LOS OSOS GROUNDWATER BASIN, BASIN MANAGEMENT COMMITTEE

NOTICE OF MEETING

NOTICE IS HEREBY GIVEN that the Los Osos Groundwater Basin, Basin Management Committee Board of Directors will hold a **Regular Board Meeting** at **1:30 P.M.** on **Wednesday, June 16, 2021.** Based on the threat of COVID-19 as reflected in the Proclamations of Emergency issued by both the Governor of the State of California and the San Luis Obispo County Emergency Services Director, as well as the Governor's Executive Order N-29-20 issued on March 17, 2020 relating to the convening of public meetings in response to the COVID-19 pandemic, this meeting will be conducted as a phone-in/web-based meeting only. There will be no physical meeting location for this BMC Meeting. Members of the public can participate via phone or by logging into the web-based meeting.

For quick access, go to https://us04web.zoom.us/j/778762508
(This link will help connect both your browser and telephone to the call)
If not using a computer, dial 1 (669) 900-6833 or 1 (346) 248-779 and enter **778 762 508**

All persons desiring to speak during any Public Comment can submit a comment by:

- Email at dheimel@wsc-inc.com by 5:00 PM on the day prior to the Committee meeting.
- Teleconference by phone at 1 (669) 900-6833 and enter **778 762 508**
- Teleconference by phone at 1 (346) 248-7799 and enter **778 762 508**
- Teleconference meeting at https://us04web.zoom.us/j/778762508
- Mail by 5:00 PM on the day prior to the Committee meeting to:
  Attn: Dan Heimel (Basin Management Committee)
  2122 9th St.
  Suite 110
  Los Osos, CA 93402

Additional information on how to submit Public Comment is provided on page 3 of this Agenda

Directors: Agenda items are numbered for identification purposes only and may not necessarily be considered in numerical order.

NOTE: The Basin Management Committee reserves the right to limit each speaker to three (3) minutes per subject or topic. In compliance with the Americans with Disabilities Act and Executive Order N 29-20, all possible accommodations will be made for individuals with disabilities, so they may participate in the meeting. Persons who require accommodation for any audio, visual or other disability in order to participate in the meeting of the BMC are encouraged to request such accommodation 48 hours in advance of the meeting from Dan Heimel at dheimel@wsc-inc.com.

BASIN MANAGEMENT COMMITTEE BOARD OF DIRECTORS AGENDA

1. **CALL TO ORDER**

2. **ROLL CALL**

3. **BOARD MEMBER COMMENTS**

   Board members may make brief comments, provide project status updates, or communicate with other directors, staff, or the public regarding non-agenda topics.

4. SPECIAL PRESENTATION

Presentation from San Luis Obispo County staff regarding:

1. The County's role in land use and resource management decisions affecting Los Osos
2. Overview and relationship of County planning documents and studies
3. Timeline for pending County planning documents and studies

5. CONSENT AGENDA

The following routine items listed below are scheduled for consideration as a group. Each item is recommended for approval unless noted and may be approved in their entirety by one motion. Any member of the public who wishes to comment on any Consent Agenda item may do so at this time. Consent items generally require no discussion. However, any Director may request that any item be withdrawn from the Consent Agenda and moved to the "Action Items" portion of the Agenda to permit discussion or to change the recommended course of action. The Board may approve the remainder of the Consent Agenda on one motion.

- **a. Approval of Minutes from May 19, 2021 Meeting**
- **b. Approval of Amended Minutes from March 25, 2021 Meeting**
- **c. 2021 Budget Update and Invoice Register**

6. PUBLIC COMMENTS ON ITEMS NOT APPEARING ON THE AGENDA

The Basin Management Committee will consider public comments on items not appearing on the agenda and within the subject matter jurisdiction of the Basin Management Committee. The Basin Management Committee cannot enter into a detailed discussion or take any action on any items presented during public comments at this time. Such items may only be referred to the Executive Director or other staff for administrative action or scheduled on a subsequent agenda for discussion. Persons wishing to speak on specific agenda items should do so at the time specified for those items. The presiding Chair shall limit public comments to three minutes.

7. EXECUTIVE DIRECTOR'S REPORT

8. ACTION ITEMS

a. Final Draft 2020 Annual Report

Recommendation: Receive the Final 2020 Annual Report and authorize submission to the Court or provide alternate direction to staff.

b. Update on potential geophysics opportunities for the Los Osos Basin

Recommendation: Receive an update on potential geophysics opportunities for the Los Osos Basin and provide direction to staff.

9. ADJOURNMENT

Notice of Meeting

LOS OSOS GROUNDWATER BASIN, BASIN MANAGEMENT COMMITTEE

*****CONFERENCE CALL/WEBINAR ONLY*****

Wednesday, June 16, 2021 at 1:30 PM

Important Notice Regarding COVID-19: Based on guidance from the California Department of Public Health and the California Governor's Office, in order to minimize the spread of the COVID-19 virus, please note the following:

1. The meeting will only be held telephonically and via internet via the number and website link information provided on the agenda. After each item is presented, Committee Members will have the opportunity to ask questions. Participants on the phone or on the computer will then be provided an opportunity to speak for 3 minutes as public comment prior to Committee deliberations and/or actions or moving on to the next item. If a participant wants to provide public comment on an item they should select the "Raise Hand" icon on the Zoom Online Meeting platform or press *9 if on the phone. The meeting host will then unmute the participant when it is their turn to speak and allow them to provide public comment.

2. The Committee's agenda and staff reports are available at the following website: https://www.slocounty.ca.gov/Departments/Public-Works/Committees-Programs/Los-Osos-Basin-Management-Committee-(BMC).aspx

3. If you choose not to participate in the meeting and wish to make a written comment on any matter within the Committee's subject matter jurisdiction, regardless of whether it is on the agenda for the Committee's consideration or action, please submit your comment via email or U.S. Mail by 5:00 p.m. on the day prior to the Committee meeting. Please submit your comment to Dan Heimel at dheimel@wsc-inc.com. Your comment will be placed into the administrative record of the meeting.

4. If you choose not to participate in the meeting and wish to submit verbal comment, please call (805) 457-8833 x104 and ask for Dan Heimel. If leaving a message, state and spell your name, mention the agenda item number you are calling about and leave your comment. The verbal comments must be received by no later than 9:00 a.m. on the morning of the noticed meeting and will be limited to 3 minutes. Every effort will be made to include your comment into the record, but some comments may not be included due to time limitations.

Mailing Address:
Attn: Dan Heimel
Basin Management Committee
2122 9th St.
Suite 110
Los Osos, CA 93402

All Americans with Disabilities Act (ADA) accommodations shall be promptly reviewed and resolved. Persons who require accommodations for any audio, visual or other disability in order to review an agenda, or to participate in the meeting of the Basin Management Committee per the ADA, are encouraged to request such accommodation 48 hours in advance of the meeting from Dan Heimel at (805) 457-8833 x104.

BASIN MANAGEMENT COMMITTEE BOARD OF DIRECTORS

Agenda Item 5a: Minutes of the Meeting of May 19, 2021

Agenda Item	Discussion or Action
1. CALL TO ORDER	Chairperson Ochylski called the meeting to order at 1:30 pm.
2. ROLL CALL	Daniel Heimel, Executive Director, called roll to begin the meeting. Chairperson Marshall Ochylski, Director Charlie Cote, Director Bruce Gibson and Vice Chairperson Mark Zimmer were present.
3. BOARD MEMBER COMMENTS	<u>**Board Comment**</u> None.
4. Special Presentation	None.
5. CONSENT AGENDA	
5a. Approval of Minutes of March 25, 2021 Meeting **5b. Approval of 2021 Budget Update and Invoice Register**	Review of minutes from March 25, 2021 meeting. <u>**Public Comment**</u> Keith Wimer: Correction to spelling of last name in Public Comment. <u>**Board Comment**</u> Chairperson Ochylski: Correction to Item 9: Date of next meeting should be changed from June 16 to May 19. <u>**Board Action**</u> The Board of Directors approved incorporating Consent Agenda with two changes commented above. **Ayes: Chairperson Ochylski, Director Cote Director Gibson, and Vice Chairperson Zimmer** **Nays: None** **Abstain: None** **Absent: None**
6. PUBLIC COMMENTS ON ITEMS NOT APPEARING ON THE AGENDA	<u>**Public Comment**</u> **Jeff Edwards:** Conflict of interest between Cleath-Harris and BMC; Objects to attention Sustainability Group garnered from BMC. **Linde Owen:** If nitrates come from Cabrillo Estates, horse farm and golf course, those entities should contribute; encourage S&T find nitrate source; supports Sustainability Group for ten years; put meters on private wells soon, partially paid by Basin Management Fund. <u>**Board Comment**</u> **Chairperson Ochylski:** Asked Counsel for response to conflict of interest comment by Jeff Edwards; Address at staff level.

7. EXECUTIVE DIRECTOR'S REPORT	**<u>Board Comment</u>** **Cote**: Proposals for changes to BMC initiatives status should be made directly to committee and unanimously approved; BMC should be more involved in Title 19 Water Offsets rather than County. **Zimmer:** Use caution in changes to plan; talk about staff level or unanimous vote; Title 19 review is positive news; difficult to provide good feedback to Coastal Commission due to many things happening at same time. Conservation update tied into Title 19 and 2:1 offset; conservation intended to manage existing users; take care in using conservation as offset programs. Appreciates Los Osos Sustainability letter but still working through. **Cote:** BMC should make formal recommendation to County regarding Wilde Coast Farms which states proposal should only approved if metering is placed and production data reported to BMC. Agendize for June meeting. **Heimel:** Planning Commission expects BMC review Wilde Coast Farms. Changes to Basin Plan would require BMC review and potential unanimous approval; transparent. **<u>Public Comment</u>** **Jeff Edwards:** Basin Plan Funding should be provided by new development; against JPA. Title 19 Update concern with how long; start with #5 – figure out how much water there is to conserve; Sea Pines and Broderson; latest daily discharge to Broderson; Wild Coast Farms has Water Management Plan out May 5 but nobody has analyzed; Will only SGMA basins be governed by Basin Management "Czar". **<u>Board Direction</u>** None.
8. ACTION ITEMS	
8a. Presentation of Draft 2020 Annual Report	Recommendation: Receive a presentation from BMC staff regarding the draft 2020 Annual Report and confirm June date for BMC meeting to approve final 2020 Annual Report for submission to the Court. **<u>Board Comment</u>** **Zimmer:** Tie expectations into action items; will help prioritize work. **Cote:** Interested in County paying for model. BMC should increase focus on deterioration of lower aquifer sources. Add "Upper Aquifer" to Nitrate Metric. Detailed explanations needed for adjustments made to non-metered estimates; missing from Annual Report. S&T inter-tie information should be put back. **Chairperson Ochylski:** Agree with previous director comments, and work together to analyze Sustainability Groups comments. **<u>Public Comment</u>** **Jeff Edwards**: Seawater ledge while Zone E has been sealed, Zone D still pumps; Palisades should be shut down. Written comments should be posted on website. BMC staff and Sustainability Group should do a written critical analysis of Wild Coast Farms Water Management Plan. **Linde Owen:** Explain how ag use is estimated, and how it shows a reduction. **Patrick McGibney**: Chair of LO Sustainability, concerned the Basin Plan has been underused; ADUs; will serve letter controversy. **Larry Reo**: Agricultural groundwater production should be set at 800 acre feet or higher; found significant estimation errors and unrealistic assumptions for ag water. 92% efficiency is unrealistic. Calculated estimates should be 50% instead of 92%. **Babak Naficy:** Attorney representing Sustainability Group; basis for raising yield should be 2400 instead of 2760, or explain that BMC is working on appropriate estimate of yield.

