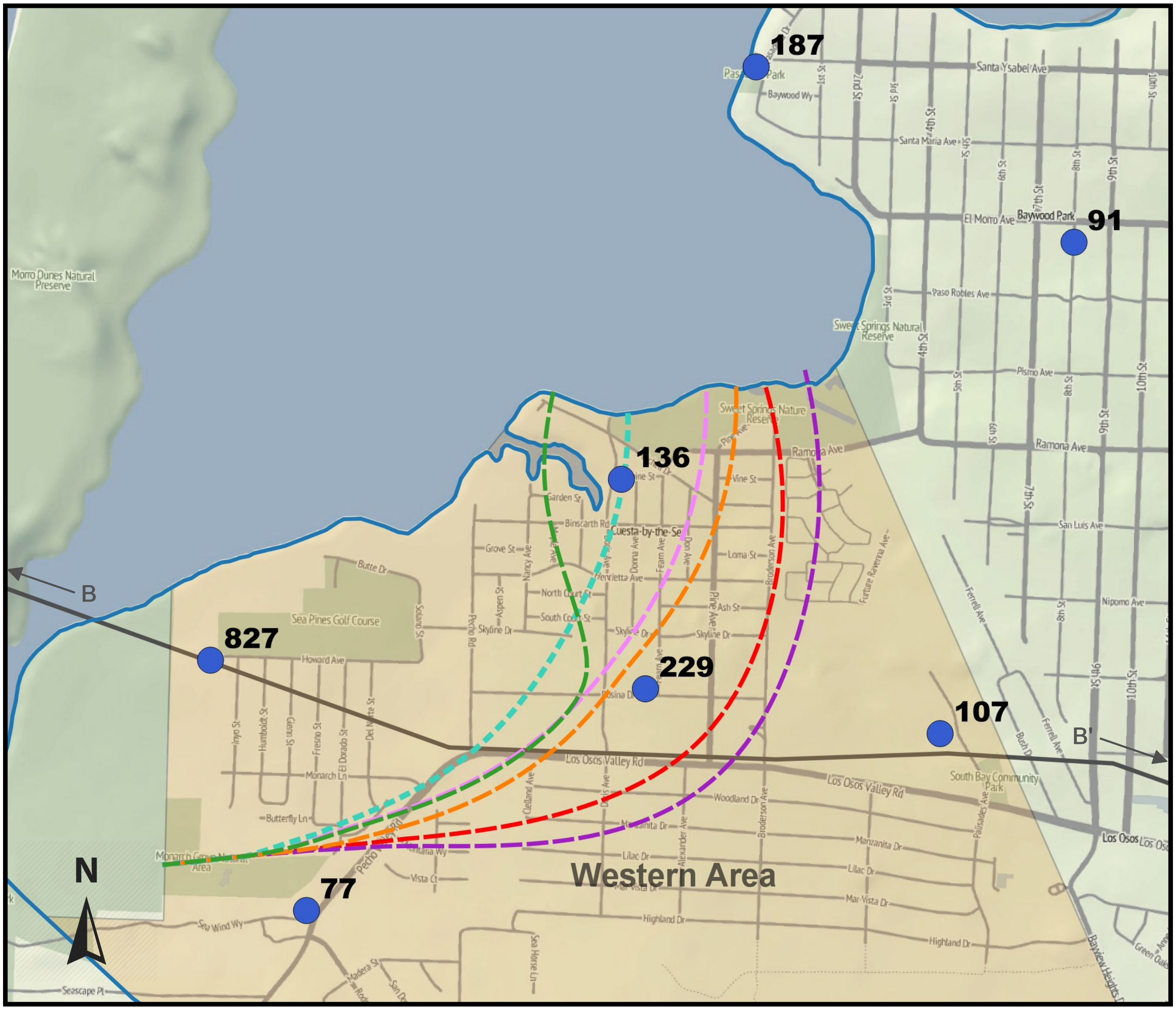
The addition of LA41 (Lupine Avenue Zone D) has contributed to a refinement of the location of the seawater intrusion front along the bay, resulting in a more westerly (improved) position compared to previous years (Figure 18). The new information shows the intrusion front located up to 1,400 feet closer to the coast between Fall 2018 and Fall 2019, but this is only due to the addition of LA41 to the contouring data set, and not to actual movement of the intrusion front. Without data from LA41, the Fall 2019 intrusion front would plot up to 200 feet east of the Fall 2018 position, indicating a slight deterioration of conditions (Appendix D).

Figure 18 is a simplification of Basin conditions, and the calculated position of the intrusion front and associated velocity of the intrusion front movement can vary significantly from year to year, and from Spring to Fall due to localized chloride fluctuations, particularly at well LA10. Furthermore, although the seawater intrusion front shown in Figure 18 is generally representative of Zone D, LA10 is completed in both Lower Aquifer Zone D and the top of Zone E, and LA11 is completed in Zone E.

Contouring for the intrusion front (250 mg/L chloride isopleth) shown in Figure 18 uses the ordinary kriging interpolation method, which provides a best (least-squares) estimate of values at unmeasured points based on the mapped values. Chloride concentrations at Dunes and Bay Area wells LA2 and LA3 are two orders of magnitude greater than the Western Area wells and were not used for contouring the intrusion front in the Western Area. The ordinary kriging interpolation method involves weighted linear interpolation, whereas the chloride concentrations approaching wells LA2 and LA3 on the sandspit do not appear to follow linear gradients.

The location of the intrusion front is also shown in cross-section on Figure 19. Lower Aquifer Zone D intrusion is discussed above. There is insufficient information to represent current Lower Aquifer Zone E intrusion in a plan view figure. A generalized plan view interpretation of Zone E intrusion using data from various years is included in Appendix D. Wells along the bay which represent Zone E water quality are LA4, located near Sea Pines Golf Course, LA11 on Pasadena Drive, and the new LA40 on Lupine Avenue (Figure 4). Water quality at LA4 has been close to seawater (17,000 mg/L chloride) since first sampled in 1985 (Cleath & Associates, 2005), while LA40 was sampled for the first time in 2019, with chloride measuring 1,460 mg/L. LA11 has historically had much lower chloride concentrations (less than 200 mg/L). Other control points for Zone E water quality along the B-B' cross-section orientation in Figure 19 are LA15 and LA18 in the Central Area. The seawater front reached LA15 in 2009, but there has been no evidence of further inland movement toward LA18, and geophysics in 2018 at nearby deep monitoring well LA14 continues to show no sign of intrusion. In 2013, LA15 was modified to remove Zone E production (CHG, 2014).

There are four locations where existing wells could potentially be modified to provide Zone E water quality data for the monitoring program, and would allow better delineation of seawater intrusion (see Appendix D). Evaluating the feasibility and costs of these modifications is recommended.



Base Image: Stamen-Terrain

0 750 1,500 2,250 3,000 ft

Scale: 1 inch ≈ 1,500 feet

Explanation

827 Groundwater with Fall 2019 lower aquifer chloride concentration in milligrams per liter (mg/L)

Cross-section alignment (Figures 5 and 19)

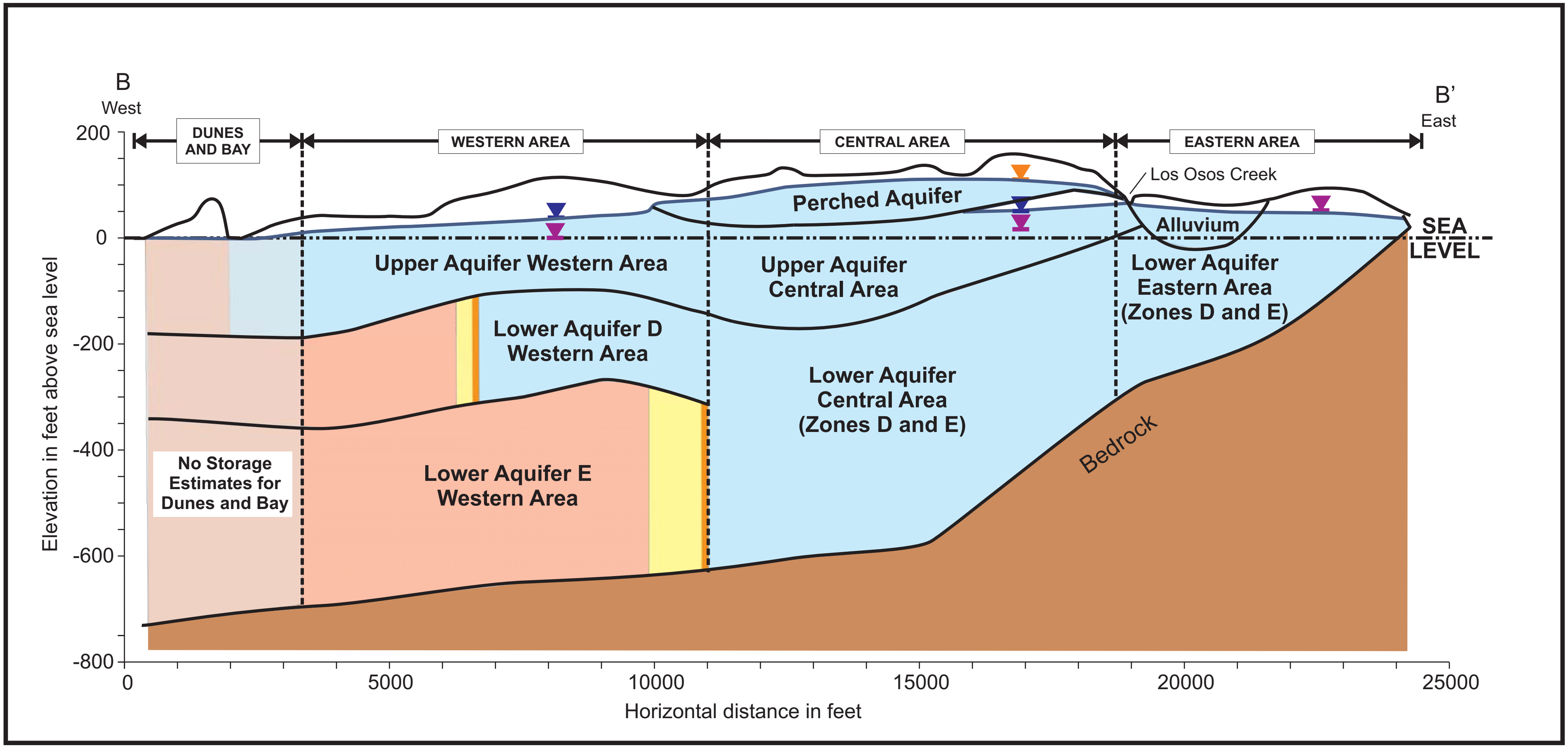
Bulletin 118 Basin Boundary

Seawater intrusion front in Western Area (250 mg/L chloride isopleth

2019
2018
2017
2016
2015
2005

Figure 18
Seawater Intrusion Front
Western Area Lower Aquifer Zone D
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists



Cross-section alignment shown in Figure 18

Explanation

Groundwater in Storage <250 mg/l Chloride 2018

Groundwater in Storage >250 mg/l Chloride 2005

Change in Groundwater in Storage >250 mg/l Chloride Winter 2005-2019

Fall 2019 seawater intrusion front

Perched Aquifer Water level

Upper Aquifer Water level

Lower Aquifer Water level

NOTE: Inland movement of intrusion front between Fall 2018 and Fall 2019 shown in Figure 18 is for Lower Aquifer Zone D. There is no evidence of further inland movement of the intrusion front in Zone E.

Figure 19
Basin Storage Compartments
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

7.4 Groundwater in Storage

Groundwater in storage for Basin areas and aquifers has been estimated through a systematic approach of water level contouring, boundary definition, volume calculations, and aquifer property estimation. The methodology was developed to facilitate change in storage calculations from year to year. An example storage calculation for the Eastern Area is shown in Appendix J. Storage estimates were performed for Spring and Fall 2019 and included separate estimates for the following areas and aquifers shown in Figure 19:

- Perched Aquifer
- Western Area Upper Aquifer
- Western Area Lower Aquifer
- Central Area Upper Aquifer
- Central Area Lower Aquifer
- Eastern Area Alluvial and Lower Aquifer

The various storage compartments are shown conceptually in Figure 19. Storage estimates for the Lower Aquifer in the Western and Central Areas combine fixed pore space volume and confined pore space volume components. The fixed volume component of storage is based on the specific yield of the aquifer sediments and is fixed because the Lower Aquifer is never dewatered in the Western and Central Areas. The confined component adds a relatively small volume of transient storage associated with the aquifer pressure and is based on the storativity of the aquifer. Specific yield values for aquifer zones are shown in Table 17 (with log correlations in Appendix J).

Table 17. Estimated Specific Yield Values

Aquifer Zone	Specific yield[1] (percent of volume)
Zone A&B	12.8
Zone C	10.2
Zone D	8.8
Zone E	10.5
Qal	13.0
Zones D&E [2]	9.8
Qal, Zones D&E [3]	10.1

Notes: [1] Weighted specific yield values based on log correlations in Appendix K.
[2] Used for Central Area storage calculations
[3] Used for Eastern Area storage calculations

Storage calculations prior to this Annual Report had assumed a fixed specific yield value of 10 percent. Beginning in 2018, storage calculations are based on specific yields for each individual aquifer zone and are more representative of Basin conditions.

Confined and semi-confined aquifer storativity values are typically orders of magnitude less than the specific yield. The average specific yield for Basin sediments is estimated to range from 9.8 percent to 13 percent (Table 17). The storativity value used for the confined aquifer in the Western and Central Areas is estimated at 0.0008 (Cleath & Associates, 2005).

The storage component of the Lower Aquifer in the Western Area Zone D represents the groundwater volume with a chloride concentration of 250 mg/L or less. Zone E in the Western Area is excluded from the storage calculations, because chloride concentrations are interpreted as mostly above 250 mg/L (Figure 19 and Figure D6, Appendix D).

All storage calculations were based on upper and lower contoured surfaces specific to the aquifer (fixed volume and confined volume were combined). For example, elevation contours on the base of the Perched Aquifer were used as the lower bounding surface for Perched Aquifer storage calculations, so no storage was assigned to unsaturated pore space between the base of the perched aquifer and saturated Upper Aquifer sediments (Figure 19). Appendix J includes a list of wells used for 2019 groundwater elevation contours and associated upper surfaces for storage calculations. Fixed surfaces used for storage calculations (base of perched aquifer, base of Upper Aquifer, base of Lower Aquifer Zone D, and base of permeable sediments were developed from existing contour maps and control points presented in prior reports (Cleath & Associates, 2003, 2005; CHG, 2015). Table 18 summarizes the estimates of fresh groundwater in storage for 2019.

Table 18. Groundwater in Storage Spring and Fall 2019 (<250 mg/L Chloride)

Basin Area	Aquifer	Zone	Spring 2019		Fall 2019	
			Total	Above Sea Level	Total	Above Sea Level
			ACRE-FEET			
Western and Central	Perched	A, B	5,700	5,700	5,700	5,700
	Upper	C	28,900	7,000	28,300	6,500
Western	Lower[1]	D[2]	14,300	<10	15,100	<10
Central	Lower[1]	D, E	55,100	<10	55,100	<10
Eastern	Alluvial and Lower	Alluvial, D, E	19,400	4,900	18,900	4,400
TOTAL			123,400	17,600	123,100	16,600

NOTES: [1]Includes fixed and confined storage.
[2] Western Area Zone E not included due to chloride>250 mg/L.

Total estimated fresh groundwater in storage for the Basin (excluding Dunes and Bay Area) averaged 123,400 acre-feet in Spring 2019, with an estimated 17,600 acre-feet above sea level (Table 18). There was a calculated net seasonal storage decline of 300 acre-feet between Spring 2019 and Fall 2019, although there was an estimated gain of 800 acre-feet of freshwater storage in Lower Aquifer Zone D. This increase in Zone D freshwater storage from Spring to Fall 2019 does not represent a retreat of the seawater intrusion front, but is a one-time adjustment from adding monitoring well LA41 to the Fall 2019 contoured data set.

There is approximately 70,000 acre-feet of fresh groundwater in storage within the Lower Aquifer in the Western Area Zone D and Central Area Zones D and E (Table 18). Because groundwater levels in the Lower Aquifer within the Western and Central Areas average more than 100 feet above the top of the aquifer, dewatering is unlikely, and this volume of storage will only change with movement of the seawater intrusion front. The Lower Aquifer storage includes a relatively small component (less than 200 acre-feet) of confined pore space volume, representing water that is available without dewatering any portion of the Lower Aquifer (the pressure component). Water is relatively incompressible, so once the pore spaces of an aquifer have been filled, substantial confining pressure is required to further increase the storage volume. Conversely, there is a much greater drop in aquifer water levels for storage withdrawals under confined conditions, compared to unconfined conditions. This smaller storage volume assumes a confined aquifer storativity of 0.0008, compared to the unconfined specific yields of 0.098 to 0.13. Table 19 compares Spring 2018 groundwater in storage with Spring 2019.

Table 19. Change in Storage Spring 2018 to Spring 2019 (<250 mg/L Chloride)

Basin Area	Aquifer	Zone	Spring 2018[1]		Change from Spring 2018 to Spring 2019	
			Total	Above Sea Level	Total	Above Sea Level
			ACRE-FEET			
Western and Central	Perched	A, B	5,800	5,800	-100	-100
	Upper	C	28,600	6,700	300	300
Western	Lower[2]	D[3]	14,200	<10	100	0
Central	Lower[2]	D, E	55,100	<10	0	0
Eastern	Alluvial and Lower	Alluvial, D, E	19,000	4,500	400	400
TOTAL			122,700	17,000	700	600

NOTES: [1]Spring 2019 storage based on updated specific yield values

[2]Includes fixed and confined storage.

[3] Western Area Zone E not included due to chloride>250 mg/L.

As shown in Table 19, there was a gain of 100 acre-feet of freshwater storage in the Lower Aquifer between Spring 2018 and Spring 2019. There was also a gain of 600 acre-feet in storage above sea level in the Basin over the same period, for a net gain of 700 acre-feet of storage between Spring 2018 and Spring 2019.

7.5 Basin Metrics

The LOBP established two methods for measuring progress in management of seawater intrusion (ISJ Group, 2015): one based on comparing annual groundwater extractions with the estimated sustainable yield of the Basin as calculated by the Basin numerical groundwater model, and one based on evaluating water level and water quality data from the LOBP Groundwater Monitoring Program. The first method involves the Basin Yield Metric and the Basin Development Metric, while the latter method involves the Water Level Metric, The Chloride Metric, and the Nitrate Metric.

7.5.1 Basin Yield Metric

The Basin Yield Metric compares the actual amount of groundwater extracted in a given year with the estimated sustainable yield of the Basin under then-current conditions. Sustainable yield is estimated using the Basin model as the maximum amount of water that may be extracted from the Basin with none of the active wells producing water with chloride concentration in excess of 250 mg/L (ISJ Group, 2015). A chloride concentration of 250 mg/L is the recommended limit for drinking water (one-half of the Secondary Maximum Contaminant Level Upper Limit of 500 mg/L). The Basin Yield Metric for 2019 is a ratio expressed as follows:

$$\frac{\text{2019 Groundwater Production}}{\text{2019 Sustainable Yield}} * 100$$

Groundwater production in 2019 was 1,900 acre-feet. The sustainable yield of the Basin with the infrastructure in place at year-end 2016 was estimated using the Basin model to be 2,760 acre-feet per year (CHG,2017b). The 2016 estimate included the first Program C well and is applicable to year-end 2019, therefore, the Basin Yield Metric in 2019 is 69. The LOBP objective for the Basin Yield Metric is 80 or less and has been met in each of the last four years.

Figure 20 compares the Basin Yield Metric and area production in the Basin since 2005. The Basin Yield Metric has dropped from an average of 125 between 2005 and 2009 to 69 in 2019. Two development scenarios from the LOBP are also provided for comparison in Figure 20.

Estimated sustainable yield in the equation above is not simply a volume of water, however, but is also the distribution of groundwater pumping across the Basin that maintains a stationary seawater front, with no active well producing water with chloride concentrations above 250 mg/L. Long-term climatic conditions are assumed for the estimated sustainable yield.

The estimated sustainable yield of the Basin has been reported to the closest 10 acre-feet, similar other water balance components estimated using the Basin model (LOBP, 2015). This level of rounding is based on the precision, not the accuracy, of the Basin model. Estimating the sustainable yield of the Basin is directly associated with mitigating seawater intrusion. The ability of the Basin model to accurately simulate seawater intrusion was evaluated during model conversion to Equivalent Freshwater Head (EFH) in 2005 (Cleath & Associates 2005) and again during model conversion to SEAWAT in 2009 (CHG, 2009a). In 2005, the EFH model estimated 620 acre-feet per year of seawater intrusion along the coast under long-term climatic conditions with 1999-2001 Basin pumping, while an analytical approach using available hydrogeologic data and Darcy's Law estimated 500 acre-feet per year of intrusion, indicating the numerical analysis (flow model) was more conservative as a Basin management tool than the analytical approach. A subsequent comparison of seawater intrusion at the coast between the EFH model and upgraded SEAWAT model of seawater intrusion at the coast showed the two models were within 2 percent of each other. The SEAWAT model also matched the historical average velocity of sea water intrusion into the Lower Aquifer of 50-60 feet per year (from water quality data), although the simulated velocity was higher in Zone D (80 feet per year) and lower in Zone E (40 feet per year).

7.5.2 Basin Development Metric

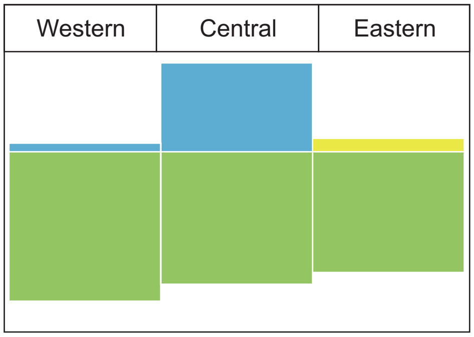
The Basin Development Metric compares the estimated sustainable yield of the Basin in a given year with the estimated maximum sustainable yield of the Basin with all potential LOBP Projects implemented (see Section 10 for a brief overview of LOBP Programs). The Basin Development Metric for 2019 is a ratio expressed as follows:

$$\frac{\text{2019 Sustainable Yield}}{\text{Maximum Sustainable Yield}} * 100$$

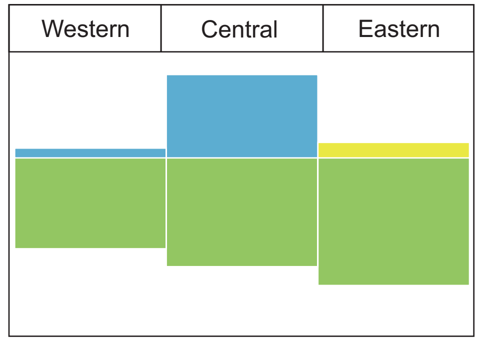
The 2019 sustainable yield is estimated at 2,760 acre-feet. The maximum sustainable yield with all LOBP projects implemented is estimated at 3,500 acre-feet. Therefore, the Basin Development Metric in 2019 is 79, which is the same value as 2018. The purpose of the metric is to inform the BMC on the percentage of the Basin's maximum sustainable yield that has been developed. There is no LOBP objective for the Basin Development Metric.

As presented in the LOBP, the estimated sustainable yield of the Basin will increase beginning with urban water reinvestment Program U and Basin infrastructure Programs A and C, which are currently in progress. The BMC may consider updating the Maximum Sustainable Yield once the location of the second Program C expansion well is finalized in order to incorporate changes to the LOBP, including revised expectations for recycled water availability.

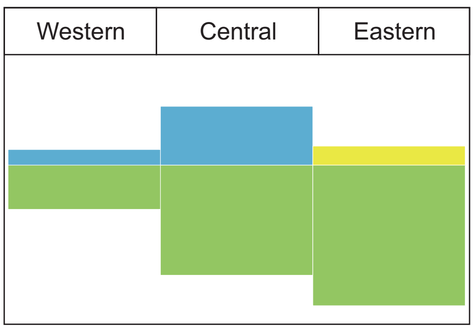
2005-2009
Average Production 3,060 AFY
Basin Yield Metric = 128



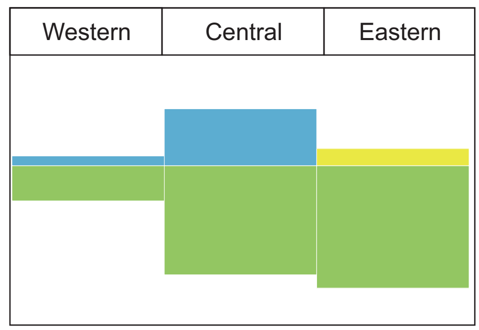
2010-2014
Average Production 2,600 AFY
Basin Yield Metric = 106



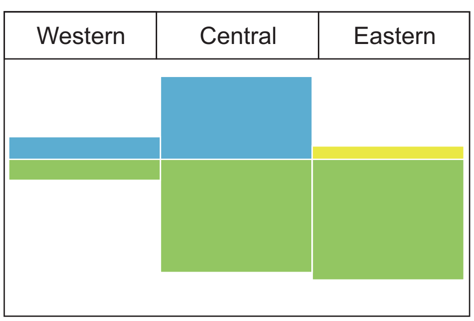
2015-2018
Average Production 2,103 AF
Basin Yield Metric = 76



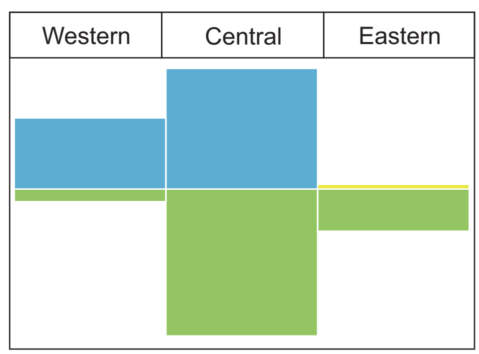
Year 2019
Average Production 1,900 AF
Basin Yield Metric = 69



E+AC+U (No Further Development Scenario)
refer to Basin Plan for full description
Average Production 2,230 AFY
Basin Yield Metric = 74



E+UG+ABC (Buildout Scenario)
refer to Basin Plan for full description
Average Production 2,380 AFY
Basin Yield Metric = 71



Explanation:

Size of rectangle is proportional to groundwater production

Alluvial Aquifer

Upper and Perched Aquifer

Lower Aquifer

Note: historical (pre-2015) and future/projected Basin Yield Metrics are from LOBP

Figure 20
Basin Yield Metric Comparison
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

7.5.3 Water Level, Chloride, and Nitrate Metrics

The Water Level, Chloride, and Nitrate Metrics are measurements of the effectiveness of Basin management. The Water Level and Chloride Metrics address changes in the Lower Aquifer related to seawater intrusion mitigation, while the Nitrate Metric addresses changes in First Water and the Upper Aquifer related to nitrate contamination mitigation.

Water Level Metric

The Water Level Metric is defined as the average Spring groundwater elevation, measured in feet above mean sea level, in five Lower Aquifer wells. These wells are LA2, LA3, LA11, LA14, and LA16 (Figure 4).

Two Water Level Metric wells (LA14 and LA16) are positioned in the Western Area near the current seawater intrusion front (250 mg/L chloride isopleth) and one well is in the Central Area on the bay front (LA11). As Basin production is redistributed through the Basin infrastructure program, these Water Level Metric wells will monitor Lower Aquifer groundwater levels in critical areas near the seawater intrusion front.

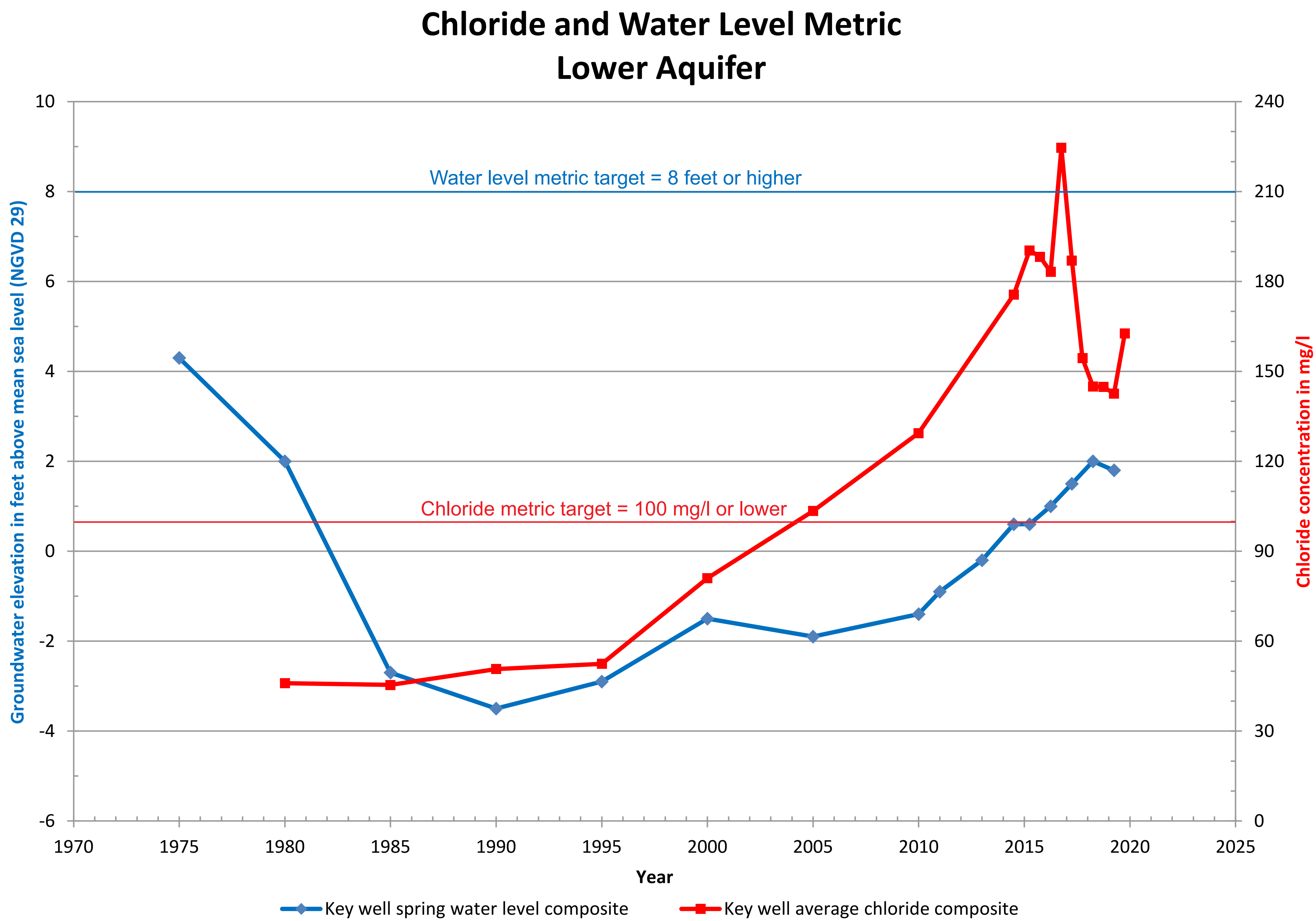
The last two Water Level Metric wells are located on the Morro Bay sand spit (LA2 and LA3), where monitoring will help evaluate regional effects, rather than just localized water level rebound. Figure 21 graphs historical trends in the metric. Table 20 presents the 2019 Water Level Metric.

Table 20. 2019 Water Level Metric

Metric Well	Spring 2019 Groundwater Elevation (feet above sea level - NGVD 29 Datum)
LA2	1.57[1]
LA3	-0.81[1]
LA11	0.63[1]
LA14	0.61[1]
LA16	7.22[1]
Water Level Metric (average)	1.8 feet

Data Source: LOBP and County Groundwater Monitoring Programs
[1]Subtracted 2.8 feet from NAVD 88 elevations in Table 5 to convert to NGVD 29 datum for metric.

The Spring 2019 Water Level Metric is 1.8 feet NGVD 29 (approximately 4.6 feet NAVD 88). Mean sea level is approximately 0 feet in the NGVD 29 datum, and 2.8 feet in the NAVD 88 datum for the central coast of California, where the Basin is located. The metric was rising (an improvement) from 2005 through 2014, likely in response to a decrease in Lower Aquifer production. Following a flat interval between 2014 and 2015, the metric continued to rise through



Note: 2019 water levels at key wells 11A2 and 14B2 were measured in winter as opposed to the spring.

Figure 21
Chloride and Water Level Metric
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

2018, but has declined slightly in 2019 (Figure 21). The LOBP objective for the Water Level Metric is 8 feet or higher (ISJ Group, 2015). Removal of the density correction at the sandspit wells, and adjustment of reference point elevations to the NGVD 29 datum has lowered the metric by a few feet compared to prior calculations (CHG 2016b). Reevaluation of the metric objective may be appropriate, however, a review of all well elevation reference points by a licensed surveyor is recommended prior to considering a change in the water level metric objective.

The decline in the Water Level Metric in 2019 during an above-average precipitation year appears anomalous, considering 2019 basin production also decreased, and is interpreted to be due to local conditions at individual metric wells. A decline of 0.2 feet is minor, and may be related to the timing of individual water level measurements relative to active pumping in the confined Lower Aquifer. Water level transducer data for LA13 (Appendix I; not a Water Level Metric well) records a two-foot rise in Lower Aquifer water levels in the Central Area between Spring 2018 and Spring 2019, with high water levels in March. Two of the metric wells were monitored in in February 2019, possibly before representative peak Spring values had been reached at those locations. An expansion of the Lower Aquifer transducer network is recommended, which will help to identify groundwater mounding effects from treated wastewater disposal at the Broderson Site (CHG, 2019a) and would provide support for interpreting Water Level Metric trends.

<u>Chloride Metric</u>

The Chloride Metric is defined as the weighted average concentration of chlorides in four key Lower Aquifer wells. One key well (LA10) is within the historical path of seawater intrusion (Cleath & Associates, 2005). Reduction in pumping from the Lower Aquifer should result in measurable declines in chloride concentrations at this well, as the hydraulic head in the Lower Aquifer increases and the inland movement of seawater decreases or is reversed. The Chloride Metric target level is 100 mg/L or lower, and the LOBP Groundwater Monitoring Program schedule for measuring the Chloride Metric is in the Spring and Fall.

There are also three key wells on the perimeter of the seawater intrusion front (LA8, LA11, and LA12). Wells LA11 and LA12 monitor Lower Aquifer chloride concentrations in the northern portion of the Basin, while LA8 monitors chloride concentrations in the southern portion. When calculating the Chloride Metric, the concentration of Well LA10 is given twice the weight of the other three wells, in order to increase the sensitivity of the metric to management actions (refer to the LOBP for a description of the development of the metric). Table 21 presents the Spring and Fall 2019 Chloride Metric. Figure 21 graphs historical values in the metric.

The Chloride Metric is a simplification of Basin conditions and can vary significantly from year to year due to localized chloride fluctuations, particularly at well LA10. Implementation of a pre-defined pumping program at LA10 was recommended to address Upper Aquifer wellbore leakage and ensure better data quality during the Spring and Fall monitoring events (CHG, 2018a). A protocol was subsequently established to sample LA10 at the end of a regular pumping cycle and following the greatest relative use period during the sampling month. In 2019, water samples collected from LA10 during both Spring and Fall monitoring events indicated no Upper Aquifer influence from wellbore leakage.

Table 21. 2019 Chloride Metric		
Metric Well (Aquifer Zone)	**Spring 2019 Chloride Concentrations**	**Fall 2019 Chloride Concentrations**
LA8 (Zone D)	75 mg/L	77 mg/L
LA10 (Zone D/E)	174 mg/L (double counted for average)	229 mg/L (double counted for average)
LA11 (Zone E)	196 mg/L	187 mg/L
LA12 (Zone D)	94 mg/L	91 mg/L
Chloride Metric (weighted average)	143 mg/L	163 mg/L

Data Source: LOBP Groundwater Monitoring Program (Appendix C)

The 2019 water quality monitoring results indicate an advance of the seawater intrusion front, compared to prior years. Seawater intrusion is typically most active in the fall, when water levels (fresh water pressures) are lowest, although chloride concentrations at individual wells may vary based on local influences. A comparison between Spring 2019 and Fall 2019 shows an increase in the metric, and the Chloride Metric has increased relative to the target value between Fall 2018 (145 mg/L) and Fall 2019 (163 mg/L), indicating intrusion during 2019 (Figure 21).

Table 21 also lists the Lower Aquifer zone tapped by the individual Chloride Metric wells. Two wells are in Zone D, one is Zone E, and one is mixed Zone D/E. The Zone E and Zone D/E wells show the greatest impact from seawater intrusion, and Zone E is interpreted to have much higher chloride concentrations than Zone D in most of the Western Area (Appendix D). As previously mentioned, there are four locations where existing wells could potentially be modified to provide Zone E water quality data for the monitoring program, which would allow better delineation of seawater intrusion (Appendix D).

Nitrate Metric

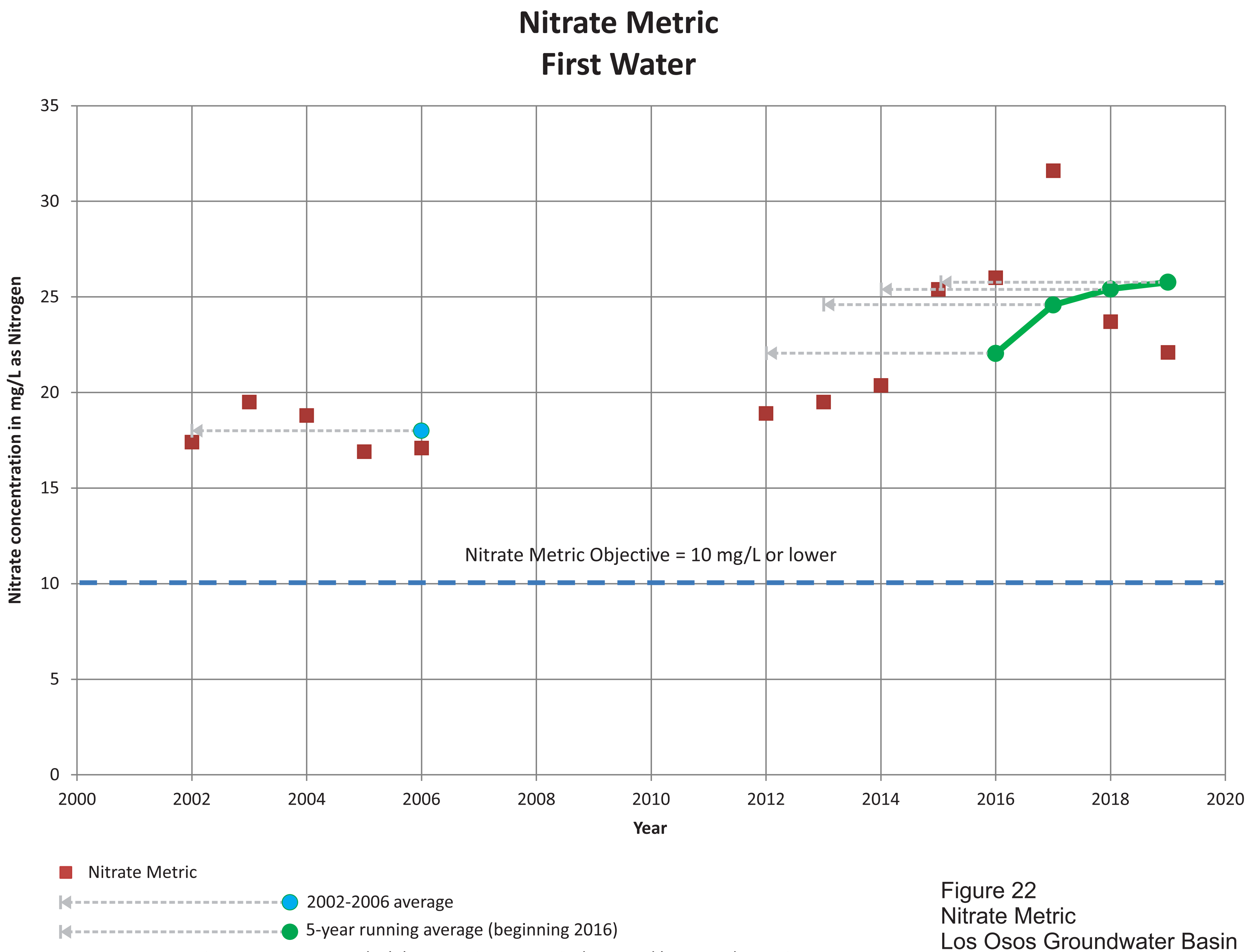
The Nitrate Metric is defined as the average concentration of nitrate in five First Water key wells located in areas of the Basin that have been impacted by elevated nitrate concentrations. The Nitrate Metric data is obtained from the LOWRF Groundwater Monitoring Program's winter sampling event and focuses on shallow, adversely impacted wells to track changes in nitrate concentrations in groundwater over time. FW10 was not sampled in 2019. Table 22 presents the Nitrate Metric for 2019. Figure 22 graphs historical values in the metric, along with the 5-year average for 2002-2006 and a 5-year running average beginning in 2012-2016. The Nitrate Metric target level is 10 mg/L or lower.

Table 22. 2019 Nitrate Metric	
Metric Well	**Winter 2019 Nitrate-Nitrogen (NO_3-N) Concentrations**
FW2	29 mg/L
FW6	2 mg/L
FW10	29 mg/L[1]
FW15	27 mg/L
FW17	23 mg/L
Nitrate Metric (average)	22 mg/L

Data Source: LOWRF Groundwater Monitoring Program (Rincon Consultants, 2019)
[1]FW10 not sampled in 2019 – used 2018 value for metric.

The Nitrate Metric was measured at 22 mg/L nitrate-nitrogen (NO_3-N), which is above the Maximum Contaminant Level of 10 mg/L (the drinking water standard). There was a 2 mg/L decrease in the Nitrate Metric from Winter 2018 (24 mg/L), to Winter 2019 (22 mg/L), a slight improvement (Figure 22). The greatest decrease in NO_3-N over the last several years was measured at key well FW6, where concentrations measured 15 mg/L in 2016, 10 mg/L in 2017, 3 mg/L in 2018, and 2 mg/L in 2019. FW6 is hydraulically downgradient of the Broderson site, and NO_3-N declines are attributable to recycled water discharges.

Independent of LOBP actions, construction and operation of the community sewer system and LOWRF will largely stop nitrate loading in the Basin from septic disposal within the wastewater service area. Nitrate concentrations in the Basin are expected to begin declining over the next decade, and in 2019 the Nitrate Metric reached the lowest point recorded since 2016. The five-year running average, which represents long term trends, is still increasing through 2015-2019 although the rate of increase has been slowing since 2016 (Figure 22).



NOTE: 5-year running average increased while 2019 Nitrate Metric decreased because data point removed from running average (2014; 20 mg/L) was less than data point added (2019; 22 mg/L).

Figure 22
Nitrate Metric
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

7.5.4 Upper Aquifer Water Level Profile

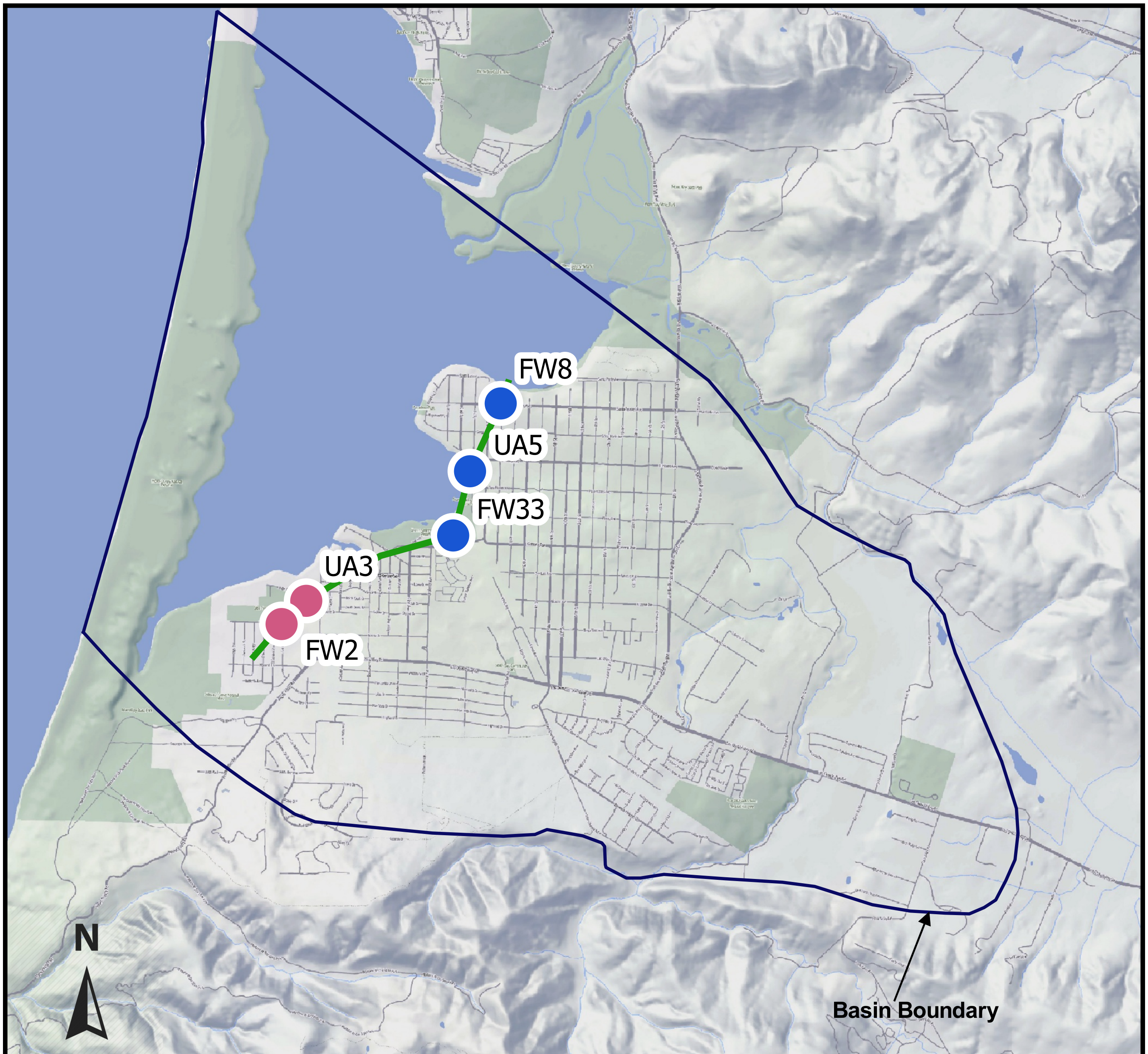
Metrics allow the BMC, regulatory agencies, and the public to evaluate the status of nitrate concentrations and seawater intrusion in the Basin through objective, numerical criteria that can be tracked over time (LOBP, 2015). The Upper Aquifer has a Nitrate Metric, but does not have Water Level Metric or Chloride Metric because seawater intrusion is not occurring in the Upper Aquifer. Seawater intrusion affects chloride concentrations in groundwater and moves primarily in response to changes in water levels and associated hydraulic head in an aquifer.

A Water Level Metric and Chloride Metric for the Upper Aquifer was recommended in the 2016 Annual Report to provide the BMC with a management tool for addressing the potential for seawater intrusion into the Upper Aquifer as Upper Aquifer production increases. There are only a few Upper Aquifer wells, however, along the shoreline of the Morro Bay estuary where seawater intrusion would be most likely to occur. An alternative management tool proposed for the Upper Aquifer is the Water Level Profile. The benefit of a profile, rather than a metric, is that spatial information is included. Conditions for seawater intrusion along the Water Level Profile could occur before an equivalent metric-based threshold is reached, since there is no averaging in the Water Level Profile. Metrics were not designed for early detection, which is what is needed for Upper Aquifer seawater intrusion monitoring.

Seawater has a density that is 1.025 times greater than fresh water. For every foot of fresh water head above sea level, the seawater interface will be displaced 40 feet below sea level, according to the Ghyben-Herzberg relation (Freeze and Cherry, 1979). Using the Ghyben-Herzberg relation and elevation contours on the base of the Upper Aquifer, a profile showing the groundwater elevations needed to avoid seawater intrusion beneath the bay shoreline (the Protective Elevation) has been prepared, along with the Spring 2019 Upper Aquifer groundwater elevations along the same profile, adjusted to the NGVD 29 datum. The resulting comparison of the Upper Aquifer Water Level Profile and the Protective Elevation is shown in Figures 23 and 24.

Water levels along the Water Level Profile in Spring 2019 were above the Protective Elevation (Figure 24). Spring water levels shown above ground surface in low-lying areas near the bay represent artesian pressures in the aquifer, and incorporate an estimated pressure at an artesian well at Sweet Springs. Groundwater seeps and springs are common along the bay shoreline, including Sweet Springs and the 3rd Street marsh.

If water levels decline below the Protective Elevation, there would be a theoretical potential under hydrostatic conditions (zero hydraulic gradient) for seawater intrusion to occur at the base of the Upper Aquifer. However, water levels have been below the Protective Elevation in the past along portions of the profile without any seawater intrusion detected, particularly during drought periods (e.g. mid 1970's at UA5 and early 1990's at UA3).



Base Image: Stamen-Terrain

0 2,000 4,000 6,000 8,000 ft

Scale: 1 inch ≈ 4,000 feet

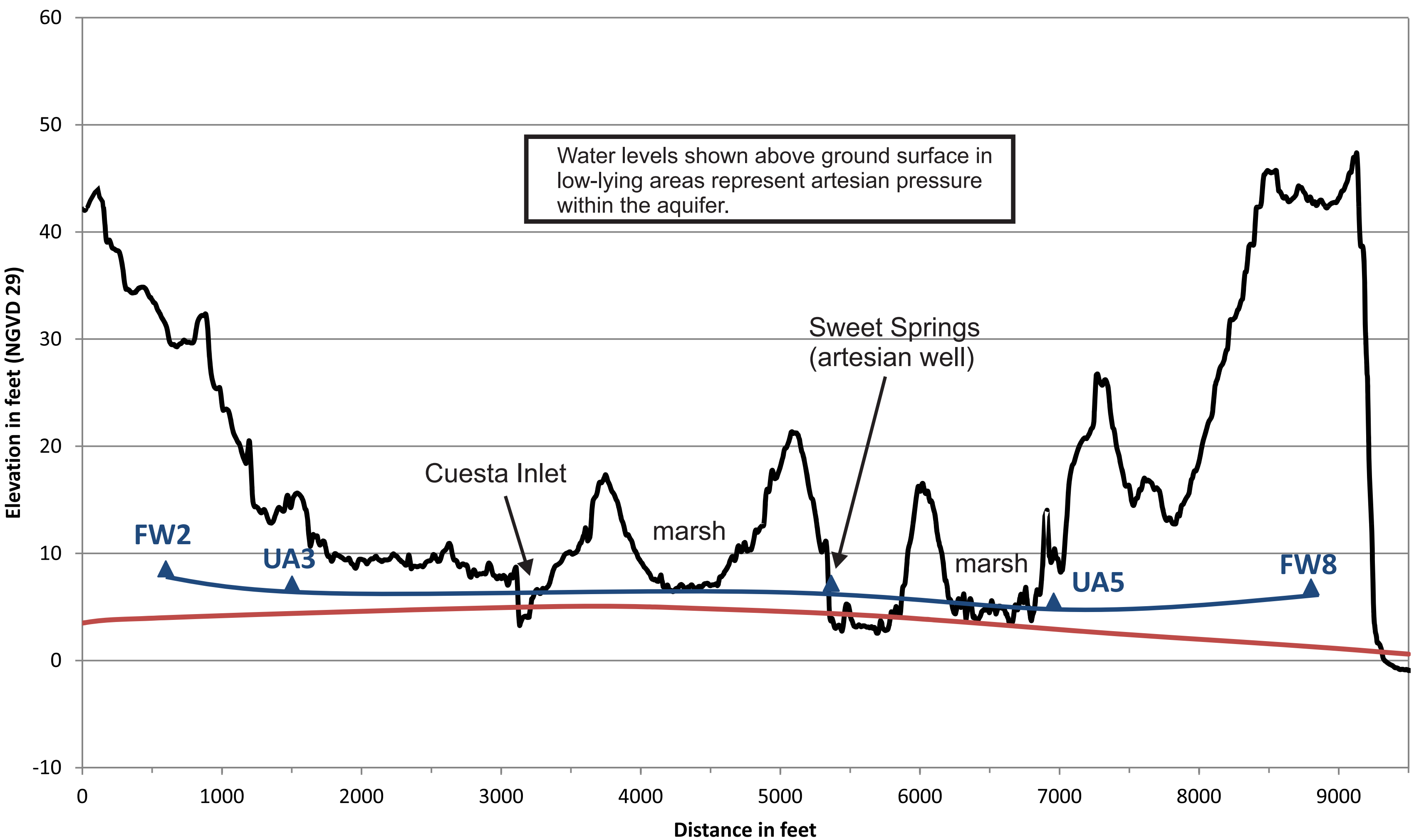
Explanation

- LOBP Water Level Monitoring Well
- Water Level and Water Quality Monitoring Well
- Water Level Profile Alignment

Figure 23
Water Level Profile Alignment
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

Upper Aquifer Water Level Profile



Explanation

- Well Location
- Ground Surface
- Protective Elevation
- Spring 2019 Upper Aquifer Water Level Profile (adjusted to NGVD 29 datum)

Figure 24
Upper Aquifer Water Level Profile
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

8. BASIN STATUS

The status of the Basin in 2019 is summarized as follows:

- The Basin received above normal rainfall in 2019. San Luis Obispo County started 2019 with moderate to severe drought conditions in January and ended in December 2019 with no drought conditions to report (NDMC/USDA/NOAA, 2019).