	Keith Wimer: Believes there is an error in metric in AMR regarding well LA3; Zone E seawater intrusion is getting worse. Annual Report changes to make easier for all stakeholders; water level data is not complete; 48 specific revisions to 2020 Draft Report. **Board Direction** 2020 Final Draft Report will be agenized for next meeting.
9. ADJOURNMENT	Meeting adjourned at approximately 3:30 PM. The next regularly scheduled meeting is on June 16, 2021 at 1:30 PM.

BASIN MANAGEMENT COMMITTEE BOARD OF DIRECTORS

Agenda Item 4a: Minutes of the Meeting of March 25, 2021

Agenda Item	Discussion or Action
1. CALL TO ORDER **2. ROLL CALL**	Chairperson Ochylski called the meeting to order at 1:30 pm. Daniel Heimel, Executive Director, called roll to begin the meeting. Chairperson Marshall Ochylski, Director Charlie Cote, and Vice Chairperson Mark Zimmer were present; Director Bruce Gibson was absent, but joined meeting at Item 4.
3. BOARD MEMBER COMMENTS	**Board Comment** None.
4. Special Presentation	Presentation on nitrate removal improvements and efficiencies. Introduced by Director Zimmer, with following comments encouraging Pilot Test concept for the BMC. Purolite Groundwater Remediation Specialist Kathy Swanson spoke about Nitrate Removal Overview, SST Resin, and Alternative Regenerants. Proposed Pilot program. Pilot unit will be automated, remote and will be available in 2-3 months. **Board Comment** **Cote:** Very interested in learning more. **Zimmer:** Decide if BMC or Golden State move forward on Pilot. **Ochylsk**i: Very interested as well to talk about it with staff. **Cote**: Possible to test on individual septic system? **Gibson**: Clarified County requirements for effluent discharge. **Public Comment** **Linde Owen**: Would the process contain toxins such as medical residual in the sludge? **Patrick McGibney**: How is this cost effective, compared to other nitrate removal, for the community? **Response to Public Comment** **Zimmer**: Brine waste stream disposal is the expensive but substantial savings achieved by regenerative. **Kathy Swanson**: Ion Exchange for nitrate removal would not remediate toxin residue, but process is focused on drinking water, rather than toxic-laden sewage.
5. CONSENT AGENDA	
5a. Approval of Minutes of January 20, 2021 Meeting. **5b. Approval of Budget Update and Invoice Register through December 2020**	Review of minutes from January 20, 2021 meeting. **Public Comment** **Linde Owen**: Appreciate extended minutes that are more understandable; budget question regarding AGP video services, and Monthly Meeting Administration cost is also very high. **Heimel response:** Open to input between balance of full transcript and time and effort; AGP reduced rate from $800 to $150 for editing and posting recording; Meeting Facilitation costs includes meeting, staff meetings, overseeing annual report – description will be updated.

	Board Comment **Cote**: Pull 5b for discussion.
5c. Approval of 2021 Budget Update and Invoice Register	**Board Action** The Board of Directors approved Item 5a and 5c. Item 5b deferred until after Executive Directors Report. **Ayes: Chairperson Ochylski, Director Gibson, and Vice Chairperson Zimmer** **Nays: None** **Abstain: Director Cote** **Absent: None**
6. PUBLIC COMMENTS ON ITEMS NOT APPEARING ON THE AGENDA	**Public Comment** **Linde Owen**: Inequity of private wells not contributing to Basin Management, hope it will be rectified possibly by ordinance; serious concern with drought. **Jeff Edwards**: Sustainability Group concern on several topics. **Patrick McGibney:** Read excerpt of letter from 2014 re: seawater intrusion. **Board Comment** None
7. EXECUTIVE DIRECTOR'S REPORT	**Board Comment** **Director Zimmer**: Sustainable Yield was revised from original and therefore needs vetting due to impact to basin yield metrics. Glad to see transducers going in. Evaluating basin metric is key analysis, and adaptive management is component. Water conservation: indoor use or total accurate today, or taken from previous report? **Heimel:** Update of Basin Yield Metric is crucial; envisions collaborative process on BMC making warranted changes; details will be discussed at future meetings. Water Conservation number has not been updated since 2019. County is evaluating conservation potential. **Director Gibson: T**ech memo on conservation potential is included in the Community Plan. **Public Comment** **Jeff Edwards:** Broderson needs loading; take water from Seapines. Funding Plans is unnecessary. Community Plan: Coastal Commission staff has not received as of March 10; ADUs will stay until Community Plan is done. **Keith Wimer:** Los Osos Sustainability Group, would like to present in future to explain points; support basin-wide funding plan. Nitrate removal. Conservation needs to be left for emergency situations. **Linde Owen:** ADU/retrofit program: there is a way to see how many have retrofitted from County. Only way to control water usage with ADUs is to charge for it. Broderson/mandate from Coastal Commission to offset ag use. **Patrick McGibney**: ADU/offset programs have no study to show effectiveness; rough estimate only. County is re-doing metrics on how offsets should be metered. **Board Direction** **Dan Heimel**: Respond to Public Comment.
8. ACTION ITEMS	

5b. Approval of Budget Update and Invoice Register through December 2020	**<u>Board Comment</u>** **Director Cote:** Are we still approving budget items for 2020; if so, it seems to be a violation of normal rules of budget; discuss at staff meeting. Heimel: Due to 4 separate parties, with billing procedures developed by BMC in 2020. At this time, the Cost Summary Table tracks this information but no mechanism to distinguish years. **Heimel:** Funding and Organizational working group is examining options to address budgeting and accounting limitations, as well as funding for all basin pumpers. **<u>Public Comment</u>** Linde Owen **<u>Board Direction</u>** Receive and file motion. **<u>Board Action</u>** **Ayes: Chairperson Ochylski, Director Gibson, Chris Gardner, and Vice Chairperson Zimmer** **Nays: None** **Abstain: None** **Absent: None**
8a. Review Preliminary Annual Report Findings	Recommendation: Receive and update on preliminary findings from 2020 Annual Report and provide direction to staff. **<u>Board Comment</u>** **Director Zimmer:** Use caution when changes are made; sustainable yield has changed once before. We've changed the Basin Yield Metrics, and now looking at another change; will affect analysis; Critical to look at projects, metrics and funding mechanisms before making additional changes today. **Heimel**: Correct; updates have been made to basin yield; updated number to account for completion of Basin Plan components. Comprehensive review of any changes by staff and BMC is critical. Next item will address. **Director Cote:** Concerned about small amount of time to review complicated document. **Heimel:** Sustainable yield metric is same used in 2017. **Director Gibson:** Need to move to transient model. **<u>Public Comment</u>** **Linde Owen** **Keith Wimer:** Error in draft; chloride level underestimated. **Patrick McGibney:** Why pending metric? **Jeff Edwards:** Include well abandonment program part of 2020 well monitoring, address with funding; make purveyor interconnectedness permanent.
8b. Formalize the Process for Implementation of Adaptive Management Plan	Recommendation: Approve the proposed approach and resolution for formalizing the procedures of implementing the Adaptive Management Plan or provide alternate direction to staff. **<u>Public Comment</u>** <u>**Jeff Edwards: C**ontinue this item off calendar since it's been on since Jan. 20th.</u> **Patrick McGibney: I**f this is adopted, will it slow or defer programs for population now; what is fiscal impact?

	Linde Owen: Costs, did the County write the resolution? Show process, who involved and how long? **<u>Board Action</u>** Defer
9. ADJOURNMENT	Meeting was adjourned at approximately 4:19 PM. The next regularly scheduled meeting is on May 19, 2021 at 1:30 PM.

Attachment 1: Cost Summary (January 2021 to Current Date) for Calendar Year 2021 Budget

Item	Description	Budget Amount	Approved Contingency Allocation	Updated Allocated Budget Amount	Costs Incurred	Percent Incurred	Remaining Budget
1	BMC Executive Director Facilitation- meeting facilitation, including preparation, staff coordination, and attendance	$70,000		$70,000	$21,195.00	30.3%	$48,805
2	Meeting Expenses - facility rent	$1,500		$1,500	$0.00	0.0%	$1,500
3	Meeting expenses - audio and video services	$6,000		$6,000	$150.00	2.5%	$5,850
4	Technical Support/Adaptive Management Services	$15,000		$15,000	$930.00	6.2%	$14,070
5	Semi Annual Seawater Intrusion Monitoring	$52,000		$52,000	$21,088.80	40.6%	$30,911
6	2020 Annual Report	$56,000		$56,000	$44,098.92	78.7%	$11,901
7	Grant Pursuit Contingency	$5,000		$5,000	$0.00	0.0%	$5,000
8	Funding and Organization Studies	$40,000		$40,000	$0.00	0.0%	$40,000
9	Recycled Water Beneficial Use Evaluation	$15,000		$15,000	$0.00	0.0%	$15,000
10	Implementation Initiative Evaluation	$25,000		$25,000	$0.00	0.0%	$25,000
	Subtotal	$285,500		$285,500	$87,463		$198,037
	10% Contingency (rounded to nearest $100)	$28,600					
	Total	**$314,100**			**$87,463**	**27.8%**	**$226,637**
	LOCSD (38%)	$119,358					
	GSWC (38%)	$119,358					
	County of SLO/SLOCFC&WCD (20%)	$62,820					
	S&T Mutual (4%)	$12,564					

Attachment 2: Invoice Register for Los Osos BMC for Calendar Year 2021

Vendor	Invoice No.	Amount	Month of Service	Description	Budget Item	Date Executive Director Approved	Date BMC Chairperson Approved	Date BMC Approved
WSC	5337	$11,520.00	Dec-20	Monthly Meeting Administration	1		Mar-21	
CHG	20210102	$13,728.92	Jan-21	Annual Report Preparation	6	Mar-21		
AGP	8386	$150.00	Jan-21	Video Production	3	Mar-21		
CHG	20210202	$5,342.50	Feb-21	Annual Report Preparation	6	Mar-21		
WSC	5558	$9,167.50	Jan-Mar-21	BMC Executive Director Facilitation	1		May-21	
CHG	20210303	$17,047.50	Mar-21	Annual Report Preparation	6	Apr-21		
CHG	20210304	$6,839.18	Mar-21	Semi Annual Seawater Intrusion Monitoring	5	Apr-21		
CHG	20210404	$7,110.00	Apr-21	Annual Report Preparation	6	May-21		
CHG	20210405	$11,079.62	Apr-21	Semi Annual Seawater Intrusion Monitoring	5	May-21		
CHG	20210406	$930.00	Apr-21	LOSG Meeting and Response to Comments	4			May-21
CHG	20210506	$870.00	May-21	Annual Report Preparation	6	Jun-21		
CHG	20210507	$3,170.00	May-21	Semi Annual Seawater Intrusion Monitoring	5	Jun-21		
WSC	5671	$12,027.50	Apr/May-21	BMC Executive Director Facilitation	1		Jun-21	
	2021 Total	**$87,462.72**						

To be approved

TO: **Los Osos Basin Management Committee**

FROM: **Dan Heimel, Executive Director**

DATE: **June 16, 2021**

SUBJECT: **Item 7 – Executive Director's Report**

Recommendations

Staff recommends that the Committee receive and file the report and provide staff with any direction for future discussions. Sections of the Executive Director's Report that have been updated or significantly changed from the previous meeting's version are underlined.