- Groundwater production for the Basin totaled 1,900 acre-feet in the 2019 calendar year, compared to 2,030 acre-feet in 2018. Purveyor groundwater production decreased by approximately 30 acre-feet while community facilities decreased by an estimated 60 acre-feet in 2019, compared to 2018. The large drop in community water use is attributed to the use of recycled water at Sea Pines Golf Course. Agricultural irrigation decreased by an estimated 40 acre-feet in 2019, compared to 2018.

- Long-term water level trends over the last 7 years in First Water wells averaged 0.15 feet of decline per year. Long-term water level trends over the last 10 years in Upper Aquifer wells averaged 0.35 feet of rise per year, and in Lower Aquifer wells averaged 0.6 feet of rise per year.

- A data gap was filled with completion of Lower Aquifer nested monitoring wells LA40 and LA41 on Lupine Avenue near the bay. The repositioned seawater intrusion front in Zone D is up to 1,400 feet closer to the coast. There was a net gain of 700 acre-feet of Basin freshwater storage between Spring 2018 and Spring 2019.

- Repositioning the seawater intrusion front toward the coast by adding monitoring well LA41 to the contouring data set does not represent movement of the front over time. Relative movement of the seawater intrusion front between Spring 2018 and Spring 2019 is interpreted to be up inland (intrusion).

- The Basin Yield Metric decreased from 74 in 2018 to 69 in 2019. The metric has met the LOBP goal of 80 or less for four consecutive years.

- The Basin Development Metric in 2019 indicates that 79 percent of the estimated maximum potential sustainable yield of the Basin has been developed. There is no LOBP objective for the Basin Development Metric. The metric has not changed from 2018, meaning that no new infrastructure projects affecting Basin sustainable yield have been completed.

- The Water Level Metric declined by 0.2 feet between Spring 2018 (2.0 foot) and Spring 2019 (1.8 feet), indicating a deterioration in 2019, and remains several feet below the target value of 8 feet. This decline in the metric value during an above-average precipitation year with lower basin production is interpreted to be due differences in timing of the measurements relative to Spring high water levels. Where continuous water level transducer data is available in the Central Area, Lower Aquifer water levels rose by two feet from Spring 2018 to Spring 2019.

- The Chloride Metric increased relative to the 100 mg/L target value between Fall 2018 (145 mg/L) and Fall 2019 (162 mg/L), indicating a deterioration in 2019.

- Upper Aquifer water levels were above the Protective Elevation along the bay, including UA3, which was below the protective elevation in 2019. There is no indication of seawater intrusion at UA3, based on chloride concentrations.

- The Nitrate Metric decreased relative to the 10 mg/L target value, from 24 mg/L NO_3-N in 2018 to 22 mg/L NO_3-N in 2019, indicating improvement in 2019.

9. RECOMMENDATIONS

The following LOBP Groundwater Monitoring Program recommendations from the 2018 Annual Report were completed, are in progress, or are planned for completion in 2020:

- Add a new Upper Aquifer and Lower Aquifer monitoring well near the bay, as recommended in the LOBP (ISJ Group, 2015). ***- Completed***

- Retain a licensed surveyor to review all available documentation on reference point elevations and to perform wellhead surveys as needed (Section 3.2.1). – ***Planned for 2020***

- Analyze FW6 for CEC's – ***Planned for 2020***

- Implementation of a pre-defined pumping program at LA10 would be recommended to address wellbore leakage and ensure better data quality during the Spring and Fall monitoring events. – ***Completed***

The following additional LOBP Groundwater Monitoring Program recommendations are provided for BMC consideration. Recommendations on Adaptive Management are provided in Section 10:

- Develop a rating curve for stream flow Sensor 751 on Los Osos Creek (Section 6).

- Re-evaluate Water Level Metric target after completion of wellhead surveys (Section 7.5.3)

- Expand the Lower Aquifer transducer network to help identify groundwater mounding effects from treated wastewater disposal at the Broderson Site and to provide support for Water Level Metric trend interpretation (Section 7.5.3).

- Evaluate feasibility and cost of modifying up to four existing program wells to become dedicated Zone E water quality monitoring locations (Section 7.3 and Appendix D).

- Consider updating the Maximum Sustainable Yield once the location of the second Program C expansion well is finalized in order to incorporate changes to the LOBP, including revised expectations for recycled water availability (Section 7.5.2).

10. ADAPTIVE MANAGEMENT PROGRAM AND STATUS OF LOBP PROGRAM IMPLEMENTATION

The LOBP describes seven potential programs of action, each of which focuses on a different aspect of Basin management (see Section 10.3). Implementation of the identified combination of the LOBP Programs is expected to result in sustainable use of the Basin.

The LOBP also provides for periodic review of the implementation of the LOBP through establishment of an Adaptive Management Plan that allows the BMC to do the following:

- Evaluate trends of key Basin metrics;
- Identify additional data needs;
- Report the data analysis to various interested parties;
- Modify the LOBP programs and schedule, if necessary, in response to current conditions and observed trends in the Basin;
- Modify procedures to utilize current best management practices; and
- Modify pumping, treatment, and/or water reuse procedures in response to Basin conditions and trends that show signs of degradation of water quality, including increased levels of contamination and/or increased levels of seawater intrusion.

The Adaptive Management Program will provide a status update on the implementation of the LOBP Programs, assess the overall effectiveness of the LOBP, and offer a tool with which to modify the LOBP programs to better meet overall LOBP objectives.

10.1 Basin Metrics

As noted in Section 7 ("Data Interpretation") of this Annual Report, the LOBP established several metrics to measure nitrate impacts to the Upper Aquifer, seawater intrusion into the Lower Aquifer, and the effect of management efforts to the BMC. These metrics allow the BMC, regulatory agencies and the public to evaluate the status of nitrate levels and seawater intrusion, and the impact of implementation of the LOBP programs, in the Basin through objective, numerical criteria that can be tracked over time. The 2019 metric values are summarized in Table 23 for easy reference during discussion and evaluation of the LOBP programs.

As discussed in Section 7.5.4, an Upper Aquifer Water Level Profile has been developed to track the potential for sea water intrusion in the Upper Aquifer. This profile currently shows that water levels in the Upper Aquifer remain safely above the Protective Elevation. The profile will be evaluated annually.

10.2 Adaptations to LOBP Programs

Based on the Basin status (Section 8) and recommendations (Section 9), the BMC intends to continuously develop and pursue additional measures related to the Groundwater Monitoring and Urban Water Use Efficiency programs. The following is an update on additional measures related to the Groundwater Monitoring and Urban Water Use Efficiency program:

Table 23. LOBP Metric Summary			
Metric	**LOBP Goal**	**Calculated Value from 2019 Data**	**Recommended Actions in Addition to LOBP Programs**
Basin Yield Metric: Comparison of current well production to sustainable yield	80 or less	69	Implement additional conservation measures to reduce indoor and outdoor demands (See Section 10.3.2)
Water Level Metric: Average groundwater elevation in 5 key wells in the Lower Aquifer	8 feet above mean sea level or higher	1.8 feet above mean sea level	Implement additional conservation measures to reduce indoor and outdoor demands (See Section 10.3.2)
Chloride Metric: Weighted average chloride concentration in 4 key wells in the Lower Aquifer	100 mg/L or lower	162 mg/L	Implement additional conservation measures to reduce indoor and outdoor demands (See Section 10.3.2)
Nitrate Metric: Average nitrate concentration in 5 key wells in the Upper Aquifer	10 mg/L or lower	22 mg/L (NO_3-N)	None recommended

Additional Water Quality Metrics. In addition to the Upper Aquifer Water Level Profile, the BMC will continue to consider developing additional metrics and/or numerical goals to protect the Upper Aquifer from water quality threats.

Contingency Plan Development. As metric trends and Basin response become better defined, the BMC intends to develop contingency plans to respond to unforeseen conditions. As funding and siting for Program C projects progress, detailed milestone schedules will also be developed.

Lower Aquifer Nitrate Trends. The BMC will continue to monitor the leakage of groundwater with elevated nitrate concentrations from the Upper Aquifer through the regional aquitard into the Lower Aquifer. Trends of increasing nitrate concentrations at some Lower Aquifer community supply wells are projected to exceed State drinking water standards, possibly within the next 10 years, as reported in the 2019 Adaptive Management TM (CHG, 2019a). The BMC will address this issue as part of strategic planning.

Adaptation of Water Conservation Measures. Evaluate the Urban Water Use Efficiency Program to determine which conservation measures are the most efficient and effective to meet the LOBP's goals.

Discussion and Recommendation of Criteria for Future Growth. Provide input into the Los Osos Community Plan (LOCP), including consideration of Basin Metrics and defined goals as they relate to the timing of future growth within the Basin. In its May 2017 meeting, the BMC authorized the release of a letter to the County Planning Department and Coastal Commission staff recommending that future development should be subject to the following provisions:
1. Any growth projections in the updated Los Osos Community Plan should be consistent with the water supply estimates provided in the Basin Management Plan.
2. The Community Plan should acknowledge any infrastructure projects contemplated by the Basin Plan that would require coastal planning action subject to the authority of the Coastal Commission. This provision would help expedite completion of any affected projects.
3. Amendments to the County's Growth Management Ordinance [separate from the Community Plan/LCP] should provide a growth rate for Los Osos consistent with the adaptive management provision of the Basin Plan. In particular, the rate of growth must be set so that the monitoring provisions of the Basin Plan confirm the adequacy of a sustainable water supply in support of any contemplated future growth.

10.3 LOBP Programs

The LOBP outlines a number of programs developed to meet the goals of the various metrics outlined above. The BMC has analyzed the impacts of implementing various combinations of programs on the Basin[1]. In particular, the BMC modeled the impact of each combination on the Basin Yield Metric, Water Level Metric and Chloride Metric. Based on this analysis, the LOBP recommends the following programs for immediate implementation[2]:

- Groundwater Monitoring Program;
- Urban Water Use Efficiency Program;
- Urban Water Reinvestment Program;
- Basin Infrastructure Programs A and C; and
- Wellhead Protection Program.

---

[1]The LOBP analyzed the following seven potential programs: (1) Groundwater Monitoring Program; (2) Urban Water Use Efficiency Program: (3) Water Reinvestment Program; (4) Basin Infrastructure Program; (5) Supplemental Water Program; (6) Imported Water Program; (7) Wellhead Protection Program.

[2]The LOBP also recommends the following programs for potential implementation if the County and the Coastal Commission were to allow future development in Los Osos as part of the LOCP and the Los Osos Habitat Conservation Plan (LOHCP): (1) Basin Infrastructure Program B; and (2) either Basin Infrastructure Program D or the Agricultural Water Reinvestment Program. Since additional development has not been authorized, these additional programs have not been included in this Annual Report.

10.3.1 Groundwater Monitoring Program

In order to allow calculation of the above metrics with a higher degree of accuracy, the BMC has implemented the Groundwater Monitoring Program. The Groundwater Monitoring Program is designed to collect, organize and report data regarding the health of the Basin from a current network of 92 wells.[3] In addition to facilitating the calculation of metrics, this data provides information needed to manage the Basin for long-term sustainability. Implementation of the Groundwater Monitoring Program also satisfies various external monitoring requirements, such as the California Statewide Groundwater Elevation Monitoring Program (CASGEM) and waste discharge and recycled water permits for the LOWRF. Monitoring under the program began in 2014 and will continue to occur in the spring and fall of each year when water levels are typically at their highest and lowest. This Annual Report represents the fourth monitoring event under the Groundwater Monitoring Program. The BMC plans to continue to report the values for all Basin metrics and other relevant, non-proprietary data to the Parties, the Court and the public in its future Annual Reports. Additional recommendations and planned actions relating to the Groundwater Monitoring Program are described in Section 9. Table 24 summarizes the status of the various implementation tasks set forth in the LOBP that is related to the Groundwater Monitoring Program.

10.3.2 Urban Water Use Efficiency Program

In order to reduce annual groundwater production from the Basin, and thus reduce the Basin Yield Metric, the LOBP recommends implementation of the Urban Water Use Efficiency Program. In October 2012, the San Luis Obispo County Board of Supervisors adopted a Water Conservation Implementation Plan ("County Water Conservation Plan"), the details of which are described in Table 25. The County Water Conservation Plan was configured to provide detailed financial and administrative structure, while substantially conforming to the LOBP. Under this program, all properties connecting to the sewer project are required to be retrofitted prior to connection, and the program is essentially complete with the exception of 44 unconnected properties (as of April 2020). Table 26 shows the total fixtures retrofitted and the total rebates provided as of December 2019.

[3]The wells are distributed laterally across the Western, Central and Eastern Areas and vertically among First Water and the Upper and Lower Aquifers. Fifteen existing wells were added to the program since 2015.

Table 24. Basin Groundwater Monitoring Program Status			
Recommended Implementation Measure	**Current Status**	**Funding Status**	**Projected Completion**
Wellhead Surveys: Perform wellhead surveys to establish reference point elevations and locations	*Not initiated		
Protocols and Objectives: Establish well monitoring protocols and data quality objectives	Complete		
Water Level Monitoring: Assign water level monitoring responsibilities to the Parties or other stakeholders	Complete		
Access to Private Wells: Contact private well owners to request permission for participation in the groundwater elevation and water quality portions of the Groundwater Monitoring Program	Most contacts made as of April 2019.	Fully funded	Ongoing
Water Quality Monitoring: Assign water quality monitoring responsibilities. The BMC will adopt a set of procedures for recording groundwater elevations and sampling for water quality.	Complete		
Data: Assign data compilation, organization and reporting duties	Complete		

* The wellhead survey project requires approval of temporary access from private landowners. Obtaining this approval has been started but is expected to be a complicated process.

Table 25. Summary from Adopted 2012 County Water Conservation Plan					
Implementation Program Plan Measure Number	**Measure**	**Customer Category**	**Program Length**	**Total Estimated Activities**	**Total Estimated Budget**
Category 1. Residential Programs					
1A	Subsidize Partial Community Retrofit, Residential	Single-Family Residential Toilets	3 Years	8,000	$2,061,375
		Single-Family Residential Showerheads	3 Years	8,000	$368,575
		Single-Family Residential Faucet Aerators	3 Years	13,500	$100,769
1B	Residential Clothes Washer Rebate	Single-Family Residential Washer	5 years	2,000	$385,000
1C	Options for Fully Retrofitted Residences	Hot Water on Demand; Dishwashers,	3 years	500	199,525
1D	Retrofit on Resale	Single-Family Residential: Owners complete retrofits through this ongoing water conservation measure.			$0
Category 2 - Commercial and Institutional					
2A	Subsidize Partial Community Retrofit, Commercial	Commercial	3 years	141	$192,223
2B	Replace Restaurant Spray Nozzles	Commercial	3 years	45	$3,649
2C	Institutional Building Retrofit	Institutional	3 years	13	$38,588
2D	Commercial High Efficiency Clothes Washer Rebate	Commercial	3 years	40	$14,280
Category 3 - Education and Outreach Program					
3A	Residential Water Surveys	Single-Family Residential	3years	5,000	$824,250
3B	Commercial, Industrial and	Commercial	3 years	141	$35,102

Table 25. Summary from Adopted 2012 County Water Conservation Plan					
Implementation Program Plan Measure Number	**Measure**	**Customer Category**	**Program Length**	**Total Estimated Activities**	**Total Estimated Budget**
	Institutional Surveys				
3C	Public Information Program	Single-Family Residential	10 years	23,000	$220,500
3D	Media Campaign	Single-Family Residential	10 years	7,000	$178,500
Category 4 - New Development (developer pays to implement water conservation measures)					$0
Contingency for Additional Measures in Years 4-10					$327,600
Category 1 - Plan Development Cost to Date					$974,558
Total Funding Commitment					$5,000,000

Table 26. Summary of Conservation Rebates Provided through December 2019				
Fixture	**Cumulative Total Thru 2016**	**Cumulative Total Thru 2017**	**Cumulative Total Thru 2018**	**Cumulative Total Thru 2019**
Toilets	3,246	3,325	3,338	3,347
Showerheads	2,362	2,385	2,387	2,389
Faucet aerators	3,211	3,226	3,226	3,226
Clothes washers	101	110	120	126
Hot water recirculator	0	0	0	3
Recycled Water Irrigation Commercial & Institutional	0	0	0	1
Total Value of Provided Rebates	$955,920	$961,888	$969,880	$974,558

Note: Total value of provided rebates is for Category 1 fixtures from Table 25.

In 2016 the BMC recommended programs to be added to the County Water Conservation Plan. The proposed BMC programs are outlined in Table 26. The County has included all of the proposed rebates within the Los Osos Wastewater Project rebate program with the exception of measures Outdoor 1 and Outdoor 2. The County has indicated that these two programs were not included due to a lack of nexus with the wastewater project. Table 27 shows the current rebates available to customers in the wastewater project service area.

Table 27. BMC Recommended Water Conservation Measures

Item No.	Conservation Measure Name	Draft Rebate Amount	Water Savings Potential and Assumptions (ac-ft/year)	Estimated Savings per Unit (gal/yr)	Fixture or Program Estimated Lifespan	Cost of rebate per acre-ft saved	Approximate Savings Potential (AFY)[4]
Indoor-1	Hot water recirculation system	$300	EPA Water Sense estimates > 10,000 gal/year, assume 5,000 to 10,000 gal/year	7,000	10	$1,396	50 to 100
Indoor -2	High efficiency clothes washer	$250	3,000 to 5,000 gal/year, depending on household size	3,300	5	$4,936	40 to 60
Indoor - 3	Replace 1.6 gpf toilets with 1.28 or below	$250	1,000 to 2,000 gal/year, depending on use	1,500	20	$2,715	30 to 50 (See Note 5)
Indoor - 4	Replace 2.0 gpm showerheads with 1.5 gpm	$40	1,000 to 2,000 gal/year, depending on use	1,500	10	$869	30 to 50 (See Note 5)
Outdoor - 1	Septic tank repurpose - roof water only	$500 (see Note 3)	Assume 3 to 4 tank volumes, at 1,000 gallons each	3,500	20	$2,327	40 to 60 (See Note 1)
Outdoor - 2	Septic tank repurpose - with recycled water hauling	$500 (see Note 3)	Potentially eliminate outdoor potable usage	6,000	20	$1,358	70 to 90 (See Note 1)
Outdoor - 3	Gray water system	$500 (see Note 3)	Potentially eliminate outdoor potable usage	6,000	20	$1,358	70 to 90 (See Note 1)
Outdoor - 4	Laundry to landscape program	$50 (see Note 3)	1,000 to 1,500 gallons per year, depending on use	1,250	5	$2,606	10 to 20 (see Note 1)
Notes:	1. Total savings for outdoor programs are not additive. For example, outdoor use can be addressed through gray water or hauled recycled water. 2. All estimates depend on use patterns and other factors. Values are stated for comparison. 3. Only one $500 rebate will be provided per property under programs Outdoor -1, 2, and 3. Participants in these programs are not eligible for program Outdoor - 4. Property owners who have already backfilled their septic tank will receive a rebate of $500 for implementation of an alternative storage tank/basin with a minimum of 500 gallons of capacity. 4. Approximate Savings Potential assumes total 4,500 unit participation. 5. Assumes 2 replacement fixtures per household unit.						

Table 28. Updated County Water Conservation Plan Los Osos Wastewater Project Proposed Rebate Program			
Measures Required for Connection to the Wastewater System			
Fixture or Appliance	**Existing Fixture Flow Rate**	**New Fixture Flow Rate Eligible for Rebate**	**Rebates**
Toilets Residential & Commercial	Greater than 1.6 gpf	1.28 gpf or less	$160
Showerheads Residential & Commercial	Greater than 2.0 gpm	1.5 gpm or less	$30
Faucet Aerators Residential	Greater than 1.5 gpm	1.5 gpm or less	$0
Faucet Aerators Commercial	Greater than 0.5 gpm	0.5 gpm	$0
Urinals Commercial	Greater than 1.0 gpf	0.5 gpf or less	$0
Pre-rinse Spray valves Commercial	Greater than 1.15 gpm	1.15 gpm or less	N/A
Optional Measures Eligible for Rebates (Requires Connection to the Wastewater System and Compliance with Above Measures)			
Toilets Residential & Commercial	Equal to 1.6 gpf	1.28 gpf or less	$160
Washers Residential & Commercial	Less than Tier 3, Water Factor 4	Tier 3, Water Factor 4 or Less	$450[1]
Hot Water Recirc System Residential & Commercial	N/A	N/A	$350
Showerheads Residential & Commercial	1.5 gpm or more	Less than 1.5 gpm	$30
Complete Gray Water System	N/A	N/A	$500
Laundry only Gray Water System	N/A	N/A	$50
Recycled Water Irrigation Commercial & Institutional	N/A	N/A	Negotiated

gpf = gallons per flush
gpm = gallons per minute
Notes: [1] Rebate not retroactive to prior rebated or prior purchased appliances.

10.3.3 Urban Water Reinvestment Program

Implementation of the Urban Water Reinvestment Program was recommended in the LOBP to increase the sustainable yield of the Basin (and thus reduce the Basin Yield Metric). The Water Reinvestment Program will accomplish the LOBP's goal of reinvesting all water collected and treated by the LOWRF in the Basin, either through direct percolation to the aquifers or reuse. Water treated by the LOWRF will be of a sufficient quality to directly percolate into the Basin or to reuse for landscape or agricultural irrigation purposes. The planned uses of that water are listed in Table 29, along with the actual uses from 2019[4].

Table 29. Planned Recycled Water Uses in the Urban Water Reinvestment Program

Potential Use	Estimated Annual Volume (AFY)	Actual Annual Volume in 2019 (AFY)
Broderson Leach Fields	448	431
Bayridge Estates Leach Fields	33	14
Urban Reuse	63	0
Sea Pines Golf Course	40	71
Los Osos Valley Memorial Park	50	0
Agricultural Reuse	146	0
Total	**780**	**516**

The LOWRF construction was completed in March 2016. Through the end of 2019, the sewer service area had connected 99.1 percent of parcels that are required to connect. Flows to the wastewater plant in 2019 were averaging approximately 480,000 gallons per day, with daily peaks of up to 540,000 gallons (535 AFY). With 99.1 percent of the required parcels connected, average wastewater flows are lower than anticipated. Projecting the actual average flow per connection through the remainder of the project results in a total estimated volume of 540 AFY, which is 240 AFY less than the anticipated 780 AFY.

Treated water in 2019 was conveyed to the Broderson and Bayridge Estates leach fields, and Sea Pines Golf Course. The anticipated groundwater mound[5] resulting from infiltration of treated wastewater disposal to leach fields at the Broderson site was detected hydraulically downgradient beginning in June 2017. Recycled water for irrigation will be provided to the schools, parks, and various agricultural areas within the Basin once flows at the wastewater plant approach anticipated

[4]This Table was reproduced (with slight edits) from Table 2 of the LOBP.
[5]Cleath & Associates, 2000, Hydrogeologic Investigation of the Broderson Site, Phase 2 Impacts Assessment, prepared for Los Osos Community Services District, November 2000.

volumes. The purveyors have executed agreements with the County of San Luis Obispo to supply recycled water to the schools. It is anticipated that recycled water will be provided as soon as the required retrofits are completed on the various school sites and all other agreement terms and conditions have been met. Retrofits at the Los Osos Middle School will be completed in the fall/winter of 2020/2021, and additional schools will be retrofitted each year until all schools are receiving recycled water.

The BMC is currently analyzing the feasibility, cost, and water supply benefits of a dry weather discharge to Los Osos Creek as a means of recharging the Lower Aquifer and enhancing Basin yield. The results of the current study will be summarized in future Annual Reports.

10.3.4 Basin Infrastructure Programs

Implementation of the Basin Infrastructure Program is designed to reduce Purveyor groundwater production from the Lower Aquifer in the Western Area and replace it with additional pumping from the Upper Aquifer and Central and Eastern Areas. This shift will also increase the Basin's sustainable yield, which in turn will help to drive down the Basin Yield Metric.

The Program is divided into four parts, designated Programs A through D. Programs A and B shift groundwater production from the Lower Aquifer to the Upper Aquifer, and Programs C and D shift production within the Lower Aquifer from the Western Area to the Central and Eastern Areas, respectively. A fifth program, Program M, was also established in the Basin Management Plan for the development of a Groundwater Monitoring Program (See Chapter 7 of the BMP), and a new Lower Aquifer monitoring well in the Cuesta by the Sea area was recommended in the 2015 Annual Report. Table 30 provides an overview of status of the Projects that are currently moving forward or have been completed. Note, no projects are currently moving forward in Program D, thus they are not shown in Table 30.

10.3.5 Wellhead Protection Program

The Wellhead Protection Program is designed to protect water quality in the Basin by managing activities within a delineated source area or protection zone around drinking water wells. This program consists primarily of the Purveyors conducting Drinking Water Source Assessment and Protection surveys for each of their wells, as well as construction and operation of the LOWRF. The BMC will identify specific actions to protect water quality in the Basin as deemed appropriate in the future, though no specific actions are recommended at this time.

Table 30. Basin Infrastructure Projects				
Project Name	**Parties Involved**	**Funding Status**	**Capital Cost**	**Status**
Program A				
Water Systems Interconnection	LOCSD/ GSWC	Fully Funded	LOCSD/GSWC $103,550	Completed
Upper Aquifer Well (8th Street)	LOCSD	Fully Funded	$250,000	Well was drilled and cased in December 2016. Budget remaining $250,000 to equip the well. Design is 100% complete and project has been included in an IRWM Grant Application. If awarded, funding is anticipated to be available in late 2020/early 2021.
South Bay Well Nitrate Removal	LOCSD			Completed
Palisades Well Modifications	LOCSD			Completed
Blending Project (Skyline Well)	GSWC	Fully Funded	$1.15 mil	Completed
Water Meters	S&T			Completed
Program B				
LOCSD Wells	LOCSD	Not Funded	BMP: $2.7 mil	Project not initiated
GSWC Wells	GSWC	Not Funded	BMP: $3.2 mil	Project not initiated
Community Nitrate Removal Facility	LOCSD/GSWC/S&T	GSWC Portion Funded	GSWC: $1.23 mil	GSWC's Program A Blending Project can be considered a first phase of the Program B Community Nitrate Removal Facility.

Project Name	Parties Involved	Funding Status	Capital Cost	Status
Program C				
Expansion Well No. 1 (Los Olivos)	GSWC	Fully Funded	$1.76 mil	Completed
Expansion Well No. 2	LOCSD is currently leading the project with potential GSWC and S&T involvement, depending on final location	LOCSD is currently leading the project with respect to funding	BMP: $2.0 mil	Property acquisition phase is on-going through efforts of LOCSD. Test hole at Site A (Los Osos Middle School) completed January 2020 and showed location was not suitable for Expansion Well. Alternative sites are being considered and plans for environmental review to identify preferred site are expected to begin in Q2 of 2020.
Expansion Well 3 and LOVR Water Main Upgrade	GSWC/LOCSD	Cooperative Funding	BMP: $1.6 mil	This project has been deferred under Adaptive Management.
LOVR Water Main Upgrade	GSWC	May be deferred	BMP: $1.53 mil	Project may not be required, depending on the pumping capacity of the drilled Program C wells. It may be deferred to Program D.
S&T/GSWC Interconnection	S&T/ GSWC	Pending	BMP: $30,000	In conceptual design

Project Name	Parties Involved	Funding Status	Capital Cost	Status
Program M				
New Zone D/E Lower Aquifer monitoring well in Cuesta by the Sea	All Parties	Funded through BMC Budget	$115,000	Completed
Program U				
Creek Discharge Program	All Parties	$50k included and approved in the CY 2019 BMC Budget	Anticipated cost of $582,000 through feasibility phase	The 2019 budget includes funding for Soil Aquifer Treatment evaluation in the amount of $50,000. BMC authorized completion of the Soil Aquifer Testing to support implementation of the Creek Discharge Program. These activities are currently on hold pending outcome of the CY 2020 BMC Budget discussion.
8th and El Moro Urban Storm Water Recovery Project	All Parties	$15k included in CY 2019 BMC Budget for initial study	NA	On hold, pending outcome of the CY 2020 BMC Budget discussion.

11. REFERENCES

Burt, C.M., Mutziger, A., Howes, D.J., and Solomon, K.H., 2002, Evaporation from Irrigated Agricultural Land in California, January.

Brown and Caldwell, 1983, Los Osos - Baywood Park Phase I Water Quality Management Study, prepared for San Luis Obispo Service Area No. 9, April 1983.

Carollo, 2012, San Luis Obispo County Master Water Report, prepared for the San Luis Obispo County Flood Control and Water Conservation District, May 2012. http://www.slocountywater.org/site/Frequent%20Downloads/Master%20Water%20Plan/

Central Coast Regional Water Quality Control Board (CCRWQCB), 2011, Waste Discharge/Recycled Water Requirements for the Los Osos Water Recycling Facility, San Luis Obispo County, Order No. R3-2011-001, May 5. https://www.waterboards.ca.gov/centralcoast/board_decisions/adopted_orders/2011/2011_0001_wdr_order.pdf.

Cleath & Associates, 2000, Hydrogeologic Investigation of the Broderson Site, Phase 2 – Impacts Assessment, prepared for the Los Osos Community Services District, November 2000.

Cleath & Associates, 2005, Sea Water Intrusion Assessment and Lower Aquifer Source Investigation of the Los Osos Valley Ground Water Basin, San Luis Obispo County, California, prepared for the Los Osos Community Services District, October 2005.

Cleath & Associates, 2006, Task 3 Upper Aquifer Water Quality Characterization, prepared for the Los Osos Community Services District, June 2006.

Cleath & Associates, 2002-2006, Quarterly Groundwater Monitoring Reports for the Los Osos Nitrate Monitoring Program, prepared for the Los Osos Community Services District.

Cleath & Associates, 2002-2006, Semi-Annual Groundwater Monitoring Reports for the Los Osos Nitrate Monitoring Program, prepared for the Los Osos Community Services District.

Cleath-Harris Geologists, 2009a, Flow Model Conversion and Urban Area Yield Update, Technical Memorandum prepared for the Los Osos ISJ Group, July 29, 2009.

Cleath-Harris Geologists, 2009b, Water Use Estimates for Private Domestic Wells, Technical Memorandum prepared for the Los Osos ISJ Group, July 29, 2009.

Cleath-Harris Geologists, 2009c, Water Use Estimates for Los Osos Creek Valley Irrigation Wells, Technical Memorandum prepared for the Los Osos ISJ Group, July 29, 2009.

Cleath-Harris Geologists, 2010, Water Quality Monitoring Results Summary, November 2009-January 2010, Los Osos Valley Groundwater Basin, Technical Memorandum prepared for the Los Osos ISJ Group, April 26, 2010.

Cleath-Harris Geologists, 2012, Los Osos Water Recycling Facility Baseline Groundwater Quality Monitoring, August 2012, prepared for San Luis Obispo County Department of Public Works, October 2012.

Cleath-Harris Geologists, 2013, Los Osos Water Recycling Facility Baseline Groundwater Quality Monitoring, June 2013, prepared for San Luis Obispo County Department of Public Works, July 2013.

Cleath-Harris Geologists, 2014, Seawater Intrusion Monitoring, Los Osos Valley Groundwater Basin, Technical Memorandum, prepared for the Los Osos ISJ Group, October 7, 2014.

Cleath-Harris Geologists, 2015a, April 2015 Lower Aquifer Monitoring, Los Osos Groundwater Basin, Draft Technical Memorandum prepared for the Los Osos ISJ Group, May 26, 2015.

Cleath-Harris Geologists, 2015b, October 2015 Lower Aquifer Monitoring, Los Osos Groundwater Basin, Technical Memorandum prepared for the Los Osos ISJ Group, December 28, 2015.

Cleath-Harris Geologists, 2015c, Los Osos Water Recycling Facility Baseline Groundwater Quality Monitoring, May 2015, prepared for San Luis Obispo County Department of Public Works, June 2015.

Cleath-Harris Geologists, 2015d, Los Osos Water Recycling Facility Baseline Groundwater Quality Monitoring, November 2015, prepared for San Luis Obispo County Department of Public Works, December 2015.

Cleath-Harris Geologists, 2016a, Los Osos Valley Groundwater Basin Boundary Modification Request, Technical Memorandum prepared for San Luis Obispo County Department of Public Works, March 25, 2016.
http://sgma.water.ca.gov/basinmod/docs/download/2071

Cleath-Harris Geologists, 2016b, Los Osos Basin Plan, Groundwater Monitoring Program 2015 Annual Monitoring Report, prepared in association with Wallace Group for the Los Osos Groundwater Basin Management Committee, September 2016.
https://www.slocountywater.org/site/Water%20Resources/LosOsos/pdf/Los%20Osos%20BMC%202015%20Annual%20Report%20Final.pdf

Cleath-Harris Geologists, 2017a, Los Osos Basin Plan, Groundwater Monitoring Program 2016 Annual Monitoring Report, prepared for the Los Osos Groundwater Basin Management Committee, June2017.
http://www.slocountywater.org/site/Water%20Resources/LosOsos/pdf/2016%20Annual%20Report%20Final.pdf

Cleath-Harris Geologists, 2017b, Basin Yield Metric Response to reduced long-term precipitation in the Los Osos Groundwater Basin, Technical Memorandum prepared for the Los Osos Groundwater Basin Management Committee and Morro Bay National Estuary program, March 3,2017.
http://www.slocountywater.org/site/Water%20Resources/LosOsos/pdf/TM%20Basin%20Yield%20Metric%20Los%20Osos%20GW%20Basin%2020180303.pdf

Cleath-Harris Geologists, 2018a, Los Osos Basin Plan, Groundwater Monitoring Program 2017 Annual Monitoring Report, prepared for the Los Osos Groundwater Basin Management Committee, June 2017.
http://www.slocountywater.org/site/Water%20Resources/LosOsos/pdf/2017%20Annual%20Report%20Final.pdf

Cleath-Harris Geologists, 2018b, Los Osos Valley Groundwater Basin Fringe Areas Characterization, prepared for San Luis Obispo County Flood Control and Water Conservation District, May 2017.
https://www.slocountywater.org/site/Water%20Resources/SGMA/lososos/pdf/Report_Fringe%20Area%20Technical%20Memorandum_Los%20Osos%20Basin.pdf

Cleath-Harris Geologists, 2019a, Draft Lower Aquifer nitrate concentrations trends review and LA11 seawater intrusion evaluation, prepared for the Los Osos Groundwater Basin Management Committee, November 6, 2019.

Cleath-Harris Geologists, 2019b, Los Osos Basin Plan Metric Trends Review and Infrastructure Program C, prepared for the Los Osos Groundwater Basin Management Committee, February 28, 2019.

Cleath-Harris Geologists, 2019c, Los Osos Basin Plan, Groundwater Monitoring Program 2018 Annual Monitoring Report, prepared for the Los Osos Groundwater Basin Management Committee, June 2019.

Department of Water Resources (DWR), State of California, 1973, Los Osos - Baywood Ground Water Protection Study, Southern District Report, October 1973.

Department of Water Resources (DWR), State of California, 2014, California Groundwater Elevation Monitoring Basin Prioritization Process, Appendix A, June 2014.

Department of Water Resources (DWR), State of California, 2016, California's Groundwater, Working Toward Sustainability, Bulletin 118 Interim Update 2016, December 22, 2016. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Files/Statewide-Reports/Bulletin_118_Interim_Update_2016.pdf

Department of Water Resources (DWR), State of California, 2018a, Bulletin 118 Groundwater Basins Subject to Critical Conditions of Overdraft – Update based on 2018 Final Basin Boundary Modifications. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Critically-Overdrafted-Basins/Files/2018CODBasins.pdf?la=en&hash=3014D2F2299AA503C469D41BBC0E8DCFCE0267F8

Department of Water Resources (DWR), State of California, 2018b,Basin Boundary Modification Request System – San Luis Obispo County 3-008 Los Osos Valley https://sgma.water.ca.gov/basinmod/basinrequest/preview/238

Department of Water Resources (DWR), State of California, 2019,Basin Boundary Modifications – Final Decisions, February 11, 2019. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Basin-Boundary-Modifications/Files/2018_BBM_SummaryTable.pdf?la=en&hash=5DAF7E8CA73DB0FED363D5C6BF78C25E96A33ADD

Freeze, R. A., and Cherry, J. A., 1979, Groundwater, Prentice-Hall, 604 p.

ISJ Group, 2015, Updated Basin Plan for the Los Osos Groundwater Basin, January 2015,http://www.slocountywater.org/site/Water%20Resources/LosOsos/pdf/Los%20Osos%20Groundwater%20Basin%20Plan%20January%202016.pdf

Johnson, A.I., 1967, Specific Yield - Compilation of Specific Yields for Various Materials, U. S. Geological Survey Water-Supply Paper 1662-D, prepared in cooperation with the California Department of Water Resources. https://pubs.usgs.gov/wsp/1662d/report.pdf

Los Osos Community Services District v. Southern California Water Company [Golden State Water Company] et al. (San Luis Obispo County Superior Court Case No. CV 040126).

National Drought Mitigation Center / U.S. Department of Agriculture / National Oceanic and Atmospheric Association, 2018, U.S. Drought Monitor, California maps. Website access: https://droughtmonitor.unl.edu/Maps/MapArchive.aspx

Rincon Consultants, 2014a, Baseline Groundwater Quality Monitoring Report for the Los Osos Water Recycling Facility, prepared for San Luis Obispo County Department of Public Works, February 2014.

Rincon Consultants, 2014b, May 2014 Baseline Groundwater Quality Monitoring Report, Los Osos Water Recycling Facility, prepared for San Luis Obispo County Department of Public Works, June 2014.

Rincon Consultants, 2014c, October 2014 Baseline Groundwater Quality Monitoring Report, Los Osos Water Recycling Facility, prepared for San Luis Obispo County Department of Public Works, December 2014.

Rincon Consultants, 2017a, December 2016 Baseline Groundwater Quality Monitoring Report, Los Osos Water Recycling Facility, prepared for San Luis Obispo County Department of Public Works, December 2016.

Rincon Consultants, 2017b, June 2017 Semiannual Groundwater Quality Monitoring Report, Los Osos Water Recycling Facility, prepared for San Luis Obispo County Department of Public Works, July 2017.

Rincon Consultants, 2018a, December 2017 Semiannual Groundwater Quality Monitoring Report, Los Osos Water Recycling Facility, prepared for San Luis Obispo County Department of Public Works, January 2018.

Rincon Consultants, 2018b, June 2018 Semiannual Groundwater Quality Monitoring Report, Los Osos Water Recycling Facility, prepared for San Luis Obispo County Department of Public Works, August 2018.

Rincon Consultants, 2019, December 2018 Semiannual Groundwater Quality Monitoring Report, Los Osos Water Recycling Facility, prepared for San Luis Obispo County Department of Public Works, January 2019.

Rincon Consultants, 2019, June 2019 Semiannual Groundwater Quality Monitoring Report, Los Osos Water Recycling Facility, prepared for San Luis Obispo County Department of Public Works, August 2019.

Rincon Consultants, 2020, December 2019 Semiannual Groundwater Quality Monitoring Report, Los Osos Water Recycling Facility, prepared for San Luis Obispo County Department of Public Works, February 2020.

San Luis Obispo County Flood Control & Water Conservation District, 2014, CASGEM Monitoring Plan for High and Medium Priority Groundwater Basins in the San Luis Obispo County Flood Control & Water Conservation District, September 2014. http://www.slocountywater.org/site/Water%20Resources/Reports/pdf/20141002%20SLO%20FC&WCD%20CASGEM%20Monitoring%20Plan.pdf

Smith, C. T., and Griggs, A. B., 1944, Chromite Deposits near San Luis Obipo, San Luis Obispo County, California, U. S. Geological Survey Bulletin 945-B.

https://pubs.er.usgs.gov/publication/b945B

SWRCB, 2009, Recycled Water Policy, adopted in Resolution No. 2009-0011 - Adoption of Policy for Water Quality Control for Recycled Water.
http://www.swrcb.ca.gov/board_decisions/adopted_orders/resolutions/2009/rs2009_0011.pdf

San Luis Obispo County Public Works Department, 2005, Water Years 2001-02 and 2002-03 Hydrologic Report, May 16, 2005.
http://slocountywater.org/site/Water%20Resources/Reports/pdf/Hydrologic%20Report%202002.pdf

San Luis Obispo County Public Works Department,2019a, Los Osos Water Recycling Facility Laboratory Report for CEC Blue Ribbon, prepared by Eurofins-Eaton Analytical, January 10, 2020.
https://ciwqs.waterboards.ca.gov/ciwqs/readOnly/PublicReportEsmrAtGlanceServlet?reportID=2&isDrilldown=true&documentID=1754256

San Luis Obispo County Public Works Department,2018b, Los Osos Water Recycling Facility 2018 Semi-Annual Report.
https://ciwqs.waterboards.ca.gov/ciwqs/readOnly/PublicReportEsmrAtGlanceServlet?reportID=2&isDrilldown=true&documentID=1754245

Yates, E.B., and Wiese, J. H., 1988, Hydrogeology and Water Resources of the Los Osos Valley Ground-Water Basin, San Luis Obispo County, California, U. S. Geological Survey, Water-Resources Investigations Report 88-4081.
http://pubs.usgs.gov/wri/1988/4081/report.pdf

APPENDIX A

Groundwater Monitoring History

Groundwater Monitoring History

Groundwater monitoring has been performed by public agencies, water purveyors, and consultants for various Basin studies and programs over several decades. The following lists include historical investigations, monitoring reports, and monitoring programs with a major focus on Basin water levels and water quality through December 31, 2019, which is the end of the period covered by this Annual Report. Figure A1 compares the scientific basin boundary used for the LOBP and prior work with the new jurisdictional boundary defined by the DWR for the Los Osos Area Subbasin.

<u>Historical Investigations</u>

- *Los Osos-Baywood Ground Water Protection Study* (DWR, 1973);
- *Morro Bay Sandspit Investigation* (DWR, 1979);
- *Los Osos -Baywood Park Phase I Water Quality Management Study* (Brown & Caldwell, 1983);
- *Hydrogeology and Water Resources of the Los Osos Valley Ground-Water Basin, San Luis Obispo County, Water-Resources Investigation 88-4081* (U.S. Geological Survey, 1988);
- *Task F - Sanitary Survey and Nitrate Source Study* (Metcalf & Eddy, 1995);
- *Sea Water Intrusion Assessment and Lower Aquifer Source Investigation of the Los Osos Valley Groundwater Basin* (Cleath & Associates, 2005);
- *Task 3 Upper Aquifer Water Quality Characterization* (Cleath & Associates, 2006);
- *Los Osos Valley Groundwater Basin Boundary Modification Request, Technical Memorandum (CHG, 2018).*

<u>Monitoring Reports</u>:

- *Baywood Groundwater Study - Fourth Quarter 1998 (San Luis Obispo County Engineering Department, 1999)*;
- *Quarterly and Semi-Annual Groundwater Monitoring Reports for the Los Osos Nitrate Monitoring Program* (Cleath & Associates, 2002-2006)
- *Water Quality Monitoring Results Summary, November 2009-January 2010, Los Osos Valley Groundwater Basin* (CHG, 2010);
- *Semi-Annual Groundwater Monitoring Reports for Los Osos Water Recycling Facility Baseline Groundwater Quality Monitoring* (CHG, 2012-2013);

- *Semi-Annual Groundwater Monitoring Reports for Los Osos Water Recycling Facility Baseline Groundwater Quality Monitoring* (Rincon Consultants, 2014a, 2014b, 2014c, 2017a, 2017b, 2018a, 2018b, 2019; CHG 2015a, CHG 2015b, CHG 2015c, 2015d);

- *Semi-Annual Groundwater Monitoring Reports for Lower Aquifer* (CHG, 2014-2015);

- *Annual Groundwater Monitoring Reports for Los Osos Basin Plan* (CHG, 2015, 2016, 2017, 2018);

- Consumer Confidence Reports (Water Quality Reports) published annually by the water purveyors.

Monitoring Programs:

- San Luis Obispo County Public Works, Semi-Annual Water Level Monitoring Program. Period of record for individual wells varies; most begin in 1970's and 1980's, and some end in 1999; program remains active.

- Purveyor Water Supply Well Monitoring per SWRCB-Division of Drinking Water requirements. Period of record for individual wells varies; program remains active.

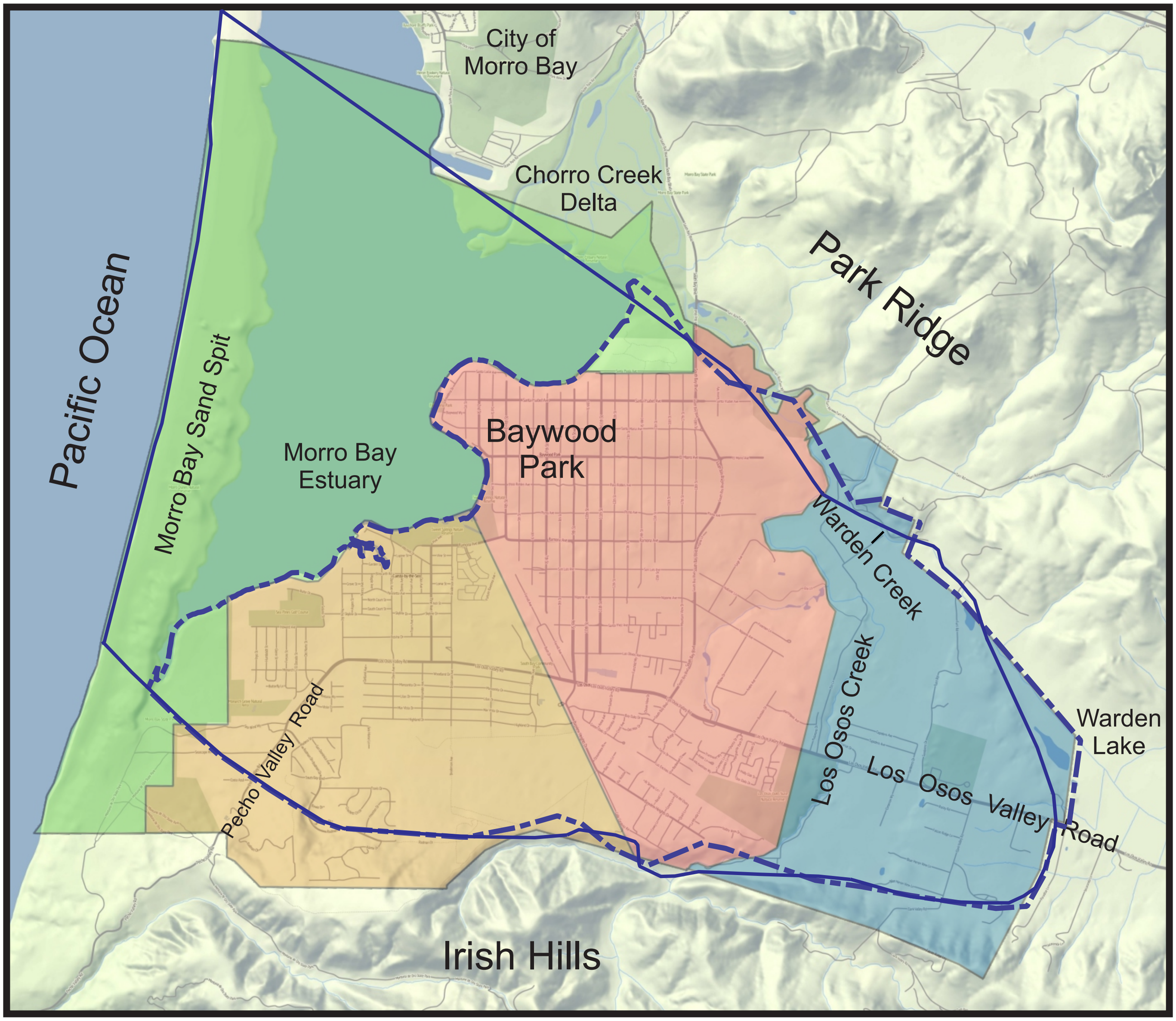
- 2002-2006 Los Osos Nitrate Monitoring Program. Water levels measured quarterly to semi-annually; program ended October 2006.

- 2012-2019 Los Osos Water Recycling Facility Groundwater Monitoring Program. Water levels measured semi-annually, currently on a June and December schedule; program remains active.

- 2014-2015 Lower Aquifer Monitoring Program. Water levels measured semi-annually; program ended in 2015 (replaced by LOBP Groundwater Monitoring Program).

In addition to water quality and water level reporting, this 2019 Annual Report compiles groundwater production, precipitation, and stream flow data from water purveyors (LOCSD, GSWC, and S&T, providing metered production records) and San Luis Obispo County Department of Public Works, providing precipitation at the Los Osos Landfill and stream flow data for Los Osos Creek.

Purveyor municipal production data are based on meter readings. Domestic groundwater production estimates are based on the last reported water use estimates for 2013 from the LOBP, with minor adjustments in 2016 for the inclusion of additional residences in the Eastern Area (CHG, 2016). Production estimates for community facilities and agricultural wells are based on a soil-moisture budget using local precipitation, land use, and evapotranspiration data (Appendix G).



Base Image: Stamen-Terrain

0 2000 4000 6000 8000 ft

Scale: 1 inch ≈ 4,000 feet

Explanation

Basin Plan Areas:

Dunes and Bay Area

Western Area

Central Area

Eastern Area

DWR Bulletin 118 Basin Boundary (Los Osos Area Subbasin)

Basin Boundary from Los Osos Basin Plan

Figure A1
Basin Location and Plan Areas
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

APPENDIX B

Los Osos Basin Plan
Groundwater Monitoring Program Well Information

Los Osos Basin Plan
Monitoring Well Network
First Water/Perched Aquifer Group

Program ID	State Well Number	Name/Location	Basin Area	Coordinates			Well Type	Current Well Owner	Well Data			Aquifer				
				Latitude	Longitude	RP Elevation* (feet amsl)			Screened Interval (feet bgs)	Well Depth (feet bgs)	Casing Diameter (inches)	Creek Valley Alluvium	Zone A/B	Zone C	Zone D	Zone E
FW1	30S/10E-13A7							PRIVATE								
FW2	30S/10E-13L8	Howard/ Del Norte	Western	35.3149	120.8552	32.63	MW	LOCSD	26-36	37	2			x		
FW3	30S/10E-13G	South Court	Western	35.3162	120.8498	50.95	MW	LOCSD	47-52	54	2			x		
FW4	30S/10E-13H	Broderson/Skyline	Western	35.3158	120.8432	49.33	MW	LOCSD	154-164	164	2			x		
FW5	30S/10E-13Q2	Woodland Dr.	Western	35.3119	120.8495	101.27	MW	LOCSD	97-100	105	2			x		
FW6	30S/10E-24A	Highland/Alexander	Western	35.3083	120.8453	193.04	MW	LOCSD	154-164	164	2			x		
FW7	30S/10E-24Ab	Broderson leach field	Western	35.3065	120.8460	255	MW	LOCSD	200-240	240	5			x		
FW8	30S/11E-7L4	Santa Ysabel/5th	Central	35.3302	120.8377	45.76	MW	LOCSD	40-50	50	2			x		
FW9	30S/11E-7K3	12th/ Santa Ysabel	Central	35.3299	120.8300	90.71	MW	LOCSD	55-65	70	2			x		
FW10	30S/11E-7Q1	LOCSD 8th Street - shallow	Central	35.3260	120.8342	25.29	MW	LOCSD	29-43, 54-75	75	8			x		
FW11	30S/11E-7R2	El Moro/12th St.	Central	35.3263	120.8298	61.93	MW	LOCSD	25-35	35	2			x		
FW12	30S/11E-18C2	Pismo Ave./ 5th St.	Central	35.3227	210.8376	34.55	MW	LOCSD	25-35	35	2			x		
FW13	30S/11E-18B2	Ramona/10th	Central	35.3208	120.8320	79.89	MW	LOCSD	25-35	35	2		x			
FW14	30S/11E-18E1							PRIVATE								
FW15	30S/11E-18N2	Manzanita/Ravenna	Central	35.3109	120.8401	125.53	MW	LOCSD	85-95	95	2		x			
FW16	30S/11E-18L11	Palisades Ave.	Western	35.3138	120.8374	88.02	MW	LOCSD	43-53	53	2		x			
FW17	30S/11E-18L12	Ferrell Ave.	Central	35.3138	120.8346	103.85	MW	LOCSD	25-35	35	2		x			
FW18	30S/11E-18P	Sunnyside #1	Western	35.3095	120.8352	150	MW	SLCUSD	15-35	35	2		x			
FW19	30S/11E-18J7	Los Olivos/Fairchild	Central	35.3130	120.8271	125.74	MW	LOCSD	25-35	35	2		x			
FW20	30S/11E-8Mb	Santa Maria/18th Street	Central	35.3287	120.8233	95	MW	LOCSD	37-47	47	2		x			
FW21	30S/11E-8N4	South Bay Blvd. OBS	Central	35.3253	120.8213	95.99	MW	LOCSD	40-50	50	2		x			
FW22	30S/11E-17F4							PRIVATE								
FW23	30S/11E-17N4							PRIVATE								
FW24	30S/11E-17J2	USGS Eto North - shallow	Eastern	35.3142	120.8119	87	MW	PRIVATE[1]	50-70	70	2			x		
FW25	30S/11E-17R1							PRIVATE								
FW26	30S/11E-20A2							PRIVATE								
FW27	30S/11E-20L1							PRIVATE								
FW28	30S/11E-20M2							PRIVATE								
FW29	30S/11E-20A1							PRIVATE								
FW30	30S/11E-18R1							PRIVATE								
FW31	30S/11E-19A	Bayridge Field #2	Central	35.3066	120.8276	213	MW	LOCSD	18-38	38	4		x			
FW32	30S/11E-21D14							PRIVATE								
FW33+	30S/11E-18D1S							PRIVATE								

[1] FW24 is former USGS monitorng well (information in public domain)

*Datum varies between NGVD 29 and NAVD 88 (see report Tables 4-8 for details).