Discussion

This report was prepared to summarize administrative matters not covered in other agenda items and to provide a general update on staff activities.

Funding and Financing Programs to Support Basin Plan Implementation

Prop 1 GWGP: As indicated in the January 2018 meeting, the State Board confirmed that sea water intrusion mitigation projects under Program C are eligible for low interest loans but are not currently eligible for grants under the Proposition 1 Groundwater Grant Program (GWGP). New wells in the upper and lower aquifer are viewed as aquifer management, not aquifer clean-up as defined by the State, therefore we will need to look for future funding rounds and other opportunities. Round 3 of the Prop 1 GWGP is anticipated to be released in July of 2021. If aquifer clean-up projects (e.g. Community Nitrate Facility, Upper Aquifer Capture and Treatment) are proposed for further implementation of the Basin Plan the BMC could consider pursuing grant funding through this program.

IRWM: The Program A upper aquifer well at 8th Street was submitted by Los Osos CSD to the local IRWM process in 2019 and was subsequently selected to be a part of the application for the current funding opportunity. The application for this grant was submitted in December 2019 and the Project was included in the Department of Water Resource's July 2020 Final Funding Award List for the full grant request ($238,000).

Prop 1 SWGP: The concept of urban storm water recovery at 8th and El Moro was ranked in the County Stormwater Resource Plan, and a grant opportunity may be available through the Prop 1 Storm Water Grant Program (SWGP). The application period for Round 2 of SWGP funding has closed. The Stormwater Resource Plan can be found here:
https://www.slocounty.ca.gov/Departments/Public-Works/Committees-Programs/Stormwater-Resource-Plan.aspx
And information about the Storm Water Grant Program can be found here:
https://www.waterboards.ca.gov/water_issues/programs/grants_loans/swgp/prop1/

WRFP: The State Water Resource Control Board (SWRCB) recently increased the amount for Water Recycled Program Planning (WRFP) grants from \$75k to \$150k. This could provide a grant funding opportunity to advance Basin Plan initiatives, with a reduced cost to the community of Los Osos, through preparation of a Recycled Water Facilities Planning Study (RWFPS). Potential scope items for the RWFPS could include:

- Transient Groundwater Model Development
- Soil Aquifer Treatment (SAT) Assessment
- Broderson/Creek Discharge Scenario Analysis
- Stormwater and Perched Water Recovery Project – Feasibility Study
- Adaptive Management Groundwater Modeling
- RWFPS Report Development

Status of BMC Initiatives

Formalize Sustainable Yield: Updated production capacity at purveyor wells received for two of the three purveyors. Recycled water distribution updated. Will update sustainable yield for year-end 2020 and incorporate into 2021 Annual Report. Current draft BYM of 73 based on sustainable yield of 2,760 AFY from 2019 and 2020 production of 2010 AF (2010/2760*100 = 73).

Lower Aquifer Transducer Installation: Lower Aquifer Transducer Installation: In March CHG initiated requests for permission to access and install transducers in several County monitoring wells, a private well, and a purveyor well. The requests are still in process.

Basin Metric Evaluation: Analysis of alternative metric approaches in progress. This will be a separate TM for review after completion of annual report. Alternative metrics will be evaluated in 2021 and incorporate into the 2021 Annual Report. Draft TM anticipated in Summer/Fall 2021.

Recycled Water Beneficial Use Evaluation: Work on initiative to begin following completion of Annual Report preparations. Draft TM anticipated in August 2021.

Status of Basin Plan Implementation and Funding Plans

The BMC has requested an integrated funding plan for project implementation and BMC monitoring and administration. BMC Staff and BMC Party Staff have formed a Funding and Organizational Working Group to identify and evaluate potential future funding and organization structures for the BMC and implementation of the Basin Plan. Consistent with the Basin Plan, the Working Group is identifying and evaluating funding and organizational structures that will provide a long-term mechanism for funding BMC Administration and Basin Plan Implementation costs and that allocate costs equitably amongst all who benefit from the Basin's water resources.

The Working Group is reviewing previously completed analysis on BMC funding and organization structures, documenting the different alternatives and identifying data/information gaps that may require outside technical support. It is envisioned that the Working Group will prepare a summary of the different funding and organization structures, an outline scope of work for the Funding and Organization Study and recommended next steps for the BMC to consider for future funding of BMC Administration and Basin Plan Implementation costs.

JPA Formation: Staff level discussions continue to focus on the need for, and benefits of, forming a JPA, see table below, to assist with implementation of the Basin Plan.

Table 1. JPA Formation Considerations

Pros	Cons
• Common ownership of basin assets	• Complexity and community perception
• Ability to contract for services as an entity	• Potential for more difficulty in formal proceedings - less nimble
• GSWC can participate as a director	• More difficult to exit/change if needed
• Could cover entire limits of basin for funding	
• If carefully done, incremental costs could be limited to insurance and up-front legal expenses	
• Ability to carry-over funds from one budget year to another	

As indicated in previous meetings, it was determined that GSWC could serve as an appointed JPA director without forming a separate Mutual Water Company entity, which would simplify the process.

Discussions with BMC Party Staff indicate that the BMC Parties would like to execute the Implementation Plan initiative to first develop a roadmap for the BMC and then evaluate the potential formation of a JPA or other governance structure once there is a more defined plan for future BMC initiatives.

Program B Implementation Process and Funding: The existing nitrate removal facility owned by GSWC is intended to serve existing development, so it is likely that a Program B facility intended for future development would be jointly owned by either a JPA or by one of the public agencies.

- Likely next steps for the implementation of Program B projects include:
    - Technical Studies to validate and update cost estimates
    - Siting Studies to identify project locations
    - AB 1600 analysis to evaluate funding options relative to future development in coordination with the Los Osos Community Plan
    - Environmental Review (CEQA)
    - Land Use Permitting (e.g. Coastal Development Permits, etc.)

Land Use Planning Process Update

Los Osos Retrofit-to-Build Program (Title 19 Water Offset Requirement) Update:

The County Department of Planning and Building is in the process of hiring a consultant to update the retrofit-to-build program for Los Osos to: 1) update the water savings calculation assumptions, 2) identify initiatives to expand the program; 3) create a framework to administer new initiatives with an ongoing monitoring and reporting component; 4) estimate administrative staffing costs; 5) estimate the water savings potential remaining in Los Osos; and 6) recommend Title 19 ordinance amendments.

Los Osos Community Plan:

The Los Osos Community Plan is being reviewed by the California Coastal Commission and a hearing date has not yet been scheduled. On December 15, 2020, the County Board of Supervisors adopted the Los Osos Community Plan ("LOCP") update and Final Environmental Impact Report and tentatively adopted amendments to the Growth Management Ordinance that would establish a residential growth rate for the Los Osos urban area. The LOCP policies are still subject to change based on California Coastal Commission review. If the LOCP is certified by Coastal Commission with no changes, the Growth Management Ordinance amendments to establish a growth rate for Los Osos are effective upon certification. If the LOCP requires changes, then the growth rate would need to be established at another Board hearing. The LOCP and Growth Management Ordinance policies considered by the Board on December 15 are available at: https://agenda.slocounty.ca.gov/iip/sanluisobispo/agendaitem/details/12683.

Background

The Board authorized preparation of this update on December 11, 2012. A series of community outreach meetings to unveil the Community Plan were conducted in the Spring of 2015. The plan was prepared to be consistent and coordinated with the draft groundwater basin management plan and the draft Habitat Conservation Plan ("HCP"). The draft Environmental Impact Report was released on September 12, 2019; comments were due December 11, 2019. A Community Meeting on the Draft Environmental Impact Report for the LOCP, HCP, and associated Environmental Documents was held on October 28, 2019. The Final Environmental Impact Report and Public Hearing Draft were released on June 8, 2020. The Planning Commission held hearings on July 9, 2020, August 13, 2020, and October 8, 2020. At the October 8, 2020 hearing, the Planning Commission recommended approval of the Plan to the Board of Supervisors.

Accessory Dwelling Unit (ADU) Ordinance:

On January 28, 2020, the Board of Supervisors considered and adopted a resolution to amend Title 22 and 23 for the replacement of the Secondary Dwelling Ordinance with a new ordinance for Accessory Dwelling Units (ADUs). The Board of Supervisors adopted amendments to Table “O” of the Coastal Framework on June 16, 2020. These amendments would allow ADUs to be established in the Community of Los Osos. The amendments to Title 23 and Table “O” of the Coastal Framework for Planning are currently under review by the California Coastal Commission. Until such amendments are approved by the California Coastal Commission, the County will review ADU applications for consistency with State ADU law, which would allow for the construction of ADUs in the Coastal Zone. On March 12, 2021, Coastal Commission found that Los Osos ADU projects approved by the County thus far raise a substantial issue and did not hold a hearing on the question. The Commission took jurisdiction over the projects and voided the County's prior approval. The next step in the process is the de novo hearing, which has not yet been scheduled. The Commission would prefer to take an action on the County's proposed ADU Ordinance before taking an action on individual projects. The Commission has requested additional information from the County about the ADU Ordinance. The County is preparing a response, which includes coordinating with the Los Osos water purveyors regarding ADUs.

Los Osos Wastewater Project Flow and Connection Update

The following table summarizes flows from the LOWRF based on the available data. Cells highlighted in yellow indicate data that was not available at the time the Executive Director's Report was developed.