MW = Monitoring Well
+ New for 2019 Reporting Year

State Well Numbers for Reconstructed Wells

	NEW (2002)	OLD (1982)
FW2	30S/10E-13L8	30S/10E-13L5
FW5	30S/10E-13Q2	30S/10E-13Q1
FW8	30S/11E-7L4	30S/11E-7L3
FW9	30S/11E-7K3	30S/11E-7K2
FW11	30S/11E-7R2	30S/11E-7R1
FW12	30S/11E-18C2	30S/11E-18C1
FW13	30S/11E-18B2	30S/11E-18B1
FW15	30S/11E-18N2	30S/11E-18N1
FW16	30S/11E-18L11	30S/11E-18L3
FW17	30S/11E-18L12	30S/11E-18L4
FW19	30S/11E-18J7	30S/11E-18J6
FW21	30S/11E-8N4	30S/11E-8N2

Los Osos Basin Plan
Monitoring Well Network
Upper Aquifer Group

Program ID	State Well Number	Name/Location	Basin Area	Coordinates			Well Type	Current Well Owner	Well Data			Aquifer				
				Latitude	Longitude	RP Elevation* (feet amsl)			Screened Interval (feet bgs)	Well Depth (feet bgs)	Casing Diameter (inches)	Creek Valley Alluvium	Zone A/B	Zone C	Zone D	Zone E
UA1	30S/10E-11A1	Sandspit #1 West	Dunes and bay	35.3358	120.8638	16.01	MW	SLO CO.	150-160	160	2			x		
UA2	30S/10E-14B1	Sandspit #3 Shallow	Dunes and bay	35.3219	120.8682	19.48	MW	SLO CO.	190-200	200	1.5			x		
UA3	30S/10E-13F1	GSWC Skyline #1	Western	35.3165	120.8533	19	M	GSWC	90-195	206	14			x		
UA4	30S/10E-13L1	S&T Mutual #1	Western	35.3148	120.8531	38.68	M	S&T	100-141	141	8			x		
UA5	30S/11E-7N1	LOCSD 3rd St. Well	Central	35.3256	120.8401	9.13	M	LOCSD	56-84	80	8			x		
UA6	30S/11E-18L8	USGS Palisades OBS East 2"	Western	35.3149	120.8381	79.18	MW	SLO CO.	100-140	140	2			x		
UA7	30S/11E-18L7	USGS Palisades OBS West 2"	Western	35.3149	120.8381	79.16	MW	SLO CO.	180-220	220	2			x		
UA8	30S/11E-18K7	LOCSD 10th St. Observation West	Central	35.3130	120.8326	135.65	MW	LOCSD	200-220	220	2			x		
UA9	30S/11E-18K3	GSWC Los Olivos #3	Central	35.3133	120.8300	121.18	M	GSWC	148-202, 222-232	232	8			x		
UA10	30S/11E-18H1	LOCSD - 12th St.	Central	35.3161	120.8297	107.10	M	LOCSD	112-125, 145-159, 172-186, 216-231	232	10			x		
UA11	30S/11E-17D							PRIVATE								
UA12	30S/11E-17E9	So. Bay Blvd OBS shallow	Central	35.3158	120.8240	105.85	MW	LOCSD	184-194	204	2			x		
UA13	30S/11E-17E10	LOCSD South Bay upper	Central	35.3159	120.8239	106	M	LOCSD	170-210	220	8			x		
UA14	30S/11E-17P4							PRIVATE								
UA15	30S/11E-20B7							PRIVATE								
UA16	30S/11E-17L4							PRIVATE								
UA17	30S/11E-17E10							PRIVATE								
UA18	30S/11E-17F2							PRIVATE								

*Datum varies between NGVD 29 and NAVD 88 (see report Tables 4-8 for details).

M = Municipal
MW = Monitoring Well

Los Osos Basin Plan
Monitoring Well Network
Lower Aquifer Group

Program ID	State Well Number	Name/Location	Basin Area	Coordinates			Well Type	Well Owner	Well Data			Aquifer				
				Latitude	Longitude	RP Elevation* (feet amsl)			Screened Interval (feet bgs)	Well Depth (feet bgs)	Casing Diameter (inches)	Creek Valley Alluvium	Zone A/B	Zone C	Zone D	Zone E
LA1	30S/10E-2A1	Sandspit #2 North	Dunes and Bay	35.3530	120.8617	23.13	MW	SLO CO.	220-230	230	2					x
LA2	30S/10E-11A2	Sandspit #1 East	Dunes and Bay	35.3358	120.8638	16.07	MW	SLO CO.	234-244	244	2				x	
LA3	30S/10E-14B2	Sandspit #3 Deep	Dunes and	35.3219	120.8682	19.47	MW	SLO CO.	270-280	280	2				x	
LA4	30S/10E-13M1	USGS Howard West	Western	35.3149	120.8597	41.20	MW	PRIVATE	477-537	820	6					x
LA5	30S/10E-13L7	S&T Mutual #4	Western	35.3146	120.8531	37	M	S&T	160-300	300	8					
LA6	30S/10E-13L4	GSWC Pecho #1	Western	35.3129	120.8522	68	M	GSWC	240-380	675	14				x	
LA7	30S/10E-13P2							PRIVATE								
LA8	30S/10E-13N	S&T Mutual #5	Western	35.3088	120.8565	138.50	M	S&T	260-340	350	8				x	
LA9	30S/10E-24C1	GSWC Cabrillo #1	Western	35.3077	120.8552	178.32	M	GSWC	250-500	508	10				x	
LA10	30S/10E-13J4	GSWC Rosina #1	Western	35.3145	120.8468	95.31	M	GSWC	290-406	409	10				x	x
LA11	30S/10E-12J1	Morro Bay Observation #5	Central	35.3299	120.8440	8.43	MW	SLO CO.	349-389	389	2					x
LA12	30S/11E-7Q3	LOCSD 8th St. Lower	Central	35.3259	120.8342	24.30	M	LOCSD	230-270	270	10				x	
LA13	30S/11E-18F2	LOCSD Ferrell #2	Central	35.3159	120.8358	100	M	LOCSD	425-620	625	12				x	x
LA14	30S/11E-18L6	USGS Palisades OBS 6"	Western	35.3149	120.8381	79.36	MW	SLO CO.	355-375, 430-480, 550-600	620	6				x	x
LA15	30S/11E-18L2	LOCSD Palisades	Western	35.3136	120.8377	85	M	LOCSD	340-380	394	12				x	
LA16	30S/11E-18M1	Former CCW #5 - Broderson OBS	Western	35.3128	120.8430	106.82	MW	PRIVATE	330-355, 395-415, 465-505, 530-575	577	10				x	x
LA17	30S/11E-24A2	USGS Broderson	Western	35.3074	120.8433	210.40	MW	SLO CO.	800-860	860	6				x	x
LA18	30S/11E-18K8	10th St. Observation East	Central	35.3130	120.8325	135.74	MW	LOCSD	630-650	650	2					x
LA19	30S/11E-19H2	USGS Bayview Heights 6"	Central	35.3043	120.8266	256.20	MW	SLO CO.	280-380	740	6				x	
LA20	30S/11E-17N10	GSWC South Bay #1	Central	35.3111	120.8240	140	M	GSWC	225-295, 325-395, 485-695	715	12			x	x	x
LA21	30S/11E-17E7	So. Bay Blvd OBS deep #3	Central	35.3158	120.8240	105.85	MW	LOCSD	480-490, 500-510	520	2					x
LA22	30S/11E-17E8	So. Bay Blvd OBS middle #2	Central	35.3158	120.8240	105.85	MW	LOCSD	270-280, 370-380	390	2				x	
LA23	30S/11E-17C1							PRIVATE								
LA24	30S/11E-17J1	USGS Eto North - deep	Eastern	35.3142	120.8119	71.62	I	PRIVATE[1]	160-190, 245-260	260	6				x	x
LA25	30S/11E-20Aa							PRIVATE								
LA26	30S/11E-20G2	USGS Eto South	Eastern	35.3037	120.8131	99.66	I	PRIVATE[1]	300-360	370	6					x
LA27	30S/11E-16Nb							PRIVATE								
LA28	30S/11E-16Na							PRIVATE								
LA29	30S/11E-21E3							PRIVATE								
LA30	30S/11E-20H1							PRIVATE								
LA31	30S/11E-13M2							PRIVATE								
LA32	30S/11E-18K9	LOCSD 10th Street Production	Central	35.3103	120.8325	135	M	LOCSD	235-270, 350-49	490	14			x	x	
LA33	30S/11E-17A1							PRIVATE								
LA34	30S/11E-8F	Los Osos Landfill MW-11	Eastern	35.3201	120.8052	26.15	MW	SLO CO.	37.5-47.5	47.5					x	
LA35	30S/11E-21Bb	LOWRF South Well	Eastern	35.3076	120.7993	96	Ind	SLO CO.	180-230	230						x
LA36	30S/11E-21Ja							PRIVATE								
LA37	30S/11E-21B1	Andre Windmill Well	Eastern	35.3069	120.7976	81.4	MW	SLO CO.			6					x
LA38	30S/11E-21E							PRIVATE								
LA39	30S/11E-18K_	Los Olivos #5	Central			118	M	GSWC	335-365, 385-45	470	12				x	
LA40+	30S/10E-	LOCSD Zone E Well	Western	35.31966	120.8478	12.26	MW	LOCSD	390-410	490	2.5					x
LA41+	30S/10E-	LOCSD Zone D Well	Western	35.31966	120.8478	12.26	MW	LOCSD	310-330	350	2.5				x	

[1] LA24 amd LA26 are former USGS monitorng wells (information in public domain)

*Datum varies between NGVD 29 and NAVD 88 (see report Tables 4-8 for details).	M = Municipal
	MW = Monitoring Well
	Ind = Industrial Well
+ New for 2019 Reporting Year	I = Irrigation

Los Osos Basin Plan
Monitoring Well Network 2019
FIRST WATER

Program Well ID	Well Owner	Basin Plan Monitoring Code	County Water Level Program	LOWRF Groundwater Monitoring Program[1]	**2019 Basin Plan Monitoring Program[2]**
FW1	PRIVATE	L			**L**
FW2	LOCSD	L, G		L, G	**L**
FW3	LOCSD	L		L	**L**
FW4	LOCSD	L		L	**L**
FW5	LOCSD	L, CEC		L	**L, CEC**
FW6	LOCSD	TL, G		G	**TL, G**
FW7	LOCSD	L			**L**
FW8	LOCSD	L		L	**L**
FW9	LOCSD	L		L	**L**
FW10	LOCSD	TL, G		G[3]	**TL, G**
FW11	LOCSD	L		L	**L**
FW12	LOCSD	L		L	**L**
FW13	LOCSD	L		L	**L**
FW14	PRIVATE	L		L	**L**
FW15	LOCSD	L, G		L,G	**L**
FW16	LOCSD	L		L	**L**
FW17	LOCSD	L, G		L,G	**L**
FW18	SLCUSD	L			**L**
FW19	LOCSD	L		L	**L**
FW20	LOCSD	L, G		L, G	**L**
FW21	LOCSD	L		L	**L**
FW22	PRIVATE	L, G		L, G	**L**
FW23	PRIVATE	L		L	**L**
FW24	PRIVATE	L	L		
FW25	PRIVATE	L	L		
FW26	PRIVATE	L, G, CEC			**L, G, CEC**
FW27	PRIVATE	TL			**TL**
FW28	PRIVATE	L, G	L		**G**
FW29	PRIVATE	L	L		
FW30	PRIVATE	L		L	**L**
FW31	LOCSD	L			**L**
FW32	PRIVATE	L			**L**

L = WATER LEVEL
G = GENERAL MINERAL
CEC = CONSTITUENTS OF EMERGING CONCERN
TL = TRANSDUCER WATER LEVEL

LOCSD = Los Osos Community Services District
SLCUSD = San Luis Coastal Unified School District

NOTES:
1 - Summer and winter monitoring schedule
2 - Spring and fall monitoring schedule
3 - Biennial LOWRF schedule (mon by BMC in 2019)

Los Osos Basin Plan
Monitoring Well Network 2019
UPPER AQUIFER

Program Well ID	Well Owner	Basin Plan Monitoring Code	County Water Level Program	LOWRF Groundwater Monitoring Program[1]	**2019 Basin Plan Monitoring Program[2]**
UA1	SLO CO.	L	L		
UA2	SLO CO.	L	L		
UA3	GSWC	L, G			**L, G**
UA4	S&T	TL			**TL**
UA5	LOCSD	L		L	**L**
UA6	SLO CO.	L	L		
UA7	SLO CO.	L	L		
UA8	LOCSD	L			**L**
UA9	GSWC	L, G			**L, G**
UA10	LOCSD	TL			**TL**
UA11	PRIVATE	L		L	**L**
UA12	LOCSD	L		L	**L**
UA13	LOCSD	L, G			**L, G**
UA14	PRIVATE	L			**L**
UA15	PRIVATE	L			**L**
UA16	PRIVATE	L	L		
UA17	PRIVATE	L	L		
UA18	PRIVATE	L	L		

L = WATER LEVEL
G = GENERAL MINERAL
TL = TRANSDUCER WATER LEVEL

LOCSD = Los Osos Community Services District
SLO CO = San Luis Obispo County
GSWC = Golden State Water Company
S&T = S&T Mutual Water Company

NOTES:
1 - Summer and winter monitoring schedule
2 - Spring and fall monitoring schedule

Los Osos Basin Plan
Monitoring Well Network 2019
LOWER AQUIFER

Program Well ID	Well Owner	Basin Plan Monitoring Code	County Water Level Program	**2019 Basin Plan Monitoring Program**
LA1	SLO CO.	L	L	
LA2	SLO CO.	L	L	
LA3	SLO CO.	L	L	
LA4	PRIVATE	L, GL		**L**
LA5	S&T	L	L	
LA6	GSWC	L	L	
LA7	PRIVATE	TL		**TL**
LA8	S&T	L, G		**L , G**
LA9	GSWC	L,G		**L, G**
LA10	GSWC	L, G		**L , G**
LA11	SLO CO.	L, G		**L , G**
LA12	LOCSD	L, G		**L , G**
LA13	LOCSD	TL		**TL**
LA14	SLO CO.	L,GL	L	
LA15	LOCSD	L, G		**L , G**
LA16	PRIVATE	L	L	
LA17	SLO CO.	L	L	
LA18	LOCSD	L, G		**L , G**
LA19	SLO CO.	L	L	
LA20	GSWC	L, G		**L , G**
LA21	LOCSD	L	L	
LA22	LOCSD	L,G	L	**G**
LA23	PRIVATE	L, G		**L, G**
LA24	PRIVATE	L	L	
LA25	PRIVATE	L		**L**
LA26	PRIVATE	L	L	
LA27	PRIVATE	TL		**L**
LA28	PRIVATE	L, G		**L**
LA29	PRIVATE	L	L	
LA30	PRIVATE	L, G		**L**
LA31	PRIVATE	G		**G**
LA32	LOCSD	G		**G**
LA33	PRIVATE	L		**L**
LA34	SLO CO.	L	L	
LA35	SLO CO.	L		**L**
LA36	PRIVATE	L		**L**
LA37	SLO CO.	L		**TL**
LA38	PRIVATE	L		**L**
LA39[3]	GSWC	L,G		**L,G**

L = WATER LEVEL
G = GENERAL MINERAL
GL = GEOPHYSICAL LOG (2018)
TL = TRANSDUCER WATER LEVEL

LOCSD = Los Osos Community Services District
SLO CO = San Luis Obispo County
GSWC = Golden State Water Company
S&T = S&T Mutual Water Company

NOTES:
1 - Remove G from LA6 - out of service.
3 - Well added to LOBP program
Well IDs with both April and October water quality monitoring in Italics

APPENDIX C

Field Logs and Laboratory Analytical Reports for 2019 BMC Monitoring

Note: There are no Groundwater Monitoring Field Logs for Wells LA9, LA10, LA20, UA9, and UA3; These wells were sampled by owner (GSWC).

Spring 2019 Field Logs and Analytical Results

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/3/2019
Operator: Andrea Berge
Well number and location: 30S/11E-13N (LA8)
Site and wellhead conditions: Overcast, cool. Chlorinated water purged from line for 5 minutes at 200 gpm.

Static water depth (feet):	133.5
Well depth (feet):	350
Water column (feet):	216.5
Casing diameter (inches):	8
Minimum purge volume (gal)	flush line
Purge rate (gpm):	200
Pumping water level (feet):	--
Pump setting (feet):	--
Minimum purge time (min):	flush line
Time begin purge:	8:57 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
9:02	1200	427.8	8.86	18.4	Clear, colorless, odorless
9:04	1400	409	8.73	18.4	Clear, colorless, odorless
					Sampled @ 9:07 AM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/9/2019
Operator: Andrea Berge
Well number and location: 30S/10E-12J1 (LA11)
Site and wellhead conditions: Cap in place and site secure

Static water depth (feet):	5.34
Well depth (feet):	389
Water column (feet):	383.66
Casing diameter (inches):	2
Minimum purge volume (gal)	190
Purge rate (gpm):	1.7
Pumping water level (feet):	--
Pump setting (feet):	25
Minimum purge time (min):	120
Time begin purge:	9:04 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
9:05	1	1,112	7.17	17.7	Clear, colorless, odorless, some plant matter
9:07	5	1,146	7.05	18	Clear, colorless, odorless
9:09	10	1,135	7.10	18.02	Clear, colorless, odorless
9:16	20	1,130	7.17	18.6	Clear, colorless, odorless
9:35	50	1,307	7.20	20	Cloudy, Odorless
9:47	75	1,373	7.21	20.3	Slight tinge, odorless
10:02	100	1,339	7.27	20.1	Slight tinge, odorless
10:13	120	1,329	7.29	20	Slightly cloudy, odorless
10:28	145	1,321	7.27	20.2	Clear, colorless, odorless
10:40	170	1,321	7.29	19.6	Clear, colorless, odorless
10:54	190	1,316	7.28	19.5	Clear, colorless, odorless
					Sampled @ 11:34 AM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/9/2019

Operator: Andrea Berge

Well number and location: 30S/11E-7Q3 (LA12)

Site and wellhead conditions: Sunny, gusty. Pump turned on @ 10:30 AM at 353 gpm

Static water depth (feet): 36.2 on 4/12/19

Well depth (feet): 270

Water column (feet): 233.80

Casing diameter (inches): 10

Minimum purge volume (gal) flush line

Purge rate (gpm): --

Pumping water level (feet): --

Pump setting (feet): --

Minimum purge time (min): flush line

Time begin purge: 10:30 AM

Time	Gallons	EC (μS/cm)	pH	Temp. (°C)	Comments*
11:30	1	815	7.57	21.2	Slight sulfur odor, pre-sample
11:35	2	806	7.37	21.1	Slight sulfur odor, post-sample
					Sampled @ 11:34 AM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/9/2019
Operator: Andrea Berge
Well number and location: 30S/11E-18L2 (LA15)
Site and wellhead conditions: Sunny, gusty. Pump turned on @ 10:50 AM at 600 gpm

Static water depth (feet):	105.8 on 4/12/19
Well depth (feet):	394
Water column (feet):	288.20
Casing diameter (inches):	12
Minimum purge volume (gal)	flush line
Purge rate (gpm):	--
Pumping water level (feet):	--
Pump setting (feet):	--
Minimum purge time (min):	flush line
Time begin purge:	11:59 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:00	1	739.2	7.37	20.5	Clear, colorless, odorless, pre-sample
12:03	5	741.6	7.11	20.5	Clear, colorless, odorless, post-sample
					Sampled @ 12:02 PM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/10/2019
Operator: Andrea Berge
Well number and location: 30S/11E-18K8 (LA18)
Site and wellhead conditions: Sunny, clear. Site secure and gate opened.

Static water depth (feet): 134.5
Well depth (feet): 650
Water column (feet): 515.5
Casing diameter (inches): 2
Minimum purge volume (gal) 250
Purge rate (gpm): 2
Pumping water level (feet): 142.9
Pump setting (feet): 155
Minimum purge time (min): 130
Time begin purge: 8:43 AM

Time	Gallons	EC (μS/cm)	pH	Temp. (°C)	Comments*
8:43	1	508.6	7.61	19.5	Clear, colorless, odorless
8:44	5	571.7	7.31	20.6	Clear, colorless, odorless
8:49	10	598	7.40	20.5	Clear, colorless, odorless
8:55	20	601	7.32	20.9	Clear, colorless, odorless
9:00	30	603.6	7.33	20.9	Clear, colorless, odorless
9:12	50	604.2	7.26	22.2	Clear, colorless, odorless
9:24	80	605.2	7.89	22.9	Clear, colorless, odorless
9:50	120	605	7.58	23.4	Clear, colorless, odorless
10:17	170	591.4	8.05	22.5	Clear, colorless, odorless
10:46	220	589.9	7.91	22.5	Clear, colorless, odorless
11:02	250	593.6	7.94	22.9	Clear, colorless, odorless
					Sampled @ 11:50 AM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/10/2019
Operator: Andrea Berge
Well number and location: 30S/11E-17E8 (LA22)
Site and wellhead conditions: Sunny, clear. Site secure and gate opened.

Static water depth (feet): 97.06
Well depth (feet): 380
Water column (feet): 282.9
Casing diameter (inches): 2
Minimum purge volume (gal) 140
Purge rate (gpm): 2
Pumping water level (feet): 100.3
Pump setting (feet): 120
Minimum purge time (min): 70
Time begin purge: 12:03 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:03	1	510.4	7.83	20.3	Clear, colorless, odorless
12:05	5	508.2	7.95	19.6	Clear, colorless, odorless
12:07	10	506	7.96	19.5	Clear, colorless, odorless
12:17	30	470	7.73	19.8	Clear, colorless, odorless
12:28	50	460.5	7.62	19.7	Clear, colorless, odorless
12:40	80	458.6	7.77	20.1	Clear, colorless, odorless
12:52	100	460	7.62	19.8	Clear, colorless, odorless
13:01	120	462.4	7.64	20.2	Clear, colorless, odorless
13:12	140	459.1	7.55	19.8	Clear, colorless, odorless
					Sampled @ 1:14 PM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/3/2019
Operator: Andrea Berge
Well number and location: 30S/11E-20H1 (LA30)
Site and wellhead conditions: Overcast, cool. Flushed line.

Static water depth (feet):	1.7
Well depth (feet):	140
Water column (feet):	138.3
Casing diameter (inches):	6
Minimum purge volume (gal)	flush line
Purge rate (gpm):	--
Pumping water level (feet):	--
Pump setting (feet):	--
Minimum purge time (min):	flush line
Time begin purge:	11:24 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
11:32	5	780.3	8.04	17.9	Slight brown tinge
11:35	10	783.3	7.88	18	Slight tinge
11:38	15	782.6	7.85	18	Clearer, faint tinge
					Sampled @ 11:37 AM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/3/2019
Operator: Andrea Berge
Well number and location: 30S/10E-13M2 (LA31)
Site and wellhead conditions: Overcast, cool. Gate opened.

Static water depth (feet):	39.29 on 4/4/19
Well depth (feet):	--
Water column (feet):	--
Casing diameter (inches):	8
Minimum purge volume (gal)	flush line
Purge rate (gpm):	--
Pumping water level (feet):	--
Pump setting (feet):	--
Minimum purge time (min):	flush line
Time begin purge:	11:57 AM

Time	Gallons	EC (μS/cm)	pH	Temp. (°C)	Comments*
11:58	1	2,950	8.01	18.8	Clear, colorless, odorless
12:01	5	3,000	8.03	18.8	Clear, colorless, odorless
12:02	10	2,980	7.97	18.9	Clear, colorless, odorless
12:03	15	2,980	7.96	18.7	Clear, colorless, odorless
					Sampled @ 12:05 PM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/9/2019
Operator: Andrea Berge
Well number and location: 30S/11E-18K9 (LA32)
Site and wellhead conditions: Sunny, windy. Site secure and gate opened.
Pump on since 11:00 AM
Static water depth (feet): 152.7 on 4/12/19
Well depth (feet): --
Water column (feet): --
Casing diameter (inches): --
Minimum purge volume (gal) flush line
Purge rate (gpm): --
Pumping water level (feet): --
Pump setting (feet): --
Minimum purge time (min): flush line
Time begin purge: 11:48 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
11:49	3	485.2	7.66	20.8	Clear, colorless, odorless
11:50	5	480.4	7.42	20.6	Clear, colorless, odorless
					Sampled @ 11:50 AM

*Turbidity, color, odor, sheen, debris, etc.

April 25, 2019

Lab ID : CC 1981073-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
71 Zaca Lane
Suite 140
San Luis Obispo, CA 93401

Sampled On : April 3, 2019-09:07
Sampled By : Andrea Berge
Received On : April 3, 2019-14:35
Matrix : Ground Water

Description : 13N LA8 LA-8
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	100	--	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Calcium	17	1	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Magnesium	14	1	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Potassium	1	1	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Sodium	36	1	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Total Cations	3.6	--	meq/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Boron	ND	0.1	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Copper	30	10	ug/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Iron	ND	30	ug/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Manganese	ND	10	ug/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Zinc	ND	20	ug/L		200.7	04/05/19:203736	200.7	04/05/19:204901
SAR	1.6	--	--		200.7	04/05/19:203736	200.7	04/05/19:204901
Total Alkalinity (as CaCO3)	40	10	mg/L		2320B	04/08/19:203781	2320B	04/08/19:205015
Hydroxide as OH	ND	10	mg/L		2320B	04/08/19:203781	2320B	04/08/19:205015
Carbonate as CO3	ND	10	mg/L		2320B	04/08/19:203781	2320B	04/08/19:205015
Bicarbonate as HCO3	50	10	mg/L		2320B	04/08/19:203781	2320B	04/08/19:205015
Sulfate	12.7	0.5	mg/L		300.0	04/04/19:203920	300.0	04/04/19:205133
Chloride	75	1	mg/L		300.0	04/04/19:203920	300.0	04/04/19:205133
Nitrate as NO3	32.1	0.4	mg/L		300.0	04/04/19:203920	300.0	04/04/19:205133
Nitrite as N	ND	0.2	mg/L		300.0	04/04/19:203920	300.0	04/04/19:205133
Nitrate + Nitrite as N	7.2	0.1	mg/L		300.0	04/04/19:203920	300.0	04/04/19:205133
Fluoride	ND	0.1	mg/L		300.0	04/04/19:203920	300.0	04/04/19:205133
Total Anions	3.7	--	meq/L		2320B	04/08/19:203781	2320B	04/08/19:205015
pH	6.3	--	units		4500-H B	04/12/19:204035	4500HB	04/12/19:205293
Specific Conductance	434	1	umhos/cm		2510B	04/05/19:203701	2510B	04/05/19:204853
Total Dissolved Solids	250	20	mg/L		2540CE	04/05/19:203717	2540C	04/08/19:204927
MBAS Screen	Negative	0.1	mg/L		5540C	04/05/19:203812	5540C	04/15/19:204989
Aggressiveness Index	9.5	--	--		4500-H B	04/12/19:204035	4500HB	04/12/19:205293
Langelier Index (20°C)	-2.3	--	--		4500-H B	04/12/19:204035	4500HB	04/12/19:205293
Nitrate Nitrogen	7.2	0.1	mg/L		300.0	04/04/19:203920	300.0	04/04/19:205133

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

May 14, 2019

Lab ID : CC 1981198-002
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
71 Zaca Lane
Suite 140
San Luis Obispo, CA 93401

Sampled On : April 15, 2019-11:50
Sampled By : Zac Reineke
Received On : April 15, 2019-14:23
Matrix : Ground Water

Description : Cabrillo (24C1) LA-9
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	112	--	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Calcium	17	1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Magnesium	17	1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Potassium	2	1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Sodium	45	1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Total Cations	4.3	--	meq/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Boron	ND	0.1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Copper	ND	10	ug/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Iron	ND	30	ug/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Manganese	ND	10	ug/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Zinc	ND	20	ug/L		200.7	04/18/19:204255	200.7	04/22/19:205841
SAR	1.8	--	--		200.7	04/18/19:204255	200.7	04/22/19:205841
Total Alkalinity (as CaCO3)	60	10	mg/L		2320B	04/24/19:204498	2320B	04/24/19:205996
Hydroxide as OH	ND	10	mg/L		2320B	04/24/19:204498	2320B	04/24/19:205996
Carbonate as CO3	ND	10	mg/L		2320B	04/24/19:204498	2320B	04/24/19:205996
Bicarbonate as HCO3	70	10	mg/L		2320B	04/24/19:204498	2320B	04/24/19:205996
Sulfate	15.6	0.5	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Chloride	92	1	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Nitrate as NO3	25.4	0.4	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Nitrite as N	ND	0.2	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Nitrate + Nitrite as N	5.7	0.1	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Fluoride	ND	0.1	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Total Anions	4.5	--	meq/L		2320B	04/24/19:204498	2320B	04/24/19:205996
pH	7.1	--	units		4500-H B	04/23/19:204456	4500HB	04/23/19:205876
Specific Conductance	488	1	umhos/cm		2510B	04/17/19:204194	2510B	04/17/19:205499
Total Dissolved Solids	310	20	mg/L		2540CE	04/18/19:204266	2540C	04/19/19:205646
MBAS Screen	Negative	0.1	mg/L		5540C	04/16/19:204223	5540C	04/16/19:205535
Aggressiveness Index	10.5	--	--		4500-H B	04/23/19:204456	4500HB	04/23/19:205876
Langelier Index (20°C)	-1.3	--	--		4500-H B	04/23/19:204456	4500HB	04/23/19:205876
Nitrate Nitrogen	5.7	0.1	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

May 14, 2019

Lab ID : CC 1981198-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
71 Zaca Lane
Suite 140
San Luis Obispo, CA 93401

Sampled On : April 15, 2019-11:30
Sampled By : Zac Reineke
Received On : April 15, 2019-14:23
Matrix : Ground Water

Description : Rosina (13J1) LA-10
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	251	--	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Calcium	38	1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Magnesium	38	1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Potassium	2	1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Sodium	31	1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Total Cations	6.4	--	meq/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Boron	ND	0.1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Copper	ND	10	ug/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Iron	130	30	ug/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Manganese	ND	10	ug/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Zinc	ND	20	ug/L		200.7	04/18/19:204255	200.7	04/22/19:205841
SAR	0.9	--	--		200.7	04/18/19:204255	200.7	04/22/19:205841
Total Alkalinity (as CaCO3)	70	10	mg/L		2320B	04/24/19:204498	2320B	04/24/19:205996
Hydroxide as OH	ND	10	mg/L		2320B	04/24/19:204498	2320B	04/24/19:205996
Carbonate as CO3	ND	10	mg/L		2320B	04/24/19:204498	2320B	04/24/19:205996
Bicarbonate as HCO3	80	10	mg/L		2320B	04/24/19:204498	2320B	04/24/19:205996
Sulfate	10.4	0.5	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Chloride	174	5*	mg/L		300.0	05/13/19:205365	300.0	05/13/19:207057
Nitrate as NO3	8.6	0.4	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Nitrite as N	ND	0.2	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Nitrate + Nitrite as N	1.9	0.1	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Fluoride	ND	0.1	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Total Anions	6.6	--	meq/L		2320B	04/24/19:204498	2320B	04/24/19:205996
pH	7.0	--	units		4500-H B	04/23/19:204456	4500HB	04/23/19:205876
Specific Conductance	744	1	umhos/cm		2510B	04/17/19:204194	2510B	04/17/19:205499
Total Dissolved Solids	600	20	mg/L		2540CE	04/18/19:204266	2540C	04/19/19:205646
MBAS Screen	Negative	0.1	mg/L		5540C	04/16/19:204223	5540C	04/16/19:205535
Aggressiveness Index	10.8	--	--		4500-H B	04/23/19:204456	4500HB	04/23/19:205876
Langelier Index (20°C)	-1.1	--	--		4500-H B	04/23/19:204456	4500HB	04/23/19:205876
Nitrate Nitrogen	1.9	0.1	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

May 3, 2019

Lab ID : CC 1981127-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
71 Zaca Lane
Suite 140
San Luis Obispo, CA 93401

Sampled On : April 9, 2019-10:55
Sampled By : Andrea Berge
Received On : April 9, 2019-14:03
Matrix : Ground Water

Description : 12J1 (LA11) LA-11
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
General Mineral								
Total Hardness as CaCO3	539	--	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Calcium	76	1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Magnesium	85	1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Potassium	4	1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Sodium	85	1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Total Cations	14.6	--	meq/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Boron	0.2	0.1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Copper	ND	10	ug/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Iron	210	30	ug/L		200.7	04/11/19:203944	200.7	04/12/19:205366
Manganese	40	10	ug/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Zinc	ND	20	ug/L		200.7	04/11/19:203944	200.7	04/11/19:205239
SAR	1.6	--	--		200.7	04/11/19:203944	200.7	04/11/19:205239
Total Alkalinity (as CaCO3)	290	10	mg/L		2320B	04/15/19:204109	2320B	04/15/19:205455
Hydroxide as OH	ND	10	mg/L		2320B	04/15/19:204109	2320B	04/15/19:205455
Carbonate as CO3	ND	10	mg/L		2320B	04/15/19:204109	2320B	04/15/19:205455
Bicarbonate as HCO3	350	10	mg/L		2320B	04/15/19:204109	2320B	04/15/19:205455
Sulfate	189	0.5	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Chloride	196	5*	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Nitrate as NO3	ND	0.4	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Nitrite as N	ND	0.2	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Fluoride	ND	0.5*	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Total Anions	15.2	--	meq/L		2320B	04/15/19:204109	2320B	04/15/19:205455
pH	7.4	--	units		4500-H B	04/12/19:204035	4500HB	04/12/19:205293
Specific Conductance	1430	1	umhos/cm		2510B	04/11/19:203962	2510B	04/11/19:205190
Total Dissolved Solids	860	20	mg/L		2540CE	04/11/19:203967	2540C	04/12/19:205249
MBAS Screen	Negative	0.1	mg/L		5540C	04/10/19:203926	5540C	04/10/19:205147
Aggressiveness Index	12.1	--	--		4500-H B	04/12/19:204035	4500HB	04/12/19:205293
Langelier Index (20°C)	0.2	--	--		4500-H B	04/12/19:204035	4500HB	04/12/19:205293
Nitrate Nitrogen	ND	0.1	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

May 3, 2019

Lab ID : CC 1981127-002
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
71 Zaca Lane
Suite 140
San Luis Obispo, CA 93401

Sampled On : April 9, 2019-11:34
Sampled By : Andrea Berge
Received On : April 9, 2019-14:03
Matrix : Ground Water

Description : 7Q3 (LA12) LA-12
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
General Mineral								
Total Hardness as CaCO3	301	--	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Calcium	48	1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Magnesium	44	1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Potassium	2	1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Sodium	53	1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Total Cations	8.4	--	meq/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Boron	0.2	0.1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Copper	ND	10	ug/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Iron	180	30	ug/L		200.7	04/11/19:203944	200.7	04/12/19:205366
Manganese	60	10	ug/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Zinc	ND	20	ug/L		200.7	04/11/19:203944	200.7	04/11/19:205239
SAR	1.3	--	--		200.7	04/11/19:203944	200.7	04/11/19:205239
Total Alkalinity (as CaCO3)	240	10	mg/L		2320B	04/15/19:204109	2320B	04/15/19:205455
Hydroxide as OH	ND	10	mg/L		2320B	04/15/19:204109	2320B	04/15/19:205455
Carbonate as CO3	ND	10	mg/L		2320B	04/15/19:204109	2320B	04/15/19:205455
Bicarbonate as HCO3	300	10	mg/L		2320B	04/15/19:204109	2320B	04/15/19:205455
Sulfate	49.7	0.5	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Chloride	94	1	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Nitrate as NO3	ND	0.4	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Nitrite as N	ND	0.2	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Fluoride	ND	0.1	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Total Anions	8.6	--	meq/L		2320B	04/15/19:204109	2320B	04/15/19:205455
pH	7.5	--	units		4500-H B	04/12/19:204035	4500HB	04/12/19:205293
Specific Conductance	844	1	umhos/cm		2510B	04/11/19:203962	2510B	04/11/19:205190
Total Dissolved Solids	480	20	mg/L		2540CE	04/11/19:203967	2540C	04/12/19:205249
MBAS Screen	Negative	0.1	mg/L		5540C	04/10/19:203926	5540C	04/10/19:205147
Aggressiveness Index	12.0	--	--		4500-H B	04/12/19:204035	4500HB	04/12/19:205293
Langelier Index (20°C)	0.09	--	--		4500-H B	04/12/19:204035	4500HB	04/12/19:205293
Nitrate Nitrogen	ND	0.1	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

May 3, 2019

Lab ID : CC 1981127-004
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
71 Zaca Lane
Suite 140
San Luis Obispo, CA 93401

Sampled On : April 9, 2019-12:02
Sampled By : Andrea Berge
Received On : April 9, 2019-14:03
Matrix : Ground Water

Description : 18L2 (LA15) LA-15
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	301	--	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Calcium	48	1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Magnesium	44	1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Potassium	1	1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Sodium	38	1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Total Cations	7.7	--	meq/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Boron	ND	0.1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Copper	ND	10	ug/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Iron	ND	30	ug/L		200.7	04/11/19:203944	200.7	04/12/19:205366
Manganese	ND	10	ug/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Zinc	ND	20	ug/L		200.7	04/11/19:203944	200.7	04/11/19:205239
SAR	1.0	--	--		200.7	04/11/19:203944	200.7	04/11/19:205239
Total Alkalinity (as CaCO3)	200	10	mg/L		2320B	04/15/19:204109	2320B	04/15/19:205455
Hydroxide as OH	ND	10	mg/L		2320B	04/15/19:204109	2320B	04/15/19:205455
Carbonate as CO3	ND	10	mg/L		2320B	04/15/19:204109	2320B	04/15/19:205455
Bicarbonate as HCO3	250	10	mg/L		2320B	04/15/19:204109	2320B	04/15/19:205455
Sulfate	29.2	0.5	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Chloride	102	1	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Nitrate as NO3	3.7	0.4	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Nitrite as N	ND	0.2	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Nitrate + Nitrite as N	0.8	0.1	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Fluoride	0.1	0.1	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Total Anions	7.6	--	meq/L		2320B	04/15/19:204109	2320B	04/15/19:205455
pH	7.4	--	units		4500-H B	04/12/19:204035	4500HB	04/12/19:205293
Specific Conductance	774	1	umhos/cm		2510B	04/11/19:203962	2510B	04/11/19:205190
Total Dissolved Solids	460	20	mg/L		2540CE	04/11/19:203967	2540C	04/12/19:205249
MBAS Screen	Negative	0.1	mg/L		5540C	04/10/19:203926	5540C	04/10/19:205147
Aggressiveness Index	11.8	--	--		4500-H B	04/12/19:204035	4500HB	04/12/19:205293
Langelier Index (20°C)	-0.08	--	--		4500-H B	04/12/19:204035	4500HB	04/12/19:205293
Nitrate Nitrogen	0.8	0.1	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

April 25, 2019

Lab ID : CC 1981156-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
71 Zaca Lane
Suite 140
San Luis Obispo, CA 93401
Description : 18K8 (LA18) LA-18
Project : Los Osos BMC Monitoring

Sampled On : April 10, 2019-11:05
Sampled By : Andrea Berge
Received On : April 10, 2019-14:23
Matrix : Ground Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
General Mineral								
Total Hardness as CaCO3	245	--	mg/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Calcium	52	1	mg/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Magnesium	28	1	mg/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Potassium	2	1	mg/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Sodium	25	1	mg/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Total Cations	6.0	--	meq/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Boron	ND	0.1	mg/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Copper	ND	10	ug/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Iron	ND	30	ug/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Manganese	70	10	ug/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Zinc	ND	20	ug/L		200.7	04/12/19:204025	200.7	04/12/19:205365
SAR	0.7	--	--		200.7	04/12/19:204025	200.7	04/12/19:205365
Total Alkalinity (as CaCO3)	240	10	mg/L		2320B	04/16/19:204176	2320B	04/16/19:205514
Hydroxide as OH	ND	10	mg/L		2320B	04/16/19:204176	2320B	04/16/19:205514
Carbonate as CO3	ND	10	mg/L		2320B	04/16/19:204176	2320B	04/16/19:205514
Bicarbonate as HCO3	290	10	mg/L		2320B	04/16/19:204176	2320B	04/16/19:205514
Sulfate	37.4	0.5	mg/L		300.0	04/11/19:204164	300.0	04/11/19:205451
Chloride	32	1	mg/L		300.0	04/11/19:204164	300.0	04/11/19:205451
Nitrate as NO3	ND	0.4	mg/L		300.0	04/11/19:204164	300.0	04/11/19:205451
Nitrite as N	ND	0.2	mg/L		300.0	04/11/19:204164	300.0	04/11/19:205451
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	04/11/19:204164	300.0	04/11/19:205451
Fluoride	0.3	0.1	mg/L		300.0	04/11/19:204164	300.0	04/11/19:205451
Total Anions	6.4	--	meq/L		2320B	04/16/19:204176	2320B	04/16/19:205514
pH	7.6	--	units		4500-H B	04/16/19:204190	4500HB	04/16/19:205488
Specific Conductance	620	1	umhos/cm		2510B	04/12/19:204000	2510B	04/12/19:205245
Total Dissolved Solids	380	20	mg/L		2540CE	04/15/19:204119	2540C	04/16/19:205449
MBAS Screen	Negative	0.1	mg/L		5540C	04/12/19:204123	5540C	04/12/19:205399
Aggressiveness Index	12.1	--	--		4500-H B	04/16/19:204190	4500HB	04/16/19:205488
Langelier Index (20°C)	0.2	--	--		4500-H B	04/16/19:204190	4500HB	04/16/19:205488
Nitrate Nitrogen	ND	0.1	mg/L		300.0	04/11/19:204164	300.0	04/11/19:205451

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

May 14, 2019

Lab ID : CC 1981198-003
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
71 Zaca Lane
Suite 140
San Luis Obispo, CA 93401

Sampled On : April 15, 2019-12:05
Sampled By : Zac Reineke
Received On : April 15, 2019-14:23
Matrix : Ground Water

Description : South Bay (17N10) LA-20
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	181	--	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Calcium	28	1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Magnesium	27	1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Potassium	2	1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Sodium	34	1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Total Cations	5.1	--	meq/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Boron	0.1	0.1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Copper	ND	10	ug/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Iron	ND	30	ug/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Manganese	ND	10	ug/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Zinc	ND	20	ug/L		200.7	04/18/19:204255	200.7	04/22/19:205841
SAR	1.1	--	--		200.7	04/18/19:204255	200.7	04/22/19:205841
Total Alkalinity (as CaCO3)	160	10	mg/L		2320B	04/24/19:204498	2320B	04/24/19:205996
Hydroxide as OH	ND	10	mg/L		2320B	04/24/19:204498	2320B	04/24/19:205996
Carbonate as CO3	ND	10	mg/L		2320B	04/24/19:204498	2320B	04/24/19:205996
Bicarbonate as HCO3	200	10	mg/L		2320B	04/24/19:204498	2320B	04/24/19:205996
Sulfate	21.7	0.5	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Chloride	42	1	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Nitrate as NO3	13.7	0.4	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Nitrite as N	ND	0.2	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Nitrate + Nitrite as N	3.1	0.1	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Fluoride	0.1	0.1	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Total Anions	5.1	--	meq/L		2320B	04/24/19:204498	2320B	04/24/19:205996
pH	7.4	--	units		4500-H B	04/23/19:204456	4500HB	04/23/19:205876
Specific Conductance	559	1	umhos/cm		2510B	04/17/19:204194	2510B	04/17/19:205499
Total Dissolved Solids	310	20	mg/L		2540CE	04/18/19:204266	2540C	04/19/19:205646
MBAS Screen	Negative	0.1	mg/L		5540C	04/16/19:204223	5540C	04/16/19:205535
Aggressiveness Index	11.4	--	--		4500-H B	04/23/19:204456	4500HB	04/23/19:205876
Langelier Index (20°C)	-0.4	--	--		4500-H B	04/23/19:204456	4500HB	04/23/19:205876
Nitrate Nitrogen	3.1	0.1	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

April 25, 2019

Lab ID : CC 1981156-002
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
71 Zaca Lane
Suite 140
San Luis Obispo, CA 93401

Sampled On : April 10, 2019-13:14
Sampled By : Andrea Berge
Received On : April 10, 2019-14:23
Matrix : Ground Water

Description : 17G8 (LA22) LA-22
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
General Mineral								
Total Hardness as CaCO3	153	--	mg/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Calcium	25	1	mg/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Magnesium	22	1	mg/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Potassium	1	1	mg/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Sodium	28	1	mg/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Total Cations	4.3	--	meq/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Boron	ND	0.1	mg/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Copper	ND	10	ug/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Iron	ND	30	ug/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Manganese	ND	10	ug/L		200.7	04/12/19:204025	200.7	04/12/19:205365
Zinc	ND	20	ug/L		200.7	04/12/19:204025	200.7	04/12/19:205365
SAR	1.0	--	--		200.7	04/12/19:204025	200.7	04/12/19:205365
Total Alkalinity (as CaCO3)	150	10	mg/L		2320B	04/17/19:204214	2320B	04/18/19:205601
Hydroxide as OH	ND	10	mg/L		2320B	04/17/19:204214	2320B	04/18/19:205601
Carbonate as CO3	ND	10	mg/L		2320B	04/17/19:204214	2320B	04/18/19:205601
Bicarbonate as HCO3	180	10	mg/L		2320B	04/17/19:204214	2320B	04/18/19:205601
Sulfate	13.6	0.5	mg/L		300.0	04/11/19:204164	300.0	04/11/19:205451
Chloride	46	1	mg/L		300.0	04/11/19:204164	300.0	04/11/19:205451
Nitrate as NO3	25.5	0.4	mg/L		300.0	04/11/19:204164	300.0	04/11/19:205451
Nitrite as N	ND	0.2	mg/L		300.0	04/11/19:204164	300.0	04/11/19:205451
Nitrate + Nitrite as N	5.8	0.1	mg/L		300.0	04/11/19:204164	300.0	04/11/19:205451
Fluoride	ND	0.1	mg/L		300.0	04/11/19:204164	300.0	04/11/19:205451
Total Anions	4.9	--	meq/L		2320B	04/17/19:204214	2320B	04/18/19:205601
pH	7.2	--	units		4500-H B	04/17/19:204230	4500HB	04/17/19:205552
Specific Conductance	466	1	umhos/cm		2510B	04/12/19:204000	2510B	04/12/19:205245
Total Dissolved Solids	290	20	mg/L		2540CE	04/15/19:204119	2540C	04/16/19:205449
MBAS Screen	Negative	0.1	mg/L		5540C	04/12/19:204123	5540C	04/12/19:205399
Aggressiveness Index	11.2	--	--		4500-H B	04/17/19:204230	4500HB	04/17/19:205552
Langelier Index (20°C)	-0.7	--	--		4500-H B	04/17/19:204230	4500HB	04/17/19:205552
Nitrate Nitrogen	5.8	0.1	mg/L		300.0	04/11/19:204164	300.0	04/11/19:205451

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

April 25, 2019

Lab ID : CC 1981073-002
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
71 Zaca Lane
Suite 140
San Luis Obispo, CA 93401

Sampled On : April 3, 2019-11:37
Sampled By : Andrea Berge
Received On : April 3, 2019-14:35
Matrix : Ground Water

Description : 20H1 LA30 LA-30
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	396	--	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Calcium	68	1	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Magnesium	55	1	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Potassium	1	1	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Sodium	36	1	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Total Cations	9.5	--	meq/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Boron	0.1	0.1	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Copper	ND	10	ug/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Iron	4190	30	ug/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Manganese	1020	10	ug/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Zinc	ND	20	ug/L		200.7	04/05/19:203736	200.7	04/05/19:204901
SAR	0.8	--	--		200.7	04/05/19:203736	200.7	04/05/19:204901
Total Alkalinity (as CaCO3)	320	10	mg/L		2320B	04/07/19:203746	2320B	04/07/19:204916
Hydroxide as OH	ND	10	mg/L		2320B	04/07/19:203746	2320B	04/07/19:204916
Carbonate as CO3	ND	10	mg/L		2320B	04/07/19:203746	2320B	04/07/19:204916
Bicarbonate as HCO3	390	10	mg/L		2320B	04/07/19:203746	2320B	04/07/19:204916
Sulfate	92.8	0.5	mg/L		300.0	04/04/19:203920	300.0	04/04/19:205133
Chloride	52	1	mg/L		300.0	04/04/19:203920	300.0	04/04/19:205133
Nitrate as NO3	ND	0.4	mg/L		300.0	04/04/19:203920	300.0	04/04/19:205133
Nitrite as N	ND	0.2	mg/L		300.0	04/04/19:203920	300.0	04/04/19:205133
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	04/04/19:203920	300.0	04/04/19:205133
Fluoride	0.2	0.1	mg/L		300.0	04/04/19:203920	300.0	04/04/19:205133
Total Anions	9.8	--	meq/L		2320B	04/07/19:203746	2320B	04/07/19:204916
pH	7.8	--	units		4500-H B	04/16/19:204190	4500HB	04/16/19:205488
Specific Conductance	903	1	umhos/cm		2510B	04/05/19:203701	2510B	04/05/19:204853
Total Dissolved Solids	540	20	mg/L		2540CE	04/05/19:203717	2540C	04/08/19:204927
MBAS Screen	Negative	0.1	mg/L		5540C	04/05/19:203812	5540C	04/05/19:204989
Aggressiveness Index	12.5	--	--		4500-H B	04/16/19:204190	4500HB	04/16/19:205488
Langelier Index (20°C)	0.7	--	--		4500-H B	04/16/19:204190	4500HB	04/16/19:205488
Nitrate Nitrogen	ND	0.1	mg/L		300.0	04/04/19:203920	300.0	04/04/19:205133

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

April 25, 2019

Lab ID : CC 1981073-003
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
71 Zaca Lane
Suite 140
San Luis Obispo, CA 93401

Sampled On : April 3, 2019-12:05
Sampled By : Andrea Berge
Received On : April 3, 2019-14:35
Matrix : Ground Water

Description : 13M2 LA31 LA-31
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
General Mineral								
Total Hardness as CaCO3	640	--	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Calcium	103	1	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Magnesium	93	1	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Potassium	4	1	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Sodium	341	1	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Total Cations	27.7	--	meq/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Boron	0.2	0.1	mg/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Copper	ND	10	ug/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Iron	ND	30	ug/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Manganese	ND	10	ug/L		200.7	04/05/19:203736	200.7	04/05/19:204901
Zinc	ND	20	ug/L		200.7	04/05/19:203736	200.7	04/05/19:204901
SAR	5.9	--	--		200.7	04/05/19:203736	200.7	04/05/19:204901
Total Alkalinity (as CaCO3)	50	10	mg/L		2320B	04/07/19:203746	2320B	04/07/19:204916
Hydroxide as OH	ND	10	mg/L		2320B	04/07/19:203746	2320B	04/07/19:204916
Carbonate as CO3	ND	10	mg/L		2320B	04/07/19:203746	2320B	04/07/19:204916
Bicarbonate as HCO3	70	10	mg/L		2320B	04/07/19:203746	2320B	04/07/19:204916
Sulfate	179	0.5	mg/L		300.0	04/04/19:203920	300.0	04/05/19:205133
Chloride	940	10*	mg/L		300.0	04/04/19:203920	300.0	04/05/19:205133
Nitrate as NO3	2.8	0.4	mg/L		300.0	04/04/19:203920	300.0	04/05/19:205133
Nitrite as N	ND	0.2	mg/L		300.0	04/04/19:203920	300.0	04/05/19:205133
Nitrate + Nitrite as N	0.6	0.1	mg/L		300.0	04/04/19:203920	300.0	04/05/19:205133
Fluoride	ND	0.1	mg/L		300.0	04/04/19:203920	300.0	04/05/19:205133
Total Anions	31.4	--	meq/L		2320B	04/07/19:203746	2320B	04/07/19:204916
pH	7.8	--	units		4500-H B	04/16/19:204190	4500HB	04/16/19:205488
Specific Conductance	3290	1	umhos/cm		2510B	04/05/19:203701	2510B	04/05/19:204853
Total Dissolved Solids	2010	20	mg/L		2540CE	04/05/19:203717	2540C	04/08/19:204927
MBAS Screen	Negative	0.1	mg/L		5540C	04/05/19:203812	5540C	04/05/19:204989
Aggressiveness Index	11.9	--	--		4500-H B	04/16/19:204190	4500HB	04/16/19:205488
Langelier Index (20°C)	-0.03	--	--		4500-H B	04/16/19:204190	4500HB	04/16/19:205488
Nitrate Nitrogen	0.6	0.1	mg/L		300.0	04/04/19:203920	300.0	04/05/19:205133

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

May 3, 2019

Lab ID : CC 1981127-003
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
71 Zaca Lane
Suite 140
San Luis Obispo, CA 93401

Sampled On : April 9, 2019-11:50
Sampled By : Andrea Berge
Received On : April 9, 2019-14:03
Matrix : Ground Water

Description : 18K9 (LA32) LA-32
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	172	--	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Calcium	26	1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Magnesium	26	1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Potassium	1	1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Sodium	33	1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Total Cations	4.9	--	meq/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Boron	ND	0.1	mg/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Copper	ND	10	ug/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Iron	ND	30	ug/L		200.7	04/11/19:203944	200.7	04/12/19:205366
Manganese	ND	10	ug/L		200.7	04/11/19:203944	200.7	04/11/19:205239
Zinc	ND	20	ug/L		200.7	04/11/19:203944	200.7	04/11/19:205239
SAR	1.1	--	--		200.7	04/11/19:203944	200.7	04/11/19:205239
Total Alkalinity (as CaCO3)	160	10	mg/L		2320B	04/15/19:204109	2320B	04/15/19:205455
Hydroxide as OH	ND	10	mg/L		2320B	04/15/19:204109	2320B	04/15/19:205455
Carbonate as CO3	ND	10	mg/L		2320B	04/15/19:204109	2320B	04/15/19:205455
Bicarbonate as HCO3	200	10	mg/L		2320B	04/15/19:204109	2320B	04/15/19:205455
Sulfate	21.5	0.5	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Chloride	34	1	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Nitrate as NO3	6.9	0.4	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Nitrite as N	ND	0.2	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Nitrate + Nitrite as N	1.6	0.1	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Fluoride	0.1	0.1	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153
Total Anions	4.8	--	meq/L		2320B	04/15/19:204109	2320B	04/15/19:205455
pH	7.6	--	units		4500-H B	04/12/19:204035	4500HB	04/12/19:205293
Specific Conductance	474	1	umhos/cm		2510B	04/11/19:203962	2510B	04/11/19:205190
Total Dissolved Solids	270	20	mg/L		2540CE	04/11/19:203967	2540C	04/12/19:205249
MBAS Screen	Negative	0.1	mg/L		5540C	04/10/19:203926	5540C	04/10/19:205147
Aggressiveness Index	11.6	--	--		4500-H B	04/12/19:204035	4500HB	04/12/19:205293
Langelier Index (20°C)	-0.2	--	--		4500-H B	04/12/19:204035	4500HB	04/12/19:205293
Nitrate Nitrogen	1.6	0.1	mg/L		300.0	04/10/19:204307	300.0	04/10/19:205153

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

ENVIRONMENTAL AGRICULTURAL
Analytical Chemists

May 14, 2019

Cleath-Harris Geologists
Attn: Spencer Harris
71 Zaca Lane
Suite 140
San Luis Obispo, CA 93401
Description : Los Olivos #5 (I8K) LA-39
Project : Los Osos BMC Monitoring

Lab ID : CC 1981198-004
Customer ID : 8-514

Sampled On : April 15, 2019-12:20
Sampled By : Zac Reineke
Received On : April 15, 2019-14:23
Matrix : Ground Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	230	--	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Calcium	33	1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Magnesium	36	1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Potassium	2	1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Sodium	41	1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Total Cations	6.4	--	meq/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Boron	ND	0.1	mg/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Copper	ND	10	ug/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Iron	ND	30	ug/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Manganese	ND	10	ug/L		200.7	04/18/19:204255	200.7	04/22/19:205841
Zinc	ND	20	ug/L		200.7	04/18/19:204255	200.7	04/22/19:205841
SAR	1.2	--	--		200.7	04/18/19:204255	200.7	04/22/19:205841
Total Alkalinity (as CaCO3)	240	10	mg/L		2320B	04/24/19:204498	2320B	04/24/19:205996
Hydroxide as OH	ND	10	mg/L		2320B	04/24/19:204498	2320B	04/24/19:205996
Carbonate as CO3	ND	10	mg/L		2320B	04/24/19:204498	2320B	04/24/19:205996
Bicarbonate as HCO3	290	10	mg/L		2320B	04/24/19:204498	2320B	04/24/19:205996
Sulfate	27.4	0.5	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Chloride	38	1	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Nitrate as NO3	ND	0.4	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Nitrite as N	ND	0.2	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Fluoride	0.1	0.1	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656
Total Anions	6.4	--	meq/L		2320B	04/24/19:204498	2320B	04/24/19:205996
pH	8.1	--	units		4500-H B	05/07/19:205052	4500HB	05/07/19:206686
Specific Conductance	619	1	umhos/cm		2510B	04/17/19:204194	2510B	04/17/19:205499
Total Dissolved Solids	350	20	mg/L		2540CE	04/18/19:204266	2540C	04/19/19:205646
MBAS Screen	Negative	0.1	mg/L		5540C	04/16/19:204223	5540C	04/16/19:205535
Aggressiveness Index	12.4	--	--		4500-H B	05/07/19:205052	4500HB	05/07/19:206686
Langelier Index (20°C)	0.5	--	--		4500-H B	05/07/19:205052	4500HB	05/07/19:206686
Nitrate Nitrogen	ND	0.1	mg/L		300.0	04/16/19:204295	300.0	04/16/19:205656

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

Fall 2019 Field Logs and Analytical Results

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/3/2019
Operator: Andrea Berge
Well number and location: 30S/11E-20M2 (FW28)
Site and wellhead conditions: Sunny, breezy. Site secure, well not running.

Static water depth (feet): 28.77
Well depth (feet): 102
Water column (feet): 73.23
Casing diameter (inches):
Minimum purge volume (gal) flush line
Purge rate (gpm): --
Pumping water level (feet): --
Pump setting (feet): --
Minimum purge time (min): flush line
Time begin purge: 11:05 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
11:06	1	866	7.79	21.5	Clear, colorless, odorless
11:11	10	863.3	7.61	21	Pump turns on. Clear, colorless, odorless
11:16	20	864.9	7.46	19	Clear, colorless, odorless
11:21	40	859.7	7.37	17.2	Clear, colorless, odorless
					Sampled @ 11:22 AM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/2/2019
Operator: Andrea Berge
Well number and location: 30S/11E-17E10 (UA13)
Site and wellhead conditions: Well has been running since 7:00 am

Static water depth (feet): 94.3 on 10/11/19
Well depth (feet): 142
Water column (feet): 47.7
Casing diameter (inches): 8
Minimum purge volume (gal) flush line
Purge rate (gpm): --
Pumping water level (feet): --
Pump setting (feet): --
Minimum purge time (min): flush line
Time begin purge: 12:31 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:32		531.1	7.73	19.9	Clear, colorless, odorless
					Sampled @ 12:34 PM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/7/2019
Operator: Andrea Berge
Well number and location: 30S/11E-13N (LA8)
Site and wellhead conditions: Site secure. Well running at 200 gpm for 5 minutes

Static water depth (feet): 133.9
Well depth (feet): 350
Water column (feet): 216.1
Casing diameter (inches): 8
Minimum purge volume (gal) flush line
Purge rate (gpm): 200
Pumping water level (feet): --
Pump setting (feet): --
Minimum purge time (min): flush line
Time begin purge: 9:53 AM

Time	Gallons (from spigot)	EC (µS/cm)	pH	Temp. (°C)	Comments*
9:55	1200	459.2	7.65	18.6	Clear, colorless, odorless
9:57	1600	434	7.91	18.4	Clear, colorless, odorless
9:58	2200	431.3	7.62	18.5	Clear, colorless, odorless
					Sampled @ 10:00 AM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/2/2019
Operator: Andrea Berge, James Carlson
Well number and location: 30S/10E-12J1 (LA11)
Site and wellhead conditions: Sunny and still. Site secure, cap in place

Static water depth (feet):	6.93
Well depth (feet):	389
Water column (feet):	382
Casing diameter (inches):	2
Minimum purge volume (gal)	187.74
Purge rate (gpm):	~1.8
Pumping water level (feet):	11.38
Pump setting (feet):	25
Minimum purge time (min):	120
Time begin purge:	9:15 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
9:15	1	1,128	8.08	18.7	Clear, colorless, odorless
9:19	5	1,123	7.95	18.6	Clear, colorless, odorless
9:24	10	1,120	7.74	19	Clear, colorless, odorless
9:31	20	1,114	7.79	19.5	Clear, colorless, odorless
9:47	45	1,145	8.01	20.1	Clear, colorless, odorless
9:55	55	1,337	7.87	20.2	Slightly cloudy, odorless
10:09	75	1,353	7.56	21.1	Faintly cloudy, odorless
10:26	100	1,342	7.50	21.2	Faintly cloudy, odorless
10:40	120	1,326	7.78	20.6	Clear, colorless, odorless
10:56	145	1,309	8.08	20.9	Clear, colorless, odorless
11:15	170	1,310	7.71	21.3	Clear, colorless, odorless
11:27	190	1,308	7.49	21.3	Clear, colorless, odorless
					Sampled @ 11:32 AM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/2/2019
Operator: James Carlson
Well number and location: 30S/11E-7Q3 (LA12)
Site and wellhead conditions: Sunny and clear, site secure.

Static water depth (feet): 35.7 on 10/11/19
Well depth (feet): 270
Water column (feet): 234
Casing diameter (inches): 10
Minimum purge volume (gal) flush line
Purge rate (gpm): --
Pumping water level (feet): --
Pump setting (feet): --
Minimum purge time (min): flush line
Time begin purge: 11:56 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
11:57	2	790	7.55	21.8	Clear, colorless, odorless
					Sampled @ 11:59 AM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/2/2019
Operator: James Carlson
Well number and location: 30S/11E-18L2 (LA15)
Site and wellhead conditions: Well has been running 7:30 am to 9:00 am at 600 gpm.
Well turned back on for sampling at 12:40 pm

Static water depth (feet): 98.1 on 10/11/19
Well depth (feet): 394
Water column (feet): 296
Casing diameter (inches): 12
Minimum purge volume (gal) flush line
Purge rate (gpm): --
Pumping water level (feet): --
Pump setting (feet): --
Minimum purge time (min): flush line
Time begin purge: 12:41 PM

Time	Gallons (from spigot)	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:42	2	355.0	7.60	19.3	Clear, colorless, odorless

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/9/2019
Operator: Andrea Berge, James Carlson
Well number and location: 30S/11E-18K8 (LA18)
Site and wellhead conditions: Overcast, site secure and gate opened

Static water depth (feet): 139.12
Well depth (feet): 650
Water column (feet): 511
Casing diameter (inches): 2
Minimum purge volume (gal) 250
Purge rate (gpm): 1
Pumping water level (feet): 144.8
Pump setting (feet): 160
Minimum purge time (min): 180
Time begin purge: 8:58 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
8:57	1	550.6	7.75	20	Clear, colorless, odorless
8:59	5	577.5	7.52	21	Clear, colorless, odorless
9:03	10	588.9	7.59	21.4	Clear, colorless, odorless
9:11	20	592	7.53	21.7	Clear, colorless, odorless
9:19	30	588.8	7.76	21.6	Clear, colorless, odorless
9:41	50	590.8	7.56	22.3	Clear, colorless, odorless
10:07	80	591.2	7.58	22.7	Clear, colorless, odorless
10:42	120	584.3	8.09	23	Clear, colorless, odorless
11:22	170	588.8	7.56	22.8	Clear, colorless, odorless
12:03	220	593	7.51	23.1	Clear, colorless, odorless
12:18	240	592.4	7.54	23.2	Clear, colorless, odorless
12:25	250	589.7	7.72	22.7	Clear, colorless, odorless
					Sampled @ 12:26 PM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/9/2019
Operator: Andrea Berge, James Carlson
Well number and location: 30S/11E-17E8 (LA22)
Site and wellhead conditions: Overcast, cool. Site secure.

Static water depth (feet):	126.08
Well depth (feet):	390
Water column (feet):	263.9
Casing diameter (inches):	2
Minimum purge volume (gal)	125
Purge rate (gpm):	~1.3
Pumping water level (feet):	128.3
Pump setting (feet):	120
Minimum purge time (min):	97
Time begin purge:	12:52 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:53	1	501.8	8.23	20.3	Clear, colorless, odorless
12:26	5	505.3	8.22	20.3	Slightly cloudy, odorless
13:01	10	504	8.16	20.3	Slightly cloudy, odorless
13:04	15	500	7.94	20.4	Clear, colorless, odorless
13:16	25	470.3	7.75	20.7	Clear, colorless, odorless
13:24	35	468.2	7.38	20.7	Clear, colorless, odorless
13:31	45	468.6	7.49	20.5	Clear, colorless, odorless
13:39	55	467.5	7.38	20.6	Clear, colorless, odorless
13:46	75	470.7	7.35	23.4	Clear, colorless, odorless
14:13	95	471.3	7.84	20.7	Clear, colorless, odorless
14:29	115	467.4	7.71	20.4	Clear, colorless, odorless
14:37	125	464.9	7.31	20.7	Clear, colorless, odorless
					Sampled @ 14:37

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/3/2019
Operator: Andrea Berge
Well number and location: 30S/11E-20H1 (LA30)
Site and wellhead condition:

Static water depth (feet):	20.86 (recovering)
Well depth (feet):	140
Water column (feet):	119.14
Casing diameter (inches):	6
Minimum purge volume (gal)	flush line
Purge rate (gpm):	--
Pumping water level (feet):	--
Pump setting (feet):	--
Minimum purge time (min):	flush line
Time begin purge:	10:15 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
10:17	1	800.6	7.69	25.2	Slightly cloudy, odorless
10:19	5	827.3	7.73	20.4	Slightly cloudy, odorless
10:21	10	831.6	7.62	19.6	Clear, colorless, odorless
10:23	20	814.3	7.51	20	Clear, colorless, odorless
					Sampled @ 10:25 AM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/3/2019
Operator: Andrea Berge
Well number and location: 30S/10E-13M2 (LA31)
Site and wellhead conditions: Sunny breezy. Gate locked, site secure.

Static water depth (feet): 36.04
Well depth (feet): --
Water column (feet): --
Casing diameter (inches): 8
Minimum purge volume (gal) flush line
Purge rate (gpm): --
Pumping water level (feet): --
Pump setting (feet): --
Minimum purge time (min): flush line
Time begin purge: 12:18 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:19	1	2,880	7.85	18.6	Clear, colorless, odorless
12:25	10	2,940	7.75	18	Clear, colorless, odorless
12:26	15	2,960	7.63	17.8	Clear, colorless, odorless
12:27	20	2,930	7.61	18.1	Clear, colorless, odorless
					Sampled @ 12:28 PM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/2/2019
Operator: Andrea Berge, James Carlson
Well number and location: 30S/11E-18K9 (LA32)
Site and wellhead conditions: Sunny and clear. Site secure and gate opened.

Static water depth (feet):	159.8 on 10/11/19
Well depth (feet):	--
Water column (feet):	--
Casing diameter (inches):	--
Minimum purge volume (gal)	flush line
Purge rate (gpm):	--
Pumping water level (feet):	--
Pump setting (feet):	--
Minimum purge time (min):	flush line
Time begin purge:	12:16 PM

Time	Gallons (from spigot)	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:17	2	494.2	7.95	21.7	Clear, colorless, odorless
					Sampled @ 12:18 PM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 11/5/2019
Operator: J. Carlson
Well number and location: Lupine Zone E (LA40)
Site and wellhead conditions: Site secure, temporary fence gone, temporary caps in place and replaced with permanent caps.

Static water depth (feet): 9.64
Well depth (feet): 487.5
Water column (feet): 477.86
Casing diameter (inches): 2.26
Minimum purge volume (gal) 240.0
Pumping water level (feet): 123.1
Purge Rate (GPM): ~0.8
Pump setting (feet): 150
Time begin purge: 10:55 AM

Time	Gallons	EC (μS)	pH	Temp. (°C)	Comments*
10:55 AM	1	997	7.82	19.7	clear, colorless, odorless
11:07 AM	10	1018	7.68	19.0	clear, colorless, odorless
11:26 AM	20	2480	7.33	19.3	clear, colorless, odorless
11:57 AM	40	2690	7.19	19.8	clear, colorless, odorless
12:25 PM	60	3530	7.07	20.6	clear, colorless, odorless
1:05 PM	80	3670	7.01	20.8	clear, colorless, odorless
1:40 PM	100	4540	6.93	20.7	clear, colorless, odorless
2:21 PM	120	4680	6.89	21.3	clear, colorless, odorless
2:50 PM	140	4650	6.86	21.3	clear, colorless, odorless
3:28 PM	160	4850	6.85	21.1	clear, colorless, odorless
4:06 PM	180	4920	6.84	20.2	clear, colorless, odorless
4:37 PM	200	5050	6.84	20.5	clear, colorless, odorless
Purge stopped at 4:37 PM 11/5/2019 and continued at 9:18 AM 11/6/2019					
9:18 AM	220	5170	6.90	19.2	clear, colorless, odorless
9:47 AM	240	4670	6.92	19.8	clear, colorless, odorless
10:28 AM	260	5230	6.85	20.7	clear, colorless, odorless
11:07 AM	280	5190	6.84	21.4	clear, colorless, odorless
11:42 AM	300	5250	6.85	21.4	clear, colorless, odorless
					Sampled @ 11:49 AM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 11/6/2019
Operator: J. Carlson
Well number and location: Lupine Zone D (LA41)
Site and wellhead conditions: Site secure, new caps in place.

Static water depth (feet): 8.92
Well depth (feet): 350
Water column (feet): 341.08
Casing diameter (inches): 2.26
Minimum purge volume (gal) 213.0
Pumping water level (feet): 119.8
Purge Rate (GPM): ~0.6
Pump setting (feet): 150
Time begin purge: 12:10 PM

Time	Gallons	EC (µS)	pH	Temp. (°C)	Comments*
12:11 PM	1	1035	7.41	19.4	clear, colorless, odorless
12:53 PM	20	906	7.40	19.0	clear, colorless, odorless
1:30 PM	40	950	7.28	20.1	clear, colorless, odorless
2:04 PM	60	1060	7.20	20.2	clear, colorless, odorless
2:36 PM	80	1100	7.16	20.8	slightly turbid, light grey odorless
2:52 PM	90	1147	7.52	20.1	turbid, light brown, odorless
3:15 PM	100	1138	7.52	19.9	slightly turbid, light grey, odorless
3:31 PM	110	1148	7.23	20.1	slightly turbid, light grey, odorless
3:48 PM	120	1155	7.20	20.0	slightly turbid, light grey, odorless
4:11 PM	130	1164	7.20	19.7	slightly turbid, colorless, odorless
4:25 PM	140	1125	7.21	20.1	slightly turbid, colorless, odorless
Purge stopped at 4:25 PM 11/6/19 and continued at 8:52 AM 11/7/2019					
8:52 AM	150	1162	7.22	18.30	clear, colorless, odorless
9:10 AM	160	1158	7.14	19.0	clear, colorless, odorless
9:42 AM	180	1149	7.13	19.8	clear, colorless, odorless
10:18 AM	200	1145	7.09	20.7	clear, colorless, odorless
10:36 AM	210	1145	7.09	20.8	clear, colorless, odorless
10:58 AM	220	1158	7.46	20.8	clear, colorless, odorless
					Sampled @ 10:59 AM

*Turbidity, color, odor, sheen, debris, etc.

November 14, 2019

Lab ID : CC 1983664-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 16, 2019-12:01
Sampled By : James Carlson
Received On : October 16, 2019-12:51
Matrix : Ground Water

Description : 20A2 (FW26) FW-26
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	231	--	mg/L		200.7	10/19/19:212105	200.7	10/22/19:216609
Calcium	35	1	mg/L		200.7	10/19/19:212105	200.7	10/22/19:216609
Magnesium	35	1	mg/L		200.7	10/19/19:212105	200.7	10/22/19:216609
Potassium	1	1	mg/L		200.7	10/19/19:212105	200.7	10/22/19:216609
Sodium	36	1	mg/L		200.7	10/19/19:212105	200.7	10/22/19:216609
Total Cations	6.2	--	meq/L		200.7	10/19/19:212105	200.7	10/22/19:216609
Boron	ND	0.1	mg/L		200.7	10/19/19:212105	200.7	10/22/19:216609
Copper	ND	10	ug/L		200.7	10/19/19:212105	200.7	10/22/19:216609
Iron	1810	30	ug/L		200.7	10/19/19:212105	200.7	10/22/19:216609
Manganese	480	10	ug/L		200.7	10/19/19:212105	200.7	10/22/19:216609
Zinc	ND	20	ug/L		200.7	10/19/19:212105	200.7	10/22/19:216609
SAR	1.0	--	--		200.7	10/19/19:212105	200.7	10/22/19:216609
Total Alkalinity (as CaCO3)	180	10	mg/L		2320B	10/28/19:212412	2320B	10/28/19:216932
Hydroxide as OH	ND	10	mg/L		2320B	10/28/19:212412	2320B	10/28/19:216932
Carbonate as CO3	ND	10	mg/L		2320B	10/28/19:212412	2320B	10/28/19:216932
Bicarbonate as HCO3	220	10	mg/L		2320B	10/28/19:212412	2320B	10/28/19:216932
Sulfate	29.4	0.5	mg/L		300.0	10/17/19:212068	300.0	10/17/19:216357
Chloride	80	1	mg/L		300.0	10/17/19:212068	300.0	10/17/19:216357
Nitrate as NO3	ND	0.4	mg/L		300.0	10/17/19:212068	300.0	10/17/19:216357
Nitrite as N	ND	0.2	mg/L		300.0	10/17/19:212068	300.0	10/17/19:216357
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/17/19:212068	300.0	10/17/19:216357
Fluoride	ND	0.1	mg/L		300.0	10/17/19:212068	300.0	10/17/19:216357
Total Anions	6.5	--	meq/L		2320B	10/28/19:212412	2320B	10/28/19:216932
pH	6.7	--	units		4500-H B	10/22/19:212040	4500HB	10/22/19:216538
Specific Conductance	675	1	umhos/cm		2510B	10/29/19:212481	2510B	10/29/19:216956
Total Dissolved Solids	370	20	mg/L		2540CE	10/18/19:212086	2540C	10/21/19:216445
MBAS Screen	Negative	0.1	mg/L		5540C	10/17/19:212288	5540C	10/17/19:216631
Aggressiveness Index	10.9	--	--		4500-H B	10/22/19:212040	4500HB	10/22/19:216538
Langelier Index (20°C)	-1.0	--	--		4500-H B	10/22/19:212040	4500HB	10/22/19:216538
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/17/19:212068	300.0	10/17/19:216357

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

October 23, 2019

Lab ID : CC 1983504-002
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 3, 2019-11:22
Sampled By : Andrea Berge
Received On : October 3, 2019-14:59
Matrix : Ground Water

Description : 20M2 (FW28) FW-28
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	393	--	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Calcium	67	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Magnesium	55	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Potassium	1	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Sodium	38	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Cations	9.5	--	meq/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Boron	0.1	0.1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Copper	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Iron	420	30	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Manganese	50	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Zinc	ND	20	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
SAR	0.8	--	--		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Alkalinity (as CaCO3)	310	10	mg/L		2320B	10/15/19:211921	2320B	10/15/19:216188
Hydroxide as OH	ND	10	mg/L		2320B	10/15/19:211921	2320B	10/15/19:216188
Carbonate as CO3	ND	10	mg/L		2320B	10/15/19:211921	2320B	10/15/19:216188
Bicarbonate as HCO3	380	10	mg/L		2320B	10/15/19:211921	2320B	10/15/19:216188
Sulfate	102	0.5	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Chloride	64	1	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Nitrate as NO3	ND	0.4	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Nitrite as N	ND	0.2	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Fluoride	0.3	0.1	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Total Anions	10.2	--	meq/L		2320B	10/15/19:211921	2320B	10/15/19:216188
pH	7.4	--	units		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Specific Conductance	965	1	umhos/cm		2510B	10/17/19:212060	2510B	10/17/19:216340
Total Dissolved Solids	600	20	mg/L		2540CE	10/08/19:211617	2540C	10/09/19:215826
MBAS Screen	Negative	0.1	mg/L		5540C	10/04/19:211571	5540C	10/04/19:215650
Aggressiveness Index	12.1	--	--		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Langelier Index (20°C)	0.2	--	--		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

November 7, 2019

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 13F4 Skyline UA-3
Project : Los Osos BMC Monitoring

Lab ID : CC 1983629-002
Customer ID : 8-514

Sampled On : October 14, 2019-10:45
Sampled By : Zac Reineke
Received On : October 14, 2019-14:35
Matrix : Ground Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	112	--	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Calcium	20	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Magnesium	15	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Potassium	1	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Sodium	49	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Cations	4.4	--	meq/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Boron	ND	0.1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Copper	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Iron	ND	30	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Manganese	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Zinc	ND	20	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
SAR	2.0	--	--		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Alkalinity (as CaCO3)	60	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Hydroxide as OH	ND	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Carbonate as CO3	ND	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Bicarbonate as HCO3	70	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Sulfate	24.2	0.5	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Chloride	63	1	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Nitrate as NO3	78.9	0.4	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Nitrite as N	ND	0.2	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Nitrate + Nitrite as N	17.8	0.1	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Fluoride	ND	0.1	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Total Anions	4.7	--	meq/L		2320B	10/23/19:212280	2320B	10/23/19:216690
pH	6.7	--	units		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Specific Conductance	527	1	umhos/cm		2510B	10/26/19:212410	2510B	10/26/19:216829
Total Dissolved Solids	370	20	mg/L		2540CE	10/16/19:211940	2540C	10/17/19:216301
MBAS Screen	Negative	0.1	mg/L		5540C	10/15/19:212284	5540C	10/15/19:216627
Aggressiveness Index	10.2	--	--		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Langelier Index (20°C)	-1.7	--	--		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Nitrate Nitrogen	17.8	0.1	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

November 7, 2019

Lab ID : CC 1983629-002
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 14, 2019-10:45
Sampled By : Zac Reineke
Received On : October 14, 2019-14:35
Matrix : Ground Water

Description : 13F4 Skyline UA-3
Project : Los Osos BMC Monitoring

Sample Result - Support

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Field Test								
Temperature	64.5		°F			10/14/19 10:45	2550B	10/14/19 10:45
Conductivity	507		umhos/cm			10/14/19 10:45	2510B	10/14/19 10:45

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

November 7, 2019

Lab ID : CC 1983629-005
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 14, 2019-12:35
Sampled By : Zac Reineke
Received On : October 14, 2019-14:35
Matrix : Ground Water

Description : 18K3 Lo#3 UA-9
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	82.7	--	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Calcium	15	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Magnesium	11	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Potassium	1	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Sodium	27	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Cations	2.9	--	meq/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Boron	ND	0.1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Copper	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Iron	ND	30	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Manganese	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Zinc	ND	20	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
SAR	1.3	--	--		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Alkalinity (as CaCO3)	50	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Hydroxide as OH	ND	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Carbonate as CO3	ND	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Bicarbonate as HCO3	60	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Sulfate	8.2	0.5	mg/L		300.0	10/15/19:211941	300.0	10/15/19:216184
Chloride	42	1	mg/L		300.0	10/15/19:211941	300.0	10/15/19:216184
Nitrate as NO3	41.1	0.4	mg/L		300.0	10/15/19:211941	300.0	10/15/19:216184
Nitrite as N	ND	0.2	mg/L		300.0	10/15/19:211941	300.0	10/15/19:216184
Nitrate + Nitrite as N	9.3	0.1	mg/L		300.0	10/15/19:211941	300.0	10/15/19:216184
Fluoride	ND	0.1	mg/L		300.0	10/15/19:211941	300.0	10/15/19:216184
Total Anions	3.0	--	meq/L		2320B	10/23/19:212280	2320B	10/23/19:216690
pH	7.0	--	units		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Specific Conductance	333	1	umhos/cm		2510B	10/26/19:212410	2510B	10/26/19:216829
Total Dissolved Solids	240	20	mg/L		2540CE	10/16/19:211940	2540C	10/17/19:216301
MBAS Screen	Negative	0.1	mg/L		5540C	10/15/19:212284	5540C	10/15/19:216627
Aggressiveness Index	10.3	--	--		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Langelier Index (20°C)	-1.6	--	--		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Nitrate Nitrogen	9.3	0.1	mg/L		300.0	10/15/19:211941	300.0	10/15/19:216184

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

November 7, 2019

Lab ID : CC 1983629-005
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 14, 2019-12:35
Sampled By : Zac Reineke
Received On : October 14, 2019-14:35
Matrix : Ground Water

Description : 18K3 Lo#3 UA-9
Project : Los Osos BMC Monitoring

Sample Result - Support

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Field Test								
Temperature	65.7		°F			10/14/19 12:35	2550B	10/14/19 12:35
Conductivity	324		umhos/cm			10/14/19 12:35	2510B	10/14/19 12:35

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

October 16, 2019

Lab ID : CC 1983436-004
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 2, 2019-12:34
Sampled By : James Carlson
Received On : October 2, 2019-14:53
Matrix : Ground Water

Description : 17E10 (UA13) UA-13
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	165	--	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Calcium	25	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Magnesium	25	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Potassium	1	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Sodium	42	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Total Cations	5.2	--	meq/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Boron	0.1	0.1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Copper	ND	10	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215799
Iron	ND	30	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Manganese	ND	10	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Zinc	20	20	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215735
SAR	1.4	--	--		200.7	10/04/19:211494	200.7	10/08/19:215735
Total Alkalinity (as CaCO3)	100	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Hydroxide as OH	ND	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Carbonate as CO3	ND	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Bicarbonate as HCO3	120	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Sulfate	25.5	0.5	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Chloride	60	1	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Nitrate as NO3	69.6	0.4	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Nitrite as N	ND	0.2	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Nitrate + Nitrite as N	15.7	0.1	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Fluoride	ND	0.1	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Total Anions	5.3	--	meq/L		2320B	10/14/19:211819	2320B	10/15/19:216120
pH	7.4	--	units		4500-H B	10/15/19:211902	4500HB	10/15/19:216106
Specific Conductance	559	1	umhos/cm		2510B	10/10/19:211747	2510B	10/10/19:215900
Total Dissolved Solids	360	20	mg/L		2540CE	10/04/19:211481	2540C	10/07/19:215640
MBAS Screen	Negative	0.1	mg/L		5540C	10/03/19:211570	5540C	10/03/19:215649
Aggressiveness Index	11.2	--	--		4500-H B	10/15/19:211902	4500HB	10/15/19:216106
Langelier Index (20°C)	-0.7	--	--		4500-H B	10/15/19:211902	4500HB	10/15/19:216106
Nitrate Nitrogen	15.7	0.1	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

October 23, 2019

Lab ID : CC 1983520-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 7, 2019-10:00
Sampled By : Andrea Berge
Received On : October 7, 2019-11:03
Matrix : Ground Water

Description : 13N (LA8) LA-8
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	95.0	--	mg/L		200.7	10/16/19:211980	200.7	10/17/19:216320
Calcium	15	1	mg/L		200.7	10/16/19:211980	200.7	10/17/19:216320
Magnesium	14	1	mg/L		200.7	10/16/19:211980	200.7	10/17/19:216320
Potassium	1	1	mg/L		200.7	10/16/19:211980	200.7	10/17/19:216320
Sodium	37	1	mg/L		200.7	10/16/19:211980	200.7	10/17/19:216320
Total Cations	3.5	--	meq/L		200.7	10/16/19:211980	200.7	10/17/19:216320
Boron	ND	0.1	mg/L		200.7	10/16/19:211980	200.7	10/17/19:216320
Copper	20	10	ug/L		200.7	10/16/19:211980	200.7	10/17/19:216320
Iron	ND	30	ug/L		200.7	10/16/19:211980	200.7	10/17/19:216320
Manganese	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/17/19:216320
Zinc	ND	20	ug/L		200.7	10/16/19:211980	200.7	10/17/19:216320
SAR	1.7	--	--		200.7	10/16/19:211980	200.7	10/17/19:216320
Total Alkalinity (as CaCO3)	50	10	mg/L		2320B	10/17/19:212029	2320B	10/17/19:216403
Hydroxide as OH	ND	10	mg/L		2320B	10/17/19:212029	2320B	10/17/19:216403
Carbonate as CO3	ND	10	mg/L		2320B	10/17/19:212029	2320B	10/17/19:216403
Bicarbonate as HCO3	60	10	mg/L		2320B	10/17/19:212029	2320B	10/17/19:216403
Sulfate	14.4	0.5	mg/L		300.0	10/08/19:211668	300.0	10/08/19:215805
Chloride	77	1	mg/L		300.0	10/08/19:211668	300.0	10/08/19:215805
Nitrate as NO3	34.2	0.4	mg/L		300.0	10/08/19:211668	300.0	10/08/19:215805
Nitrite as N	ND	0.2	mg/L		300.0	10/08/19:211668	300.0	10/08/19:215805
Nitrate + Nitrite as N	7.7	0.1	mg/L		300.0	10/08/19:211668	300.0	10/08/19:215805
Fluoride	ND	0.1	mg/L		300.0	10/08/19:211668	300.0	10/08/19:215805
Total Anions	4.0	--	meq/L		2320B	10/17/19:212029	2320B	10/17/19:216403
pH	7.6	--	units		4500-H B	10/15/19:211902	4500HB	10/15/19:216106
Specific Conductance	446	1	umhos/cm		2510B	10/17/19:212060	2510B	10/17/19:216340
Total Dissolved Solids	250	20	mg/L		2540CE	10/09/19:211679	2540C	10/10/19:215890
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/19:211873	5540C	10/08/19:216057
Aggressiveness Index	10.9	--	--		4500-H B	10/15/19:211902	4500HB	10/15/19:216106
Langelier Index (20°C)	-1.0	--	--		4500-H B	10/15/19:211902	4500HB	10/15/19:216106
Nitrate Nitrogen	7.7	0.1	mg/L		300.0	10/08/19:211668	300.0	10/08/19:215805

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

November 7, 2019

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 13J1 Rosina LA-10
Project : Los Osos BMC Monitoring

Lab ID : CC 1983629-003
Customer ID : 8-514

Sampled On : October 14, 2019-11:30
Sampled By : Zac Reineke
Received On : October 14, 2019-14:35
Matrix : Ground Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
General Mineral								
Total Hardness as CaCO3	332	--	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Calcium	54	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Magnesium	48	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Potassium	1	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Sodium	33	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Cations	8.1	--	meq/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Boron	ND	0.1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Copper	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Iron	140	30	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Manganese	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Zinc	ND	20	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
SAR	0.8	--	--		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Alkalinity (as CaCO3)	70	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Hydroxide as OH	ND	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Carbonate as CO3	ND	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Bicarbonate as HCO3	80	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Sulfate	12.7	0.5	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Chloride	229	5*	mg/L		300.0	10/15/19:211931	300.0	10/16/19:216165
Nitrate as NO3	8.7	0.4	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Nitrite as N	ND	0.2	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Nitrate + Nitrite as N	2.0	0.1	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Fluoride	ND	0.1	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Total Anions	8.2	--	meq/L		2320B	10/23/19:212280	2320B	10/23/19:216690
pH	7.1	--	units		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Specific Conductance	961	1	umhos/cm		2510B	10/26/19:212410	2510B	10/26/19:216829
Total Dissolved Solids	830	20	mg/L		2540CE	10/16/19:211940	2540C	10/17/19:216301
MBAS Screen	Negative	0.1	mg/L		5540C	10/15/19:212284	5540C	10/15/19:216627
Aggressiveness Index	11.1	--	--		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Langelier Index (20°C)	-0.8	--	--		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Nitrate Nitrogen	2.0	0.1	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

November 7, 2019

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 13J1 Rosina LA-10
Project : Los Osos BMC Monitoring

Lab ID : CC 1983629-003
Customer ID : 8-514

Sampled On : October 14, 2019-11:30
Sampled By : Zac Reineke
Received On : October 14, 2019-14:35
Matrix : Ground Water

Sample Result - Support

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Field Test								
Temperature	68.1		°F			10/14/19 11:30	2550B	10/14/19 11:30
Conductivity	977		umhos/cm			10/14/19 11:30	2510B	10/14/19 11:30

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

October 16, 2019

Lab ID : CC 1983436-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 2, 2019-11:32
Sampled By : James Carlson
Received On : October 2, 2019-14:53
Matrix : Ground Water

Description : 12J1 (LA11) LA-11
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
General Mineral								
Total Hardness as CaCO3	570	--	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Calcium	80	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Magnesium	90	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Potassium	5	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Sodium	91	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Total Cations	15.5	--	meq/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Boron	0.3	0.1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Copper	ND	10	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215799
Iron	130	30	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Manganese	40	10	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Zinc	ND	20	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215735
SAR	1.7	--	--		200.7	10/04/19:211494	200.7	10/08/19:215735
Total Alkalinity (as CaCO3)	290	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Hydroxide as OH	ND	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Carbonate as CO3	50	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Bicarbonate as HCO3	250	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Sulfate	189	0.5	mg/L		300.0	10/03/19:211476	300.0	10/04/19:215514
Chloride	187	5*	mg/L		300.0	10/03/19:211476	300.0	10/04/19:215514
Nitrate as NO3	ND	0.4	mg/L		300.0	10/03/19:211476	300.0	10/04/19:215514
Nitrite as N	ND	0.2	mg/L		300.0	10/03/19:211476	300.0	10/04/19:215514
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/03/19:211476	300.0	10/04/19:215514
Fluoride	0.1	0.1	mg/L		300.0	10/03/19:211476	300.0	10/04/19:215514
Total Anions	15.0	--	meq/L		2320B	10/14/19:211819	2320B	10/15/19:216120
pH	7.6	--	units		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Specific Conductance	1520	1	umhos/cm		2510B	10/10/19:211747	2510B	10/10/19:215900
Total Dissolved Solids	1000	20	mg/L		2540CE	10/04/19:211481	2540C	10/07/19:215640
MBAS Screen	Negative	0.1	mg/L		5540C	10/03/19:211570	5540C	10/03/19:215649
Aggressiveness Index	12.4	--	--		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Langelier Index (20°C)	0.5	--	--		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/03/19:211476	300.0	10/04/19:215514

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

October 16, 2019

Lab ID : CC 1983436-002
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 2, 2019-11:59
Sampled By : James Carlson
Received On : October 2, 2019-14:53
Matrix : Ground Water

Description : 7Q3 (LA12) LA-12
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	312	--	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Calcium	49	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Magnesium	46	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Potassium	2	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Sodium	56	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Total Cations	8.7	--	meq/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Boron	0.2	0.1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Copper	ND	10	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215799
Iron	90	30	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Manganese	50	10	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Zinc	ND	20	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215735
SAR	1.4	--	--		200.7	10/04/19:211494	200.7	10/08/19:215735
Total Alkalinity (as CaCO3)	280	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Hydroxide as OH	ND	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Carbonate as CO3	20	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Bicarbonate as HCO3	290	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Sulfate	50.9	0.5	mg/L		300.0	10/03/19:211476	300.0	10/04/19:215514
Chloride	91	1	mg/L		300.0	10/03/19:211476	300.0	10/04/19:215514
Nitrate as NO3	ND	0.4	mg/L		300.0	10/03/19:211476	300.0	10/04/19:215514
Nitrite as N	ND	0.2	mg/L		300.0	10/03/19:211476	300.0	10/04/19:215514
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/03/19:211476	300.0	10/04/19:215514
Fluoride	ND	0.1	mg/L		300.0	10/03/19:211476	300.0	10/04/19:215514
Total Anions	9.0	--	meq/L		2320B	10/14/19:211819	2320B	10/15/19:216120
pH	8.0	--	units		4500-H B	10/15/19:211902	4500HB	10/15/19:216106
Specific Conductance	877	1	umhos/cm		2510B	10/10/19:211747	2510B	10/10/19:215900
Total Dissolved Solids	530	20	mg/L		2540CE	10/04/19:211481	2540C	10/07/19:215640
MBAS Screen	Negative	0.1	mg/L		5540C	10/03/19:211570	5540C	10/03/19:215649
Aggressiveness Index	12.5	--	--		4500-H B	10/15/19:211902	4500HB	10/15/19:216106
Langelier Index (20°C)	0.7	--	--		4500-H B	10/15/19:211902	4500HB	10/15/19:216106
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/03/19:211476	300.0	10/04/19:215514

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

October 16, 2019

Lab ID : CC 1983436-005
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 2, 2019-12:43
Sampled By : James Carlson
Received On : October 2, 2019-14:53
Matrix : Ground Water

Description : 1862 (LA15) LA-15
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	137	--	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Calcium	22	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Magnesium	20	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Potassium	1	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Sodium	29	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Total Cations	4.0	--	meq/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Boron	ND	0.1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Copper	ND	10	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215799
Iron	ND	30	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Manganese	ND	10	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Zinc	ND	20	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215735
SAR	1.1	--	--		200.7	10/04/19:211494	200.7	10/08/19:215735
Total Alkalinity (as CaCO3)	80	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Hydroxide as OH	ND	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Carbonate as CO3	ND	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Bicarbonate as HCO3	100	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Sulfate	13.4	0.5	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Chloride	44	1	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Nitrate as NO3	30.0	0.4	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Nitrite as N	ND	0.2	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Nitrate + Nitrite as N	6.8	0.1	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Fluoride	ND	0.1	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Total Anions	3.6	--	meq/L		2320B	10/14/19:211819	2320B	10/15/19:216120
pH	7.3	--	units		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Specific Conductance	389	1	umhos/cm		2510B	10/10/19:211747	2510B	10/10/19:215900
Total Dissolved Solids	270	20	mg/L		2540CE	10/04/19:211481	2540C	10/07/19:215640
MBAS Screen	Negative	0.1	mg/L		5540C	10/03/19:211570	5540C	10/03/19:215649
Aggressiveness Index	10.9	--	--		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Langelier Index (20°C)	-0.9	--	--		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Nitrate Nitrogen	6.8	0.1	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

November 7, 2019

Lab ID : CC 1983602-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 9, 2019-12:26
Sampled By : James Carlson
Received On : October 9, 2019-15:22
Matrix : Ground Water

Description : 18K8 (LA18) LA-18
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	253	--	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Calcium	52	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Magnesium	30	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Potassium	2	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Sodium	26	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Cations	6.2	--	meq/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Boron	ND	0.1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Copper	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Iron	ND	30	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Manganese	80	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Zinc	ND	20	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
SAR	0.7	--	--		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Alkalinity (as CaCO3)	240	10	mg/L		2320B	10/21/19:212160	2320B	10/21/19:216546
Hydroxide as OH	ND	10	mg/L		2320B	10/21/19:212160	2320B	10/21/19:216546
Carbonate as CO3	ND	10	mg/L		2320B	10/21/19:212160	2320B	10/21/19:216546
Bicarbonate as HCO3	290	10	mg/L		2320B	10/21/19:212160	2320B	10/21/19:216546
Sulfate	40.5	0.5	mg/L		300.0	10/10/19:211760	300.0	10/10/19:216025
Chloride	33	1	mg/L		300.0	10/10/19:211760	300.0	10/10/19:216025
Nitrate as NO3	ND	0.4	mg/L		300.0	10/10/19:211760	300.0	10/10/19:216025
Nitrite as N	ND	0.2	mg/L		300.0	10/10/19:211760	300.0	10/10/19:216025
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/10/19:211760	300.0	10/10/19:216025
Fluoride	0.3	0.1	mg/L		300.0	10/10/19:211760	300.0	10/10/19:216025
Total Anions	6.5	--	meq/L		2320B	10/21/19:212160	2320B	10/21/19:216546
pH	7.9	--	units		4500-H B	10/15/19:211902	4500HB	10/15/19:216106
Specific Conductance	647	1	umhos/cm		2510B	10/19/19:212107	2510B	10/19/19:216398
Total Dissolved Solids	390	20	mg/L		2540CE	10/11/19:211780	2540C	10/14/19:216039
MBAS Screen	Negative	0.1	mg/L		5540C	10/10/19:211888	5540C	10/10/19:216621
Aggressiveness Index	12.4	--	--		4500-H B	10/15/19:211902	4500HB	10/15/19:216106
Langelier Index (20°C)	0.5	--	--		4500-H B	10/15/19:211902	4500HB	10/15/19:216106
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/10/19:211760	300.0	10/10/19:216025

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

November 7, 2019

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 17N10 South Bay LA-20
Project : Los Osos BMC Monitoring

Lab ID : CC 1983629-001
Customer ID : 8-514

Sampled On : October 14, 2019-09:20
Sampled By : Zac Reineke
Received On : October 14, 2019-14:35
Matrix : Ground Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	221	--	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Calcium	34	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Magnesium	33	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Potassium	2	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Sodium	40	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Cations	6.2	--	meq/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Boron	ND	0.1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Copper	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Iron	ND	30	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Manganese	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Zinc	ND	20	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
SAR	1.2	--	--		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Alkalinity (as CaCO3)	240	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Hydroxide as OH	ND	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Carbonate as CO3	ND	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Bicarbonate as HCO3	290	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Sulfate	29.0	0.5	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Chloride	41	1	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Nitrate as NO3	3.0	0.4	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Nitrite as N	ND	0.2	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Nitrate + Nitrite as N	0.7	0.1	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Fluoride	0.2	0.1	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165
Total Anions	6.6	--	meq/L		2320B	10/23/19:212280	2320B	10/23/19:216690
pH	7.2	--	units		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Specific Conductance	626	1	umhos/cm		2510B	10/26/19:212410	2510B	10/26/19:216829
Total Dissolved Solids	380	20	mg/L		2540CE	10/16/19:211940	2540C	10/17/19:216301
MBAS Screen	Negative	0.1	mg/L		5540C	10/15/19:212284	5540C	10/15/19:216627
Aggressiveness Index	11.5	--	--		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Langelier Index (20°C)	-0.3	--	--		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Nitrate Nitrogen	0.7	0.1	mg/L		300.0	10/15/19:211931	300.0	10/15/19:216165

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

November 7, 2019

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 17N10 South Bay LA-20
Project : Los Osos BMC Monitoring

Lab ID : CC 1983629-001
Customer ID : 8-514

Sampled On : October 14, 2019-09:20
Sampled By : Zac Reineke
Received On : October 14, 2019-14:35
Matrix : Ground Water

Sample Result - Support

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Field Test								
Temperature	68.9		°F			10/14/19 09:20	2550B	10/14/19 09:20
Conductivity	640		umhos/cm			10/14/19 09:20	2510B	10/14/19 09:20

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

November 7, 2019

Lab ID : CC 1983602-002
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 9, 2019-14:37
Sampled By : James Carlson
Received On : October 9, 2019-15:22
Matrix : Ground Water

Description : 17E8 (LA22) LA-22
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	155	--	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Calcium	24	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Magnesium	23	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Potassium	1	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Sodium	28	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Cations	4.3	--	meq/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Boron	ND	0.1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Copper	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Iron	ND	30	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Manganese	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Zinc	ND	20	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
SAR	1.0	--	--		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Alkalinity (as CaCO3)	120	10	mg/L		2320B	10/21/19:212160	2320B	10/21/19:216546
Hydroxide as OH	ND	10	mg/L		2320B	10/21/19:212160	2320B	10/21/19:216546
Carbonate as CO3	ND	10	mg/L		2320B	10/21/19:212160	2320B	10/21/19:216546
Bicarbonate as HCO3	150	10	mg/L		2320B	10/21/19:212160	2320B	10/21/19:216546
Sulfate	14.9	0.5	mg/L		300.0	10/10/19:211760	300.0	10/10/19:216025
Chloride	49	1	mg/L		300.0	10/10/19:211760	300.0	10/10/19:216025
Nitrate as NO3	30.8	0.4	mg/L		300.0	10/10/19:211760	300.0	10/10/19:216025
Nitrite as N	ND	0.2	mg/L		300.0	10/10/19:211760	300.0	10/10/19:216025
Nitrate + Nitrite as N	7.0	0.1	mg/L		300.0	10/10/19:211760	300.0	10/10/19:216025
Fluoride	ND	0.1	mg/L		300.0	10/10/19:211760	300.0	10/10/19:216025
Total Anions	4.6	--	meq/L		2320B	10/21/19:212160	2320B	10/21/19:216546
pH	7.3	--	units		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Specific Conductance	485	1	umhos/cm		2510B	10/19/19:212107	2510B	10/19/19:216398
Total Dissolved Solids	270	20	mg/L		2540CE	10/11/19:211780	2540C	10/14/19:216039
MBAS Screen	Negative	0.1	mg/L		5540C	10/10/19:211888	5540C	10/10/19:216621
Aggressiveness Index	11.2	--	--		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Langelier Index (20°C)	-0.7	--	--		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Nitrate Nitrogen	7.0	0.1	mg/L		300.0	10/10/19:211760	300.0	10/10/19:216025

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

October 23, 2019

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 20H1 (LA30) LA-30
Project : Los Osos BMC Monitoring

Lab ID : CC 1983504-001
Customer ID : 8-514

Sampled On : October 3, 2019-10:25
Sampled By : Andrea Berge
Received On : October 3, 2019-14:59
Matrix : Ground Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	363	--	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Calcium	63	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Magnesium	50	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Potassium	2	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Sodium	37	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Cations	8.9	--	meq/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Boron	0.1	0.1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Copper	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Iron	1000	30	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Manganese	160	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Zinc	ND	20	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
SAR	0.8	--	--		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Alkalinity (as CaCO3)	310	10	mg/L		2320B	10/15/19:211921	2320B	10/15/19:216188
Hydroxide as OH	ND	10	mg/L		2320B	10/15/19:211921	2320B	10/15/19:216188
Carbonate as CO3	ND	10	mg/L		2320B	10/15/19:211921	2320B	10/15/19:216188
Bicarbonate as HCO3	380	10	mg/L		2320B	10/15/19:211921	2320B	10/15/19:216188
Sulfate	82.3	0.5	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Chloride	59	1	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Nitrate as NO3	ND	0.4	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Nitrite as N	ND	0.2	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Fluoride	0.2	0.1	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Total Anions	9.6	--	meq/L		2320B	10/15/19:211921	2320B	10/15/19:216188
pH	7.5	--	units		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Specific Conductance	981	1	umhos/cm		2510B	10/14/19:211887	2510B	10/14/19:216076
Total Dissolved Solids	530	20	mg/L		2540CE	10/08/19:211617	2540C	10/09/19:215826
MBAS Screen	Negative	0.1	mg/L		5540C	10/04/19:211571	5540C	10/04/19:215650
Aggressiveness Index	12.2	--	--		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Langelier Index (20°C)	0.3	--	--		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

October 23, 2019

Lab ID : CC 1983504-003
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 3, 2019-12:28
Sampled By : Andrea Berge
Received On : October 3, 2019-14:59
Matrix : Ground Water

Description : 13M2 (LA31) LA-31
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	574	--	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Calcium	90	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Magnesium	85	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Potassium	4	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Sodium	340	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Cations	26.4	--	meq/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Boron	0.2	0.1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Copper	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Iron	40	30	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Manganese	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Zinc	ND	20	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
SAR	6.2	--	--		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Alkalinity (as CaCO3)	50	10	mg/L		2320B	10/15/19:211921	2320B	10/15/19:216188
Hydroxide as OH	ND	10	mg/L		2320B	10/15/19:211921	2320B	10/15/19:216188
Carbonate as CO3	ND	10	mg/L		2320B	10/15/19:211921	2320B	10/15/19:216188
Bicarbonate as HCO3	70	10	mg/L		2320B	10/15/19:211921	2320B	10/15/19:216188
Sulfate	169	0.5	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Chloride	827	17*	mg/L		300.0	10/04/19:211547	300.0	10/05/19:215622
Nitrate as NO3	2.9	0.4	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Nitrite as N	ND	0.2	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Nitrate + Nitrite as N	0.7	0.1	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Fluoride	ND	0.1	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622
Total Anions	28.0	--	meq/L		2320B	10/15/19:211921	2320B	10/15/19:216188
pH	7.4	--	units		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Specific Conductance	3120	1	umhos/cm		2510B	10/17/19:212060	2510B	10/17/19:216340
Total Dissolved Solids	2120	20	mg/L		2540CE	10/08/19:211617	2540C	10/09/19:215826
MBAS Screen	Negative	0.1	mg/L		5540C	10/04/19:211571	5540C	10/04/19:215650
Aggressiveness Index	11.5	--	--		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Langelier Index (20°C)	-0.5	--	--		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Nitrate Nitrogen	0.7	0.1	mg/L		300.0	10/04/19:211547	300.0	10/04/19:215622

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

October 16, 2019

Lab ID : CC 1983436-003
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 18K9 (LA32) LA-32
Project : Los Osos BMC Monitoring

Sampled On : October 2, 2019-12:18
Sampled By : James Carlson
Received On : October 2, 2019-14:53
Matrix : Ground Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
General Mineral								
Total Hardness as CaCO3	185	--	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Calcium	28	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Magnesium	28	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Potassium	1	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Sodium	35	1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Total Cations	5.2	--	meq/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Boron	0.1	0.1	mg/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Copper	ND	10	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215799
Iron	ND	30	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Manganese	ND	10	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215735
Zinc	ND	20	ug/L		200.7	10/04/19:211494	200.7	10/08/19:215735
SAR	1.1	--	--		200.7	10/04/19:211494	200.7	10/08/19:215735
Total Alkalinity (as CaCO3)	180	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Hydroxide as OH	ND	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Carbonate as CO3	ND	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Bicarbonate as HCO3	200	10	mg/L		2320B	10/14/19:211819	2320B	10/15/19:216120
Sulfate	24.7	0.5	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Chloride	36	1	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Nitrate as NO3	6.3	0.4	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Nitrite as N	ND	0.2	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Nitrate + Nitrite as N	1.4	0.1	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Fluoride	0.1	0.1	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513
Total Anions	4.9	--	meq/L		2320B	10/14/19:211819	2320B	10/15/19:216120
pH	7.4	--	units		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Specific Conductance	531	1	umhos/cm		2510B	10/10/19:211747	2510B	10/10/19:215900
Total Dissolved Solids	310	20	mg/L		2540CE	10/04/19:211481	2540C	10/07/19:215640
MBAS Screen	Negative	0.1	mg/L		5540C	10/03/19:211570	5540C	10/03/19:215649
Aggressiveness Index	11.5	--	--		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Langelier Index (20°C)	-0.3	--	--		4500-H B	10/10/19:211741	4500HB	10/10/19:215893
Nitrate Nitrogen	1.4	0.1	mg/L		300.0	10/03/19:211467	300.0	10/04/19:215513

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

November 7, 2019

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 18K Lo#5 LA-39
Project : Los Osos BMC Monitoring

Lab ID : CC 1983629-004
Customer ID : 8-514

Sampled On : October 14, 2019-12:20
Sampled By : Zac Reineke
Received On : October 14, 2019-14:35
Matrix : Ground Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	225	--	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Calcium	34	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Magnesium	34	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Potassium	1	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Sodium	41	1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Cations	6.3	--	meq/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Boron	ND	0.1	mg/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Copper	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Iron	ND	30	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Manganese	ND	10	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
Zinc	ND	20	ug/L		200.7	10/16/19:211980	200.7	10/16/19:216320
SAR	1.2	--	--		200.7	10/16/19:211980	200.7	10/16/19:216320
Total Alkalinity (as CaCO3)	240	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Hydroxide as OH	ND	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Carbonate as CO3	ND	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Bicarbonate as HCO3	300	10	mg/L		2320B	10/23/19:212280	2320B	10/23/19:216690
Sulfate	28.6	0.5	mg/L		300.0	10/15/19:211941	300.0	10/15/19:216184
Chloride	37	1	mg/L		300.0	10/15/19:211941	300.0	10/15/19:216184
Nitrate as NO3	ND	0.4	mg/L		300.0	10/15/19:211941	300.0	10/15/19:216184
Nitrite as N	ND	0.2	mg/L		300.0	10/15/19:211941	300.0	10/15/19:216184
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/15/19:211941	300.0	10/15/19:216184
Fluoride	0.1	0.1	mg/L		300.0	10/15/19:211941	300.0	10/15/19:216184
Total Anions	6.6	--	meq/L		2320B	10/23/19:212280	2320B	10/23/19:216690
pH	7.2	--	units		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Specific Conductance	628	1	umhos/cm		2510B	10/26/19:212410	2510B	10/26/19:216829
Total Dissolved Solids	370	20	mg/L		2540CE	10/16/19:211940	2540C	10/17/19:216301
MBAS Screen	Negative	0.1	mg/L		5540C	10/15/19:212284	5540C	10/15/19:216627
Aggressiveness Index	11.5	--	--		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Langelier Index (20°C)	-0.3	--	--		4500-H B	10/17/19:212020	4500HB	10/17/19:216300
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/15/19:211941	300.0	10/15/19:216184

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

November 7, 2019

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 18K Lo#5 LA-39
Project : Los Osos BMC Monitoring

Lab ID : CC 1983629-004
Customer ID : 8-514

Sampled On : October 14, 2019-12:20
Sampled By : Zac Reineke
Received On : October 14, 2019-14:35
Matrix : Ground Water

Sample Result - Support

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Field Test								
Temperature	70.2		°F			10/14/19 12:20	2550B	10/14/19 12:20
Conductivity	652		umhos/cm			10/14/19 12:20	2510B	10/14/19 12:20

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

December 4, 2019

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : Lupine Zone E (LA40) LA-40
Project : Los Osos BMC Monitoring

Lab ID : CC 1983911-001
Customer ID : 8-514

Sampled On : November 6, 2019-11:49
Sampled By : Spencer Harris
Received On : November 6, 2019-14:15
Matrix : Ground Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
General Mineral								
Total Hardness as CaCO3	2090	--	mg/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Calcium	388	1	mg/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Magnesium	272	1	mg/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Potassium	6	1	mg/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Sodium	182	1	mg/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Total Cations	49.8	--	meq/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Boron	ND	0.1	mg/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Copper	ND	10	ug/L		200.7	11/12/19:213078	200.7	11/19/19:218124
Iron	ND	30	ug/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Manganese	60	10	ug/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Zinc	ND	20	ug/L		200.7	11/12/19:213078	200.7	11/18/19:218087
SAR	1.7	--	--		200.7	11/12/19:213078	200.7	11/18/19:218087
Total Alkalinity (as CaCO3)	170	10	mg/L		2320B	11/19/19:213362	2320B	11/20/19:218198
Hydroxide as OH	ND	10	mg/L		2320B	11/19/19:213362	2320B	11/20/19:218198
Carbonate as CO3	ND	10	mg/L		2320B	11/19/19:213362	2320B	11/20/19:218198
Bicarbonate as HCO3	210	10	mg/L		2320B	11/19/19:213362	2320B	11/20/19:218198
Sulfate	224	4*	mg/L		300.0	11/25/19:213623	300.0	11/25/19:218466
Chloride	1460	20*	mg/L		300.0	11/25/19:213623	300.0	11/25/19:218466
Nitrate as NO3	5.9	0.9	mg/L		4500NO3F	11/07/19:212865	4500NO3F	11/07/19:217486
Nitrite as N	0.3	0.1	mg/L		4500NO2F	11/07/19:212866	4500NO3F	11/07/19:217482
Nitrate + Nitrite as N	1.6	0.2	mg/L		4500NO3F	11/07/19:212865	4500NO3F	11/07/19:217486
Fluoride	ND	0.1	mg/L		300.0	11/25/19:213623	300.0	11/25/19:218466
Total Anions	49.4	--	meq/L		2320B	11/19/19:213362	2320B	11/20/19:218198
pH	7.0	--	units		4500-H B	11/21/19:213466	4500HB	11/21/19:218274
Specific Conductance	5330	1	umhos/cm		2510B	11/27/19:213676	2510B	11/27/19:218554
Total Dissolved Solids	4750	20*	mg/L		2540CE	11/08/19:212915	2540C	11/11/19:217645
MBAS Screen	Negative	0.1	mg/L		5540C	11/07/19:213304	5540C	11/07/19:218029
Aggressiveness Index	12.2	--	--		4500-H B	11/21/19:213466	4500HB	11/21/19:218274
Langelier Index (20°C)	0.2	--	--		4500-H B	11/21/19:213466	4500HB	11/21/19:218274
Nitrate Nitrogen	1.3	0.2	mg/L		4500NO3F	11/07/19:212865	4500NO3F	11/07/19:217486

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

November 26, 2019

Lab ID : CC 1983936-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : Lupine Zone D (LA41) LA-41
Project : Los Osos BMC Monitoring

Sampled On : November 7, 2019-10:59
Sampled By : James Carlson
Received On : November 7, 2019-12:47
Matrix : Ground Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	312	--	mg/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Calcium	69	1	mg/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Magnesium	34	1	mg/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Potassium	4	1	mg/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Sodium	140	1	mg/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Total Cations	12.4	--	meq/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Boron	ND	0.1	mg/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Copper	ND	10	ug/L		200.7	11/12/19:213078	200.7	11/19/19:218124
Iron	1370	30	ug/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Manganese	60	10	ug/L		200.7	11/12/19:213078	200.7	11/18/19:218087
Zinc	ND	20	ug/L		200.7	11/12/19:213078	200.7	11/18/19:218087
SAR	3.4	--	--		200.7	11/12/19:213078	200.7	11/18/19:218087
Total Alkalinity (as CaCO3)	170	10	mg/L		2320B	11/20/19:213413	2320B	11/21/19:218260
Hydroxide as OH	ND	10	mg/L		2320B	11/20/19:213413	2320B	11/21/19:218260
Carbonate as CO3	ND	10	mg/L		2320B	11/20/19:213413	2320B	11/21/19:218260
Bicarbonate as HCO3	210	10	mg/L		2320B	11/20/19:213413	2320B	11/21/19:218260
Sulfate	188	0.5	mg/L		300.0	11/08/19:212977	300.0	11/08/19:217611
Chloride	136	3*	mg/L		300.0	11/08/19:212977	300.0	11/09/19:217611
Nitrate as NO3	13.6	0.4	mg/L		300.0	11/08/19:212977	300.0	11/08/19:217611
Nitrite as N	0.3	0.2	mg/L		300.0	11/08/19:212977	300.0	11/08/19:217611
Nitrate + Nitrite as N	3.4	0.1	mg/L		300.0	11/08/19:212977	300.0	11/08/19:217611
Fluoride	0.1	0.1	mg/L		300.0	11/08/19:212977	300.0	11/08/19:217611
Total Anions	11.4	--	meq/L		2320B	11/20/19:213413	2320B	11/21/19:218260
pH	7.7	--	units		4500-H B	11/21/19:213466	4500HB	11/21/19:218274
Specific Conductance	1310	1	umhos/cm		2510B	11/21/19:213483	2510B	11/21/19:218294
Total Dissolved Solids	760	20	mg/L		2540CE	11/11/19:213001	2540C	11/12/19:217714
MBAS Screen	Negative	0.1	mg/L		5540C	11/08/19:213305	5540C	11/08/19:218030
Aggressiveness Index	12.2	--	--		4500-H B	11/21/19:213466	4500HB	11/21/19:218274
Langelier Index (20°C)	0.3	--	--		4500-H B	11/21/19:213466	4500HB	11/21/19:218274
Nitrate Nitrogen	3.1	0.1	mg/L		300.0	11/08/19:212977	300.0	11/08/19:217611

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

CEC Testing

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/16/2019
Operator: A. Berge, J. Carlson
Well number and location: 30S/11E-13Q2 (FW5)
Site and wellhead conditions: Overcast and cold. Well secure and locked, one bolt missing.