<u>LOWRF Wastewater and Recycled Water Flows</u>

Year	Month	Influent	Broderson	Bayridge	Sea Pines	Giaco-mazzi	Construction Water	Ag Users	Discharge/ Recycled Water Delivery Total (AF)
2021	Jan	48.7	38.0	1.1	1.7	0.0	0.0	0.1	42.6
2021	Feb	43.0	47.3	1.7	1.0	0.0	0.0	0.0	50.5
2021	Mar	47.5	47.2	1.9	1.0	0.0	0.0	0.0	50.3
2021	Apr								
2021	May								
2021	Jun								
2021	Jul								
2021	Aug								
2021	Sept								
2021	Oct								
2021	Nov								
2021	Dec								
Total									

Enforcement: A list of properties that were not connected were transferred to County Code Enforcement and Notice of Violations were issued last year in Feb. 2019. That list was about 70 properties. As of 5/12/2021, the sewer service area has a 99.4% connection status with a total of 36 properties not yet connected. Of those, one is not required to connect because there is no structure (demolished), 18 have expired building permits, and the rest have an open Code Enforcement case.

The County has assigned staff in code enforcement to Los Osos. Expired permits did not receive a Code Enforcement case because those properties have their own noticing process through the Building Department which, if not corrected, could result in a Notice of Violation.

Water Conservation Update

Rebate Update: Average indoor water usage for 2019 was estimated to be 40 gpd per person and remains at that number currently.

Cannabis and Hemp Information

Hemp: According to the Ag Commissioners Office there is no hemp cultivation currently registered in Los Osos.

Cannabis: On January 28, 2021, the County Planning Commission approved a request by Wild Coast Farms for a Coastal Development Permit / Development Plan (DRC2018-00215) and adopted the Mitigated Negative Declaration (MND) prepared for the project to allow for the phased development to establish 27,500 sf of indoor cannabis cultivation area (22,000 sf canopy); 12,600 sf of ancillary and commercial indoor nursery area; a 1,472 sf metal building for indoor ancillary processing, a cloning area, a restroom, storage, and an office; Ancillary Transport; and related site improvements (e.g., composting area, trash / recycling area, parking, general storage, etc.). A parking modification is requested to allow 9 parking spaces instead of the required 81. The project will result in the disturbance of approximately 3 acres on a 73.5 acre parcel located at 2198 Los Osos Valley Road, approximately 0.5 miles northwest of the Los Osos Valley Road/Clark Valley Road intersection and directly west of the Los Osos Wastewater Facility (LOWWF). The site is in the Agriculture land use category and within the area governed by the Estero Area Plan. The project site is outside the Los Osos Urban Reserve and the Los Osos Community Services District boundary and is within the Coastal Appeal Area.

The Planning Commission approval has been appealed to the County Board of Supervisors. An appeal hearing date has not yet been scheduled.

The Planning Commission hearing item documents (staff report, findings, presentation, conditions of approval, MND, etc.) are available at:
https://agenda.slocounty.ca.gov/iip/sanluisobispo/agendaitem/details/12865

The permit Conditions of Approval require the applicant to submit a Water Conservation Plan for review and approval by the Department of Planning and Building prior to building permit issuance to implement a water demand offset of 3.5 acre-feet per year (AFY), to be verifiable and permanent.

Sustainable Groundwater Management Act (SGMA)

SGMA Overview: The SGMA took effect on January 1, 2015.[1] SGMA provides new authorities to local agencies with water supply, water management or land use responsibilities and requires various actions be taken in order to achieve sustainable groundwater management in high and medium priority groundwater basins. Los Osos Valley Groundwater Basin (Los Osos Basin) was subject to SGMA based on the 2014 Basin Prioritization by the California Department of Water Resources (DWR) that listed the Los Osos Basin as high priority and in critical conditions of overdraft.[2]

Basin Prioritization: On December 18, 2019, DWR released the SGMA 2019 Basin Prioritizations. Basins or subbasins reassess to low or very low priority basins or subbasins are not subject to SGMA regulations. A summary of DWR's Final SGMA Prioritizations for the Los Osos Area Subbasin and Warden Creek Subbasin are listed below:

- Los Osos Area Subbasin is listed as **very low** priority for SGMA[3] and in critical conditions of overdraft[4]
  - SGMA does not apply to the portions of Los Osos Basin that are adjudicated provided that certain requirements are met (Water Code §10720.8).
- Warden Creek Subbasin is listed as **very low** priority for SGMA[3]

For more information on DWR's basin boundary modification and prioritization process, please visit: https://water.ca.gov/Programs/Groundwater-Management/Basin-Prioritization

Additional Attachments:

1. None

[1] On September 16, 2014, Governor Jerry Brown signed into law a three-bill legislative package, composed of AB 1739 (Dickinson), SB 1168 (Pavley), and SB 1319 (Pavley), collectively known as SGMA

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

[3] As noted by DWR, the priority for the subbasin has been set to very low (0 total priority points) as a result of conditions being met under sub-component C of the Draft SGMA 2019 Basin Prioritizations.

[4] Critical conditions of overdraft have been identified in 21 groundwater basins as described in Bulletin 118 (Water Code Section 12924). Bulletin 118 (updates 2003) defines a groundwater basin subject to condition of critical overdraft as: "A basin is subject to critical conditions of overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts."

TO: Los Osos Basin Management Committee

FROM: Dan Heimel, Executive Director

DATE: June 16, 2021

SUBJECT: Item 8a – Final Draft 2020 Annual Report

Recommendations

Recommendations: Receive the Final Draft 2020 Annual Report and authorize submission to the Court or provide alternate direction to staff.

Discussion

Section 5.8.3 of the Final Judgment requires that the preparation of an Annual Report by June 30 of each year. The BMC retained Cleath Harris Geologists (CHG) to prepare the fifth Annual Report for calendar year 2020. The Final Draft 2020 Annual Report and comment/response logs are attached and a staff summary will be provided at the meeting.

Financial Considerations

Budget items 5 and 6 in the adopted calendar year 2021 budget address monitoring and preparation of the annual report.

FINAL DRAFT

LOS OSOS BASIN PLAN
GROUNDWATER MONITORING PROGRAM
2020 ANNUAL MONITORING REPORT

Prepared for the

BASIN MANAGEMENT COMMITTEE

June 2021

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

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EXECUTIVE SUMMARY

The Los Osos Basin Plan Groundwater Monitoring Program - 2020 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 for calendar year 2020. 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 Los Osos Groundwater Basin (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 2020 is summarized in Table ES-1 below. Purveyor (Los Osos Community Services District, Golden State Water Company, and S&T Mutual Water Company) production has increased by seven percent compared to 2019, while total Basin production has increased by six percent compared to 2019.

Table ES-1. Groundwater Production

Description	2019 Production in Acre-Feet	2020 Production in Acre-Feet
Los Osos Community Services District	506	527
Golden State Water Company	454	502
S&T Mutual Water Company	31	34
Purveyor Subtotal	**991**	**1,063**
Domestic wells	220	220
Community facilities	60	80
Agricultural wells	630	650
Total Estimated Production[1]	**1,900**	**2,010**

[1] Rounded to the nearest 10 acre-feet. Includes estimated production from non-metered wells per methods described in Appendix G and LOBP Section 4 and Section 7.5.

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. 41)**. The Basin received below average rainfall in 2020. The drought condition for San Luis Obispo County ranged from no drought to moderate drought conditions during 2020 (NDMC/USDA/NOAA, 2020).
>
> **Seawater intrusion front (p. 55)**. The seawater intrusion front advanced inland between Fall 2019 and Fall 2020 (a deterioration).
>
> **Basin Yield Metric (p. 64)**. The Basin Yield Metric increased between 2019 and 2020 (a deterioration) but has met the LOBP goal since 2016.
>
> **Water Level Metric (p. 67)**. The Water Level Metric was stable between Spring 2019 and Spring 2020 (no change in condition) and has not reached the target value.
>
> **Chloride Metric (p. 69)**. The Chloride Metric increased between Fall 2019 and Fall 2020 (a deterioration) and has not reached the target value.
>
> **Nitrate Metric (p. 70)**. The Nitrate Metric decreased between Winter 2019 and Winter 2020 (an improvement) but has not reached the target value.
>
> **Upper Aquifer Water Level Profile (p. 73)**. Water levels in the Upper Aquifer along the bay remain safely above the Protective Elevation.

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, evaluating the feasibility of modifying up to four existing monitoring network wells for dedicated Zone E water quality monitoring, and updating the Maximum Sustainable Yield (sustainable yield with all LOBP projects implemented) of the Basin now that the location of the second Program C expansion well has been selected.

LOBP Metrics

As described in Section 7.5 ("Basin Metrics") of this Annual Report, the LOBP established several basin metrics to evaluate 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 2020 Data**	**Change in Condition from 2019**
Basin Yield Metric	80 or less	73	Increased (deterioration)
Water Level Metric	8 feet above mean sea level or higher	1.8 feet above mean sea level	Stable (no change)
Chloride Metric	100 mg/L or lower	205 mg/L	Increased (deterioration)
Nitrate Metric	10 mg/L or lower	20 mg/L (NO_3-N)	Decreased (improvement)

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:

Upper Aquifer Water Level Profile. 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.

Updated Metric Evaluation. Included in the Calendar Year 2021 BMC Budget is an initiative to evaluate the existing Basin Monitoring Metrics and to develop recommendations for opportunities to improve those metrics and/or add additional metrics to be able to better assess the health of the basin. The updated Basin Metric evaluation will take into account monitoring data collected after development of the Basin Plan, along with new monitoring locations/wells (e.g. Lupine/Cuesta by the Sea Monitoring Well). Any modifications to the LOBP Metrics will require approval by the BMC through the Adaptive Management process.

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).

Evaluation of Water Conservation Measures. To improve the understanding of the effectiveness of existing conservation programs and the future conservation potential within the community, the purveyors are considering performing an updated water conservation evaluation to determine the amount of additional water savings that could be achieved through additional conservation efforts and programs.

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 LOCP should be consistent with the water supply estimates provided in the Basin Management Plan.
2. The LOCP should acknowledge any infrastructure projects contemplated by the LOBP 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 LOCP/LCP] should provide a growth rate for Los Osos consistent with the adaptive management provision of the LOBP. In particular, the rate of growth must be set so that the monitoring provisions of the LOBP confirm the adequacy of a sustainable water supply in support of any contemplated future growth.

.

LOBP Infrastructure Programs

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

Table 30. Basin Infrastructure Projects

Project Name	Parties Involved	Funding Status	Capital Cost	Status
Program A				
Water Systems Interconnection	LOCSD/ GSWC			Completed
Upper Aquifer Well (8th Street)	LOCSD	Fully Funded	$320,000	Well was drilled and cased in December 2016. Budget remaining $320,000 to equip the well. Design is 100% complete and project has been included in an IRWM Grant Application. Construction is scheduled to move forward in summer of 2021.
South Bay Well Nitrate Removal	LOCSD			Completed
Palisades Well Modifications	LOCSD			Completed
Blending Project (Skyline Well)	GSWC			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 might be capable of expanding to be the 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			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	Site selection is complete; the environmental work and submittal of the Minor Use Permit to the County will be completed in May 2021. Construction is anticipated to begin Q1 2022.
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	Currently on hold, pending the completion of S&T's water meter cellular updates.