Static water depth (feet):	81.87
Well depth (feet):	105
Water column (feet):	23.13
Casing diameter (inches):	2
Minimum purge volume (gal)	11.31
Purge rate (gpm):	1.5
Pumping water level (feet):	--
Pump setting (feet):	100
Minimum purge time (min):	35
Time begin purge:	10:01 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
10:02	1	943.2	7.84	18	Orange, cloudy, odorless
10:06	5	950	6.92	18.5	Cloudy, odorless
10:10	10	967.7	6.67	18.6	Slightly colorless, odorless
0:00	15	976.1	6.50	19	Clear, colorless, odorless
10:24	20	980.2	6.48	19.1	Clear, colorless, odorless
10:30	25	989.8	6.32	19	Clear, colorless, odorless
10:37	30	993	6.39	18.9	Clear, colorless, odorless
10:42	35	989.4	6.32	18.8	Clear, colorless, odorless
					Sampled @ 10:46 AM

*Turbidity, color, odor, sheen, debris, etc.

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/16/2019
Operator: A. Berge, J. Carlson
Well number and location: 30S/11E-20A2 (FW26)
Site and wellhead conditions: Sunny and cool. Well clear and static

Static water depth (feet): 19.55
Well depth (feet): 60
Water column (feet): 40.45
Casing diameter (inches): 6
Minimum purge volume (gal) flush line
Purge rate (gpm): --
Pumping water level (feet): --
Pump setting (feet): --
Minimum purge time (min): flush line
Time begin purge: 11:35 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
11:35	3	642	7.04	16.8	Clear, colorless, sulfur odor
11:37	10	637	7.04	17.6	Clear, colorless, sulfur odor
11:38	20	635.4	7.04	17	Clear, colorless, sulfur odor
11:39	30	632	7.07	17	Clear, colorless, sulfur odor
11:40	40	630.8	7.04	17	Clear, colorless, odorless
11:42	60	630.7	7.12	17	Clear, colorless, odorless
11:44	80	628.9	7.16	16.8	Clear, colorless, odorless
11:46	100	628.3	7.14	17	Clear, colorless, odorless
11:51	150	628.1	7.10	17	Clear, colorless, faint sulfur odor
11:56	200	627.3	7.11	17.1	Clear, colorless, odorless
12:01	250	627.2	7.13	17	Clear, colorless, odorless
					Sampled @ 12:01 PM

*Turbidity, color, odor, sheen, debris, etc.

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders:	9J17045	**Report Date:**	1/28/2020
		Received Date:	10/17/2019
Project:	Los Osos Groundwater CECs	**Turnaround Time:**	Normal
		Phones:	(805) 543-1413
		Fax:	-
Attn:	Spencer Harris	**P.O. #:**	
Client:	Cleath-Harris Geologists, Inc. 75 Zaca Lane, Suite 110 San Luis Obispo, CA 93401	**Billing Code:**	

ELAP-CA #1132 • EPA-UCMR #CA00211 • Guam-EPA #17-008R • HW-DOH # • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-CA #04229CA • NELAP-OR #4047 • NJ-DEP #CA015 • NV-DEP #NAC 445A • SCAQMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear Spencer Harris,

Enclosed are the results of analyses for samples received 10/17/19 with the Chain-of-Custody document. The samples were received in good condition, at 2.0 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Brandon Gee
Operations Manager/Senior PM

14859 Clark Avenue,City of Industry CA, 91745 | Phone: (626) 336-2139 | Fax: (626) 336-2634
www.wecklabs.com

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Cleath-Harris Geologists, Inc.
75 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Project Number: Los Osos Groundwater CECs

Project Manager: Spencer Harris

Reported: 01/28/2020 14:51

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
QA1- Clean Water/ Travel Blank	A. BERGE	9J17045-01	Water	10/16/19 09:17	
QA2- Equipment Blank	A. BERGE	9J17045-02	Water	10/16/19 09:43	
FW5 (13Q2)	A.Berge	9J17045-03	Water	10/16/19 10:46	
FW26 (20A1)	A.Berge	9J17045-04	Water	10/16/19 12:01	

Analyses Accreditation Summary

Analyte	CAS #	Not By NELAP	ANAB ISO 17025
SM 5910B in Water			
UV 254		✓	

14859 Clark Avenue,City of Industry CA, 91745 | Phone: (626) 336-2139 | Fax: (626) 336-2634
www.wecklabs.com

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Cleath-Harris Geologists, Inc.
75 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Project Number: Los Osos Groundwater CECs

Project Manager: Spencer Harris

Reported: 01/28/2020 14:51

Sample Results

Sample: QA1- Clean Water/ Travel Blank — 9J17045-01 (Water) — Sampled: 10/16/19 9:17 by A. BERGE

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
PPCPs - Hormones by LC/MSMS-APCI						
Method: EPA 1694M-APCI **Batch ID:** W9L1349 **Instr:** LCMS02 **Prepared:** 11/12/19 09:35 **Analyst:** kan						
17-b-Estradiol	ND	1.0	ng/l	1	11/15/19	
PPCPs - Pharmaceuticals by LC/MSMS-ESI-						
Method: EPA 1694M-ESI- **Batch ID:** W9K0617 **Instr:** LCMS02 **Prepared:** 11/12/19 09:37 **Analyst:** kan						
Gemfibrozil	ND	1.0	ng/l	1	12/03/19	
Iopromide	ND	5.0	ng/l	1	12/03/19	
Triclosan	ND	2.0	ng/l	1	12/03/19	
PPCPs - Pharmaceuticals by LC/MSMS-ESI+						
Method: EPA 1694M-ESI+ **Batch ID:** W9K0619 **Instr:** LCMS02 **Prepared:** 11/12/19 09:38 **Analyst:** kan						
Caffeine	ND	1.0	ng/l	1	12/18/19	
DEET	**1.9**	1.0	ng/l	1	12/18/19	B
Sucralose	ND	65	ng/l	1	12/18/19	R-01

Sample: QA2- Equipment Blank — 9J17045-02 (Water) — Sampled: 10/16/19 9:43 by A. BERGE

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
PPCPs - Hormones by LC/MSMS-APCI						
Method: EPA 1694M-APCI **Batch ID:** W9L1349 **Instr:** LCMS02 **Prepared:** 11/12/19 09:35 **Analyst:** kan						
17-b-Estradiol	ND	1.0	ng/l	1	11/15/19	
PPCPs - Pharmaceuticals by LC/MSMS-ESI-						
Method: EPA 1694M-ESI- **Batch ID:** W9K0617 **Instr:** LCMS02 **Prepared:** 11/12/19 09:37 **Analyst:** kan						
Gemfibrozil	ND	1.0	ng/l	1	12/03/19	
Iopromide	ND	5.0	ng/l	1	12/03/19	
Triclosan	ND	2.0	ng/l	1	12/03/19	
PPCPs - Pharmaceuticals by LC/MSMS-ESI+						
Method: EPA 1694M-ESI+ **Batch ID:** W9K0619 **Instr:** LCMS02 **Prepared:** 11/12/19 09:38 **Analyst:** kan						
Caffeine	**1.8**	1.0	ng/l	1	12/18/19	B
DEET	**2.4**	1.0	ng/l	1	12/18/19	B
Sucralose	ND	5.0	ng/l	1	12/18/19	

14859 Clark Avenue,City of Industry CA, 91745 | Phone: (626) 336-2139 | Fax: (626) 336-2634
www.wecklabs.com

Cleath-Harris Geologists, Inc.
75 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Project Number: Los Osos Groundwater CECs

Project Manager: Spencer Harris

Reported: 01/28/2020 14:51

Sample Results

(Continued)

Sample: FW5 (13Q2)
9J17045-03 (Water)

Sampled: 10/16/19 10:46 by A.Berge

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods						
Method: EPA 350.1 **Batch ID:** W9J1639 **Instr:** AA06 **Prepared:** 10/28/19 11:07 **Analyst:** ymt						
Ammonia as N	ND	0.10	mg/l	1	10/28/19	
Method: EPA 353.2 **Batch ID:** W9J1081 **Instr:** AA01 **Prepared:** 10/17/19 11:06 **Analyst:** sar						
Nitrate as N	**33**	1.0	mg/l	5	10/17/19 12:33	
Method: SM 2510B **Batch ID:** W9K0029 **Instr:** AA02 **Prepared:** 11/01/19 12:22 **Analyst:** sbn						
Specific Conductance (EC)	**1100**	2.0	umhos/cm	1	11/01/19	
Method: SM 5310B **Batch ID:** W9J1139 **Instr:** TOC02 **Prepared:** 10/18/19 09:41 **Analyst:** jlp						
Total Organic Carbon (TOC)	**1.2**	0.30	mg/l	1	10/18/19	
Method: SM 5910B **Batch ID:** W9J1120 **Instr:** UVVIS04 **Prepared:** 10/17/19 17:38 **Analyst:** ssi						
UV 254	**0.016**	0.009	1/cm	1	10/17/19 19:04	
Nitrosamines by isotopic dilution GC/MS CI Mode						
Method: EPA 1625M **Batch ID:** W9J1127 **Instr:** GCMS09 **Prepared:** 10/18/19 16:30 **Analyst:** mld						
N-Nitrosodimethylamine	ND	2.0	ng/l	1	11/11/19	
PPCPs - Hormones by LC/MSMS-APCI						
Method: EPA 1694M-APCI **Batch ID:** W9L1349 **Instr:** LCMS02 **Prepared:** 11/12/19 09:35 **Analyst:** kan						
17-b-Estradiol	ND	1.0	ng/l	1	11/15/19	
PPCPs - Pharmaceuticals by LC/MSMS-ESI-						
Method: EPA 1694M-ESI- **Batch ID:** W9K0617 **Instr:** LCMS02 **Prepared:** 11/12/19 09:37 **Analyst:** kan						
Gemfibrozil	ND	1.0	ng/l	1	12/03/19	
Iopromide	ND	5.0	ng/l	1	12/03/19	
Triclosan	ND	2.0	ng/l	1	12/03/19	
PPCPs - Pharmaceuticals by LC/MSMS-ESI+						
Method: EPA 1694M-ESI+ **Batch ID:** W9K0619 **Instr:** LCMS02 **Prepared:** 11/12/19 09:38 **Analyst:** kan						
Caffeine	ND	1.0	ng/l	1	12/18/19	
DEET	**2.3**	1.0	ng/l	1	12/18/19	B
Sucralose	**190**	5.0	ng/l	1	12/18/19	

14859 Clark Avenue,City of Industry CA, 91745 | Phone: (626) 336-2139 | Fax: (626) 336-2634
www.wecklabs.com

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Cleath-Harris Geologists, Inc.
75 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Project Number: Los Osos Groundwater CECs

Project Manager: Spencer Harris

Reported: 01/28/2020 14:51

Sample Results

(Continued)

Sample: FW26 (20A1) Sampled: 10/16/19 12:01 by A.Berge

9J17045-04 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods						
Method: EPA 350.1 **Batch ID:** W9J1639 **Instr:** AA06 **Prepared:** 10/28/19 11:07 **Analyst:** ymt						
Ammonia as N	**0.21**	0.10	mg/l	1	10/28/19	
Method: EPA 353.2 **Batch ID:** W9J1081 **Instr:** AA01 **Prepared:** 10/17/19 11:06 **Analyst:** sar						
Nitrate as N	ND	0.20	mg/l	1	10/17/19 12:34	
Method: SM 2510B **Batch ID:** W9K0029 **Instr:** AA02 **Prepared:** 11/01/19 12:22 **Analyst:** sbn						
Specific Conductance (EC)	**650**	2.0	umhos/cm	1	11/01/19	
Method: SM 5310B **Batch ID:** W9J1139 **Instr:** TOC02 **Prepared:** 10/18/19 09:41 **Analyst:** jlp						
Total Organic Carbon (TOC)	**1.8**	0.30	mg/l	1	10/18/19	
Method: SM 5910B **Batch ID:** W9J1120 **Instr:** UVVIS04 **Prepared:** 10/17/19 17:38 **Analyst:** ssi						
UV 254	**0.035**	0.009	1/cm	1	10/17/19 19:04	
Nitrosamines by isotopic dilution GC/MS CI Mode						
Method: EPA 1625M **Batch ID:** W9J1127 **Instr:** GCMS09 **Prepared:** 10/18/19 16:30 **Analyst:** mld						
N-Nitrosodimethylamine	ND	2.0	ng/l	1	11/09/19	
PPCPs - Hormones by LC/MSMS-APCI						
Method: EPA 1694M-APCI **Batch ID:** W9L1349 **Instr:** LCMS02 **Prepared:** 11/12/19 09:35 **Analyst:** kan						
17-b-Estradiol	ND	1.0	ng/l	1	11/15/19	
PPCPs - Pharmaceuticals by LC/MSMS-ESI-						
Method: EPA 1694M-ESI- **Batch ID:** W9K0617 **Instr:** LCMS02 **Prepared:** 11/12/19 09:37 **Analyst:** kan						
Gemfibrozil	ND	1.0	ng/l	1	12/03/19	
Iopromide	ND	5.0	ng/l	1	12/03/19	
Triclosan	ND	2.0	ng/l	1	12/03/19	
PPCPs - Pharmaceuticals by LC/MSMS-ESI+						
Method: EPA 1694M-ESI+ **Batch ID:** W9K0619 **Instr:** LCMS02 **Prepared:** 11/12/19 09:38 **Analyst:** kan						
Caffeine	ND	1.0	ng/l	1	12/18/19	
DEET	**12**	1.0	ng/l	1	12/18/19	
Sucralose	**21**	5.0	ng/l	1	12/18/19	

14859 Clark Avenue,City of Industry CA, 91745 | Phone: (626) 336-2139 | Fax: (626) 336-2634

www.wecklabs.com

Cleath-Harris Geologists, Inc. 75 Zaca Lane, Suite 110 San Luis Obispo, CA 93401	**Project Number:** Los Osos Groundwater CECs **Project Manager:** Spencer Harris	**Reported:** 01/28/2020 14:51

Quality Control Results

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W9J1081 - EPA 353.2										
Blank (W9J1081-BLK1)				**Prepared & Analyzed: 10/17/19**						
Nitrate as N	ND	0.20	mg/l							
LCS (W9J1081-BS1)				**Prepared & Analyzed: 10/17/19**						
Nitrate as N	0.964	0.20	mg/l	1.00		96	90-110			
Matrix Spike (W9J1081-MS1)	**Source: 9J16100-01**			**Prepared & Analyzed: 10/17/19**						
Nitrate as N	7.73	0.20	mg/l	2.00	5.78	97	90-110			
Matrix Spike Dup (W9J1081-MSD1)	**Source: 9J16100-01**			**Prepared & Analyzed: 10/17/19**						
Nitrate as N	7.78	0.20	mg/l	2.00	5.78	100	90-110	0.6	20	
Batch: W9J1120 - SM 5910B										
Blank (W9J1120-BLK1)				**Prepared & Analyzed: 10/17/19**						
UV 254	ND	0.009	1/cm							
Blank (W9J1120-BLK2)				**Prepared: 10/17/19 Analyzed: 11/04/19**						
UV 254	ND	0.009	1/cm							
LCS (W9J1120-BS1)				**Prepared & Analyzed: 10/17/19**						
UV 254	0.095	0.009	1/cm	0.0880		108	90-110			
LCS (W9J1120-BS2)				**Prepared: 10/17/19 Analyzed: 11/04/19**						
UV 254	0.089	0.009	1/cm	0.0880		101	90-110			
Duplicate (W9J1120-DUP1)	**Source: 9J17045-03**			**Prepared & Analyzed: 10/17/19**						
UV 254	0.017	0.009	1/cm		0.016			6	10	
Batch: W9J1139 - SM 5310B										
Blank (W9J1139-BLK1)				**Prepared & Analyzed: 10/18/19**						
Total Organic Carbon (TOC)	ND	0.30	mg/l							
LCS (W9J1139-BS1)				**Prepared & Analyzed: 10/18/19**						
Total Organic Carbon (TOC)	0.928	0.30	mg/l	1.00		93	85-115			
Matrix Spike (W9J1139-MS1)	**Source: 9J14013-13**			**Prepared & Analyzed: 10/18/19**						
Total Organic Carbon (TOC)	6.34	0.30	mg/l	5.00	1.30	101	76-115			
Matrix Spike Dup (W9J1139-MSD1)	**Source: 9J14013-13**			**Prepared & Analyzed: 10/18/19**						
Total Organic Carbon (TOC)	6.15	0.30	mg/l	5.00	1.30	97	76-115	3	20	
Batch: W9J1639 - EPA 350.1										
Blank (W9J1639-BLK1)				**Prepared & Analyzed: 10/28/19**						
Ammonia as N	ND	0.10	mg/l							
Blank (W9J1639-BLK2)				**Prepared & Analyzed: 10/28/19**						
Ammonia as N	ND	0.10	mg/l							
LCS (W9J1639-BS1)				**Prepared & Analyzed: 10/28/19**						
Ammonia as N	0.257	0.10	mg/l	0.250		103	90-110			
LCS (W9J1639-BS2)				**Prepared & Analyzed: 10/28/19**						
Ammonia as N	0.258	0.10	mg/l	0.250		103	90-110			
Matrix Spike (W9J1639-MS1)	**Source: 9J17055-01**			**Prepared & Analyzed: 10/28/19**						

Cleath-Harris Geologists, Inc.
75 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Project Number: Los Osos Groundwater CECs

Project Manager: Spencer Harris

Reported: 01/28/2020 14:51

Quality Control Results (Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W9J1639 - EPA 350.1 (Continued)										
Matrix Spike (W9J1639-MS1)	**Source: 9J17055-01**			**Prepared & Analyzed: 10/28/19**						
Ammonia as N	0.255	0.10	mg/l	0.250	ND	102	90-110			
Matrix Spike (W9J1639-MS2)	**Source: 9J17055-02**			**Prepared & Analyzed: 10/28/19**						
Ammonia as N	0.274	0.10	mg/l	0.250	0.0166	103	90-110			
Matrix Spike Dup (W9J1639-MSD1)	**Source: 9J17055-01**			**Prepared & Analyzed: 10/28/19**						
Ammonia as N	0.256	0.10	mg/l	0.250	ND	102	90-110	0.4	15	
Matrix Spike Dup (W9J1639-MSD2)	**Source: 9J17055-02**			**Prepared & Analyzed: 10/28/19**						
Ammonia as N	0.274	0.10	mg/l	0.250	0.0166	103	90-110	0.3	15	
Batch: W9K0029 - SM 2510B										
Blank (W9K0029-BLK1)				**Prepared & Analyzed: 11/01/19**						
Specific Conductance (EC)	ND	2.0	umhos/cm							
LCS (W9K0029-BS1)				**Prepared & Analyzed: 11/01/19**						
Specific Conductance (EC)	179	2.0	umhos/cm	180		99	95-105			
Duplicate (W9K0029-DUP1)	**Source: 9J11007-01**			**Prepared & Analyzed: 11/01/19**						
Specific Conductance (EC)	650	2.0	umhos/cm		649			0.2	5	

Quality Control Results (Continued)

Nitrosamines by isotopic dilution GC/MS CI Mode

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W9J1127 - EPA 1625M										
Blank (W9J1127-BLK1)				**Prepared: 10/18/19 Analyzed: 11/07/19**						
N-Nitrosodimethylamine	ND	2.0	ng/l							
Blank (W9J1127-BLK2)				**Prepared: 10/18/19 Analyzed: 11/08/19**						
N-Nitrosodimethylamine	ND	2.0	ng/l							QC-2
Blank (W9J1127-BLK3)				**Prepared: 10/18/19 Analyzed: 11/11/19**						
N-Nitrosodimethylamine	ND	2.0	ng/l							QC-2
LCS (W9J1127-BS1)				**Prepared: 10/18/19 Analyzed: 11/07/19**						
N-Nitrosodimethylamine	1.94	2.0	ng/l	2.00		97	50-150			
LCS (W9J1127-BS2)				**Prepared: 10/18/19 Analyzed: 11/08/19**						
N-Nitrosodimethylamine	1.89	2.0	ng/l	2.00		94	50-150			QC-2
LCS (W9J1127-BS3)				**Prepared: 10/18/19 Analyzed: 11/11/19**						
N-Nitrosodimethylamine	1.91	2.0	ng/l	2.00		95	50-150			QC-2
LCS Dup (W9J1127-BSD1)				**Prepared: 10/18/19 Analyzed: 11/07/19**						
N-Nitrosodimethylamine	2.08	2.0	ng/l	2.00		104	50-150	7	50	
LCS Dup (W9J1127-BSD2)				**Prepared: 10/18/19 Analyzed: 11/08/19**						
N-Nitrosodimethylamine	2.01	2.0	ng/l	2.00		101	50-150	6	50	QC-2
LCS Dup (W9J1127-BSD3)				**Prepared: 10/18/19 Analyzed: 11/11/19**						
N-Nitrosodimethylamine	2.04	2.0	ng/l	2.00		102	50-150	7	50	QC-2

Cleath-Harris Geologists, Inc.
75 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Project Number: Los Osos Groundwater CECs

Project Manager: Spencer Harris

Reported: 01/28/2020 14:51

Quality Control Results

(Continued)

PPCPs - Hormones by LC/MSMS-APCI

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W9L1349 - EPA 1694M-APCI										
Blank (W9L1349-BLK1)				**Prepared: 11/12/19 Analyzed: 11/15/19**						
17-b-Estradiol	ND	1.0	ng/l							
LCS (W9L1349-BS1)				**Prepared: 11/12/19 Analyzed: 11/15/19**						
17-b-Estradiol	14.9	1.0	ng/l	10.0		149	65-146			Q-08
LCS Dup (W9L1349-BSD1)				**Prepared: 11/12/19 Analyzed: 11/15/19**						
17-b-Estradiol	11.1	1.0	ng/l	10.0		111	65-146	29	30	

Quality Control Results

(Continued)

PPCPs - Pharmaceuticals by LC/MSMS-ESI-

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W9K0617 - EPA 1694M-ESI-										
Blank (W9K0617-BLK1)				**Prepared: 11/12/19 Analyzed: 12/03/19**						
Bisphenol A	13.3	1.0	ng/l							B
Diclofenac	ND	1.0	ng/l							
Gemfibrozil	ND	1.0	ng/l							
Ibuprofen	ND	1.0	ng/l							
Iopromide	ND	5.0	ng/l							
Naproxen	ND	1.0	ng/l							
Salicylic Acid	ND	50	ng/l							
Triclosan	ND	2.0	ng/l							
LCS (W9K0617-BS1)				**Prepared: 11/12/19 Analyzed: 12/03/19**						
Bisphenol A	17.9	1.0	ng/l	10.0		179	53-168			BS-H
Diclofenac	6.63	1.0	ng/l	10.0		66	37-218			
Gemfibrozil	11.9	1.0	ng/l	10.0		119	76-122			
Ibuprofen	7.63	1.0	ng/l	10.0		76	67-139			
Iopromide	6.65	5.0	ng/l	50.0		13	0.1-163			
Naproxen	8.64	1.0	ng/l	10.0		86	64-138			
Salicylic Acid	148	50	ng/l	100		148	56-229			
Triclosan	12.0	2.0	ng/l	10.0		120	76-139			
LCS Dup (W9K0617-BSD1)				**Prepared: 11/12/19 Analyzed: 12/03/19**						
Bisphenol A	18.7	1.0	ng/l	10.0		187	53-168	4	30	BS-H
Diclofenac	5.37	1.0	ng/l	10.0		54	37-218	21	30	
Gemfibrozil	11.7	1.0	ng/l	10.0		117	76-122	2	30	
Ibuprofen	7.82	1.0	ng/l	10.0		78	67-139	2	30	
Iopromide	10.3	5.0	ng/l	50.0		21	0.1-163	43	30	Q-12
Naproxen	8.54	1.0	ng/l	10.0		85	64-138	1	30	
Salicylic Acid	149	50	ng/l	100		149	56-229	0.7	30	
Triclosan	13.4	2.0	ng/l	10.0		134	76-139	11	30	

14859 Clark Avenue,City of Industry CA, 91745 | Phone: (626) 336-2139 | Fax: (626) 336-2634

www.wecklabs.com

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Cleath-Harris Geologists, Inc.
75 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Project Number: Los Osos Groundwater CECs

Project Manager: Spencer Harris

Reported: 01/28/2020 14:51

Quality Control Results

(Continued)

PPCPs - Pharmaceuticals by LC/MSMS-ESI+

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W9K0619 - EPA 1694M-ESI+										
Blank (W9K0619-BLK1)				**Prepared: 11/12/19 Analyzed: 12/18/19**						
Acetaminophen	ND	20	ng/l							
Amoxicillin	ND	10	ng/l							
Atenolol	ND	1.0	ng/l							
Atorvastatin	ND	1.0	ng/l							
Azithromycin	ND	10	ng/l							
Caffeine	2.23	1.0	ng/l							B
Carbamazepine	ND	1.0	ng/l							
Ciprofloxacin	ND	5.0	ng/l							
Cotinine	40.1	2.0	ng/l							B
DEET	1.80	1.0	ng/l							B
Diazepam	ND	1.0	ng/l							
Fluoxetine	ND	1.0	ng/l							
Galaxolide (HHCB)	34.9	10	ng/l							B
Meprobamate	9.57	1.0	ng/l							B
Methadone	ND	1.0	ng/l							
Oxybenzone	2.87	1.0	ng/l							B-06
Phenytoin (Dilantin)	ND	1.0	ng/l							
Praziquantel	ND	1.0	ng/l							
Primidone	ND	1.0	ng/l							
Quinoline	ND	1.0	ng/l							
Sulfamethoxazole	ND	1.0	ng/l							
TCEP	ND	1.0	ng/l							
TCPP	19.4	1.0	ng/l							B
TDCPP	10.1	1.0	ng/l							B
Trimethoprim	ND	1.0	ng/l							
Blank (W9K0619-BLK2)				**Prepared: 11/12/19 Analyzed: 12/18/19**						
Sucralose	ND	5.0	ng/l							QC-2
LCS (W9K0619-BS1)				**Prepared: 11/12/19 Analyzed: 12/18/19**						
Acetaminophen	108	20	ng/l	200		54	66-156			BS-04
Amoxicillin	50.4	10	ng/l	100		50	14-167			
Atenolol	16.2	1.0	ng/l	10.0		162	56-164			
Atorvastatin	18.8	1.0	ng/l	10.0		188	0.1-173			BS-04
Azithromycin	149	10	ng/l	100		149	52-166			
Caffeine	11.1	1.0	ng/l	10.0		111	55-152			
Carbamazepine	9.15	1.0	ng/l	10.0		92	60-135			
Ciprofloxacin	73.3	5.0	ng/l	50.0		147	51-168			
Cotinine	18.1	2.0	ng/l	10.0		181	68-155			BS-04
DEET	11.7	1.0	ng/l	10.0		117	45-135			
Diazepam	9.89	1.0	ng/l	10.0		99	58-127			

14859 Clark Avenue,City of Industry CA, 91745 | Phone: (626) 336-2139 | Fax: (626) 336-2634
www.wecklabs.com

Cleath-Harris Geologists, Inc.
75 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Project Number: Los Osos Groundwater CECs

Project Manager: Spencer Harris

Reported: 01/28/2020 14:51

Quality Control Results

(Continued)

PPCPs - Pharmaceuticals by LC/MSMS-ESI+ (Continued)

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W9K0619 - EPA 1694M-ESI+ (Continued)										
LCS (W9K0619-BS1)				**Prepared: 11/12/19 Analyzed: 12/18/19**						
Fluoxetine	6.36	1.0	ng/l	10.0		64	55-150			
Galaxolide (HHCB)	134	10	ng/l	50.0		268	50-150			Q-10
Meprobamate	36.3	1.0	ng/l	10.0		363	11-166			Q-10
Methadone	11.1	1.0	ng/l	10.0		111	62-137			
Oxybenzone	15.7	1.0	ng/l	10.0		157	50-150			Q-08
Phenytoin (Dilantin)	10.5	1.0	ng/l	10.0		105	69-138			
Praziquantel	25.3	1.0	ng/l	10.0		253	50-150			Q-08
Primidone	10.6	1.0	ng/l	10.0		106	54-147			
Quinoline	4.56	1.0	ng/l	10.0		46	50-150			BS-04
Sulfamethoxazole	12.7	1.0	ng/l	10.0		127	60-133			
TCEP	4.55	1.0	ng/l	10.0		46	25-149			
TCPP	27.8	1.0	ng/l	10.0		278	24-149			Q-10
TDCPP	3.65	1.0	ng/l	10.0		36	20-158			
Trimethoprim	10.8	1.0	ng/l	10.0		108	67-139			
LCS (W9K0619-BS2)				**Prepared: 11/12/19 Analyzed: 12/18/19**						
Sucralose	46.9	5.0	ng/l	50.0		94	50-150			QC-2
LCS Dup (W9K0619-BSD1)				**Prepared: 11/12/19 Analyzed: 12/18/19**						
Acetaminophen	275	20	ng/l	200		138	66-156	87	30	A-01a
Amoxicillin	204	10	ng/l	100		204	14-167	121	30	BS-04
Atenolol	10.3	1.0	ng/l	10.0		103	56-164	45	30	Q-12
Atorvastatin	16.2	1.0	ng/l	10.0		162	0.1-173	15	30	
Azithromycin	164	10	ng/l	100		164	52-166	10	30	
Caffeine	11.4	1.0	ng/l	10.0		114	55-152	3	30	
Carbamazepine	10.7	1.0	ng/l	10.0		107	60-135	16	30	
Ciprofloxacin	78.9	5.0	ng/l	50.0		158	51-168	7	30	
Cotinine	11.0	2.0	ng/l	10.0		110	68-155	49	30	A-01
DEET	11.4	1.0	ng/l	10.0		114	45-135	3	30	
Diazepam	9.66	1.0	ng/l	10.0		97	58-127	2	30	
Fluoxetine	6.22	1.0	ng/l	10.0		62	55-150	2	30	
Galaxolide (HHCB)	121	10	ng/l	50.0		242	50-150	10	30	Q-10
Meprobamate	28.6	1.0	ng/l	10.0		286	11-166	24	30	Q-10
Methadone	10.7	1.0	ng/l	10.0		107	62-137	4	30	
Oxybenzone	15.4	1.0	ng/l	10.0		154	50-150	2	30	Q-08
Phenytoin (Dilantin)	10.2	1.0	ng/l	10.0		102	69-138	3	30	
Praziquantel	25.0	1.0	ng/l	10.0		250	50-150	1	30	Q-08
Primidone	9.51	1.0	ng/l	10.0		95	54-147	11	30	
Quinoline	6.71	1.0	ng/l	10.0		67	50-150	38	30	A-01
Sulfamethoxazole	11.4	1.0	ng/l	10.0		114	60-133	11	30	
TCEP	4.81	1.0	ng/l	10.0		48	25-149	6	30	

Cleath-Harris Geologists, Inc.
75 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Project Number: Los Osos Groundwater CECs

Project Manager: Spencer Harris

Reported: 01/28/2020 14:51

Quality Control Results

(Continued)

PPCPs - Pharmaceuticals by LC/MSMS-ESI+ (Continued)

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W9K0619 - EPA 1694M-ESI+ (Continued)										
LCS Dup (W9K0619-BSD1)				**Prepared: 11/12/19 Analyzed: 12/18/19**						
TCPP	26.0	1.0	ng/l	10.0		260	24-149	7	30	Q-10
TDCPP	6.50	1.0	ng/l	10.0		65	20-158	56	30	Q-12
Trimethoprim	12.5	1.0	ng/l	10.0		125	67-139	15	30	

14859 Clark Avenue,City of Industry CA, 91745 | Phone: (626) 336-2139 | Fax: (626) 336-2634
www.wecklabs.com

Cleath-Harris Geologists, Inc.
75 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Project Number: Los Osos Groundwater CECs

Project Manager: Spencer Harris

Reported: 01/28/2020 14:51

Notes and Definitions

Item	Definition
A-01	The RPD value for BS/BSD was outside of QC acceptance limit due to failing BS recovery . Samples results were accepted based on percent recovery of BSD.
A-01a	The RPD value for BS/BSD was outside of QC acceptance limit due to failing BS recovery. Samples results were accepted based on percent recovery of BSD.
B	Blank contamination. The analyte was found in the associated blank as well as in the sample.
B-06	This analyte was found in the method blank, which was possibly contaminated during sample preparation. The batch was accepted since this analyte was either not detected or more than 10 times of the blank value for all the samples in the batch.
BS-04	The recovery of this analyte in LCS or LCSD was outside control limit. Sample was accepted based on the remaining LCS, LCSD or LCS-LL.
BS-H	The recovery of this analyte in the BS/LCS was over the control limit. Sample result is suspect.
Q-08	High bias in the QC sample does not affect sample result since analyte was not detected or below the reporting limit.
Q-10	This analyte is high bias in QC samples, sample result is suspect.
Q-12	The RPD result exceeded the QC control limits; however, both percent recoveries were acceptable. Sample results for the QC batch were accepted based on the percent recoveries and/or other acceptable QC data.
QC-2	This QC sample was reanalyzed to complement samples that require re-analysis on different date. See analysis date.
R-01	The Reporting Limit for this analyte has been raised to account for matrix interference.
% Rec	Percent Recovery
Dil	Dilution
dry	Sample results reported on a dry weight basis
MDA	Minimum Detectable Activity
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
NR	Not Reportable
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.
TIC	Tentatively Identified Compound (TIC) using mass spectrometry. The reported concentration is relative concentration based on the nearest internal standard. If the library search produces no matches at, or above 85%, the compound is reported as unknown.

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

An Absence of Total Coliform meets the drinking water standards as established by the California State Water Resources Control Board (SWRCB)

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

14859 Clark Avenue,City of Industry CA, 91745 | Phone: (626) 336-2139 | Fax: (626) 336-2634
www.wecklabs.com

APPENDIX D

Lupine Avenue Monitoring Well Documentation

APPENDIX D

Lupine Avenue Monitoring Well

Summary

The Lupine Avenue monitoring well was proposed as a nested Zone C/D/E well in the 2015 LOBP to fill a data gap near the bay. In 2019, an existing well was added to the monitoring network (FW33) to fill the Upper Aquifer Zone C data gap, and the Lupine Avenue monitoring well was constructed to monitor Lower Aquifer Zone D and Zone E.

Nested Monitoring well LA40 (Zone E) was cased with 2.5-inch diameter Schedule 80 PVC to 490 feet depth, with the well screen positioned from 390-410 feet depth. The extra 80 feet of blank casing below the screen will be used for induction and gamma geophysical logging to track vertical movement of the seawater intrusion front (every three years). A chloride concentration of 1,460 mg/L was reported at LA40 in Fall 2019.

Nested Monitoring well LA40 (Zone D) was cased with 2.5-inch diameter Schedule 80 PVC to 350 feet depth, with the well screen positioned from 310-330 feet depth. A chloride concentration of 136 mg/L was reported at LA40 in Fall 2019.

Well documentation and results interpretation attached herein include the following:

- Well Location Figure
- Well Completion Report
- Lithologic Log
- Geophysical log summaries with well construction and aquifer zone correlation
- Updated Basin cross-section E-E’ with estimated extent of Zone E seawater intrusion
- Refinement of Zone D seawater intrusion front and difference between repositioned front with and without LA41
- Available information on Zone E seawater intrusion front and existing wells where modification can increase Zone E monitoring locations.

Groundwater monitoring results from LA40 and LA41 for the Fall 2019 monitoring event are included in Table 8 and Table 11, with laboratory reports in Appendix C of this Annual Report.

Discussion

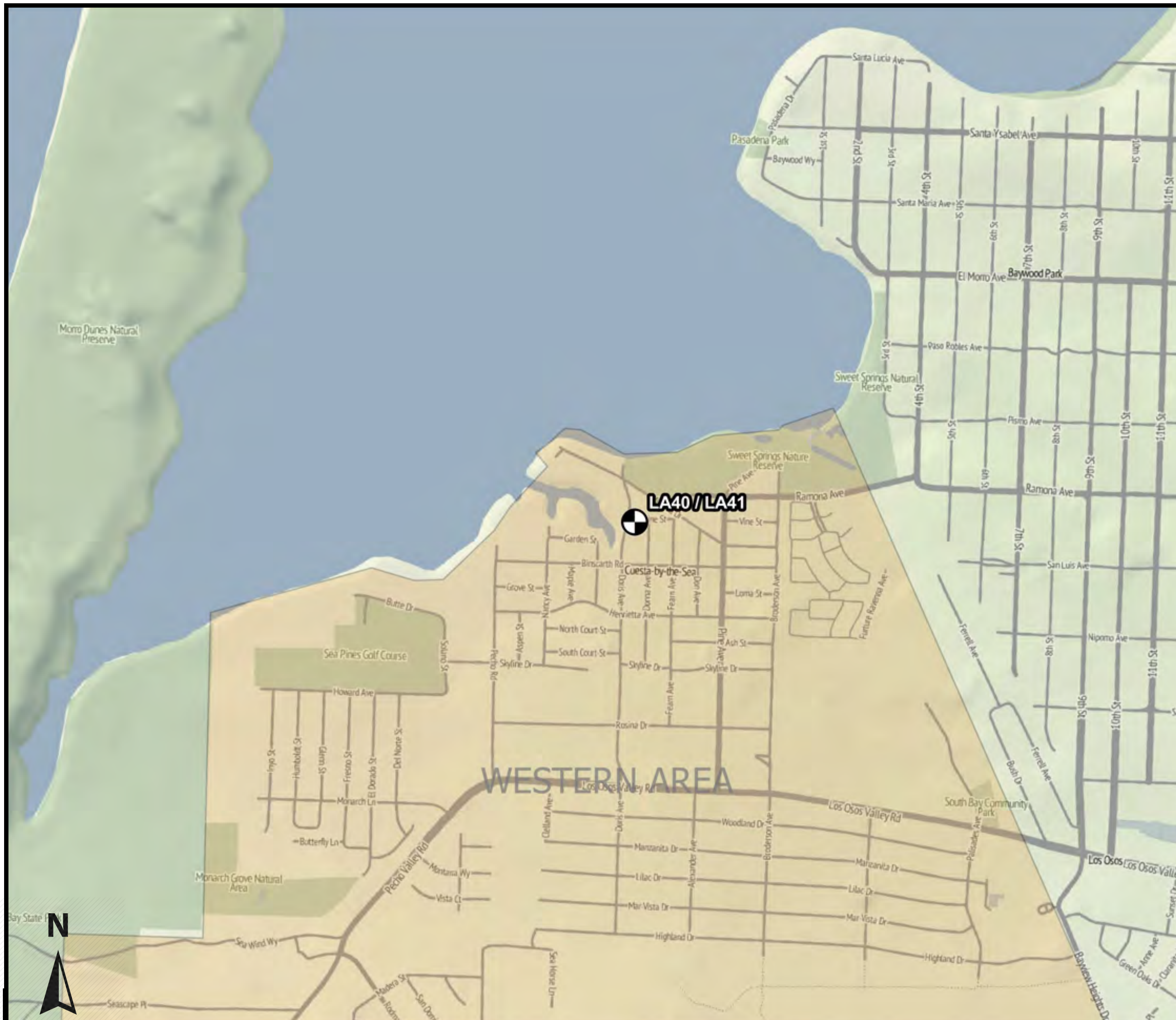
The Lupine Avenue nested monitoring well improves the delineation of seawater intrusion along the bay front. LA41 and LA40 provide new monitoring locations in Lower Aquifer Zone D and Zone E, respectively (Figure D-1). The screened intervals are correlated to Basin aquifers in Figure D-2, with additional geophysical logs shown in Figure D-3.

Monitoring results from Fall 2019 show the chloride concentration in groundwater from Zone D at 136 mg/L, which is below the 250 mg/L threshold for seawater intrusion. Chloride in Zone E, however, is 1,460 mg/L. Basin cross-section E-E' (Figure D-4) has been modified to incorporate the Lupine Avenue monitoring well results, and includes an estimated extent of seawater intrusion in Zone E, based on the limited available data.

The extent of seawater intrusion in Zone D has been refined using new data from LA41. Figure D5 compares the 250 mg/L chloride concentration contour for Fall 2018 to the contour for Fall 2019 with and without LA41. As shown in the figure, filling the data gap along the bay with LA41 repositions the seawater intrusion front up to 1,400 feet toward the coast, compared to Fall 2018. Without data from LA41, the Fall 2019 intrusion front would plot roughly 200 feet east of the Fall 2018 position. Therefore, while the overall position of the intrusion front in Zone D is interpreted to be closer to the coast after filling the data gap, there was some landward encroachment of the front between Fall 2018 and Fall 2019.

The extent of the seawater intrusion in Zone E has also been presented using new information from LA40. Figure D6 shows the available water quality data from Zone E from various years, with an estimate of the generalized location of the seawater intrusion front. Zone E water quality is available for three wells near the bay: LA4, LA11, and the new LA40. Only one other well, LA18, provides Zone E water quality data useful in delineating the intrusion front. Given the limited data, Zone E had been interpreted in prior Annual Reports as having effectively intruded most of the Western Area, and the new information from LA40 supports that conclusion.

There are some locations where existing wells could potentially be modified to provide Zone E water quality data (Figure D6). One type of modification would consist of inserting a well liner to isolate Zone E and then sealing off Zone D (LA13 and LA16). At LA14, installation of a packer may be sufficient to isolate Zone E, while at LA17, modification to bypass a section of collapsed casing would be necessary. Evaluating the feasibility and costs of these modifications is recommended.



Base Image: Stamen-Terrain

0 1,500 3,000 ft

Scale: 1 inch ≈ 1,500 feet

Explanation

Monitoring Well LA40 / LA41

WESTERN AREA

Figure D1
Lupine Avenue Monitoring Well (LA40/LA41) Location

Los Osos Groundwater Basin 2019 Annual Report

Cleath-Harris Geologists

Lupine Avenue Monitoring Well

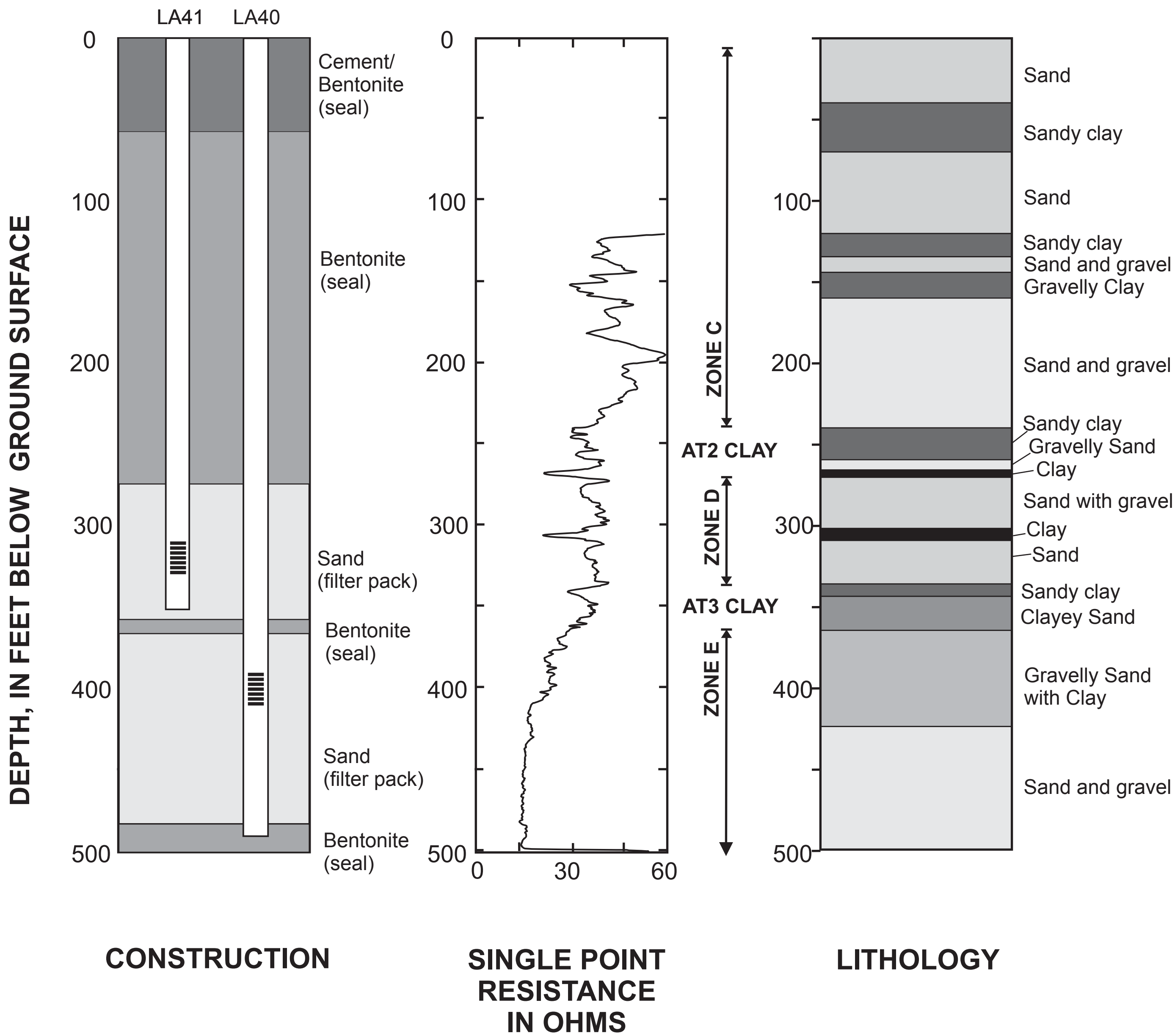


Figure D2
Lupine Avenue Aquifer Zone Correlation
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

Lupine Avenue Monitoring Well

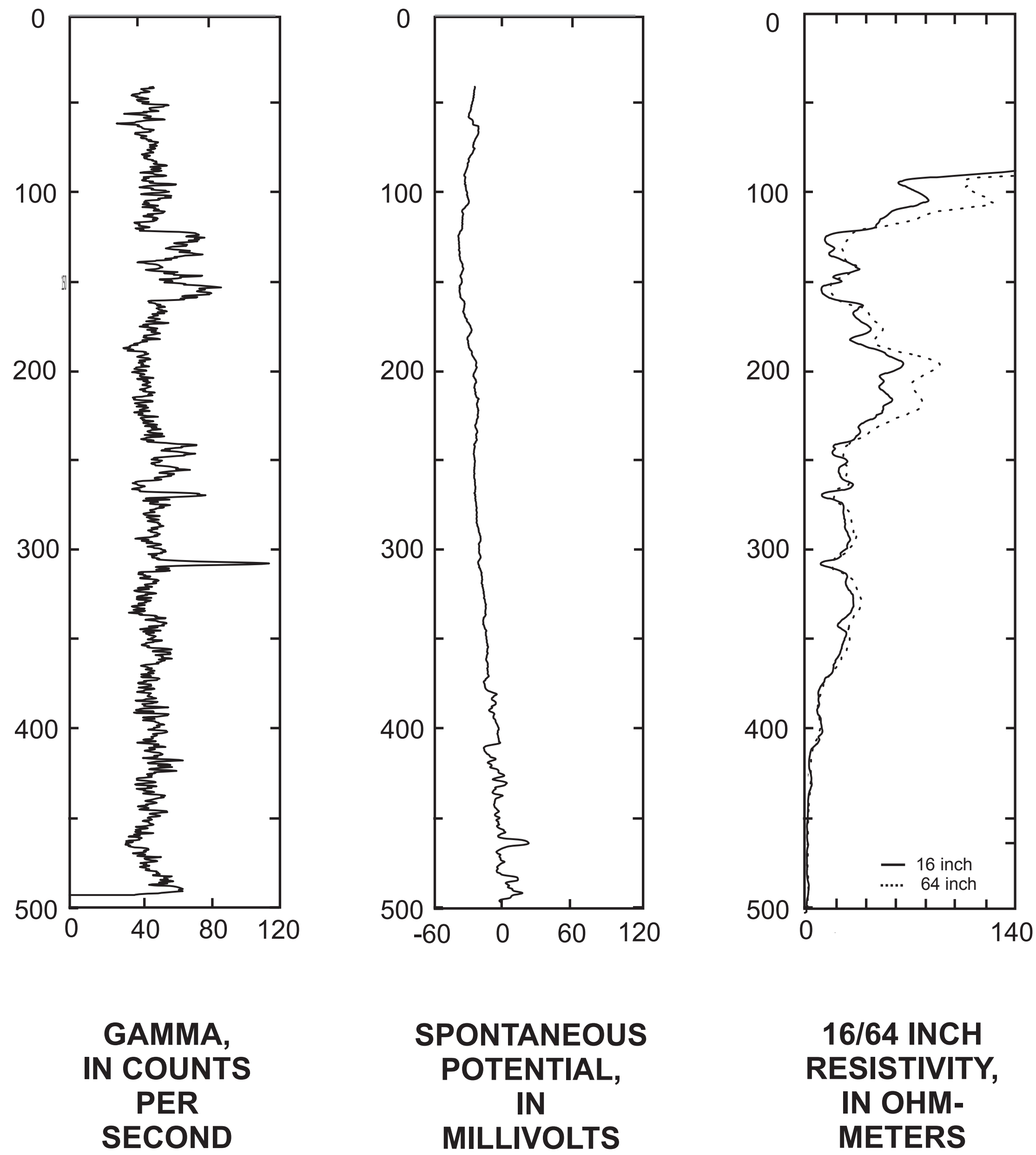
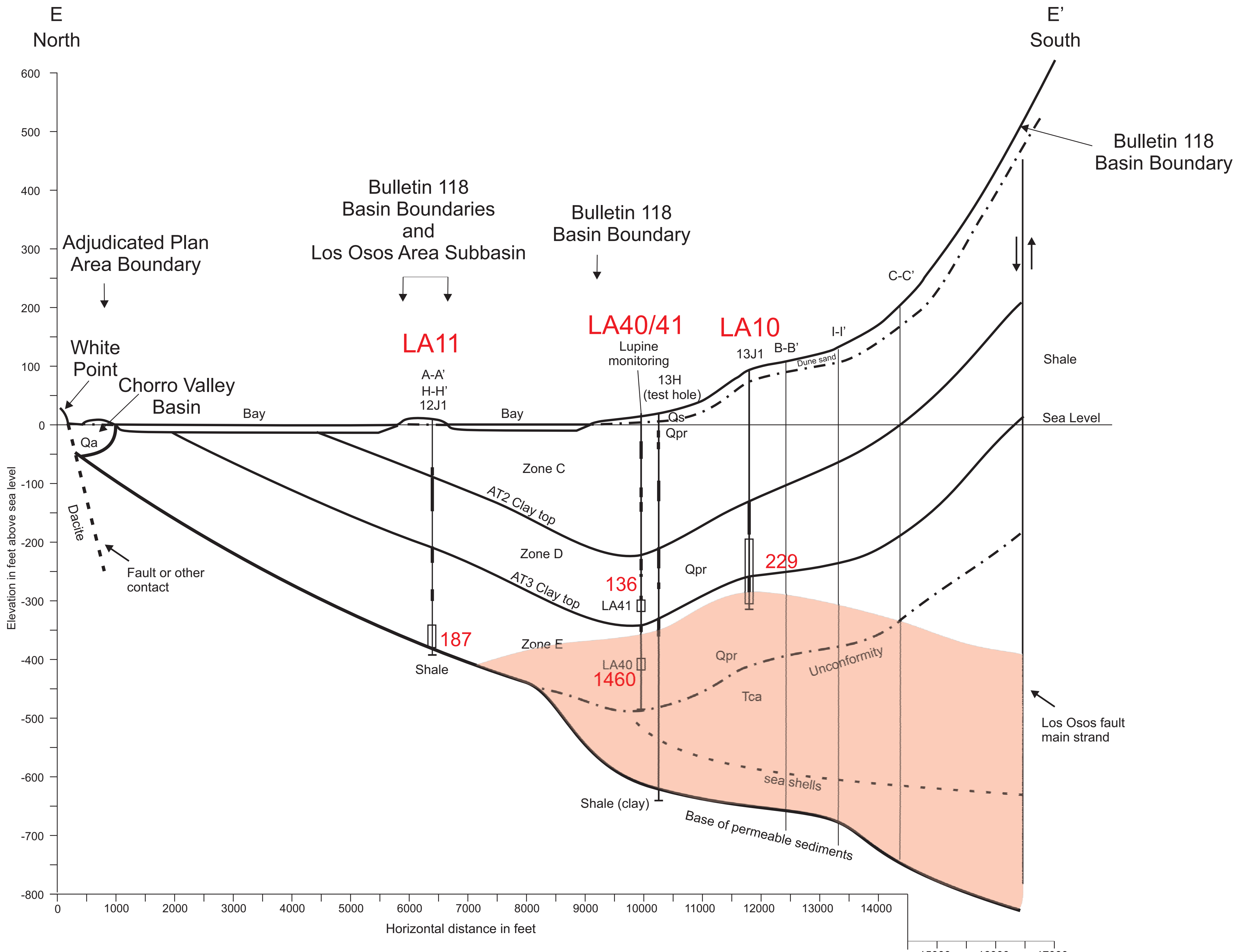


Figure D3
Lupine Avenue Geophysics
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists



Aquifer Zones:
Zone A - Perched Aquifer
Zone B - Transitional Aquifer
Zone C - Upper Aquifer
Zone D - Lower Aquifer (shallow)
Zone E - Lower Aquifer (deep)

Well data point
12J1 Well ID
Clay layer
Well screen

Formation:
Qa - alluvium
Qs - dune sand
Qpr - Paso Robles Formation
Tca - Careaga Formation

Cross-secgtion alignment shown in Figure 1

187 - Chloride concentration in mg/L (Fall 2019)

Estimated extent of Zone E seawater intrusion (Fall 2019)

Figure D4

Cross-Section E-E'
Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologsts

Base Image: Stamen-Terrain

Explanation

Well with Lower Aquifer chloride concentration in milligrams per liter (mg/L)

- Previously existing program well
- New program well (Lupine Avenue)

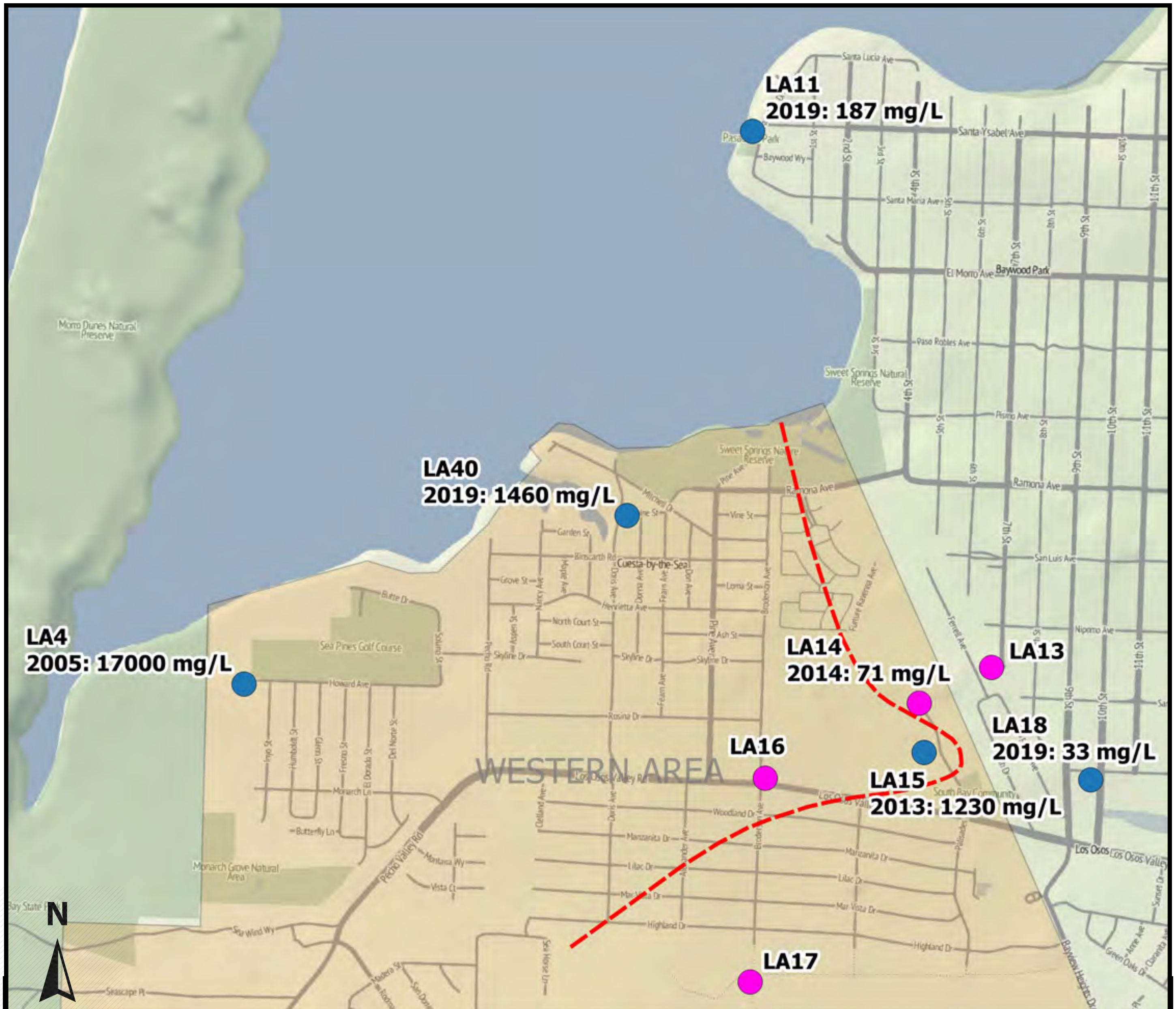
Seawater intrusion front in Western Area Zone D (250 mg/L chloride isopleth)

- Fall 2018
- Fall 2019 (LA41 Not Used)
- Fall 2019 (LA41 Used)

Figure D5
Seawater intrusion front with LA41
Western Area
Lower Aquifer Zone D

Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists



Base Image: Stamen-Terrain

0 1,500 3,000 ft

Scale: 1 inch ≈ 1,500 feet

Explanation

- Monitoring program well - Zone E with chloride concentration and year
- Potential Zone E water quality monitoring well (with well modification)
- Seawater intrusion front in Western Area Zone E (250 mg/L chloride isopleth)

Figure D6
Seawater Intrusion Front
Western Area
Lower Aquifer Zone E

Los Osos Groundwater Basin
2019 Annual Report

Cleath-Harris Geologists

APPENDIX E

Field Methods

Groundwater Level Measurement Procedures for the Los Osos Basin Plan Groundwater Monitoring Program

Introduction

This document establishes procedures for measuring and recording groundwater levels for the Los Osos Basin Plan (LOBP) Groundwater Monitoring Program, and describes various methods used for collecting meaningful groundwater data.

Static groundwater levels obtained for the LOBP Groundwater Monitoring Program are determined by measuring the distance to water in a non-pumping well from a reference point that has been referenced to sea level. Subtracting the distance to water from the elevation of the reference point determines groundwater surface elevations above or below sea level. This is represented by the following equation:

$$E_{GW} = E_{RP} - D$$

Where:

E_{GW} = Elevation of groundwater above mean sea level (feet)
E_{RP} = Elevation above sea level at reference point (feet)
D = Depth to water (feet)

References

Procedures for obtaining and reporting water level data for the LOBP Groundwater Monitoring Program are based on a review of the following documents.

- State of California, Department of Water Resources, 2010, *Groundwater Elevation Monitoring Guidelines*, prepared for use in the California Statewide Groundwater Elevation Monitoring (CASGEM) program, December. http://www.water.ca.gov/groundwater/casgem/pdfs/CASGEM%20DWR%20GW%20Guidelines%20Final%20121510.pdf
- State of California, Department of Water Resources, 2014, *Addendum to December 2010 Groundwater Elevation Monitoring Guidelines for the Department of Water Resources' California Statewide Groundwater Elevation Monitoring (CASGEM) Program*, October 2. http://www.water.ca.gov/groundwater/casgem/pdfs/PSW_addendum.pdf
- U.S. Geological Survey, 1977, *National Handbook of Recommended Methods for Water-Data Acquisition*, a Unites States contribution to the International Hydrological Program. https://pubs.usgs.gov/chapter11/
- U.S. Geological Survey, Office of Ground Water, 1997, *Ground Water Procedure Document 1, Water-level measurement using graduated steel tape, draft stand-alone procedure document*. http://pubs.usgs.gov/tm/1a1/pdf/GWPD1.pdf

- U.S. Geological Survey, Office of Ground Water, 1997, *Ground Water Procedure Document 4, Water-level measurement using an electric tape, draft stand-alone procedure document*. http://pubs.usgs.gov/tm/1a1/pdf/GWPD4.pdf
- U.S. Geological Survey, Office of Ground Water, 1997, *Ground Water Procedure Document 13, Water-level measurement using an air line, draft stand-alone procedure document*. http://pubs.usgs.gov/tm/1a1/pdf/GWPD13.pdf
- U.S. Geological Survey, 2001, *Introduction to Field Methods for Hydrologic and Environmental Studies*, Open-File Report 2001-50, 241 p. https://pubs.er.usgs.gov/publication/ofr0150

Well Information

Table 1 below lists important well information to be maintained in a well file or in a field notebook. Additional information that should be available to the person collecting water level data include a description of access to the property and the well, the presence and depth of cascading water, or downhole obstructions that could interfere with a sounding cable.

Table 1
Well File Information

Well Completion Report	Hydrologic Information	Additional Information to be Recorded
Well name	Map showing basin boundaries and wells	Township, Range, and ¼ ¼ Section
Well Owner	Name of groundwater basin	Latitude and Longitude (Decimal degrees)
Drilling Company	Description of aquifer	Assessor's Parcel Number
Location map or sketch	Confined, unconfined, or mixed aquifers	Description of well head and sounding access
Total depth	Pumping test data	Reference point elevations
Perforation interval	Hydrographs	Well use and pumping schedule if known
Casing diameter	Water quality data	Date monitoring began
Date of well completion	Property access instructions/codes	Land use

Reference Points and Reference Marks

Reference point (RP) elevations are the basis for determining groundwater elevations relative to sea level. The RP is generally that point on the well head that is the most convenient place to measure the water level in a well. In selecting an RP, an additional consideration is the ease of surveying either by Global Positioning System (GPS) or by leveling.

The RP must be clearly defined, well marked, and easily located. A description, sketch, and photograph of the point should be included in the well file. Additional Reference Marks (RMs) may be established near the wellhead on a permanent object. These additional RMs can serve as a benchmark by which the wellhead RP can be checked or re-surveyed if necessary. All RMs should be marked, sketched, photographed, and described in the well file.

All RPs for Groundwater Monitoring Program wells should be reported based on the same horizontal and vertical datum by a California licensed surveyor to the nearest tenth of one foot vertically, and the nearest one foot horizontally. The surveyor's report should be maintained in the project file.

In addition to the RP survey, the elevation of the ground surface adjacent to the well should also be measured and recorded in the well file. Because the ground surface adjacent to a well is rarely uniform, the average surface level should be estimated. This average ground surface elevation is referred to in the U.S.G.S. Procedural Document (GWPD-1, 1997) and DWR guidelines as the Land Surface Datum (LSD).

Water Level Data Collection

Prior to beginning the field work, the field technician should review each well file to determine which well owners require notification of the upcoming site visit, or which well pumps need to be turned off to allow for sufficient water level recovery. Because groundwater elevations are used to construct groundwater contour maps and to determine hydraulic gradients, the field technician should coordinate water level measurements to be collected within as short a period of time as practical. Any significant changes in groundwater conditions during monitoring events should be noted in the Annual Monitoring Report. For an individual well, the same measuring method and the same equipment should be used during each sampling event where practical.

A static water level should represent stable, non-pumping conditions at the well. When there is doubt about whether water levels in a well are continuing to recover following a pumping cycle, repeated measurements should be made. If an electric sounder is being used, it is possible to hold the sounder level at one point slightly above the known water level and wait for a signal that would indicate rising water. If applicable, the general schedule of pump operation should be determined and noted for active wells. If the well is capped but not vented, remove the cap and wait several minutes before measurement to allow water levels to equilibrate to atmospheric pressure.

When lowering a graduated steel tape (chalked tape) or electric tape in a well without a sounding tube in an equipped well, the tape should be played out slowly by hand to minimize the chance of the tape end becoming caught in a downhole obstruction. The tape should be held in such a way that any change in tension will be felt. When withdrawing a sounding tape, it should also be brought up slowly so that if an obstruction is encountered, tension can be relaxed so that the tape can be lowered again before attempting to withdraw it around the obstruction.

Despite all precautions, there is a small risk of measuring tapes becoming stuck in equipped wells without dedicated sounding tubes. If a tape becomes stuck, the equipment should be left on-site and re-checked after the well has gone through a few cycles of pumping, which can free the tape due to movement/vibration of the pump column. If the tape remains stuck, a pumping contractor will be needed to retrieve the equipment. A dedicated sounding tube may be installed by the pumping contractor at that time.

All water level measurements should be made to an accuracy of 0.01 feet. The field technician should make at least two measurements. If measurements of static levels do not agree to within 0.02 feet of each other, the technician should continue measurements until the reason for the disparity is determined, or the measurements are within 0.02 feet.

Record Keeping in the Field

The information recorded in the field is typically the only available reference for the conditions at the time of the monitoring event. During each monitoring event it is important to record any conditions at a well site and its vicinity that may affect groundwater levels, or the field technician's ability to obtain groundwater levels. Table 2 lists important information to record, however, additional information should be included when appropriate.

Table 2
Information Recorded at Each Well Site

Well name	Changes in land use	Presence of pump lubricating oil in well
Name and organization of field technician	Changes in RP	Cascading water
Date & time	Nearby wells in use	Equipment problems
Measurement method used	Weather conditions	Physical changes in wellhead
Sounder used	Recent pumping info	Comments
Reference Point Description	Measurement correction(s)	Well status

Measurement Techniques

Four standard methods of obtaining water levels are discussed below. The chosen method depends on site and downhole conditions, and the equipment limitations. In all monitoring situations, the procedures and equipment used should be documented in the field notes and in final reporting. Additional detail on methods of water level measurement is included in the reference documents.

Graduated Steel Tape
This method uses a graduated steel tape with a brass or stainless steel weight attached to its end. The tape is graduated in feet. The approximate depth to water should be known prior to measurement.

- Estimate the anticipated static water level in the well from field conditions and historical information;
- Chalk the lower few feet of the tape by applying blue carpenter's chalk.
- Lower the tape to just below the estimated depth to water so that a few feet of the chalked portion of the tape is submerged. Be careful not to lower the tape beyond its chalked length.
- Hold the tape at the RP and record the tape position (this is the "hold" position and should be at an even foot);

- Withdraw the tape rapidly to the surface;
- Record the length of the wetted chalk mark on the graduated tape;
- Subtract the wetted chalk number from the "hold" position number and record this number in the "Depth to Water below RP" column;
- Perform a check by repeating the measurement using a different RP hold value;
- All data should be recorded to the nearest 0.01 foot;
- Disinfect the tape by wiping down the submerged portion of the tape with single-use, unscented disinfectant wipe, or let stand for one minute in a dilute chlorine bleach solution and dry with clean cloth.

The graduated steel tape is generally considered to be the most accurate method for measuring static water levels. Measuring water levels in wells with cascading water or with condensing water on the well casing causes potential errors, or can be impossible with a steel tape.

Electric Tape

An electric tape operates on the principle that an electric circuit is completed when two electrodes are submerged in water. Most electric tapes are mounted on a hand-cranked reel equipped with batteries and an ammeter, buzzer or light to indicate when the circuit is completed. Tapes are graduated in either one-foot intervals or in hundredths of feet depending on the manufacturer. Like graduated steel tapes, electric tapes are affixed with brass or stainless steel weights.

- Check the circuitry of the tape before lowering the probe into the well by dipping the probe into water and observe if the ammeter needle or buzzer/light signals that the circuit is completed;
- Lower the probe slowly and carefully into the well until the signal indicates that the water surface has been reached;
- Place a finger or thumb on the tape at the RP when the water surface is reached;
- If the tape is graduated in one-foot intervals, partially withdraw the tape and measure the distance from the RP mark to the nearest one-foot mark to obtain the depth to water below the RP. If the tape is graduated in hundredths of a foot, simply record the depth at the RP mark as the depth to water below the RP;
- Make all readings using the same needle deflection point on the ammeter scale (if equipped) so that water levels will be consistent between measurements;
- Make check measurements until agreement shows the results to be reliable;
- All data should be recorded to the nearest 0.01 foot;
- Disinfect the tape by wiping down the submerged portion of the tape with single-use, unscented disinfectant wipe, or let stand for one minute in a dilute chlorine bleach solution and dry with clean cloth;
- Periodically check the tape for breaks in the insulation. Breaks can allow water to enter into the insulation creating electrical shorts that could result in false depth readings.

The electric tape may give slightly less accurate results than the graduated steel tape. Errors can result from signal "noise" in cascading water, breaks in the tape insulation, tape stretch, or missing tape at the location of a splice. All electric tapes should be calibrated semi-annually against a steel tape that is maintained in the office and used only for calibration.

Air Line

The air line method is usually used only in wells equipped with pumps. This method typically uses a 1/8 or 1/4-inch diameter, seamless copper tubing, brass tubing, stainless steel tubing, or galvanized pipe with a suitable pipe tee for connecting an altitude or pressure gage. Plastic (i.e. polyethylene) tubing may also be used, but is considered less desirable because it can develop leaks as it degrades. An air line must extend far enough below the water level that the lower end remains submerged during pumping of the well. The air line is connected to an altitude gage that reads directly in feet of water, or to a pressure gage that reads pressure in pounds per square inch (psi). The gage reading indicates the length of the submerged air line.

The formula for determining the depth to water below the RP is: $\mathbf{d = k - h}$ where d = depth to water; k = constant; and h = height of the water displaced from the air line. In wells where a pressure gage is used, h is equal to 2.31 ft/psi multiplied by the gage reading. The constant value for k is approximately equivalent to the length of the air line.

- Calibrate the air line by measuring an initial depth to water (d) below the RP with a graduated steel tape. Use a tire pump, air tank, or air compressor to pump compressed air into the air line until all the water is expelled from the line. When all the water is displaced from the line, record the stabilized gage reading (h). Add d to h to determine the constant value for k.
- To measure subsequent depths to water with the air line, expel all the water from the air line, subtract the gage reading (h) from the constant k, and record the result as depth to water (d) below the RP.

The air line method is not as accurate as a graduated steel tape or electric and is typically accurate to the nearest one foot at best. Errors can occur from leaky air lines, or when tubing becomes clogged with mineral deposits or bacterial growth. The air line method is not desirable for use in the Groundwater Monitoring Program.

Pressure Transducer

Electrical pressure transducers make it possible to collect frequent and long-term water level or pressure data from wells. These pressure-sensing devices, installed at a fixed depth in a well, sense the change in pressure against a membrane. The pressure changes occur in response to changes in the height of the water column in the well above the transducer membrane. To compensate for atmospheric changes, transducers may have vented cables or they can be used in conjunction with a barometric transducer that is installed in the same well or a nearby observation well above the water level.

Transducers are selected on the basis of expected water level fluctuation. The smallest range in water levels provides the greatest measurement resolution. Accuracy is generally 0.01 to 0.1 percent of the full scale range.

Retrieving data in the field is typically accomplished by downloading data through a USB connection to a portable computer or data logger. A site visit to retrieve data should involve several steps designed to safeguard the stored data and the continued useful operation of the transducer:

- Inspect the wellhead and check that the transducer cable has not moved or slipped (the cable can be marked with a reference point that can be used to identify movement);
- Ensure that the instrument is operating properly;
- Measure and record the depth to water with a graduated steel or electric tape;
- Document the site visit, including all measurements and any problems;
- Retrieve the data and document the process;
- Review the retrieved data by viewing the file or plotting the original data;
- Recheck the operation of the transducer prior to disconnecting from the computer.

A field notebook with a checklist of steps and measurements should be used to record all field observations and the current data from the transducer. It provides a historical record of field activities. In the office, maintain a binder with field information similar to that recorded in the field notebook so that a general historical record is available and can be referred to before and after a field trip.

Quality Control

The field technician should compare water level measurements collected at each well with the available historical information to identify and resolve anomalous and potentially erroneous measurements prior to moving to the next well location. Pertinent information, such as insufficient recovery of a pumping well, proximity to a pumping well, falling water in the casing, and changes in the measurement method, sounding equipment, reference point, or groundwater conditions should be noted. Office review of field notes and measurements should also be performed by a second staff member.

Groundwater Sampling Procedures for the
Los Osos Basin Plan Groundwater Monitoring Program

Introduction

This document establishes groundwater sampling procedures for the Los Osos Basin Plan (LOBP) Groundwater Monitoring Program. Groundwater sampling procedures facilitate obtaining a representative groundwater sample from an aquifer for water quality analysis. The water sampling procedures for general mineral and dissolved nitrogen sampling are presented below, along with special procedures for collecting samples for analyzing Constituents of Emerging Concern (CECs).

References

The procedures used for the LOBP Groundwater Monitoring Program have been developed through consideration of the constituents of analysis, well construction and type, and a review of the following references:

- U.S. Environmental Protection Agency, 1999, *Compendium of ERT Groundwater Sampling Procedures*, EPA/540/P-91/007, January 1999. https://www.epa.gov/sites/production/files/2015-06/documents/fieldsamp- ertsops.pdf
- Wilde, F. D., 2004, *Cleaning of Equipment for Water Sampling* (ver 2.0): U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, Chapter A3, revised April 2004. http://water.usgs.gov/owq/FieldManual/chapter3/Ch3_contents.html
- Wilde, F. D., 2008, *Guidelines for Field-Measured Water Quality Properties* (ver. 2.0): U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, Chapter A6, Section 6, October 2008. http://water.usgs.gov/owq/FieldManual/Chapter6/6.0_contents.html

Well Information

Table 1 below lists important well information to be maintained in a well file or in a field notebook. Additional information that should be available to the person collecting groundwater samples include a description of access to the property and the well, the presence and depth of cascading water, or downhole obstructions that could interfere with sampling equipment.

Table 1
Well File Information

Well Completion Report	Hydrologic Information	Additional Information to be Recorded
Well name	Map showing basin boundaries and wells	Township, Range, and ¼ ¼ Section
Well Owner	Name of groundwater basin	Latitude and Longitude (Decimal degrees)
Drilling Company	Description of aquifer	Assessor's Parcel Number
Location map or sketch	Confined, unconfined, or mixed aquifers	Description of well head and sounding access
Total depth	Pumping test data	Reference point elevations
Perforation interval	Hydrographs	Well use and pumping schedule if known
Casing diameter	Water quality data	Date monitoring began
Date of well completion	Property access instructions/codes	Land use

Groundwater Sampling Procedures

<u>Non-equipped wells</u>

1) Calibrate field monitoring instruments each day prior to sampling;
2) Inspect wellhead condition and note any maintenance required (perform at earliest convenience);
3) Measure depth to static water (record to 0.01 inches) from surveyed reference point;
4) Install temporary purge pump to at least three feet below the water surface (deeper setting may be needed if water level draw down is too great);
5) Begin well purge, record flow rate;
6) Measure discharge water EC (measured to 10 µmhos/cm), pH (measured to 0.01 units), and temperature (measured to 0.1 degrees C) at regular intervals during well purging. Record time and gallons purged. Note discharge water color, odor, and turbidity (visual);
7) A minimum of three casing volumes of water should be removed during purging, or one borehole volume opposite perforated interval, whichever is greater*. In addition, a set of at least three consecutive field monitoring measurements with stable values should be recorded. For EC, stability within 5 percent of the first value in the set is sufficient (typically within 20-50 µmhos/cm). For pH, stability within 0.3 units is sufficient. For temperature, stability within 0.2 degrees C is sufficient;
8) Collect sample directly from discharge tube, note sample color, odor, turbidity (visual). Use only laboratory-provided containers. Wear powder-free nitrile gloves when collecting groundwater samples;
9) Place samples on-ice for transport to the laboratory;
10) Remove temporary pump and rinse with clean water;
11) Close well and secure well box lid;

*note: If well is pumped dry at the minimum pumping rate, the well may be allowed to recover and then sampled by bailer within 24 hours.

Equipped wells

The sampling port for an equipped well must be upstream of any water filtration or chemical feeds. Sample from the discharge line as close to the wellhead as possible. Sampling procedures for equipped wells will vary. For active wells (i.e. wells used daily), the need for purging three casing volumes is unnecessary. Flush supply line from well or holding tank to sampling port, and record one set of EC, pH, and temperature readings prior to sampling. For inactive wells, a field monitoring procedure similar to that described for non-equipped wells above is appropriate. Static water level measurements should also be taken before sampling. Water samples should always be transported on-ice to the laboratory.

Chain-of-Custody

The chain-of-custody and associated sample bottle labels are used to document sample identification, specify the analyses to be performed, and trace possession and handling of a sample from the time of collection through delivery to the analytical laboratory. The sampler should fill out the sample identification labels and affix them to the sample bottles prior to, or upon, sample collection. A chain-of-custody form should be filled out by the sampler and a signature and date/time of sample transfers are required for each relinquishing and receiving party between sample collection and laboratory delivery.

Groundwater Sampling Equipment Decontamination

Field equipment should be cleaned prior to the sampling event and between sampling locations. Sampling pumps and hand bailers should be brushed with a nylon-bristle brush using a solution of 0.1 to 0.2-percent (volume/volume) non-phosphate soap in municipal-source tap water. The equipment should then be triple-rinsed with deionized water. Purge the pump hose of well water between sampling locations by pumping deionized through the hose. Groundwater sampling equipment should be protected from contact with the ground, or other potentially contaminating materials, at all times.

Special procedures for sampling for CEC compounds from unequipped well:

1) A new, teflon-lined polyethylene discharge hose or bailer will be used at each unequipped well sampling location;
2) The sampling pump will be decontaminated prior to each well sampled: Decontamination will consist of brushing pump body, inlet screen, and submerged portion of power cable in a phosphate-free cleaning solution, followed by rinsing, pumping distilled water, and final rinse;

3) Personnel collecting the sample will use powder-free nitrile gloves and observe special precautions for testing as directed by the laboratory (such as no caffeinated drink consumption on day of sampling, standing downwind of sampling port during sample collection, double-bag sample bottles, etc.);
4) Equipment blanks of distilled water pumped through the sampling pump are recommended;
5) A clean water/travel blank of distilled water (from the same source used for pump decontamination) is recommended.

APPENDIX F

Land Use and Water Use Areas
(from LOBP)

Figure 5. Land Uses in the Plan Area

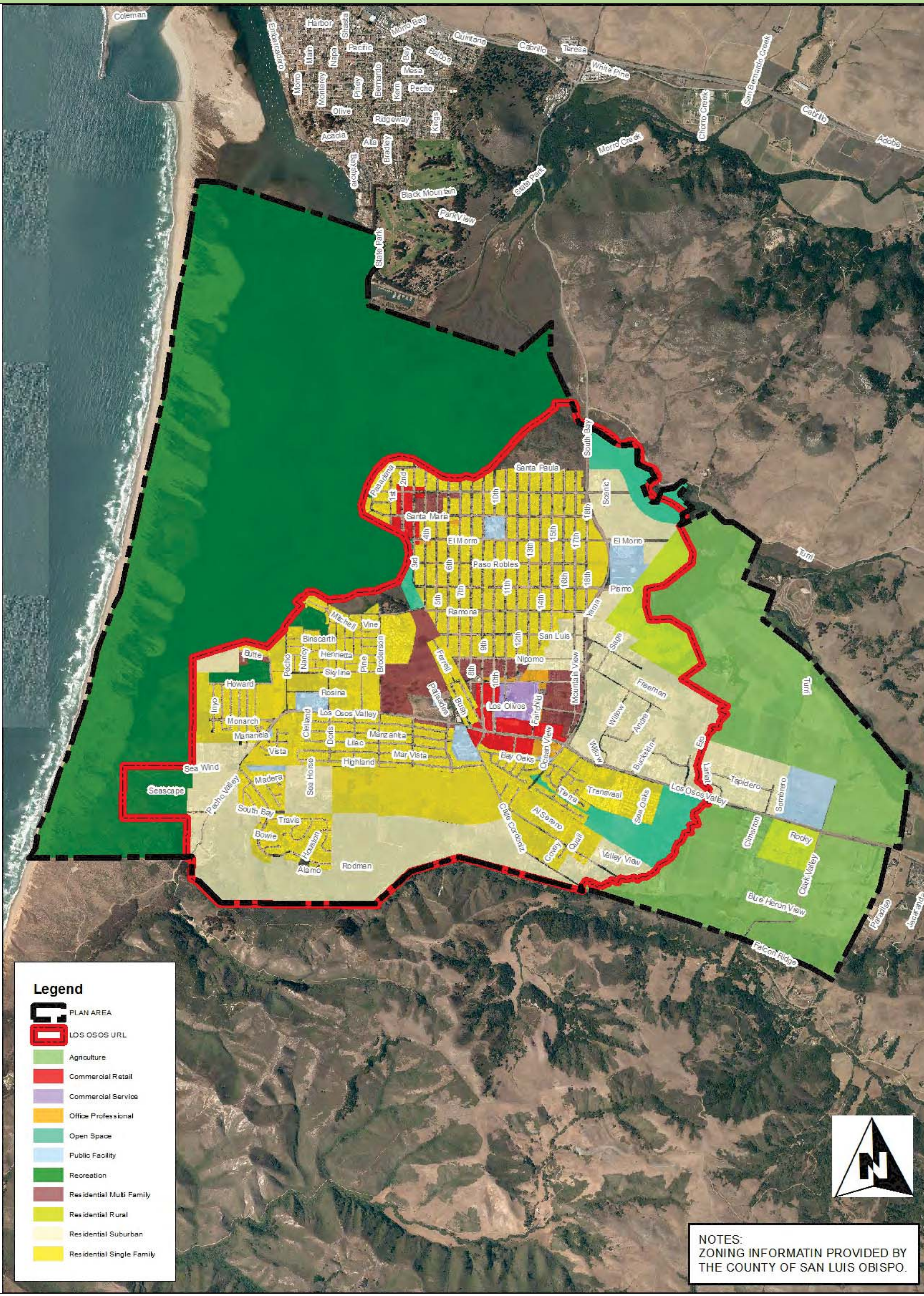
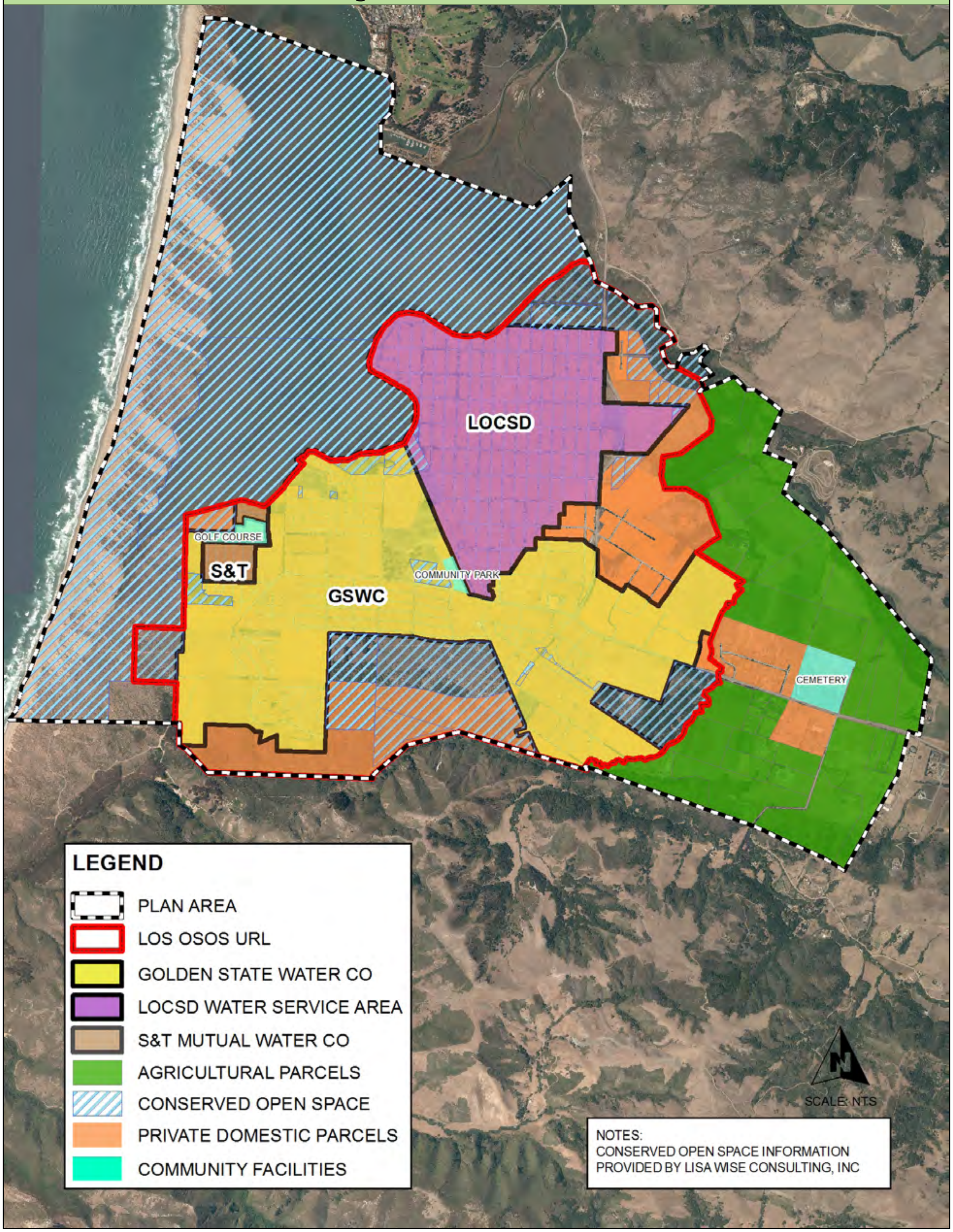


Figure 10. Water Use Areas



APPENDIX G

2019 Agricultural Water Use Estimates

Agriculture and Turf Applied Irrigation Water Estimate - 2019

Groundwater production estimates for agriculture and turf irrigation were developed using a daily soil-moisture budget with local data input. Sources of data included:

- The most recent land use survey by the County for estimating irrigated acreages (2019).
- Daily rainfall from County rain gage 727 (former Los Osos Landfill).
- Daily reference evapotranspiration from the California Irrigated Management Information System (CIMIS) Station 160 (San Luis Obispo West - Chorro Valley) located in DWR Climate Zone 6, which is the same climate zone as the Los Osos Valley.
- Water holding capacity and rooting depths from UC Davis Cooperative Extension at http://UCManageDrought.ucdavis.edu
- Crop Coefficients (Kc) from prior work in the Los Osos basin.

The soil-moisture budget methodology used accounts for soil holding capacity, crop rooting depth, leaching fraction, irrigation efficiency, local precipitation, and local reference evapotranspiration. The following equation, modified from a general formula for irrigation water requirements, was used for the soil-moisture budget (Carollo, 2012, modified from Burt et al., 2002):

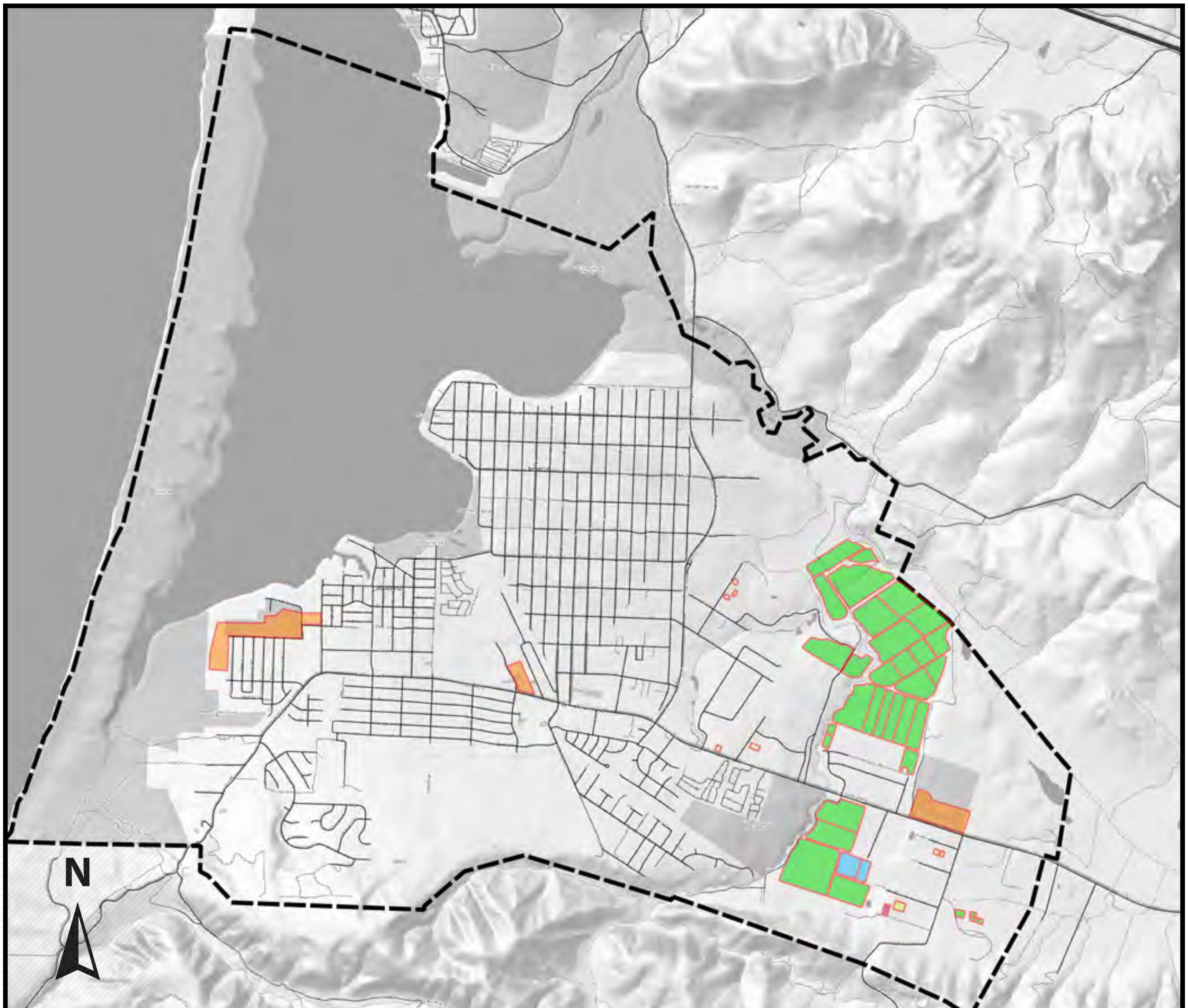
Applied Irrigation Water = (ETc - ER) / (EF)

Where:

ETc [Crop evapotranspiration] = ETo [reference evapotranspiration] x Kc [crop coefficient]
ER [effective rainfall] = rainfall stored in soil and available to crop
EF [efficiency factor] = (1-LF[leaching fraction]) x IE [irrigation efficiency]
Assumes no frost protection for crops in the Los Osos Creek Valley.

Crop data used in this annual report comes from a GIS shapefile provided by the SLO County Agricultural Commissioner's office and represents irrigated agricultural acreage for 2018. This data includes areas of irrigated fields, orchards and greenhouses and is verified by the County using aerial photography and site visits. The data is generally released after the summer following the year for which the data is compiled and prepared. This 2018 dataset was used as the basis for irrigated acreage in the adjudicated area and updated for 2019 using Normalized Difference Vegatation Index (NDVI) satellite images. Irrigated fields that were included in previous Ag Commissioner's datasets but were not included in the most recently available (2018) dataset and showed evidence of irrigation in 2019 NDVI images were added to a modified 2019 shapefile. 2019 crop acreages were then estimated using this updated dataset for use in soil moisture budget modeling.

A land use survey map for 2019 is shown in Figure G-1. Tabulation of the irrigated acreages is presented in Table G-1 below.



Base Image: Stamen Terrain in Greyscale

Explanation

Crop Type - 2018 County of SLO Data (Modified for 2019)

- Nursery
- Pasture
- Vegetables
- Vineyard

- Adjudicated Plan Area

- Community Facilities with Turf Areas

Figure G1

2019 Crop Types
Los Osos Groundwater Basin

2019 Annual Report

Cleath-Harris Geologists

Table G-1
2019 County Crop Survey
Eastern Area

Crop Type	Acres
Nursery	3.6
Pasture[1]	8.7
Vegetables	277
Vineyard	0.8
Total	290

[1]Sod farm listed as nursery in survey

Crop acreages listed in Table G-1 are in the Eastern Area (Los Osos Creek Valley and Cemetery Mesa). In addition, the turf areas for community facilities were calculated from areal images. Table G-2 presents these areas below.

Table G-2
Community Irrigated Turf Areas

Location	Acres
Memorial Park	12.5
Community Park	1.2
Sea Pines	24

Turf areas for schools, parks, cemeteries, and golf courses are generally classified in land use surveys as urban landscape, rather than given an agricultural designation. Turf grown for sod farms falls under an agricultural classification (pasture). For the purposes of the soil-moisture budget, the turf for community facilities and sod farms are considered as pasture.

The soil-moisture budget was constructed as a spreadsheet. Irrigation was applied as needed to offset soil moisture deficits after accounting for crop evapotranspiration, rainfall, rooting depths, and soil holding capacities. An efficiency factor of 92 percent was estimated by calibrating the average annual irrigation requirement from a daily soil-moisture budget prepared for 2006-2008 to the irrigation estimate from prior work, which was also based on the 2006-2008 period (CHG, 2009b). Results of the soil-moisture budget method for estimating applied irrigation for agriculture and community facilities are included in tables below.

Tables G-3 and G-4 present irrigation demand as crop evapotranspiration for calendar years 2018 and 2019. The soil-moisture budget results show crop evapotranspiration for vegetables and pasture/turf in 2019 as slightly less than 2018, reflecting greater rainfall during the 2019 calendar year.

Table G-3
Soil-Moisture Budget Results (Vegetables)

Year	Irrigation demand	ETo	ETc	Precip*
	(inches)			
2018	24.55	53.04	34.19	18.08
2019	23.83	51.11	33.33	25.03

*calendar year

Table G-4
Soil-Moisture Budget Results (Pasture/Turf)

Year	Irrigation demand	ETo	ETc	Precip*
	(inches)			
2018	38.99	53.04	53.04	18.08
2019	37.09	51.11	51.11	25.03

*calendar year

Table G-5 summarizes the estimated applied irrigation for the various agricultural land uses. Due to the relatively minor acreage involved, vineyard and nursery were converted to equivalent acres in vegetables based on water demand estimates from the County Water Master Plan table A1 (Carollo, 2012). The estimated applied irrigation for calendar year 2019 is 630 acre-feet (a reduction of 40 acre-feet from 2018).

Table G-5
Applied Irrigation for Agriculture

Description	Units	2018	2019
Irrigation demand vegetables	inches	24.55[1]	23.71[1]
Irrigation demand pasture	inches	38.99[2]	36.79[2]
Irrigation Efficiency Factor[3]	factor	0.92	0.92
Applied irrigation vegetables	feet	2.22	2.15
Applied irrigation pasture	feet	3.53	3.33
Vegetables acreage[4]	acres	286.5	281.6
Vegetables applied water	acre-feet	636	605.4
Pasture acreage[4]	acres	8.7	8.7
Pasture applied water	acre-feet	30.7	29.1
TOTAL applied agricultural irrigation (closest 10 acre-feet)	acre-feet	670	630

[1]From Table G-3;
[2]From Table G-4;
[3] From 2006-2009 calibration (CHG 2018a)
[4]2019 acreage from County GIS 2018 (vineyard and nursery acres counted as 4.6 acres in vegetables, based on equivalent water demand conversion using 2012 County Master Water Plan Table A1 [Carollo, 2012]).
[5]From Table G-1

Table G-6 summarizes the estimated applied irrigation for community facilities. The total estimated water demand for community facilities in the 2019 calendar year was 127 acre-feet.

Table G-6
2019 Applied Irrigation for Community Facilities

Description	Units	Memorial Park	Sea Pines Golf*	Community Park	Total
Turf Area (from Table G-2)	acres	12.5	24	1.2	37.7
Applied Irrigation (from Table G-5)	feet	3.36	3.36	3.36	3.36
TOTAL Applied Irrigation	acre-feet	42	80.6	4	127

*includes estimated 71 acre-feet of recycled water (10 acre-feet net production)

APPENDIX H

Precipitation and Streamflow Data

San Luis Obispo County Public Works

Recording Rain Station

MONTHLY PRECIPITATION REPORT

Station Name - Los Osos Landfill # 727

Station Location -

Latitude - 35° 19' 19"

Longitude - 120° 48' 03"

Description - Northeast Los Osos South of Turri Road

Water Years -

Beginning - 2005-2006

Ending - 2019-2020

Station Statistics -

Month	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average	0.13	0.02	0.07	0.89	1.06	2.48	3.80	2.89	2.51	0.82	0.37	0.10	15.14
Maximum	1.93	0.20	0.63	6.22	3.74	11.46	10.47	7.65	8.03	3.70	2.64	1.10	31.77

Notes -

Earlier data may be available. Contact Public Works for more information.