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			Completed
Program U				
Creek Discharge Program	All Parties		TBD	These activities are currently on hold. This initiative was not identified as one of the highest priority items during the BMC's Implementation Plan evaluation of priorities in 2020.
8th and El Moro Urban Storm Water Recovery Project	All Parties		TBD	These activities are currently on hold. This initiative was not identified as one of the highest priority items during the BMC's Implementation Plan evaluation of priorities in 2020.

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 sixth Annual Report for the Basin.

The 2020 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.

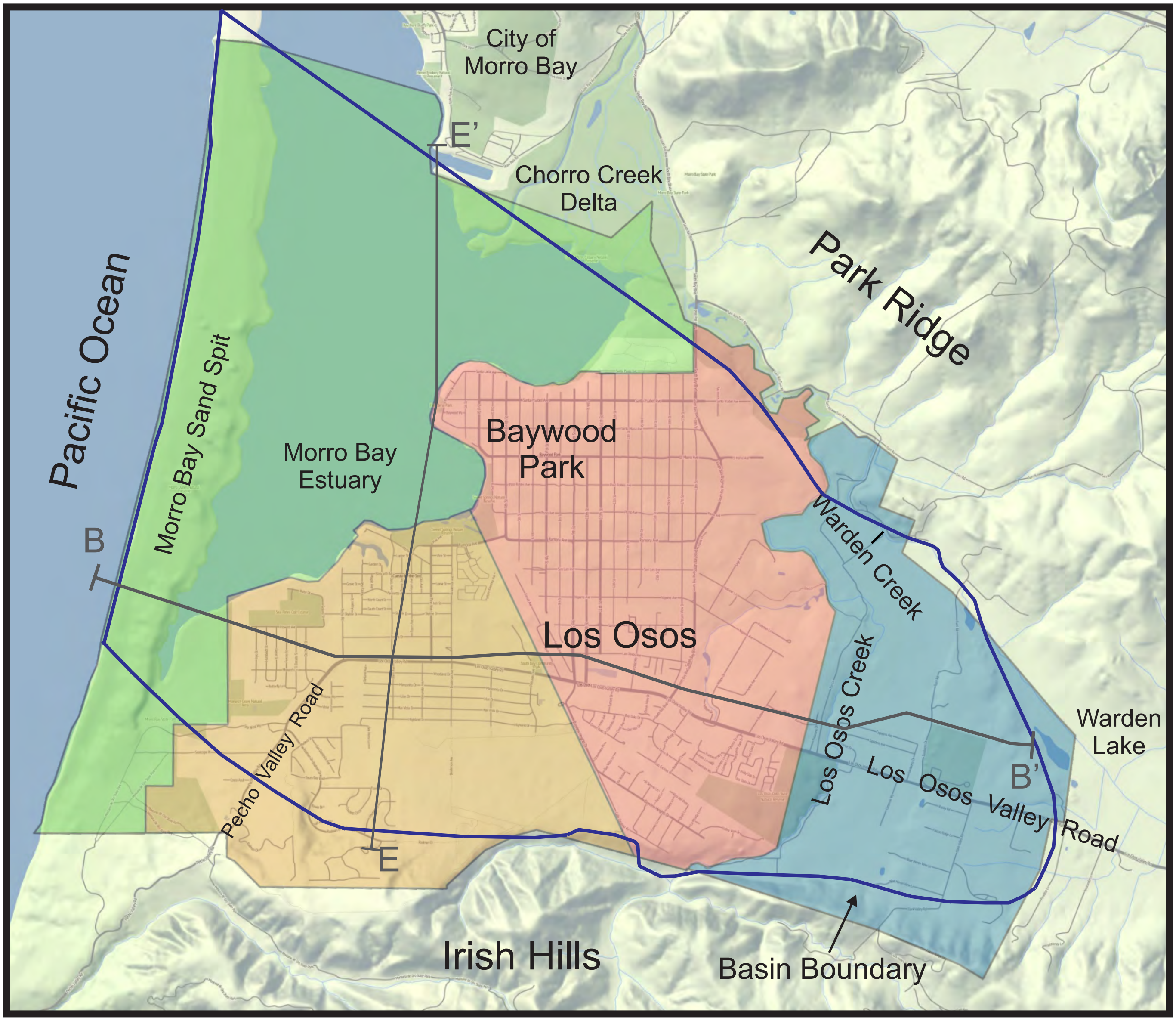
2.1 Groundwater Monitoring History

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 2020 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

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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, 20 and 21). 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
2020 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.

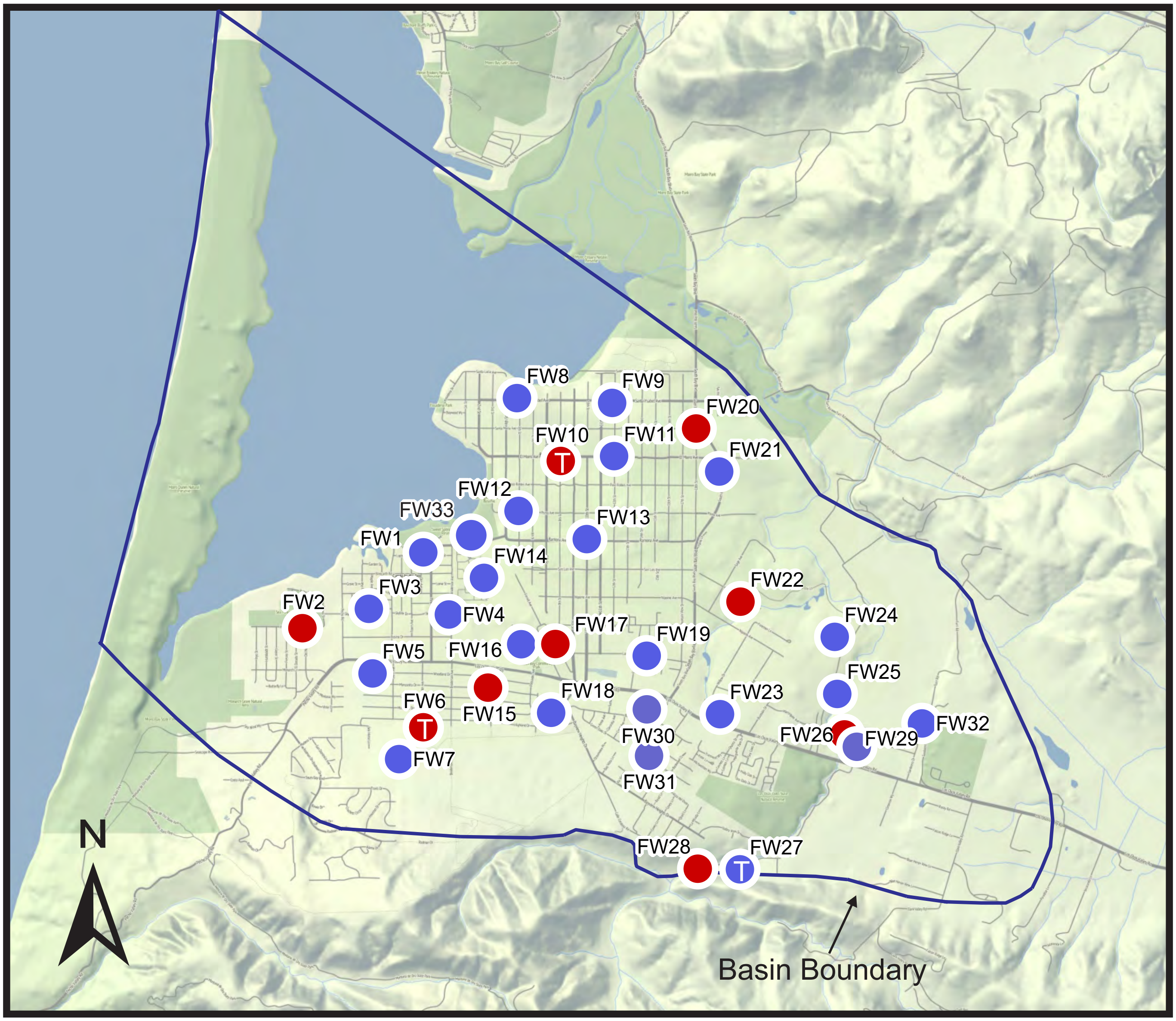
There are currently 93 wells in the LOBP Groundwater Monitoring Program, including 43 BMC member agency monitoring wells, 17 municipal wells (active and inactive) and 33 private wells (Appendix B). Private well participation in the monitoring program during 2020 was 73 percent (24 out of 33 wells). "Private" 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.

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).

A wellhead elevation survey was performed during 2020 (see Section 3.2.1 and Appendix E). The survey resulted in adjustments to reference point elevations which are used to calculate groundwater elevations. These adjustments were incorporated into the groundwater elevation contour maps and associated groundwater storage calculations.