San Luis Obispo County Public Works

Recording Rain Station

MONTHLY PRECIPITATION REPORT

Station Name and no. Los Osos Landfill # 727 *** All units are in inches ***

Water Year	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Total
2019-2020	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2018-2019	0.00	0.00	0.00	0.43	3.74	1.14	6.14	6.89	3.94	0.08	1.54	0.00	23.90
2017-2018	0.00	0.00	0.16	0.16	0.47	0.12	3.78	0.16	7.99	0.79	0.00	0.00	13.63
2016-2017	0.00	0.00	0.00	1.65	2.76	3.39	9.02	7.65	1.34	0.55	0.27	0.00	26.63
2015-2016	1.93	0.00	0.08	0.08	1.26	1.85	5.04	0.86	4.85	0.20	0.00	0.00	16.15
2014-2015	0.00	0.00	0.00	0.00	0.28	5.20	0.08	0.91	0.43	0.67	0.12	0.00	7.68
2013-2014	0.00	0.00	0.00	0.24	0.28	0.12	0.00	4.06	1.42	0.71	0.00	0.00	6.81
2012-2013	0.00	0.00	0.00	1.18	1.69	2.64	1.02	0.67	0.43	0.31	0.12	0.04	8.11
2011-2012	0.00	0.08	0.04	1.06	2.17	0.16	2.28	0.35	2.68	2.24	0.00	0.00	11.06
2010-2011	0.00	0.00	0.12	1.54	1.85	11.46	3.03	3.78	8.03	0.28	0.59	1.10	31.77
2009-2010	0.00	0.00	0.04	6.22	0.04	2.87	9.76	4.13	1.14	1.93	0.04	0.00	26.18
2008-2009	0.00	0.00	0.00	0.04	0.04	0.75	0.71	4.61	1.06	0.20	0.20	0.35	7.95
2007-2008	0.00	0.00	0.00	0.43	0.12	2.68	10.47	2.99	0.00	0.24	0.00	0.00	16.93
2006-2007	0.00	0.00	0.00	0.12	0.43	2.28	1.26	2.56	0.43	0.35	0.04	0.00	7.48
2005-2006	0.04	0.20	0.63	0.24	0.75	2.52	4.45	3.70	3.90	3.70	2.64	0.00	22.76

San Luis Obispo County Public Works

DAILY PRECIPITATION

(inches)

Station Name and no. **Los Osos Landfill # 727** Season **2018-2019**

Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Day
1								0.31	0.04				1
2								1.81	0.75				2
3				0.35				0.35	0.12				3
4				0.04		0.08		0.98					4
5						0.04	0.67	0.08	0.67				5
6						0.04	0.63		0.28		0.12		6
7									0.08				7
8								0.31					8
9							0.31	0.24	0.12				9
10								0.43	0.12				10
11							0.71						11
12							0.16						12
13								0.28					13
14							0.31	0.87					14
15							0.79	0.47					15
16						0.43	0.51	0.12		0.08	0.51		16
17						0.20	0.91	0.35					17
18											0.51		18
19							0.28		0.08		0.24		19
20									1.34		0.08		20
21					0.28			0.04	0.08		0.04		21
22													22
23					0.35				0.12				23
24					0.04	0.12							24
25					0.04	0.24							25
26											0.04		26
27								0.24	0.12				27
28				0.04	0.98				0.04				28
29					2.05								29
30													30
31							0.87						31

Total	0.00	0.00	0.00	0.43	3.74	1.14	6.14	6.89	3.94	0.08	1.54	0.00	
Cum. Total	0.00	0.00	0.00	0.43	4.17	5.31	11.46	18.35	22.28	22.36	23.90	23.90	

Season Total **23.90**

San Luis Obispo County Public Works

DAILY PRECIPITATION
(inches)

Station Name and no. **Los Osos Landfill # 727** Season **2017-2018**

Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Day
1									0.82				**1**
2									0.16				**2**
3					0.03				0.24				**3**
4							0.19						**4**
5													**5**
6													**6**
7										0.40			**7**
8					0.04		1.42						**8**
9					0.12		1.77						**9**
10			0.08						0.51				**10**
11			0.08										**11**
12									0.04	0.04			**12**
13									0.35				**13**
14									0.28				**14**
15										0.04			**15**
16					0.04				0.35	0.19			**16**
17									0.08				**17**
18							0.08						**18**
19							0.08			0.12			**19**
20				0.12		0.12			0.48				**20**
21									2.16				**21**
22									2.48				**22**
23													**23**
24													**24**
25							0.24						**25**
26					0.16			0.16					**26**
27					0.08								**27**
28													**28**
29													**29**
30													**30**
31				0.04					0.04				**31**

Total	0.00	0.00	0.16	0.16	0.47	0.12	3.78	0.16	7.99	0.79	0.00	0.00	
Cum. Total	0.00	0.00	0.16	0.32	0.79	0.91	4.69	4.85	12.84	13.63	13.63	13.63	

Season Total **13.63**

San Luis Obispo County Public Works

DAILY PRECIPITATION

(inches)

Station Name and no. **Los Osos Landfill # 727** Season **2016-2017**

Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Day
1													1
2								0.24					2
3								0.16					3
4							2.25						4
5							0.23	0.55	0.35				5
6								0.51					6
7							0.52	0.63		0.15	0.27		7
8						1.18	1.10	0.04		0.04			8
9						0.08	0.12	0.28					9
10						0.12	0.23	0.43					10
11							0.04	0.04					11
12							0.59						12
13										0.08			13
14										0.04			14
15				0.08		1.07							15
16				0.08		0.55		0.31					16
17				0.08				3.27		0.08			17
18							0.56	0.32		0.16			18
19							0.27	0.08					19
20					1.90		1.22	0.51					20
21					0.04		0.16	0.24	0.20				21
22							1.26		0.47				22
23						0.35	0.43						23
24							0.04		0.12				24
25									0.20				25
26					0.67			0.04					26
27				0.67	0.15								27
28				0.71									28
29													29
30				0.03		0.04							30
31													31

Total	0.00	0.00	0.00	1.65	2.76	3.39	9.02	7.65	1.34	0.55	0.27	0.00	
Cum. Total	0.00	0.00	0.00	1.65	4.41	7.80	16.82	24.47	25.81	26.36	26.63	26.63	

Season Total **26.63**

San Luis Obispo County Public Works

DAILY PRECIPITATION
(inches)

Station Name and no. **Los Osos Landfill # 727** Season **2015-2016**

Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Day
1													1
2					0.59								2
3						0.04							3
4				0.04									4
5							1.02		1.54				5
6							0.75		0.35				6
7							0.23		1.06				7
8					0.23					0.08			8
9					0.04		0.04						9
10					0.04	0.04	0.08		0.04				10
11						0.39			1.22				11
12													12
13						0.08	0.04		0.36				13
14			0.08						0.20				14
15				0.04	0.28		0.04						15
16							0.08						16
17								0.67					17
18							0.28	0.19					18
19	1.69					0.51	0.86						19
20	0.24								0.04				20
21						0.28			0.04				21
22						0.47	0.16			0.12			22
23							0.08						23
24						0.04							24
25					0.08								25
26													26
27													27
28													28
29													29
30							0.27						30
31							1.11						31

Total	1.93	0.00	0.08	0.08	1.26	1.85	5.04	0.86	4.85	0.20	0.00	0.00	
Cum. Total	1.93	1.93	2.01	2.09	3.35	5.20	10.24	11.10	15.95	16.15	16.15	16.15	

Season Total **16.15**

San Luis Obispo County Public Works

DAILY PRECIPITATION

(inches)

Station Name and no. **Los Osos Landfill # 727** Season **2014-2015**

Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Day
1									0.43				1
2						0.51							2
3													3
4						0.67							4
5						0.04							5
6								0.12					6
7								0.51					7
8					0.04			0.20					8
9													9
10								0.08					10
11					0.04	1.22							11
12						1.22							12
13					0.04								13
14											0.12		14
15						0.71				0.47			15
16						0.71							16
17						0.08							17
18						0.04							18
19					0.08								19
20													20
21													21
22					0.04								22
23													23
24													24
25										0.20			25
26													26
27							0.08						27
28													28
29					0.04								29
30													30
31													31
Total	0.00	0.00	0.00	0.00	0.28	5.20	0.08	0.91	0.43	0.67	0.12	0.00	
Cum. Total	0.00	0.00	0.00	0.00	0.28	5.47	5.55	6.46	6.89	7.56	7.68	7.68	

Season Total **7.68**

San Luis Obispo County Public Works

DAILY PRECIPITATION

(inches)

Station Name and no. **Los Osos Landfill # 727** Season **2013-2014**

Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Day
1									0.59	0.24			**1**
2								0.87	0.20	0.28			**2**
3								0.04					**3**
4													**4**
5													**5**
6								0.31					**6**
7						0.12							**7**
8								0.04					**8**
9								0.04					**9**
10								0.08					**10**
11													**11**
12													**12**
13													**13**
14								0.04					**14**
15													**15**
16													**16**
17													**17**
18													**18**
19													**19**
20					0.20								**20**
21					0.08								**21**
22													**22**
23													**23**
24													**24**
25										0.16			**25**
26								0.87	0.04	0.04			**26**
27								0.28					**27**
28				0.24				1.50					**28**
29									0.16				**29**
30									0.04				**30**
31									0.39				**31**

Total	0.00	0.00	0.00	0.24	0.28	0.12	0.00	4.06	1.42	0.71	0.00	0.00	
Cum. Total	0.00	0.00	0.00	0.24	0.51	0.63	0.63	4.69	6.10	6.81	6.81	6.81	

Season Total **6.81**

San Luis Obispo County Public Works

DAILY PRECIPITATION
(inches)

Station Name and no. **Los Osos Landfill # 727** Season **2012-2013**

Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Day
1						0.12				0.28			1
2						0.55							2
3													3
4										0.04			4
5							0.39						5
6							0.31				0.12		6
7									0.24				7
8								0.47	0.08				8
9					0.04								9
10				0.24									10
11				0.87									11
12						0.04							12
13													13
14									0.04				14
15						0.04							15
16					0.08	0.08							16
17					0.47	0.16							17
18					0.24								18
19								0.20					19
20													20
21				0.04									21
22						0.75							22
23						0.24							23
24							0.28					0.04	24
25						0.28	0.04						25
26						0.04							26
27													27
28					0.55								28
29					0.08	0.35							29
30				0.04	0.24				0.04				30
31									0.04				31
Total	0.00	0.00	0.00	1.18	1.69	2.64	1.02	0.67	0.43	0.31	0.12	0.04	
Cum. Total	0.00	0.00	0.00	1.18	2.87	5.51	6.54	7.20	7.64	7.95	8.07	8.11	

Season Total **8.11**

San Luis Obispo County Public Works

DAILY PRECIPITATION
(inches)

Station Name and no. **Los Osos Landfill # 727** Season **2011-2012**

Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Day
1													1
2													2
3				0.08	0.04								3
4				0.04	0.28								4
5				0.91									5
6					0.28								6
7								0.04					7
8													8
9													9
10				0.04				0.04		0.55			10
11					0.31					0.16			11
12						0.16				0.28			12
13								0.08		1.02			13
14													14
15								0.08					15
16									0.12				16
17									1.46				17
18									0.12				18
19													19
20					1.26		0.20						20
21							0.87						21
22													22
23							1.22						23
24													24
25									0.63	0.20			25
26		0.04								0.04			26
27													27
28									0.16				28
29								0.12					29
30		0.04	0.04										30
31									0.20				31

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	
Total	0.00	0.08	0.04	1.06	2.17	0.16	2.28	0.35	2.68	2.24	0.00	0.00	
Cum. Total	0.00	0.08	0.12	1.18	3.35	3.50	5.79	6.14	8.82	11.06	11.06	11.06	

Season Total **11.06**

San Luis Obispo County Public Works

DAILY PRECIPITATION

(inches)

Station Name and no. **Los Osos Landfill # 727** Season **2010-2011**

Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Day
1							0.39						1
2							2.52		0.08				2
3													3
4			0.04			0.04			0.04			0.59	4
5				0.31		0.75						0.35	5
6				0.24	0.04				0.12			0.12	6
7					0.47								7
8													8
9						0.04							9
10					0.04								10
11									0.04				11
12													12
13						0.04							13
14								0.04					14
15						0.04					0.16		15
16								0.59	0.08		0.16		16
17			0.04	0.04		0.43		0.47			0.16		17
18				0.08		2.95		1.54	0.47		0.08		18
19					0.24	2.24		0.55	2.28				19
20			0.04		0.71	1.06		0.04	2.91				20
21				0.04	0.24	0.35			0.24	0.28			21
22				0.04		1.57			0.04				22
23				0.08	0.12				0.87				23
24				0.28					0.63				24
25						0.79		0.51	0.04				25
26								0.04	0.16				26
27													27
28						0.31			0.04				28
29				0.35		0.83					0.04	0.04	29
30				0.08									30
31							0.12						31
Total	0.00	0.00	0.12	1.54	1.85	11.46	3.03	3.78	8.03	0.28	0.59	1.10	
Cum. Total	0.00	0.00	0.12	1.65	3.50	14.96	17.99	21.77	29.80	30.08	30.67	31.77	

Season Total **31.77**

San Luis Obispo County Public Works

DAILY PRECIPITATION

(inches)

Station Name and no. **Los Osos Landfill # 727** Season **2009-2010**

Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Day
1										0.04			1
2									0.08				2
3									0.43				3
4								0.08	0.04				4
5								0.51		0.31			5
6								0.39	0.20				6
7						0.47							7
8									0.04				8
9								0.63					9
10						0.75			0.04				10
11										0.98			11
12						1.22	0.51		0.08	0.08			12
13				5.43		0.04	0.31	0.04					13
14				0.79		0.04							14
15													15
16													16
17							0.55				0.04		17
18							1.14						18
19							0.91						19
20					0.04		2.36	0.04		0.51			20
21						0.16	2.01	0.12					21
22							1.22		0.04				22
23			0.04				0.04	0.04					23
24								0.39					24
25													25
26							0.59	1.42					26
27						0.08		0.47					27
28													28
29							0.08		0.04				29
30						0.12	0.04		0.04				30
31									0.12				31

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	
Total	0.00	0.00	0.04	6.22	0.04	2.87	9.76	4.13	1.14	1.93	0.04	0.00	
Cum. Total	0.00	0.00	0.04	6.26	6.30	9.17	18.94	23.07	24.21	26.14	26.18	26.18	

Season Total **26.18**

San Luis Obispo County Public Works

DAILY PRECIPITATION
(inches)

Station Name and no. **Los Osos Landfill # 727** Season **2008-2009**

Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Day
1					0.04						0.04		**1**
2							0.08		0.16		0.12		**2**
3									0.59				**3**
4				0.04					0.08				**4**
5											0.04	0.35	**5**
6								0.87					**6**
7										0.20			**7**
8													**8**
9								1.10					**9**
10													**10**
11								0.04					**11**
12								0.04					**12**
13								0.63					**13**
14								0.04					**14**
15													**15**
16						0.12							**16**
17								1.10					**17**
18													**18**
19													**19**
20													**20**
21						0.08							**21**
22						0.43		0.47	0.24				**22**
23							0.51	0.31					**23**
24							0.12						**24**
25						0.12							**25**
26													**26**
27													**27**
28													**28**
29													**29**
30													**30**
31													**31**
Total	0.00	0.00	0.00	0.04	0.04	0.75	0.71	4.61	1.06	0.20	0.20	0.35	
Cum. Total	0.00	0.00	0.00	0.04	0.08	0.83	1.54	6.14	7.20	7.40	7.60	7.95	

Season Total **7.95**

San Luis Obispo County Public Works

DAILY PRECIPITATION
(inches)

Station Name and no. **Los Osos Landfill # 727** Season **2007-2008**

Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Day
1								0.08					1
2					0.04			0.24		0.20			2
3								1.02		0.04			3
4							3.66						4
5							0.20						5
6						0.24	0.39						6
7						0.08							7
8							0.08						8
9							0.04						9
10													10
11					0.08								11
12													12
13													13
14													14
15													15
16				0.28									16
17				0.08									17
18						2.24							18
19								0.20					19
20						0.12		0.16					20
21							0.08	0.08					21
22							2.32	0.12					22
23							1.06	0.87					23
24							0.87	0.24					24
25							0.31						25
26							0.63						26
27				0.08			0.67						27
28							0.08						28
29							0.04						29
30							0.04						30
31													31
Total	0.00	0.00	0.00	0.43	0.12	2.68	10.47	2.99	0.00	0.24	0.00	0.00	
Cum. Total	0.00	0.00	0.00	0.43	0.55	3.23	13.70	16.69	16.69	16.93	16.93	16.93	

Season Total **16.93**

San Luis Obispo County Public Works

DAILY PRECIPITATION

(inches)

Station Name and no. **Los Osos Landfill # 727** Season **2006-2007**

Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Day
1													1
2								0.04					2
3													3
4							0.12				0.04		4
5													5
6													6
7								0.20					7
8						0.39							8
9						0.94							9
10						0.31		0.71					10
11					0.08								11
12								0.04					12
13				0.08	0.20								13
14					0.08								14
15													15
16													16
17					0.04	0.04	0.04						17
18													18
19										0.04			19
20									0.28	0.24			20
21						0.04							21
22								0.87		0.08			22
23				0.04				0.12					23
24													24
25								0.08					25
26					0.04	0.43		0.16	0.08				26
27						0.12	0.83	0.20	0.08				27
28							0.20	0.16					28
29							0.08						29
30													30
31													31

Total	0.00	0.00	0.00	0.12	0.43	2.28	1.26	2.56	0.43	0.35	0.04	0.00	
Cum. Total	0.00	0.00	0.00	0.12	0.55	2.83	4.09	6.65	7.09	7.44	7.48	7.48	

Season Total **7.48**

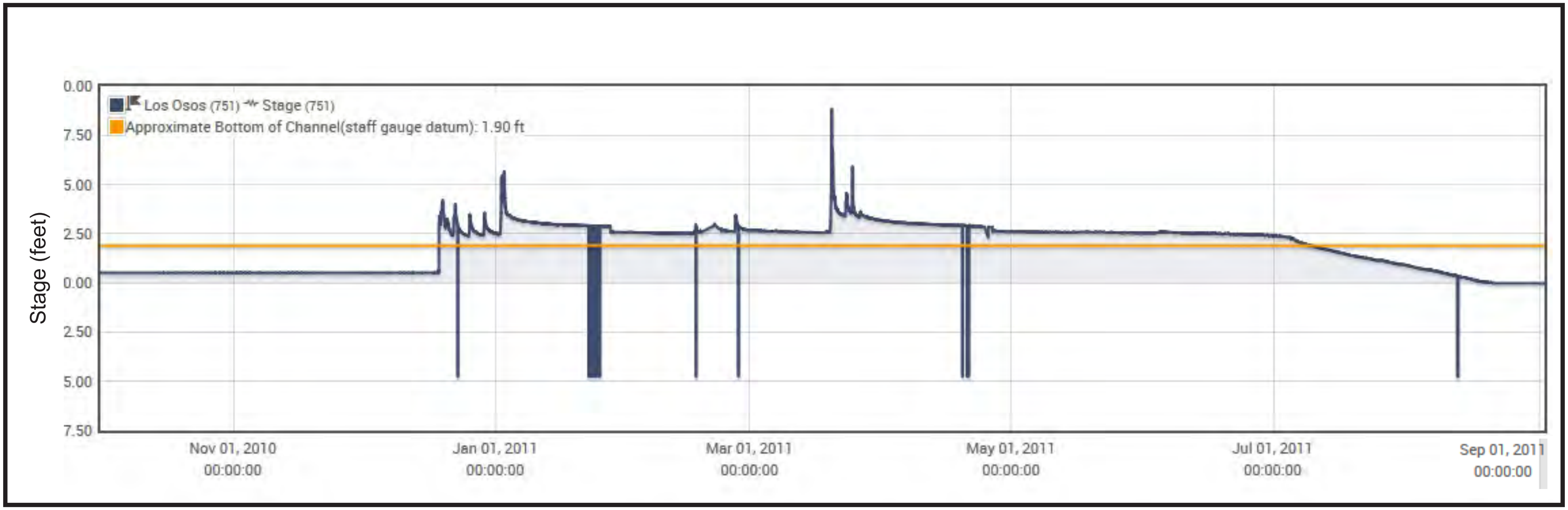
San Luis Obispo County Public Works

DAILY PRECIPITATION
(inches)

Station Name and no. **Los Osos Landfill # 727** Season **2005-2006**

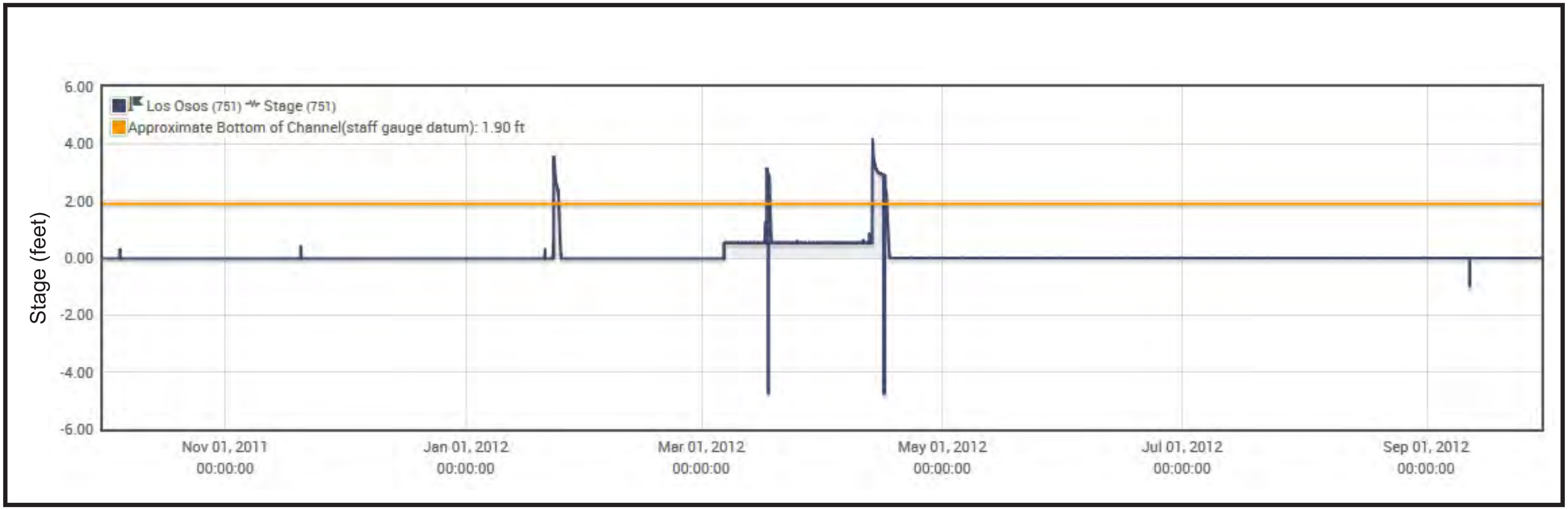
Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Day
1							1.61						1
2			0.63			0.55	2.32			0.24			2
3								0.04		1.18			3
4										0.59			4
5										0.39			5
6													6
7										0.08			7
8						0.47							8
9					0.59				0.04				9
10									0.28	0.43			10
11		0.16			0.04				0.12				11
12		0.04							0.28				12
13													13
14	0.04						0.24		0.04	0.04			14
15													15
16										0.08			16
17				0.12					0.24	0.04			17
18						0.16	0.16	3.66					18
19													19
20				0.04					0.35				20
21						0.04			0.04		2.60		21
22						0.04					0.04		22
23						0.04							23
24													24
25					0.08	0.12			0.12				25
26				0.08		0.04	0.08			0.63			26
27									0.43				27
28						0.12			1.38				28
29									0.16				29
30					0.04		0.04						30
31						0.94			0.43				31
Total	0.04	0.20	0.63	0.24	0.75	2.52	4.45	3.70	3.90	3.70	2.64	0.00	
Cum. Total	0.04	0.24	0.87	1.10	1.85	4.37	8.82	12.52	16.42	20.12	22.76	22.76	

Season Total **22.76**



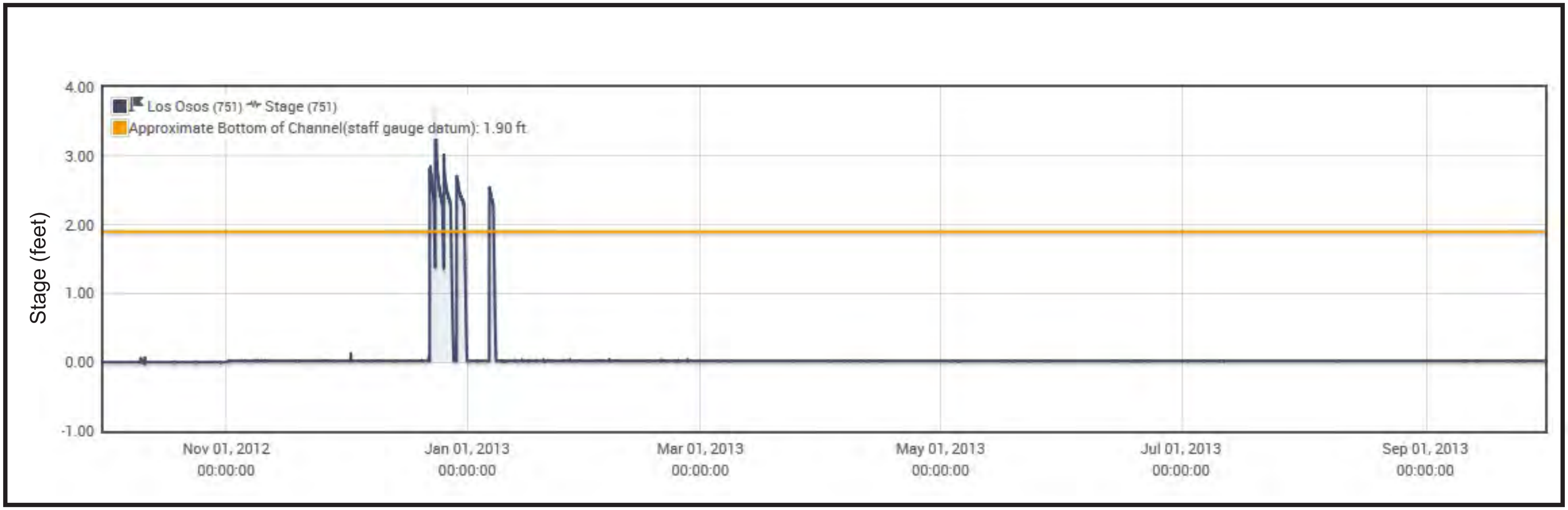
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H1
Stream Stage for 2011 Water Year
Los Osos Creek, Gage #751



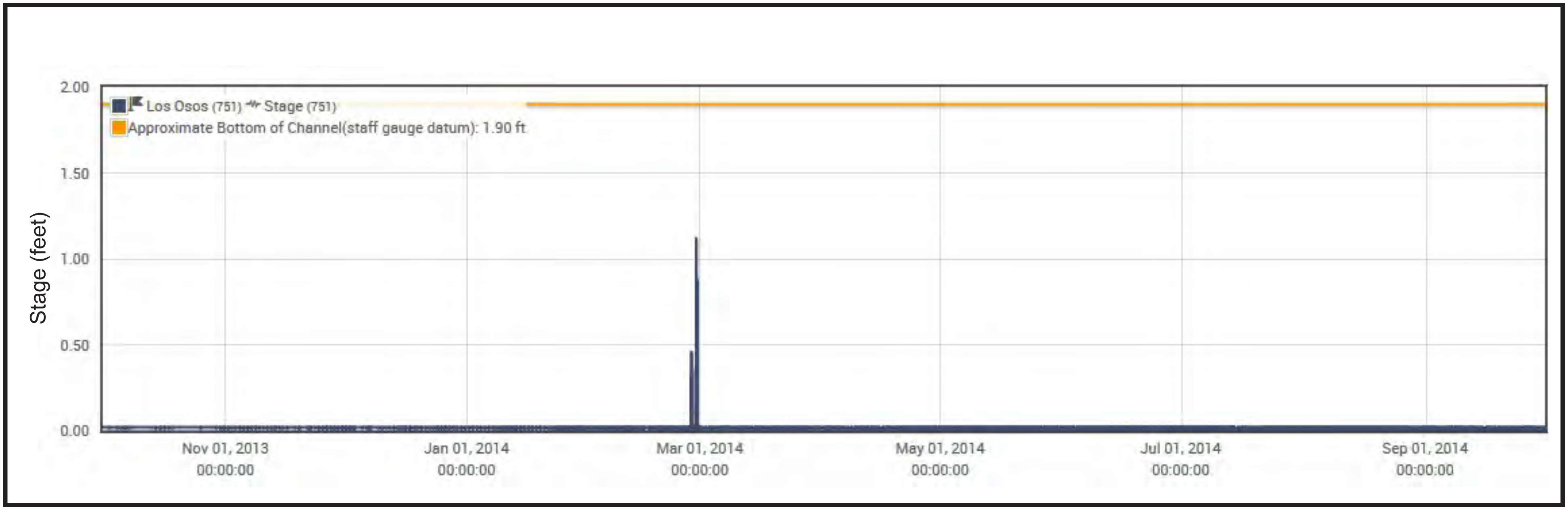
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H2
Stream Stage for 2012 Water Year
Los Osos Creek, Gage #751



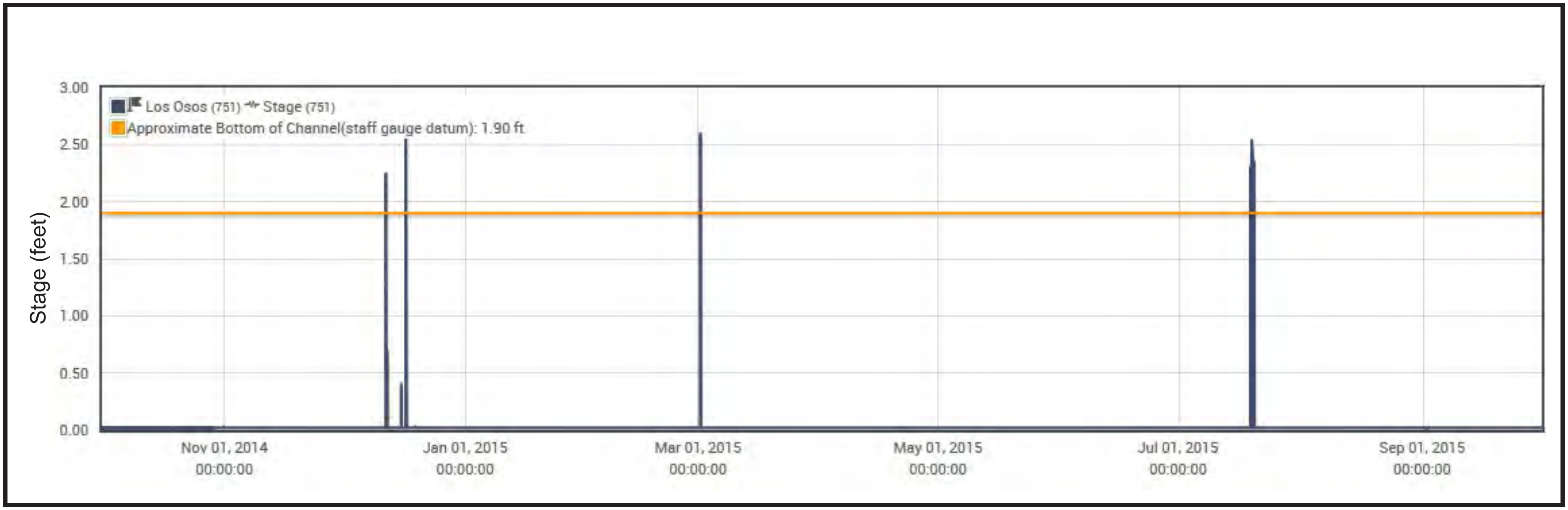
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H3
Stream Stage for 2013 Water Year
Los Osos Creek, Gage #751



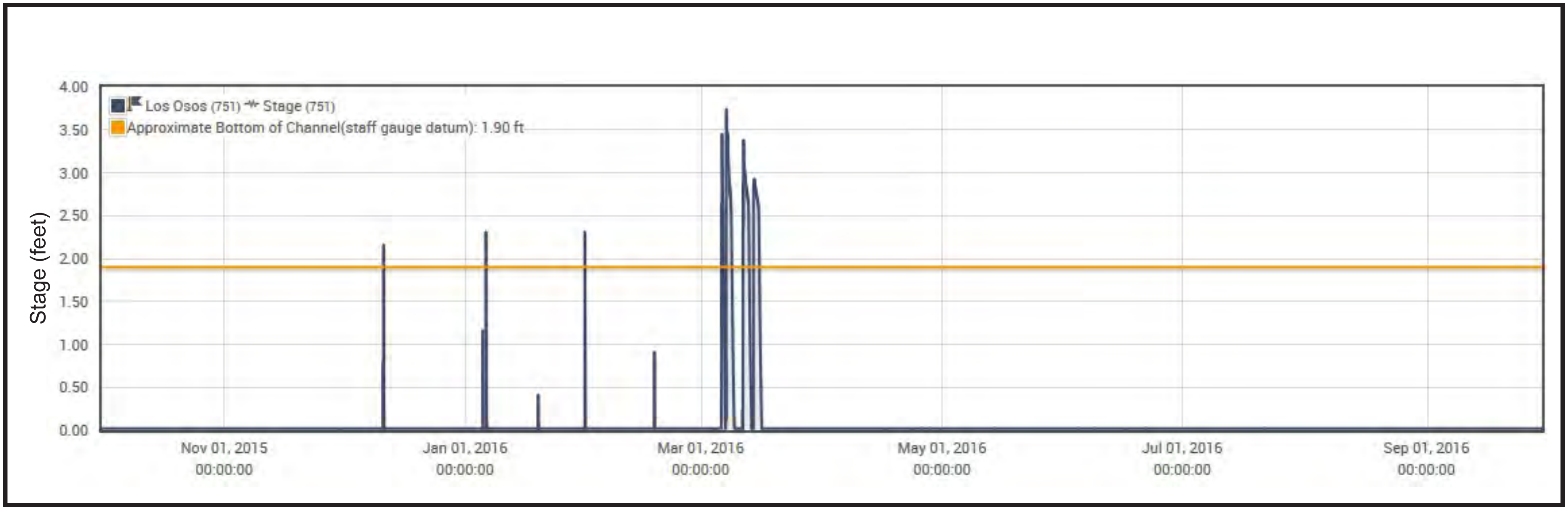
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H4
Stream Stage for 2014 Water Year
Los Osos Creek, Gage #751



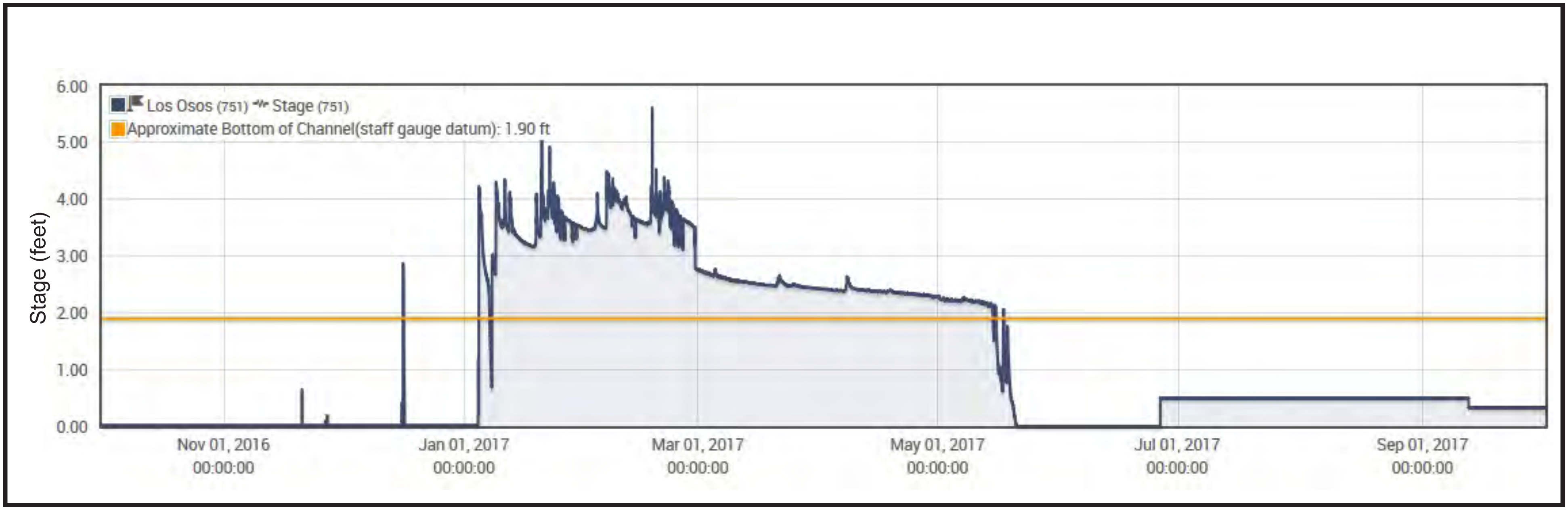
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H5
Stream Stage for 2015 Water Year
Los Osos Creek, Gage #751



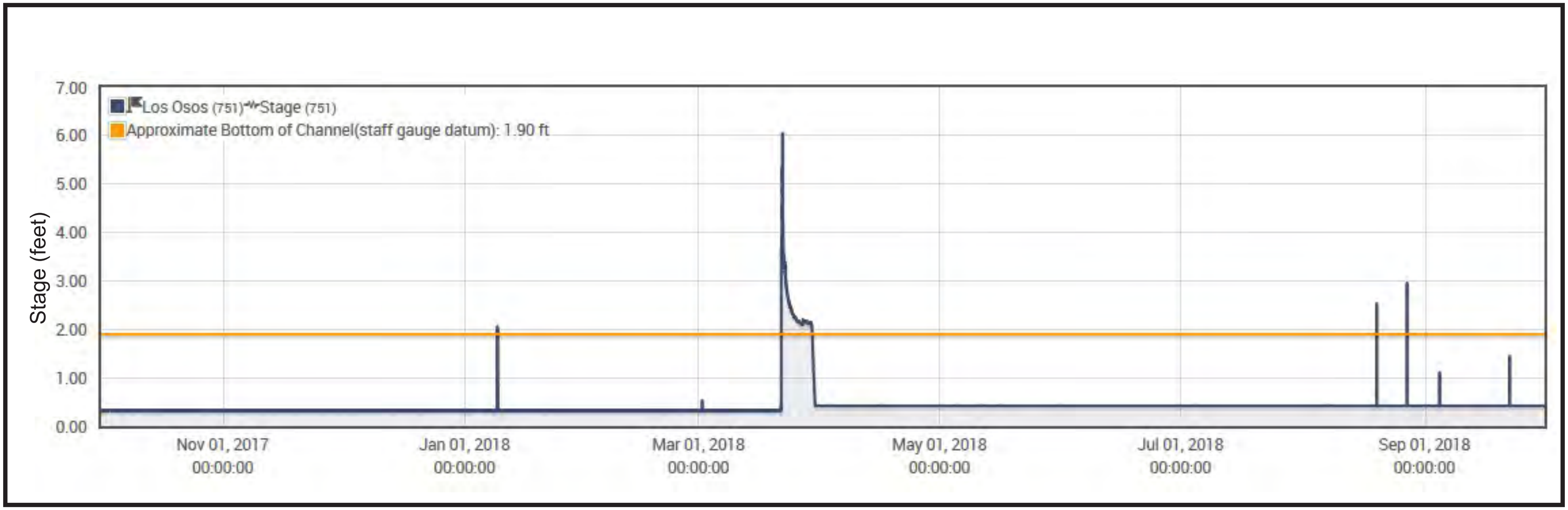
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H6
Stream Stage for 2016 Water Year
Los Osos Creek, Gage #751



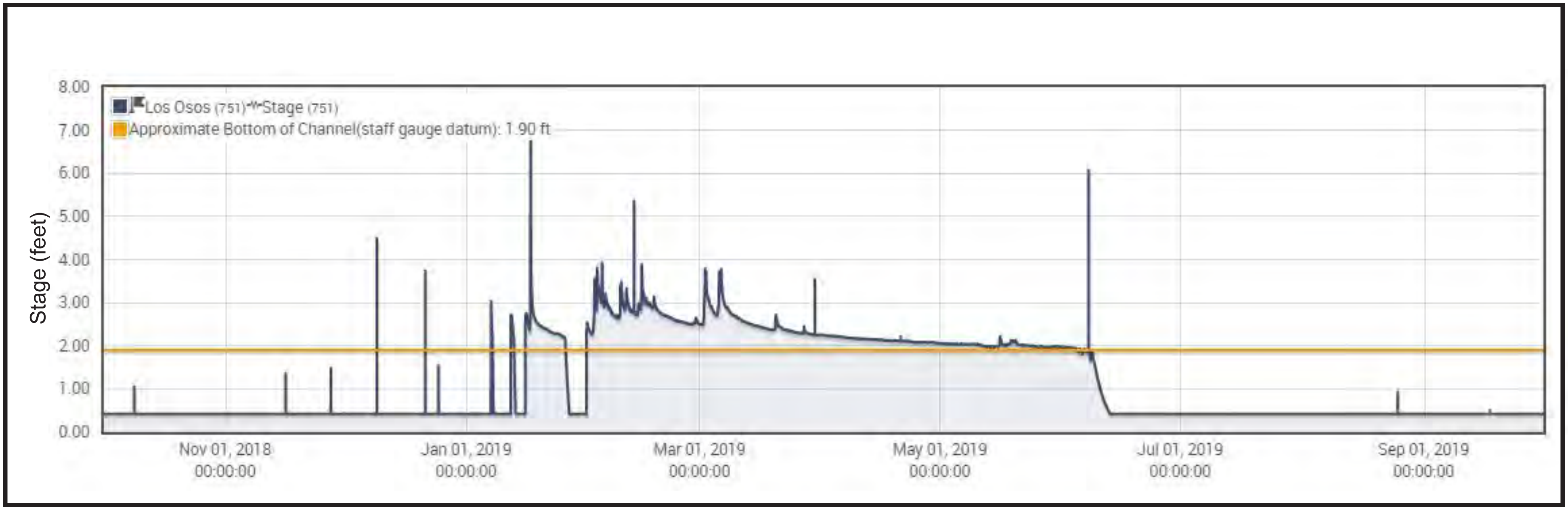
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H7
Stream Stage for 2017 Water Year
Los Osos Creek, Gage #751



Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H8
Stream Stage for 2018 Water Year
Los Osos Creek, Gage #751

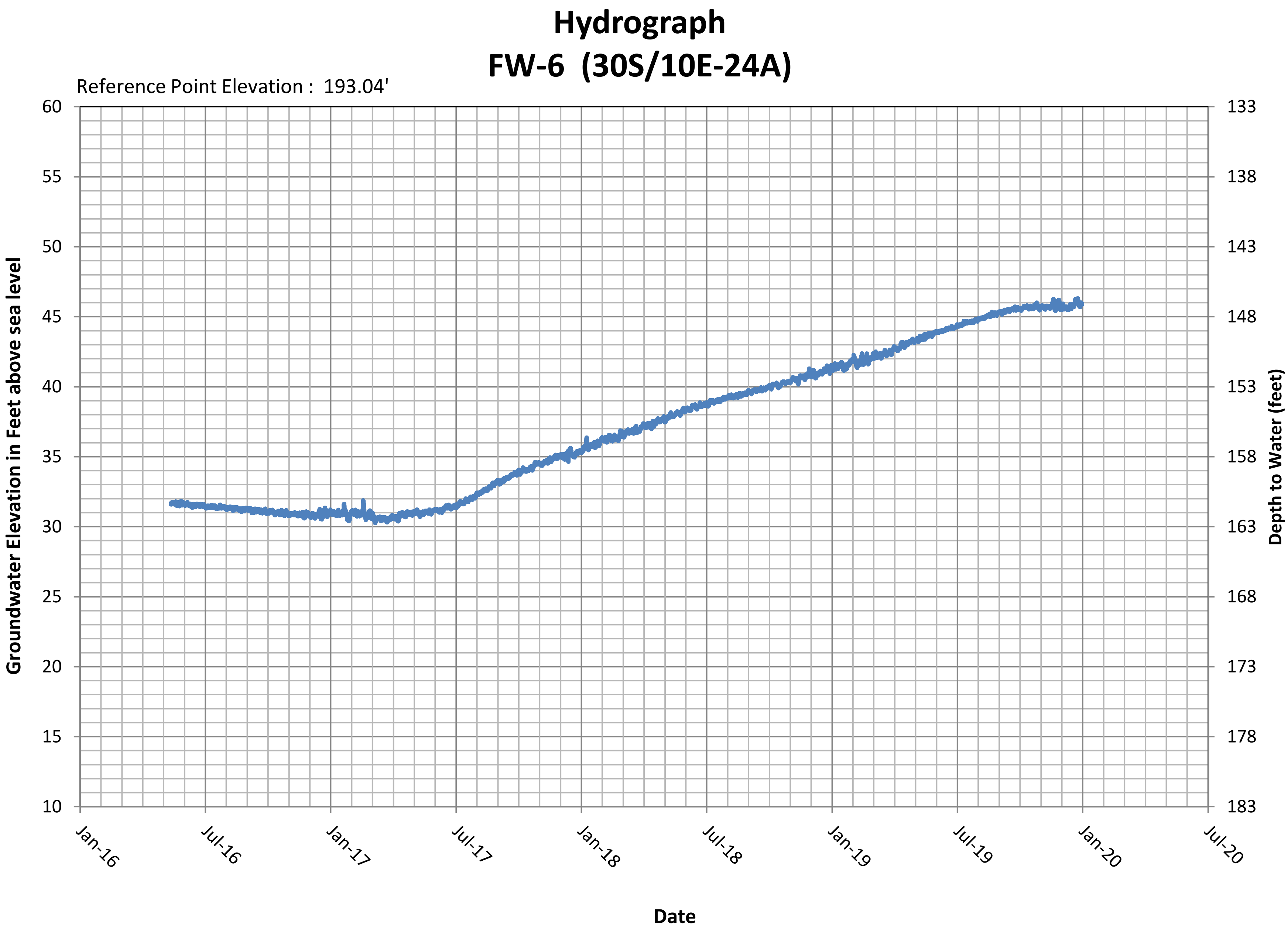


Source: County of San Luis Obispo Public Works Department, Stream Gage #751

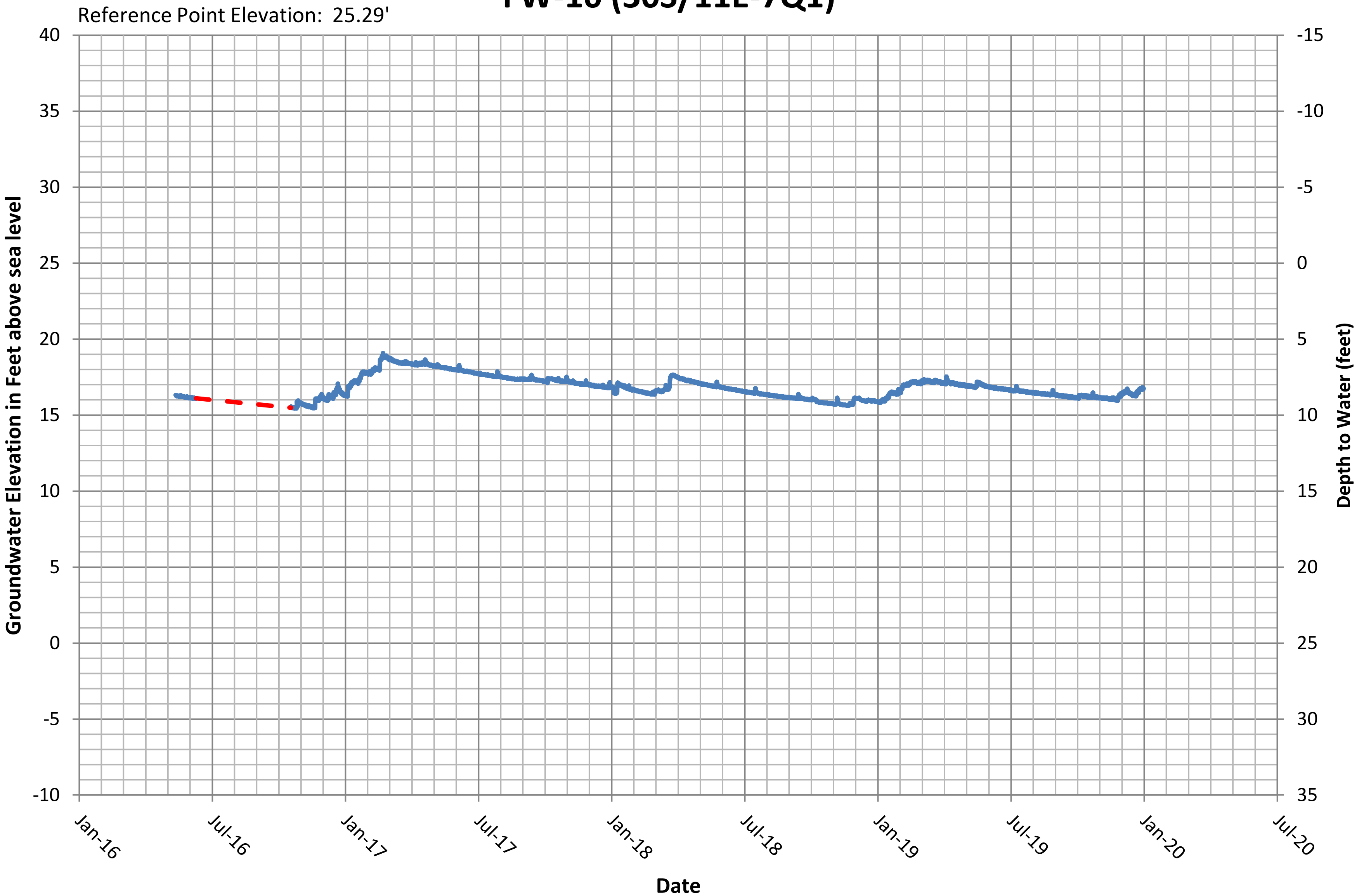
Figure H9
Stream Stage for 2019 Water Year
Los Osos Creek, Gage #751

APPENDIX I

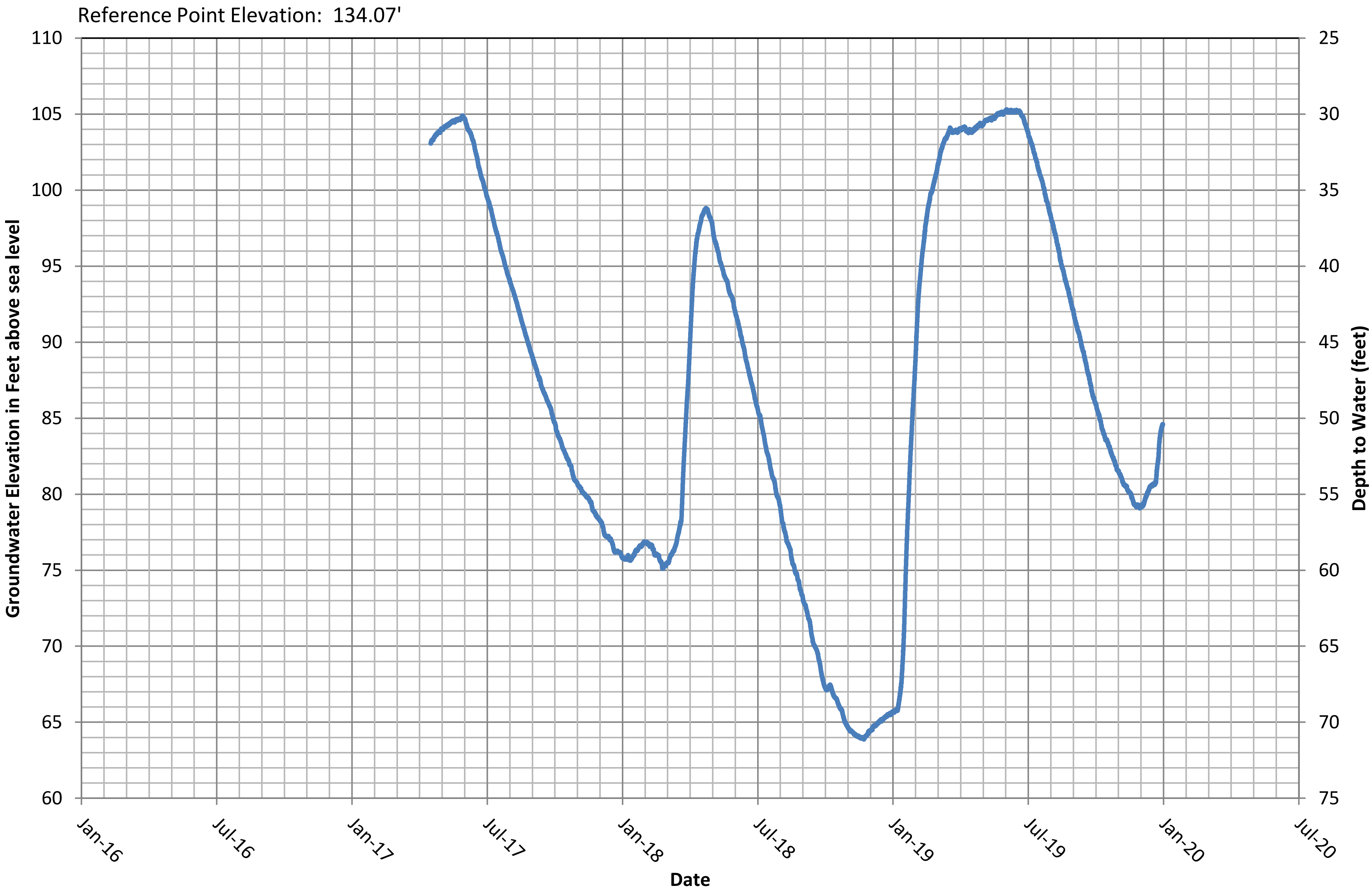
Transducer Hydrographs

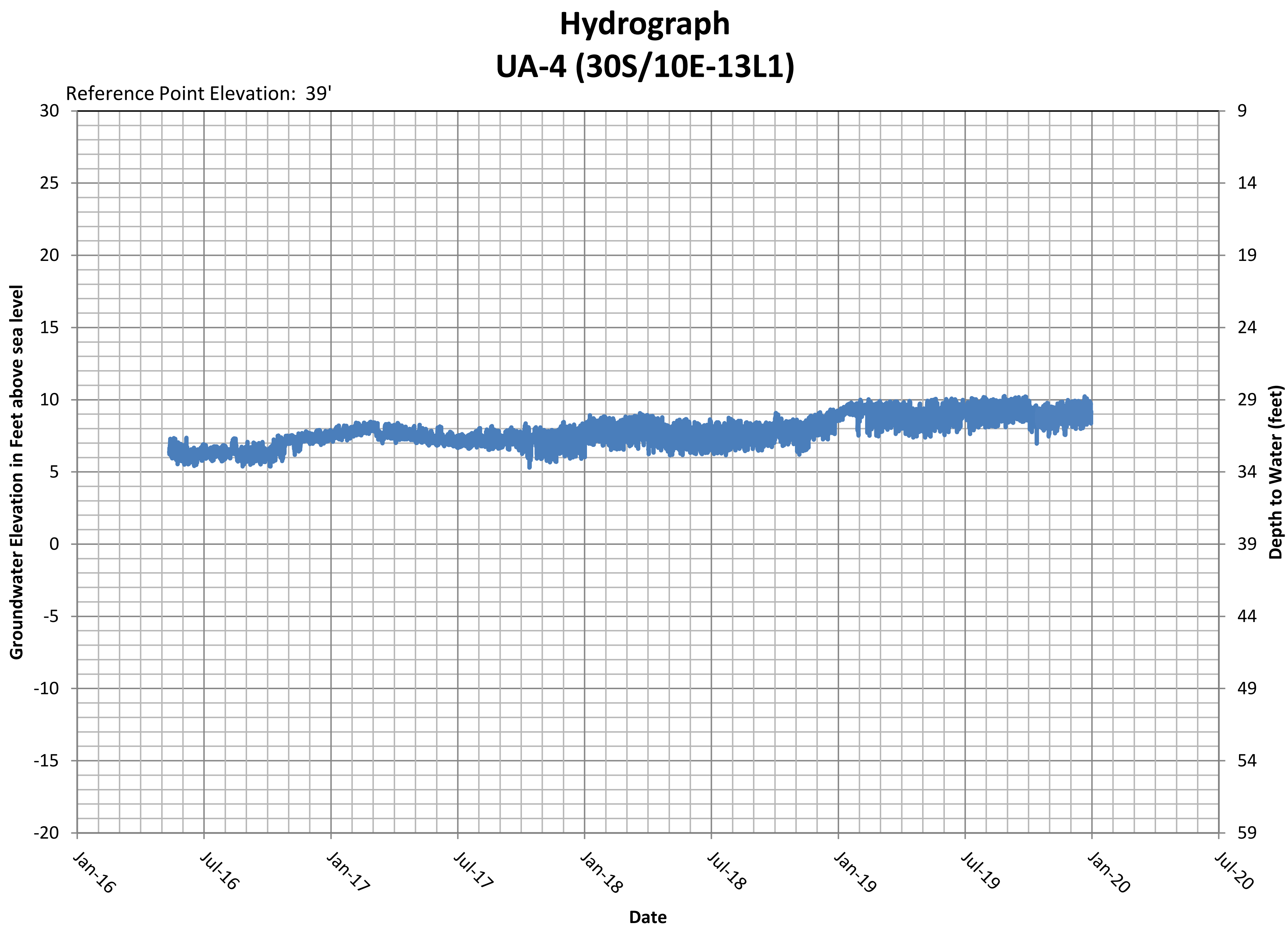

Hydrograph
FW-6 (30S/10E-24A)
Reference Point Elevation : 193.04'
60
55
50
45
40
35
30
25
20
15
10
133
138
143
148
153
158
163
168
173
178
183
Groundwater Elevation in Feet above sea level
Depth to Water (feet)
Jan-16
Jul-16
Jan-17
Jul-17
Jan-18
Jul-18
Jan-19
Jul-19
Jan-20
Jul-20
Date

Hydrograph
FW-10 (30S/11E-7Q1)

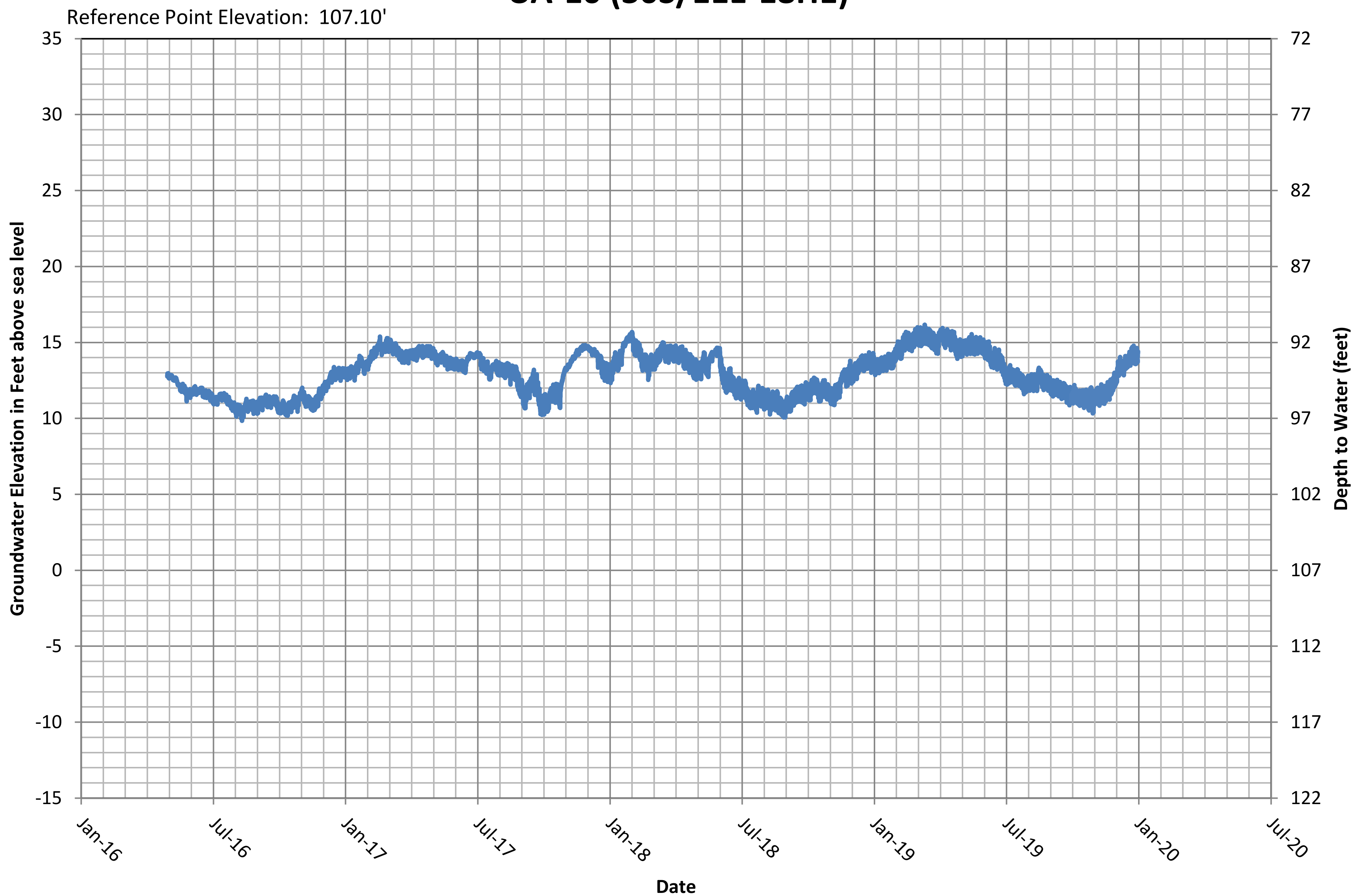


Hydrograph
FW-27 (30S/10E-20L1)



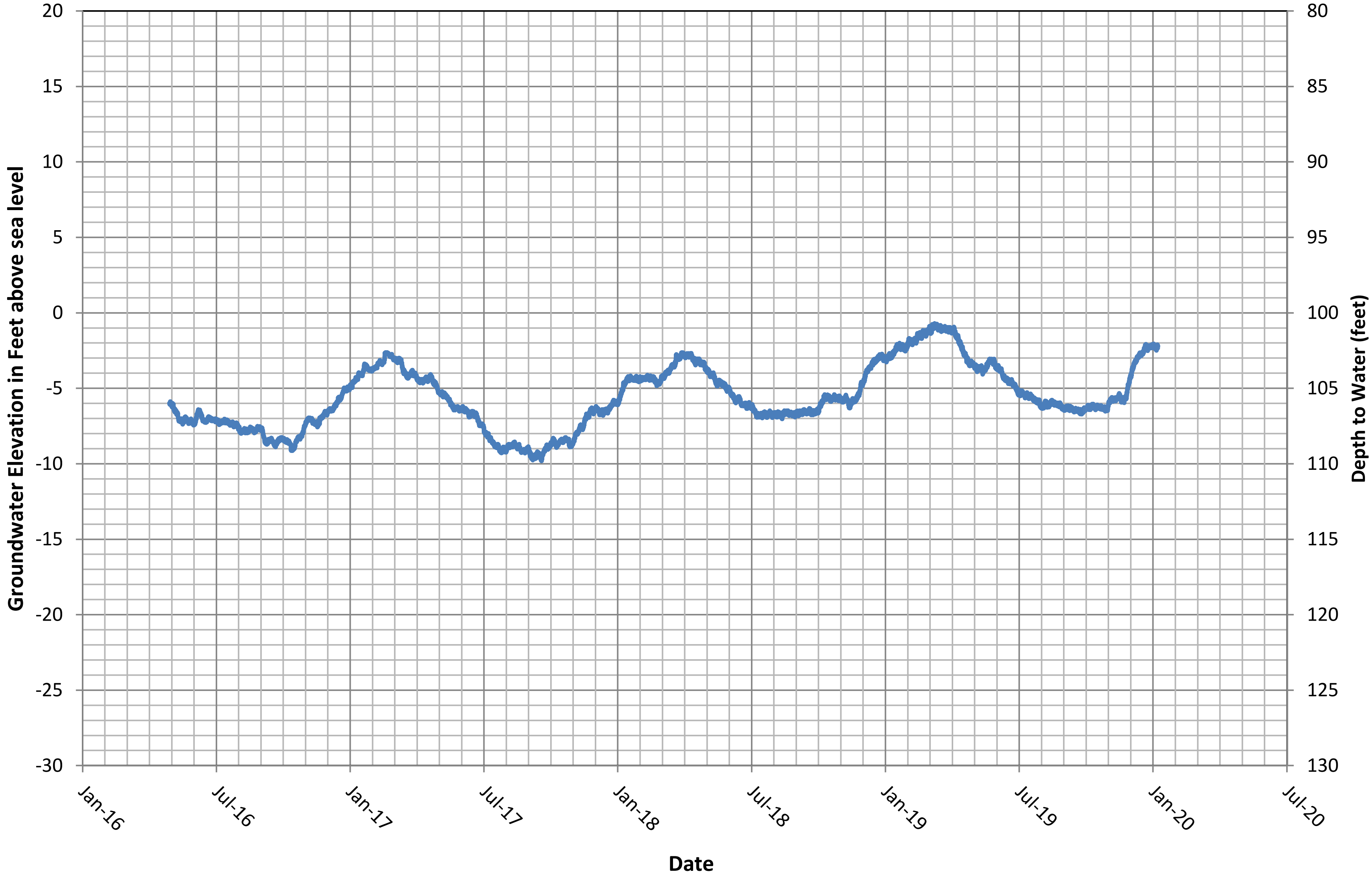

Hydrograph
UA-4 (30S/10E-13L1)
Reference Point Elevation: 39'
Groundwater Elevation in Feet above sea level
Depth to Water (feet)
Date
30
25
20
15
10
5
0
-5
-10
-15
-20
9
14
19
24
29
34
39
44
49
54
59
Jan-16
Jul-16
Jan-17
Jul-17
Jan-18
Jul-18
Jan-19
Jul-19
Jan-20
Jul-20

Hydrograph
UA-10 (30S/11E-18H1)

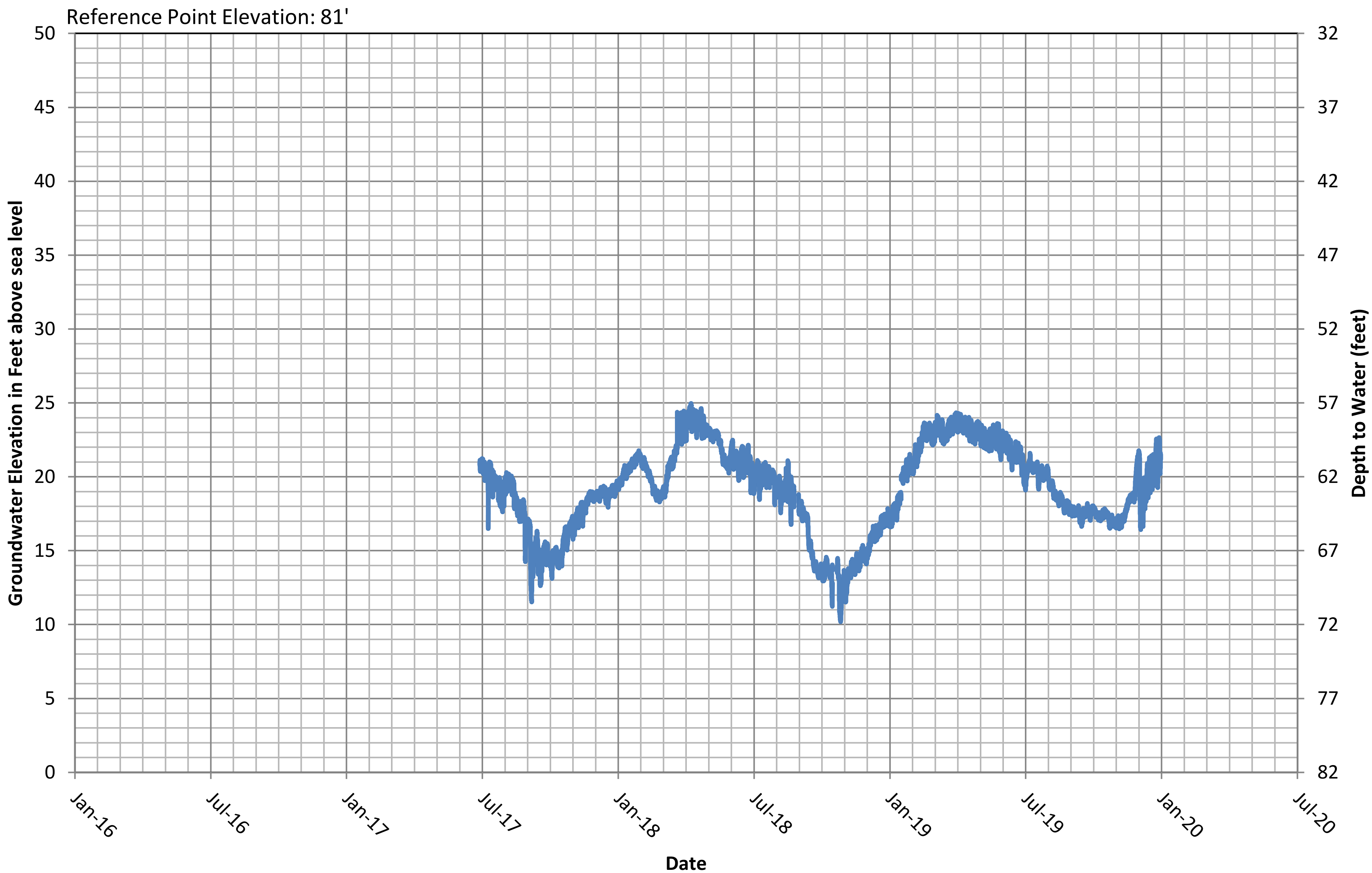


Hydrograph
LA-13 (30S/11E-18F2)

Reference Point Elevation: 100'



Hydrograph
LA-37 (30S/11E-21B1)



APPENDIX J

Groundwater Storage Calculation Example and Specific Yield Estimates

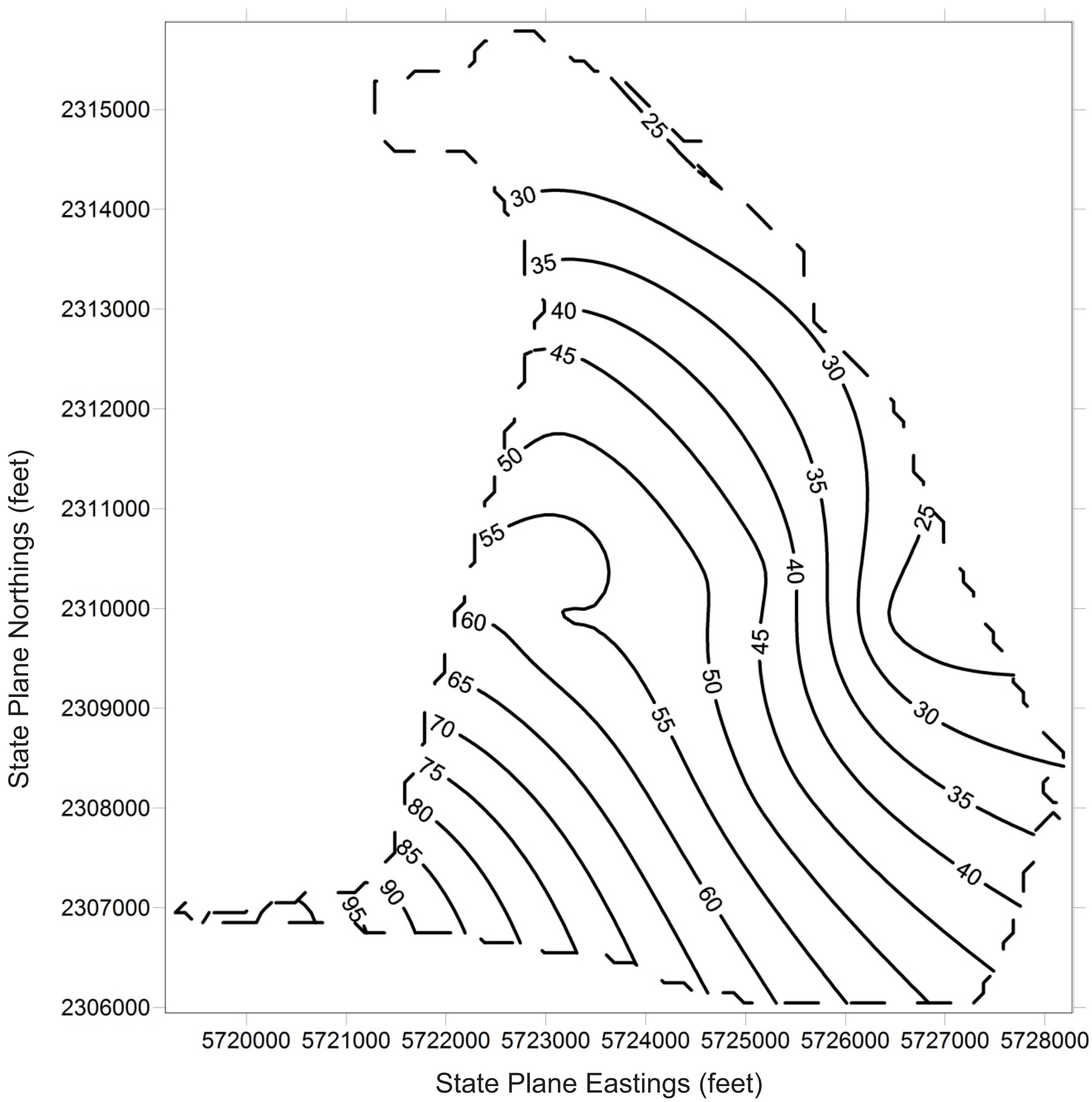
WELLS USED FOR GROUNDWATER ELEVATION CONTOURS
2019 GROUNDWATER STORAGE CALCULATIONS

FIRST WATER		UPPER AQUIFER		LOWER AQUIFER	
SPRING	FALL	SPRING	FALL	SPRING	FALL
FW2	FW2	UA1	UA1	LA1	LA1
FW3	FW3	UA2	UA2	LA2	LA2
FW4	FW4	UA3	UA3	LA3	LA3
FW5	FW5	UA4	UA4	LA4	LA4
FW6	FW6	UA5	UA5	LA5	LA5
FW8	FW8	UA6	UA6	LA6	LA6
FW9	FW9	UA8	UA8	LA8	LA8
FW10	FW10	UA9	UA9	LA9	LA9
FW11	FW11	UA10	UA10	LA10	LA10
FW12	FW12	UA12	UA12	LA11	LA11
FW13	FW13	UA16	UA16	LA12	LA12
FW15	FW15	UA17	UA17	LA13	LA13
FW17	FW17	FW2	FW2	LA14	LA14
FW18	FW18	FW3	FW3	LA15	LA15
FW19	FW19	FW4	FW4	LA16	LA16
FW20	FW20	FW5	FW5	LA18	LA18
FW21	FW21	FW6	FW6	LA19	LA19
FW22	FW22	FW8	FW8	LA20	LA20
FW23	FW23	FW9	FW9	LA21	LA21
FW24	FW24	FW10	FW10	LA24	LA24
FW26	FW26	FW11	FW11	LA25	LA25
FW27	FW27	FW12	FW12	LA26	LA26
FW28	FW28	FW15	FW15	LA27	LA27
FW29	FW29	FW24	FW24	LA28	LA28
FW30	FW30	FW26	FW26	LA29	LA29
FW31	FW31	FW27	FW27	LA30	LA30
FW32	FW32	FW29	FW29	LA33	LA33
FW33	FW33	FW32	FW32	LA34	LA34
LA34	LA34	FW33	FW33	LA35	LA35
LA35	LA35	LA34	LA34	LA36	LA37
LA36	LA37	LA35	LA35	LA37	LA38
LA37	LA38	LA37	LA37	LA38	LA39
LA38		LA38	LA38	LA39	LA41
				FW27	FW27

NOTE: Wells LA34, LA35, LA37, and LA38 represent the shallowest available water level data in the Eastern Area, and are included in the First Water and Upper Aquifer contour data sets for improved lateral control. Well FW27 is located where maximum recharge to lower aquifer from stream seepage likely occurs and provides control for all aquifers locally.

EXAMPLE STORAGE CALCULATION FOR EASTERN AREA:

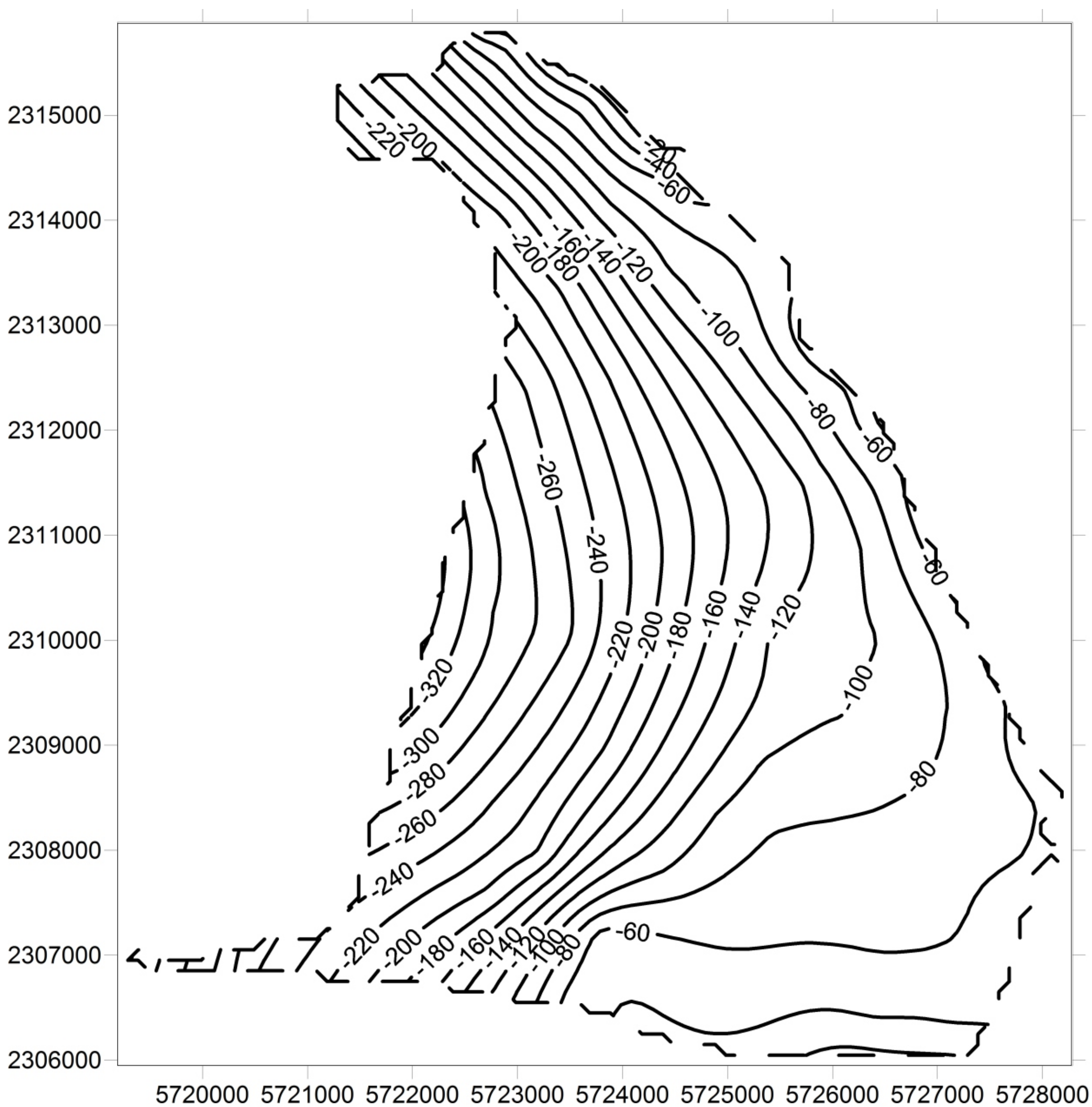
STEP 1: GRID AND TRIM WATER LEVEL CONTOURS



Spring 2019
Eastern Area Water Levels
Alluvial Aquifer and Lower Aquifer

EXAMPLE STORAGE CALCULATION FOR EASTERN AREA:

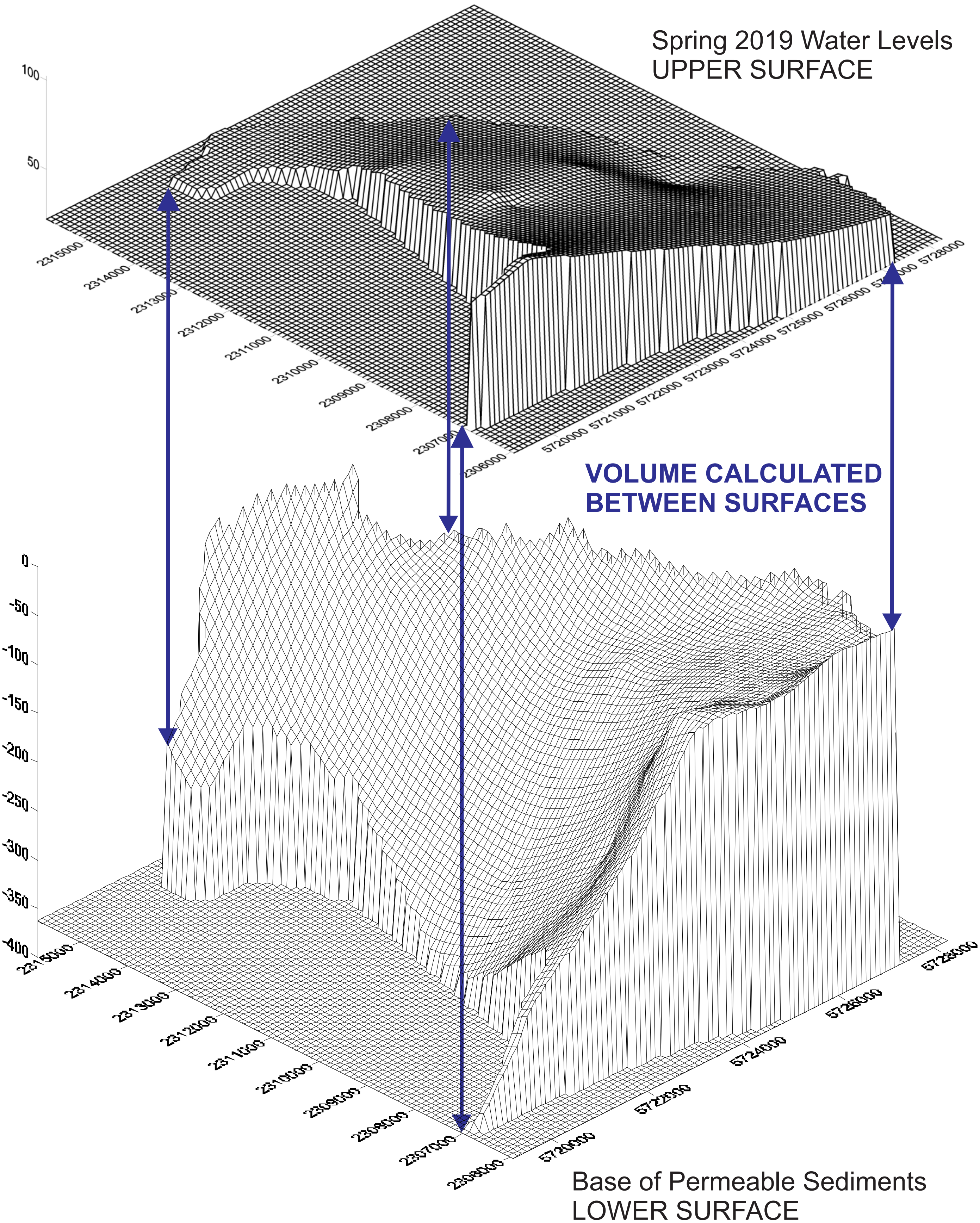
STEP 2: GRID AND TRIM BASE OF PERMEABLE SEDIMENTS



Eastern Area
Base of Permeable Sediments

EXAMPLE STORAGE CALCULATION FOR EASTERN AREA:

STEP 3: MATCH UPPER AND LOWER SURFACE GRIDS



EXAMPLE STORAGE CALCULATION FOR EASTERN AREA:

STEP 4: VOLUME COMPUTATION

Grid Volume Computations

Thu Apr 30 11:36:49 2020

Upper Surface

Grid File Name: C:\Users\HP TITAN\Desktop\Projects\Los Osos BMC\2019\BMC 2019 Annual Report\Working Data - REPORT\Contouring and Storage\BLANKED FILES\EASTERN\UpperEasternSpring2019_2.grd
Grid Size: 100 rows x 92 columns

X Minimum:	5719189
X Maximum:	5728284
X Spacing:	99.945054945055
Y Minimum:	2305947
Y Maximum:	2315886
Y Spacing:	100.39393939394
Z Minimum:	21.943506011439
Z Maximum:	105.61618312288

Lower Surface

Grid File Name: C:\Users\HP TITAN\Desktop\Projects\Los Osos BMC\2019\BMC 2019 Annual Report\Working Data - REPORT\Contouring and Storage\BASE GEOMETRY\EASTERN\BOP Eastern blanked.grd
Grid Size: 100 rows x 92 columns

X Minimum:	5719189
X Maximum:	5728284
X Spacing:	99.945054945055
Y Minimum:	2305947
Y Maximum:	2315886
Y Spacing:	100.39393939394
Z Minimum:	-362.32467224801
Z Maximum:	2.39586300134

Volumes

Z Scale Factor: 1

Total Volumes by:

Trapezoidal Rule:	8357283464.7463
Simpson's Rule:	8352776080.7164
Simpson's 3/8 Rule:	8349030749.8172

EXAMPLE STORAGE CALCULATION FOR EASTERN AREA:

STEP 5: CALCULATE GROUNDWATER IN STORAGE

Cut & Fill Volumes

Positive Volume [Cut]:	8357283464.7463
Negative Volume [Fill]:	0
Net Volume [Cut-Fill]:	8357283464.7463

Areas

Planar Areas

Positive Planar Area [Cut]:	41665677.518315
Negative Planar Area [Fill]:	0
Blanked Planar Area:	48729527.481685
Total Planar Area:	90395205

Surface Areas

Positive Surface Area [Cut]:	41787568.574995
Negative Surface Area [Fill]:	0

STORAGE CALCULATION

Positive Volume: 8,357,283,464.75 ft^3 * 0.101 specific yield ÷ 43,560 acre-feet per ft^3 = 19,377 acre-feet

BINSCARTH TEST HOLE (C&A, 2005)						
Lithology	***Start Depth***	***End Depth***	***Thickness***	***Specific Yield (percent)****	***Zone***	***Weighted Specific Yields (percent)***
						Weighted Specific Yield
sand	0	33	33	20	C	
clayey sand	33	38	5	10		
sand	38	48	10	20		
clayey sand	48	56	8	10		
sand	56	114	58	20		
clayey sand	114	152	38	10		Weighted Specific Yield
sand and gravel	152	214	62	18		17
clayey sand	214	228	14	10	D	
sandy clay	228	234	6	5		
clayey sand	234	254	20	10		
sandy clay	254	262	8	5		
sand	262	288	26	20		
sandy clay	288	298	10	5		
clayey sand	298	320	22	10		Weighted Specific Yield
sand	320	346	26	20		13
clayey sand	346	364	18	10	E	
sand	364	378	14	20		
clay	378	386	8	3		
sand and gravel	386	510	124	18		
sandstone with gravel	510	550	40	15		Weighted Specific Yield
sandstone	550	580	30	15		16.1
siltstone	580	640	60		BEDROCK	
silty clay	640	660	20			
Total Depth	660	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**15.7**

Cleath & Assoc., Seawater Intrusion Assessment and Lower Aquifer Source Investigation of the Los Osos Valley Groundwater Basin , October 2005

ML-2 (Webber, Hayes & Assoc., 2001)						
Lithology	***Start Depth***	***End Depth***	***Thickness***	***Specific Yield (percent)****	***Zone***	***Weighted Specific Yields (percent)***
sand	0	17	17	unsaturated	A+B	
silty sand	17	51	34			
clayey sand	51	62	11	10		
silty sand	62	89	27	10		Weighted Specific Yield
sandy clay	89	94	5	5		9.4
Total Depth	94	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**9.4**

Webber, Hayes & Assoc., Site Investigation Report, Bear Valley Chevron, August 29, 2001

ML-3 (Webber, Hayes & Assoc., 2001)

Lithology	Start Depth	End Depth	Thickness	Specific Yield (percent)*	Zone	Weighted Specific Yields (percent)
sand	0	22	22	unsaturated	A+B	
sand with silt	22	26.5	4.5			
sand	26.5	29	2.5			
silty sand	29	50	21	10		
clayey sand	50	55	5	10		
silty sand	55	91	36	10		
sandy clay	91	92	1	5		Weighted Specific Yield
clay	92	97	5	3		9.4
Total Depth	97	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**9.4**

ML-4 (Webber, Hayes & Assoc., 2001)

Lithology	Start Depth	End Depth	Thickness	Specific Yield (percent)*	Zone	Weighted Specific Yields (percent)
sand	0	22	22	unsaturated	A+B	
silty sand	22	30	8			
sand	30	33	3			
silty sand	33	51	18	10		
clayey sand	51	56.5	5.5	10		
silty sand	56.5	103.5	47	10		Weighted Specific Yield
clay	103.5	107	3.5	3		9.7
clayey gravel	107	109	2		C	
clay	109	110	1			
Total Depth	107	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**9.7**

ML-7 (Webber, Hayes & Assoc., 2001)

Lithology	Start Depth	End Depth	Thicknes s	Specific Yield (percent)*	Zone	Weighted Specific Yields (percent)
sand	0	19	19	unsaturated	A+B	
silty sand	19	32.5	13.5			
sand	32.5	37.5	5			
silty sand	37.5	101.5	64	10		Weighted Specific Yield
clay	101.5	108	6.5	3		9.4
clayey gravel with sand	108	111	3	7	C	
sandy clay	111	115	4	5		
clayey gravel with sand	115	118	3	7		
sandy clay	118	136	18	5		
clayey gravel with sand	136	154	18	7		Weighted Specific Yield
silty sand	154	175	21	10		7.3
Total Depth	175	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**8.3**

Webber, Hayes & Assoc., Site Investigation Report, Bear Valley Chevron, August 29, 2001

ML-8 (Webber, Hayes & Assoc., 2001)

Lithology	*Start Depth*	*End Depth*	*Thickness*	*Specific Yield (percent)**	*Zone*	*Weighted Specific Yields (percent)*
sand	0	17	17	unsaturated	A+B	
silty sand	17	26	9			
sand	26	36	10			
silty sand	36	51	15			
clay	51	52	1			
clayey sand with gravel	52	58	6			
silty sand	58	101.5	43.5	10		Weighted Specific Yield
clay	101.5	103	1.5	3		9.8
silty sand	103	105	2	10	C	
sandy clay	105	112	7	5		
clayey gravel with sand	112	114	2	7		
silty sand	114	115.5	1.5	10		
clayey gravel with sand	115.5	118	2.5	7		
sandy clay with gravel	118	120	2	7		
clayey sand	120	132	12	10		
sandy clay with gravel	132	136	4	7		
clayey gravel with sand	136	140	4	7		
clayey sand	140	144	4	10		
clayey gravel with sand	144	150	6	7		Weighted Specific Yield
silty sand	150	175	25	10		8.7
Total Depth	175	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**9.1**

WELL 30S/11E-7Q03 (LA12)

Lithology	*Start Depth*	*End Depth*	*Thickness*	*Specific Yield (percent)**	*Zone*	*Weighted Specific Yields (percent)*
sandy brown soil	0	6	6	unsaturated	C	
sand	6	17	11	20		
clay some gravel	17	20	3	7		
sand	20	48	28	20		
clay	48	52	4	3		Weighted Specific Yield
cemented sand	52	127	75	15		16
clay	127	230	103	3	D	
sand some gravel	230	245	15	18		Weighted Specific Yield
gravel	245	276	31	18		7.6
clay	276	325	49	3	E	
sand	325	332	7	20		
clay	332	343	11	3		
sand	343	350	7	20		
sand and gravel	350	356	6	18		
rock	356	357	1	15		Weighted Specific Yield
sand and gravel	357	402	45	18		11.1
clay	402	411	9	3	BEDROCK	
Total Depth	411	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**11.3**

WELL 30S/10E-12J01 (LA11)						
Lithology	***Start Depth***	***End Depth***	***Thickness***	***Specific Yield (percent)****	***Zone***	***Weighted Specific Yields (percent)***
sand	5	27	22	20	C	
clay	27	32	5	3		
sand and peat	32	70	38	5		
clay	70	72	2	3		Weighted Specific Yield
gravel	72	82	10	18		10.8
clay	82	96	14	3	D	
sand	96	100	4	20		
silt	100	135	35	5		
clay	135	157	22	3		
gravel	157	158	1	18		
sand	158	169	11	20		
sand and clay	169	194	25	5		
gravel	194	205	11	18		Weighted Specific Yield
sand and clay	205	217	12	5		7.3
clay	217	222	5	3	E	
sand and clay	222	245	23	5		
sand and gravel	245	257	12	18		
sand	257	264	7	20		
sand and gravel	264	274	10	18		
sand	274	290	16	20		
sand and silt	290	304	14	5		
sand	304	323	19	20		
sand and clay	323	330	7	5		
clay	330	339	9	3		
sand	339	341	2	20		
clay	341	346	5	3		
sand	346	352	6	20		
sand and clay	352	356	4	5		
sand	356	370	14	20		Weighted Specific Yield
sand and gravel	370	386	16	18		13.4
clay	386	392	6		BEDRO CK	
shale	392	402	10			
Total Depth	402	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**10.5**

** Johnson, A. I., 1967, Specific Yield - Compilation of Specific Yields for Various Materials, U.S. Geological Survey Water Supply Paper 1662-D*

WELL 30S/10E-13L04 (LA6)

Lithology	*Start Depth*	*End Depth*	*Thickness*	*Specific Yield (percent)**	*Zone*	*Weighted Specific Yields (percent)*
top soil	0	19	19	unsaturated	A+B	
clay, some gravel and sand	19	26	7			
gravel, clay and sand	26	41	15			Weighted Specific Yield
fine sand	41	61	20	20		20
clay, sand, small rocks	61	71	10	7	C	
clay, few pebbles	71	75	4	3		
fine gravel and sand	75	81	6	18		
sandy clay	81	95	14	5		
hard clay	95	97	2	3		
fine sand	97	115	18	20		
clay	115	118	3	3		
sand and gravel	118	149	31	18		
reddish brown clay, pebbly	149	164	15	7		
gravel	164	170	6	18		Weighted Specific Yield
sand and clay	170	190	20	5		11.7
tan clay, some gravel	190	210	20	7	D	
hard green clay	210	240	30	3		
tan sand	240	248	8	20		
clay and sand	248	260	12	5		
fine sand	260	277	17	20		
gravel	277	283	6	18		
fine sand	283	293	10	20		
fine gravel	293	310	17	18		
sand and clay	310	340	30	5		
coarse gravel	340	356	16	18		Weighted Specific Yield
gravel and clay	356	370	14	7		10.8
fine sand	370	394	24	20	E	
coarse gravel boulders	394	426	32	18		
gravel	426	456	30	18		
clay sand and gravel	456	500	44	7		
sand clay and gravel	500	570	70	7		
gravel and clay	570	600	30	7		
silt and clay	600	619	19	5		
black mud	619	621	2	3		Weighted Specific Yield
gravel	621	670	49	18		12
hard clay, sandstone	670	675	5		BEDROCK	Weighted Specific Yield
Total Depth	675	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**11.8**

WELL 30S/11E-16Na (LA28)

Lithology	*Start Depth*	*End Depth*	*Thickness*	*Specific Yield (percent)**	*Zone*	*Weighted Specific Yields (percent)*
soil	0	12	12	unsaturated	Qal	
clay	12	20	8			
fine sand	20	30	10	15		
shale and gravel	30	32	2	21		
fine sand	32	40	8	15		
fine sand and clay	40	57	17	5		Weighted Specific Yield
gravel and wood	57	60	3	21		11.5
clay and sand	60	65	5	5	D	
clay	65	70	5	3		
sand	70	100	30	20		
sand and clay	100	108	8	5		
sand and gravel	108	135	27	18		
clay	135	171	36	3		
clay and sand	171	200	29	5		Weighted Specific Yield
sand	200	207	7	20		10.6
clay	207	225	18	3	E	
fine sand	225	250	25	20		
clay and sand	250	255	5	5		
clay	255	258	3	3		
fine sand and gravel	258	275	17	18		
clay and sand	275	290	15	5		
fine sand	290	320	30	20		Weighted Specific Yield
sandstone gravel	320	340	20	18		14.5
sandstone	340	358	18	15	BEDROCK	Weighted Specific Yield
Total Depth	358	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**12.3**

WELL 30S/11E-17A01 (LA33)

Lithology	*Start Depth*	*End Depth*	*Thicknes s*	*Specific Yield (percent)**	*Zone*	*Weighted Specific Yields (percent)*
adobe and gravel	0	11	11	unsaturated	Qal	
clay	11	25	14			
gravel	25	28	3	21		
clay and gravel	28	34	6	7		Weighted Specific Yield
gravel	34	38	4	21		14.5
clay	38	70	32	3	D	
sand some gravel	70	71	1	18		
clay	71	78	7	3		
sand and gravel	78	86	8	18		
clay	86	90	4	3		
gravel and sand	90	92	2	18		
hard clay	92	95	3	3		
gravel and sand	95	101	6	18		Weighted Specific Yield
hard clay	101	107	6	3		6.7
Total Depth	107	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**7.9**

WELL 30S/11E-17C01 (LA23)

Lithology	*Start Depth*	*End Depth*	*Thickness*	*Specific Yield (percent)**	*Zone*	*Weighted Specific Yields (percent)*
sandy soil	0	3	3	unsaturated	A+B	
sand	3	28	25			
sandy clay	28	34	6	5		Weighted Specific Yield
sand	34	48	14	20		15.5
clay	48	52	4	3	C	
sand and gravel	52	56	4	18		
clay	56	76	20	3		
clay and gravel	76	80	4	7		
sandy clay	80	91	11	5		
sand	91	104	13	20		
clay	104	108	4	3		Weighted Specific Yield
sand	108	114	6	20		9.4
silty clay	114	148	34	5	D	
sandy clay	148	165	17	5		
sand	165	183	18	20		Weighted Specific Yield
sand and gravel	183	230	47	18		12.6
clay	230	236	6	3	E	
sandy clay	236	246	10	5		
sand and gravel	246	254	8	18		Weighted Specific Yield
clay	254	270	16	3		6.5
Total Depth	270	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**11**

WELL 30S/11E-17E7 (LA21)

Lithology	*Start Depth*	*End Depth*	*Thickness*	*Specific Yield (percent)**	*Zone*	*Weighted Specific Yields (percent)*
sand	0	55	55	unsaturated	C	
sandy clay	55	60	5	5		
sand	60	94	34	20		Weighted Specific Yield
sandy clay	94	126	32	5		12.2
sand with gravel	126	136	10	18	D	
sandy clay	136	168	32	5		
silty sand	168	180	12	10		
sandy clay	180	184	4	5		
sand with gravel	184	210	26	18		
silty clay	210	220	10	5		
silty sand	220	230	10	10		
silty /sandy clay	230	270	40	5		
silty sand	270	290	20	10		
clay	290	314	24	3		
silt and sand	314	320	6	10		
sandy / silty clay	320	352	32	5		
clayey sand	352	364	12	10		Weighted Specific Yield
silty sand	364	382	18	10		8.2
sandy clay	382	430	48	5	E	
silty sand	430	434	4	10		
clay	434	442	8	3		
silty sand	442	468	26	10		
sand	468	474	6	20		
sandstone	474	492	18	15		
clay	492	498	6	3		Weighted Specific Yield
sandstone	498	518	20	15		9.4
franciscan	518	560	42		BEDROCK	Weighted Specific Yield
Total Depth	560	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**9.9**

WELL 30S/11E-17J01 (LA24)

Lithology	Start Depth	End Depth	Thickness	Specific Yield (percent)*	Zone	Weighted Specific Yields (percent)
all inferred from e-log						
no data	0	8	8	unsaturated	C	
clay	8	15	7			
sandy clay	15	37	22	5		
clay	37	40	3	3		
sandy clay	40	48	8	5		Weighted Specific Yield
sand	48	72	24	20		11.2
sandy clay	72	118	46	5	D	
sand	118	128	10	20		
sandy clay	128	150	22	5		
sand	150	163	13	20		
clay	163	168	5	3		Weighted Specific Yield
sand	168	189	21	20		10.6
sandy clay	189	214	25	5	E	
sand	214	220	6	20		
clay with sand beds	220	232	12	5		
sand, some clay	232	244	12	15		
clay	244	262	18	3		
sandy clay	262	271	9	5		
clay	271	278	7	3		
sandy clay	278	291	13	5		
clay	291	297	6	3		
sandy clay and clay	297	315	18	5		
clay	315	319	4	3		Weighted Specific Yield
sand	319	329	10	20		7.1
rock	329	333	4		BEDROCK	
Total Depth	333	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**9.1**

17N4

Lithology	Start Depth	End Depth	Thickness	Specific Yield (percent)*	Zone	Weighted Specific Yields (percent)
top soil	0	4	4	unsaturated	A+B	
sand	4	25	21	20		
sand	25	38	13	20		
clay	38	40	2	3		Weighted Specific Yield
sand	40	68	28	20		19.5
Total Depth	68	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**19.5**

WELL 30S/11E-17N10 (LA20)						
Lithology	***Start Depth***	***End Depth***	***Thickness***	***Specific Yield (percent)****	***Zone***	***Weighted Specific Yields (percent)***
fill	0	3	3	unsaturated	A+B	
sand	3	37	34			
clay	37	42	5	3		
gravelly clay	42	50	8	7		
clay	50	58	8	3		
sand and gravel	58	81	23	18		
sand	81	92	11	20		Weighted Specific Yield
sand and gravel	92	98	6	18		13.7
clayey sand	98	120	22	5	C	
sand and gravel	120	150	30	18		
clayey gravel	150	170	20	7		
gravelly sand	170	187	17	18		
gravelly clay	187	197	10	7		Weighted Specific Yield
sandy gravel	197	210	13	18		12.5
clay	210	225	15	3	D	
sand and gravel	225	250	25	18		
sandy clay	250	260	10	5		
sand and gravel	260	270	10	18		
gravelly clay	270	275	5	7		
gravelly sand	275	290	15	18		
sandy clay	290	320	30	5		Weighted Specific Yield
sand	320	400	80	20		14.6
sandy clay	400	480	80	5	E	
gravelly sand	480	530	50	18		
sand / silty sand	530	630	100	5		Weighted Specific Yield
sandy clay	630	750	120	5		6.9
Total Depth	750	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**9.9**

WELL 30S/11E-18F02 (LA13)						
Lithology	***Start Depth***	***End Depth***	***Thickness***	***Specific Yield (percent)****	***Zone***	***Weighted Specific Yields (percent)***
sand	0	45	45	unsaturated	C	
clay	45	65	20			
gravel and sand	65	70	5			
clay	70	80	10			
clay and gravel	80	105	25	7		
clay	105	117	12	3		
shale gravel	117	120	3	18		
sandy clay	120	170	50	5		
sand and gravel	170	180	10	18		
clay	180	245	65	3		Weighted Specific Yield
gravel and sand	245	255	10	18		6.1
clay	255	280	25	3	D	
sand, some gravel	280	285	5	18		
clay	285	300	15	3		
clay, gravel sand	300	340	40	10		
sandy clay	340	420	80	5		Weighted Specific Yield
sandy shale gravel	420	455	35	5		5.9
clay	455	537	82	3	E	
hard sandstone	537	555	18	15		
sand and gravel	555	600	45	18		Weighted Specific Yield
gravel and sea shells	600	610	10	18		9.7
shale	610	645	35		BEDROCK	
Total Depth	645	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**6.2**

WELL 30S/11E-18K08 (LA18)

Lithology	Start Depth	End Depth	Thickness	Specific Yield (percent)*	Zone	Weighted Specific Yields (percent)
Sand	50	110	60	20	A & B	20.00
sandy clay	110	132	22	5	C	
cemented sand	132	151	19	15		
sandy clay	151	158	7	5		
sand	158	195	37	20		
sandy clay	195	200	5	5		
sand	200	225	25	20		
sandy clay	225	235	10	5		
sand	235	254	19	20		
sandy clay	254	260	6	5		Weighted Specific Yield
sand with gravel	260	264	4	18		14.5
sandy clay	264	288	24	5	D	
clayey sand	288	305	17	10		
sandy clay	305	310	5	5		
clayey sand	310	324	14	10		
clay with sand	324	350	26	5		
silty sand	350	370	20	10		
sandy clay	370	380	10	5		
sand	380	386	6	20		
sandy clay	386	395	9	5		Weighted Specific Yield
silty sand	395	490	95	10		8.6
clay sandy clay	490	515	25	3	E	
silty sand	515	592	77	10		Weighted Specific Yield
sand with seashells	592	660	68	20		13
Total Depth	660	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**12.4**

WELL 30S/11E-18M01 (LA16)

Lithology	Start Depth	End Depth	Thickness	Specific Yield (percent)*	Zone	Weighted Specific Yields (percent)
fine brown sand	40	70	30	20	C	
sand, sandy clay	70	160	90	5		Weighted Specific Yield
sand	160	165	5	20		9.2
sandy clay	165	245	80	5	D	
sandy clay with gravel	245	275	30	7		
sandy clay	275	350	75	5		Weighted Specific Yield
sand and gravel	350	372	22	18		6.7
sandy clay with gravel	372	392	20	7	E	
sandy clay	392	460	68	5		
sandy clay with gravel	460	490	30	7		
sandy clay	490	536	46	5		
sand and gravel	536	562	26	18		Weighted Specific Yield
sandy clay with gravel	562	630	68	7		7.2
Total Depth	630	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**7.4**

WELL 30S/11E-19H2 (LA19)

Lithology	*Start Depth*	*End Depth*	*Thickness*	*Specific Yield (percent)**	*Zone*	*Weighted Specific Yields (percent)*
sand	0	73	73	unsaturated	C	
silty mudstone with gravel	73	93	20			
sand and clay	93	103	10			
gravel	103	180	77			Weighted Specific Yield
gravel, clay, silt	180	220	40			
gravel, clay, silt	220	260	40	15	D	
clay, silt, some sand and gravel	260	290	30	7		Weighted Specific Yield
sand with silty clay	290	380	90	7		9
silty clay	380	460	80	5	E	
silty clay, gravel	460	520	60	15		
gravel and clay	520	535	15	15		
silty fine sand	535	680	145	10		Weighted Specific Yield
silt with clay	680	740	60	5		9.1
Total Depth	740	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**9.1**

WELL 30S/11E-20Aa (LA25)

Lithology	*Start Depth*	*End Depth*	*Thickness*	*Specific Yield (percent)**	*Zone*	*Weighted Specific Yields (percent)*
soil	0	2	2	unsturated	Qa	
clay	2	18	16			
sand and gravel	18	40	22	21		Weighted Specific Yield
fine sand	40	60	20	15		18.1
clay	60	110	50	3	D	
fine sand	110	123	13	15		
clay	123	130	7	3		
fine sand and gravel	130	133	3	18		
clay	133	135	2	3		
sand and gravel	135	137	2	18		
clay and sand	137	152	15	5		
sand and gravel	152	154	2	18		
clay	154	165	11	3		
fine sand	165	175	10	15		Weighted Specific Yield
fine sand and gravel	175	180	5	18		7.1
clay	180	230	50	3	E	
fine sand	230	240	10	15		Weighted Specific Yield
sand and gravel	240	350	110	18		13.4
sandstone	350	360	10		BEDROCK	Weighted Specific Yield
Total Depth	360	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**11.7**

WELL 30S/11E-20A02 (FW26)

Lithology	***Start Depth***	***End Depth***	***Thickness***	***Specific Yield (percent)****	***Zone***	***Weighted Specific Yields (percent)***
top soil	0	18	18	unsaturated	Qal	
clay	18	33	15	3		
gravel	33	44	11	21		
clay	44	46	2	3		
gravel and clay	46	58	12	7		Weighted Specific Yield
gravel	58	65	7	21		10.9
clay	65	95	30		D	
Total Depth	95	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**10.9**

WELL 30S/11E-20G02 (LA26)

Lithology	***Start Depth***	***End Depth***	***Thickness***	***Specific Yield (percent)****	***Zone***	***Weighted Specific Yields (percent)***
silty-clay-soil	0	11	11	unsaturated	Qal	
gravel	11	15	4			
clayey sand	15	53	38	10		Weighted Specific Yield
gravel	53	55	2	21		10.6
clayey sand	55	75	20	10	C	10
clay	75	117	42	3	D	
gravel	117	120	3	18		
sand	120	197	77	20		Weighted Specific Yield
coarse sand and gravel	197	213	16	18		14.6
clayey sand	213	290	77	10	E	
sand	290	315	25	20		Weighted Specific Yield
gravelly sand	315	335	20	18		13.4
bedrock, tight rock	335	380	45	15	BEDROCK	
Total Depth	380	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**13.3**

WELL 30S/11E-24A2 (LA17)						
Lithology	***Start Depth***	***End Depth***	***Thickness***	***Specific Yield (percent)****	***Zone***	***Weighted Specific Yields (percent)***
					C	
sand	0	207	207	unsaturated		
gravelly clay	207	276	69	7	D	
gravel some clay and sand	276	328	52	18		
sand	328	346	18	20		
clay	346	370	24	3		Weighted Specific Yield
clay and sand	370	380	10	5		11
clay	380	432	52	3	E	
clay and sand	432	650	218	5		
sand and gravel	650	817	167	18		Weighted Specific Yield
sand and gravel	817	960	143	18		11.8
Total Depth	960	**BOREHOLE WEIGHTED SPECIFIC YIELD (PERCENT)**				**11.6**

** Johnson, A. I., 1967, Specific Yield - Compilation of Specific Yields for Various Materials, U.S. Geological Survey Water Supply Paper 1662-D*