Base Image: Stamen-Terrain

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Scale: 1 inch ≈ 4,000 feet

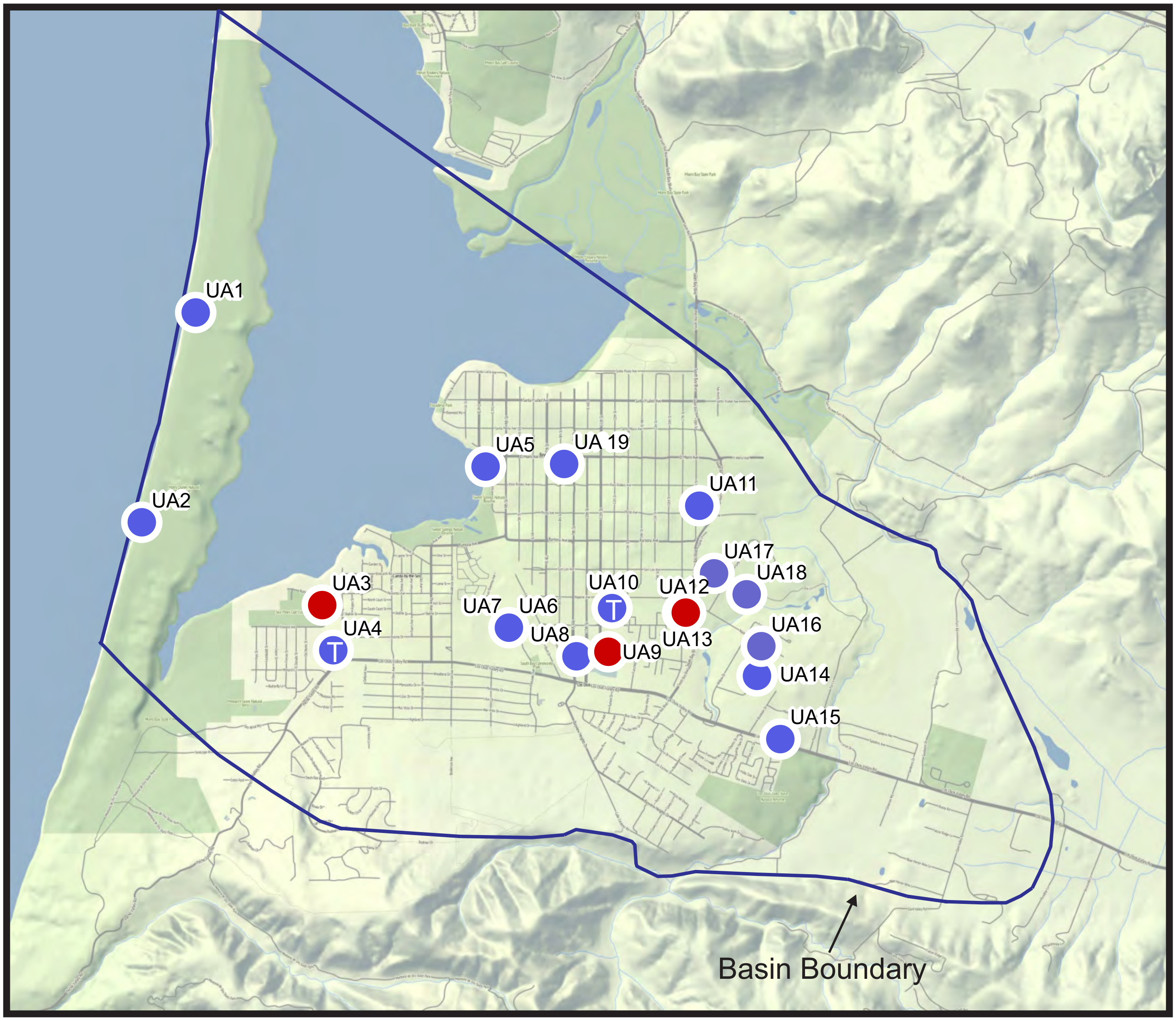
Explanation

- LOBP Water Level Monitoring 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
2020 Annual Report

Cleath-Harris Geologists



Base Image: Stamen-Terrain

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Scale: 1 inch ≈ 4,000 feet

Explanation

- LOBP Water Level Monitoring 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
2020 Annual Report

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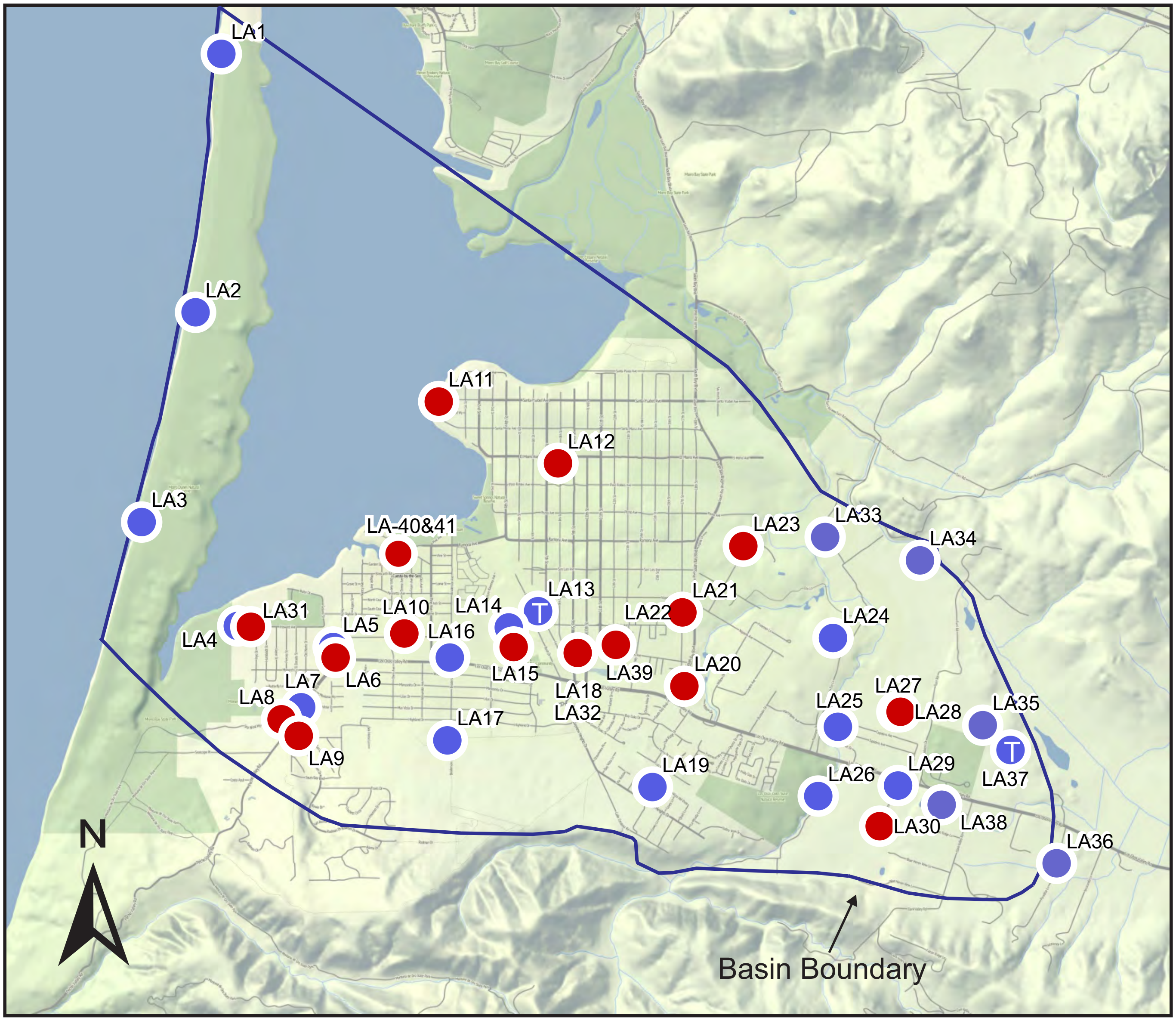

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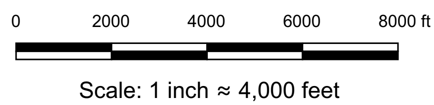


Explanation

- LOBP Water Level Monitoring Well
- 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
2020 Annual Report

Cleath-Harris Geologists

Of the 93 wells currently in the LOBP Groundwater Monitoring Program, 33 are representative of First Water, 19 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, 39 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.

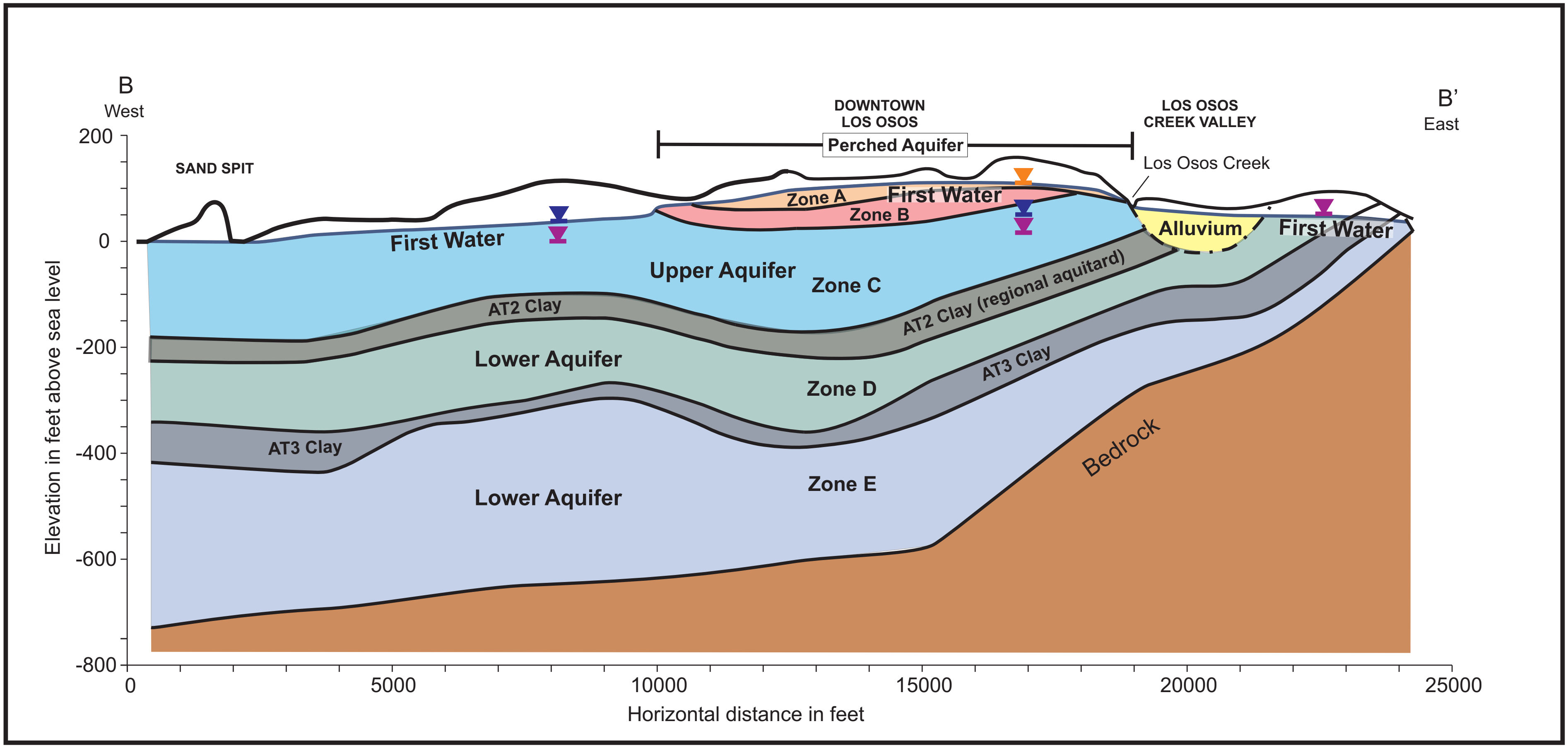
Upper Aquifer

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.

Seawater intrusion is a major concern for the Lower Aquifer. The seawater intrusion front corresponds to the position of the 250 mg/L chloride concentration isopleth, which has been advancing inland for decades, and continues to advance under current basin condition, based on the monitoring program data. A significant reduction in Lower Aquifer production in the Western Area, 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
2020 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		0.002
Caffeine	Stimulant		0.001
NDMA (Nitroso-dimethylamine)	Disinfection Byproduct		0.002
Gemfibrozil	Pharmaceutical Residue	Performance	0.001
DEET (Diethyl-meta-toluamide)	Personal Care Product		0.001
Iopromide	Pharmaceutical Residue		0.005
Sucralose	Food additive		0.005
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. Prior to 2019, 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, although the Los Osos Area subbasin is still classified as subject to critical overdraft due to seawater intrusion (DWR, 2021). 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 2020, including:

- An elevation survey was completed at 20 wells across the basin.
- A recycled water beneficial use study was authorized to analyze the benefits of discharging recycled water to Broderson, Bay Ridge Estates, Sea Pines Golf Course, and/or other future locations and opportunities to increase the amount of water sent to LOWRF.
- A Basin Metric study was authorized to evaluate existing metrics and the potential for modifications or additional metrics to track Basin status with respect to seawater intrusion and nitrate contamination.

- Expansion of the Lower Aquifer water level transducer network was authorized to assist in characterizing development of the groundwater mound associated with recycled water discharges at Broderson.

- LOCSD, a BMC member, completed environmental screening of potential Program C expansion well sites and authorized proceeding with Phase 2 of the California Environmental Quality Act analysis at Site E on Bay Oaks Drive.

3. CONDUCT OF WORK

This Annual Report covers monitoring activities performed during the 2020 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 2020.

3.1 Services Provided

All 2020 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 D. 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, 2005 and 2020 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.

An elevation survey at 20 wells was performed by a licensed surveyor in 2020. The wells surveyed were mostly locations where no prior surveys had been performed, along with a few locations where original County survey data were available for comparison. Results of the survey show surveyed NAVD 88 elevations averaged 1.2 feet higher than the prior estimated elevations in the 16 wells for which no prior survey was available, and averaged 1.7 feet higher in four wells where County NGVD 29 survey data were available. These results suggest the 2.8-foot upward shift currently used to convert the County survey to NAVD 88 may warrant revision. A licensed surveyor review of reference point elevation documentation, including available information for the original County survey, is recommended to complete the transition to the NAVD 88 datum. Results of the 2020 elevation survey are shown in Appendix E.

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 D.

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 D.

3.3 Monitoring Staff Affiliations

Monitoring services that contributed data to the 2020 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 2020 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 2020 monitoring program reports (Rincon Consultants, 2020; 2021).

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 2020, 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 2020, rather than using the June and December 2020 LOWRF monitoring event values.

Table 3. Spring 2020 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]	4/17/2020	21.85	10.78
FW3	30S/10E-13G	50.95 [1]	4/17/2020	39.54	11.41
FW4	30S/10E-13H	49.33 [1]	4/17/2020	24.19	25.14
FW5	30S/10E-13Q2	101.27 [1]	4/17/2020	81.37	19.90
FW6	30S/10E-24A	193.04 [1]	4/17/2020	145.56	47.48
FW7	30S/10E-24Ab	Not measured (damaged)			
FW8	30S/11E-7L4	45.76 [1]	4/14/2020	37.44	8.32
FW9	30S/11E-7K3	90.71 [1]	4/14/2020	55.38	35.33
FW10	30S/11E-7Q1	25.29 [1]	4/17/2020	8.5	16.79
FW11	30S/11E-7R2	61.93 [1]	4/14/2020	24.28	37.65
FW12	30S/11E-18C2	34.55 [1]	4/17/2020	19.73	14.82
FW13	30S/11E-18B2	79.89 [1]	4/17/2020	21.84	58.05
FW14	30S/11E-18E1	PRIVATE (not measured - destroyed)			
FW15	30S/11E-18N2	125.53 [1]	4/17/2020	77.6	47.93
FW16	30S/11E-18L11	88.02 [1]	4/17/2020	44.89	43.13
FW17	30S/11E-18L12	103.85 [1]	4/17/2020	22.02	81.83
FW18	30S/11E-18P	143.92 [1]	4/17/2020	26.1	117.82
FW19	30S/11E-18J7	125.74 [1]	4/17/2020	25.7	100.04
FW20	30S/11E-8Mb	94.75 [1]	4/14/2020	45.87	48.88
FW21	30S/11E-8N4	95.99 [1]	4/17/2020	40.15	55.84
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 (not measured)			
FW30	30S/11E-18R1	PRIVATE (measured)			
FW31	30S/11E-19A	214.67 [1]	4/17/2020	30.13	184.54
FW32	30S/11E-21D14	PRIVATE (measured)			
FW33	30S/11E-18D1S	PRIVATE (measured)			

NOTES: 1 NAVD88 elevation as reported by licensed land surveyor

Table 4. Spring 2020 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]	4/29/2020	13.7	2.3
UA2	30S/10E-14B1	23.90 [1]	4/29/2020	21.1	2.8
UA3	30S/10E-13F1	17.57 [1]	4/28/2020	9	8.6
UA4	30S/10E-13L1	38.68 [3]	4/17/2020	29.94	8.7
UA5	30S/11E-7N1	9.13 [3]	4/14/2020	4	5.1
UA6	30S/11E-18L8	79.18 [1]	3/24/2020	55.4	23.8
UA7	30S/11E-18L7	79.16 [1]	3/24/2020	63.9	15.3
UA8	30S/11E-18K7	137.17 [1]	4/14/2020	119.36	17.8
UA9	30S/11E-18K3	121.18 [3]	4/29/2020	110	11.2
UA10	30S/11E-18H1	107.10 [3]	4/17/2020	92.31	14.79
UA11	30S/11E-17D	PRIVATE (not measured)			
UA12	30S/11E-17E9	105.85 [3]	4/14/2020	87.23	18.6
UA13	30S/11E-17E10	107.81 [1]	4/14/2020	90	17.81
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 (measured)			
UA19	30S/11E-7Q__	26 [2]	4/24/2020	15.97	8.03

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

Table 5. Spring 2020 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]	4/29/2020	15.7	7.4
LA2	30S/10E-11A2	16.07 [1]	4/29/2020	11.8	4.3
LA3	30S/10E-14B2	23.89 [1]	4/29/2020	21.6	2.3
LA4	30S/10E-13M1	41.20 [3]	4/9/2020	43.87	-2.7
LA5	30S/10E-13L7	37.87 [1]	4/1/2020	31.8	6.1
LA6	30S/10E-13L4	74.58 [1]	4/30/2020	64	10.6
LA7	30S/10E-13P2	PRIVATE (not measured)			
LA8	30S/10E-13N	141.36 [1]	4/14/2020	132.7	8.7
LA9	30S/10E-24C1	178.32 [3]	4/30/2020	174	4.3
LA10	30S/10E-13J1	95.31 [3]	4/28/2020	91	4.3
LA11	30S/10E-12J1	8.43 [1]	4/14/2020	4.8	3.6
LA12	30S/11E-7Q3	24.30 [3]	4/14/2020	28.2	-3.9
LA13	30S/11E-18F2	100 [3]	4/17/2020	102.1	-2.1
LA14	30S/11E-18L6	79.36 [1]	3/24/2020	76.4	3.0
LA15	30S/11E-18L2	88.08 [1]	4/14/2020	96	-7.9
LA16	30S/11E-18M1	106.82 [3]	3/24/2020	99.7	7.1
LA17	30S/11E-24A2	210.40 [3]	3/25/2020	154.4	56.0
LA18	30S/11E-18K8	137.13 [1]	4/14/2020	134.89	2.2
LA19	30S/11E-19H2	256.20 [3]	3/25/2020	264.8	-8.6
LA20	30S/11E-17N10	141.22 [1]	4/30/2020	150	-8.8
LA21	30S/11E-17E7	105.85 [3]	3/25/2020	108.4	-2.6
LA22	30S/11E-17E8	105.85 [3]	3/25/2020	97.9	7.9
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]	4/11/2020	3.44	22.71
LA35	30S/11E-21Bb	86.8 [2]	4/17/2020	63	23.8
LA36	30S/11E-21Ja	PRIVATE (not measured)			
LA37	30S/11E-21B1	81.61 [1]	4/17/2020	57.86	23.75
LA38	30S/11E-21E	PRIVATE (measured)			
LA39	30S/11E-18K_	121.74 [1]	4/29/2020	146	-24.26
LA40	30S/11E-13Ba	11.47 [1]	4/6/2020	8.42	3.05
LA41	30S/11E-13Bb	11.46 [1]	4/6/2020	9.30	2.16

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

Table 6. Fall 2020 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]	10/1/2020	23.21	9.4
FW3	30S/10E-13G	50.95 [1]	10/1/2020	40.14	10.8
FW4	30S/10E-13H	49.33 [1]	10/1/2020	25.38	24.0
FW5	30S/10E-13Q2	101.27 [1]	10/14/2020	81.54	19.7
FW6	30S/10E-24A	193.04 [1]	10/2/2020	144.54	48.5
FW7	30S/10E-24Ab	Not measured (damaged)			
FW8	30S/11E-7L4	45.76 [1]	10/5/2020	38.16	7.6
FW9	30S/11E-7K3	90.71 [1]	10/1/2020	55.38	35.3
FW10	30S/11E-7Q1	25.29 [1]	10/2/2020	9.6	15.7
FW11	30S/11E-7R2	61.93 [1]	10/1/2020	25.34	36.6
FW12	30S/11E-18C2	34.55 [1]	10/5/2020	20.57	14.0
FW13	30S/11E-18B2	79.89 [1]	10/5/2020	24.05	55.8
FW14	30S/11E-18E1	PRIVATE (not measured - destroyed)			
FW15	30S/11E-18N2	125.53 [1]	10/1/2020	76.98	48.6
FW16	30S/11E-18L11	88.02 [1]	10/1/2020	45.55	42.5
FW17	30S/11E-18L12	103.85 [1]	10/2/2020	23.38	80.5
FW18	30S/11E-18P	143.92 [1]	10/2/2020	27.2	116.7
FW19	30S/11E-18J7	125.74 [1]	10/5/2020	27.3	98.4
FW20	30S/11E-8Mb	94.75 [1]	DRY		
FW21	30S/11E-8N4	95.99 [1]	10/5/2020	41.33	54.7
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 (not measured)			
FW30	30S/11E-18R1	PRIVATE (measured)			
FW31	30S/11E-19A	214.67 [1]	10/2/2020	29.78	184.9
FW32	30S/11E-21D14	PRIVATE (measured)			
FW33	30S/11E-18D1S	PRIVATE (measured)			

NOTES: [1] NAVD88 elevation as reported by licensed land surveyor

Table 7. Fall 2020 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]	11/2/2020	12.5	3.5
UA2	30S/10E-14B1	23.90 [1]	11/5/2020	19.55	4.4
UA3	30S/10E-13F1	17.57 [1]	10/2/2020	10	7.6
UA4	30S/10E-13L1	38.68 [3]	10/2/2020	30.73	8.0
UA5	30S/11E-7N1	9.13 [3]	10/14/2020	3.5	5.6
UA6	30S/11E-18L8	79.18 [1]	9/29/2020	56	23.2
UA7	30S/11E-18L7	79.16 [1]	9/29/2020	65.1	14.1
UA8	30S/11E-18K7	137.17 [1]	10/13/2020	118.65	18.5
UA9	30S/11E-18K3	121.18 [3]	10/13/2020	112	9.2
UA10	30S/11E-18H1	107.10 [3]	10/2/2020	94.85	12.3
UA11	30S/11E-17D	PRIVATE (not measured)			
UA12	30S/11E-17E9	105.85 [3]	10/6/2020	89.97	15.9
UA13	30S/11E-17E10	107.81 [1]	10/14/2020	94.9	12.9
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 (measured)			
UA19	30S/11E-7Q_	26 [2]	10/2/2020	16.46	7.54

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 2020 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]	11/5/2020	15.55	7.6
LA2	30S/10E-11A2	16.07 [1]	11/5/2020	11.50	4.6
LA3	30S/10E-14B2	23.89 [1]	11/5/2020	21.85	2.0
LA4	30S/10E-13M1	41.20 [3]	10/1/2020	44.73	-3.5
LA5	30S/10E-13L7	37.87 [1]	10/15/2020	32.2	5.7
LA6	30S/10E-13L4	74.58 [1]	10/19/2020	64	10.6
LA7	30S/10E-13P2	PRIVATE (not measured)			
LA8	30S/10E-13N	141.36 [1]	10/1/2020	134.3	7.1
LA9	30S/10E-24C1	178.32 [3]	10/13/2020	173	5.3
LA10	30S/10E-13J1	95.31 [3]	10/12/2020	92	3.3
LA11	30S/10E-12J1	8.43 [1]	10/1/2020	7.1	1.3
LA12	30S/11E-7Q3	24.30 [3]	10/14/2020	38.3	-14.0
LA13	30S/11E-18F2	100 [3]	10/2/2020	106.76	-6.8
LA14	30S/11E-18L6	79.36 [1]	9/29/2020	80	-0.6
LA15	30S/11E-18L2	88.08 [1]	10/14/2020	101.8	-13.7
LA16	30S/11E-18M1	106.82 [3]	9/29/2020	101.1	5.7
LA17	30S/11E-24A2	210.40 [3]	10/2/2020	172.3	38.1
LA18	30S/11E-18K8	137.13 [1]	10/22/2020	139.41	-2.3
LA19	30S/11E-19H2	256.20 [3]	9/30/2020	266	-9.8
LA20	30S/11E-17N10	141.22 [1]	10/12/2020	158	-16.8
LA21	30S/11E-17E7	105.85 [3]	9/30/2020	116.1	-10.3
LA22	30S/11E-17E8	105.85 [3]	9/30/2020	124.6	-18.8
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]	10/1/2020	7.64	18.5
LA35	30S/11E-21Bb	86.8 [2]	10/2/2020	72	14.8
LA36	30S/11E-21Ja	PRIVATE (not measured)			
LA37	30S/11E-21B1	81.61 [1]	10/2/2020	65.08	16.5
LA38	30S/11E-21E	PRIVATE (measured)			
LA39	30S/11E-18K_	121.74 [1]	10/13/2020	149	-27.26
LA40	30S/11E-13Ba	11.47 [1]	10/6/2020	9.9	1.57
LA41	30S/11E-13Bb	11.46 [1]	10/7/2020	12.36	-0.9

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.

4.2 Water Quality Results

Available Fall 2020 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 2020 water quality monitoring at First Water or Upper Aquifer Wells. Available Spring and Fall 2020 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 2020 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.

In 2020, Lower Aquifer wells LA2 and LA3 on the Morro Bay sand spit were scheduled to be purged and sampled. LA2 was sampled, but LA3 was not due to access issues. These wells 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 2025, however, CHG will plan on sampling LA3 in Fall 2021 as a replacement for 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 2020 in the County's LOWRF Groundwater Monitoring Program reports (Rincon Consultants, 2020; 2021). Nitrate concentration trends are tracked using the Nitrate Metric (see Section 7.5.3).

Lower Aquifer water quality results for 2020 show three wells, (LA 10, LA31 and LA40) 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, FW6, and FW26 in October 2020 (CEC constituents list and reporting limits shown in Table 2). 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 has subsided and groundwater mounding from the Broderson Site has reached FW6, there is sufficient water column to allow CEC testing. Wells FW5 and FW6 are 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. 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 and FW6, based on sucralose and nitrate concentrations, but not likely at FW26.

Table 9. Fall 2020 Water Quality Results - First Water and Upper 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
FW2*	30S/10E-13L8	12/7/20	*736*	6.09	450	--	--	--	100	22	23	0.13	--	--	--	100	--
FW6*	30S/10E-24A	12/10/20	*825*	6.48	330	--	--	--	80	2.7	27	0.11	--	--	--	49	--
FW10*	30S/11E-7Q1	12/11/20	*719*	6.57	460	--	--	--	120	24	59	0.24	--	--	--	97	--
FW15*	30S/11E-18N2	12/11/20	*658*	6.17	450	--	--	--	120	27	54	0.17	--	--	--	65	--
FW17*	30S/11E-18L12	12/9/20	*523*	6.29	360	--	--	--	56	22	42	0.12	--	--	--	38	--
FW20*	30S/11E-8Mb	NOT SAMPLED															
FW22*	30S/11E-17F4	12/11/20	*478*	6.40	380	--	--	--	130	0.88	28.0	<0.05	--	--	--	64	--
FW26	30S/11E-20A2	10/14/20	682	7.01	390	<10	230	180	77	<0.1	29.40	<0.1	33	35	<1	37	63.86
FW28	30S/11E-20M2	10/7/20	1020	7.50	610	<10	410	419	63	<0.1	93.8	0.1	74	57	2	42	59.4
UA1	30S/10E-11A1	11/5/20	45200	7.55	31300	<10	160	130	15,100	<0.2†	2310	2.7	393	1170	530	9980	67.3
UA3	30S/10E-13F4	10/7/20	594	7.30	370	<10	80	130	68	18.3	24.2	<0.1	24	17	1	57	67
UA9	30S/11E-18K3	10/7/20	362	7.50	240	<10	60	82.7	43	9.0	8.6	<0.1	15	11	<1	28	67
UA13	30S/11E-17E10	10/12/20	544	7.50	340	<10	110	163	54	13.8	22.4	<0.1	24	25	1	39	66.7

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 2020 (Rincon Consultants, 2021)

† = Laboratory PQL limit changed from 0.1 mg/L to 0.2 mg/L in the fall of 2020.

Only field reading available

LOBP Well	State Well Number	Date	SC	pH (field)	TDS	Alkalinity CO3	Alkalinity HCO3	Alkalinity 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	4/13/2020	443	7.99	300	<10	60	50	75	7.4	14.5	0.1	17	15	2	37	64.8
LA9	30S/10E-24C1	4/21/2020	492	6.71	290	<10	50	40	80	9.1	8.4	<0.1	12	11	1	34	69
LA10	30S/10E-13J1	4/21/2020	1310	6.7	970	<10	80	70	320	2.1	14.2	<0.1	59	50	2	32	63
LA11	30S/10E-12J1	4/14/2020	1580	7.08	950	<10	350	290	222	<0.1	187	0.2	81	113	5	83	68.5
LA12	30S/10E-7Q3	4/16/2020	883	7.77	500	<10	310	250	94	<0.1	54.7	0.1	48	44	2	52	69.8
LA15	30S/11E-18L2	4/16/2020	832	7.71	460	<10	260	210	109	0.8	32.5	<0.1	49	43	2	37	68
LA18	30S/11E-18K8	4/14/2020	629	7.54	400	<10	290	240	33	<0.1	40.2	<0.1	55	32	2	26	71.8
LA20	30S/11E-17N10	4/21/2020	705	7.03	400	<10	300	240	50	0.7	26.9	<0.1	36	34	2	42	68
LA22	30S/11E-17E8	4/14/2020	482	7.95	280	<10	160	130	48	6.3	14.9	<0.1	26	24	1	27	67.5
LA23,28	PRIVATE (not sampled)																
LA30	30S/11E-20H1	4/9/2020	1000	7.62	580	<10	400	320	56	<0.1	103	<0.1	69	53	1	40	63.3
LA31	30S/10E-13M2	4/9/2020	2970	7.76	1740	<10	70	50	738	0.6	152	0.1	86	74	4	258	63.5
LA32	30S/11E-18K9	4/16/2020	272	8.1	190	<10	60	50	35	6	5.4	<0.1	11	11	<1	20	66.6
LA39	30S/11E-18K_	4/21/2020	674	6.91	370	<10	300	240	37	0.2	28.4	<0.1	37	35	2	42	69
LA40	30S/10E-13Ba	4/7/2020	7360	6.95	6340	<10	240	190	2190	0.3	202	<0.1	569	458	7	203	67.1
LA41	30S/10E-13Bb	4/8/2020	943	7.14	560	< 10	310	260	68	0.3	109	<0.1	44	23	2	101	67.1

Table 10. Spring 2020 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.

Table 11. Fall 2020 Water Quality Results - Lower 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
LA2	30S/10E-11A2	11/5/2020	18000	7.35	15300	<10	220	6700	5890	<0.2	777	<0.1	1140	936	38	1560	67.8
LA8	30S/10E-13N	10/1/2020	464	7.9	300	<10	60	108	76	7.5	14.4	<0.1	17	16	1	40	65.8
LA9	30S/10E-24C1	10/7/2020	460	7.40	270	<10	60	102	75	6.6	13.1	<0.1	16	15	1	40	68
LA10	30S/10E-13J1	10/7/2020	618	7.6	430	<10	70	183	115*	4.6	11.3	<0.1	29	27	1	33	70
LA11	30S/10E-12J1	10/1/2020	1650	7.06	1040	<10	350	763	242	<0.1	183	0.2	85	134	5	88	70
LA12	30S10E-7Q3	10/5/2020	891	7.87	510	<10	300	321	89	<0.1	49.6	0.2	51	47	2	57	70
LA15	30S/11E-18L2	10/5/2020	841	7.75	450	<10	250	319	109	0.7	29.7	<0.1	52	46	2	41	69.3
LA18	30S/11E-18K8	10/22/2020	669	7.58	370	<10	300	247	32	<0.1	38.2	<0.1	51	29	3	26	73
LA20	30S/11E-17N10	10/7/2020	654	7.5	350	<10	290	227	40	0.7	27	<0.1	35	34	2	42	71
LA22	30S/11E-17E8	10/6/2020	506	7.48	340	<10	160	181	47	6.7	14.7	<0.1	28	27	1	30	68.2
LA23, 28	PRIVATE (not sampled)																
LA30	30S/11E-20H1	10/1/2020	1000	7.55	600	<10	400	428	57	<0.1	107	<0.1	71	61	1	40	66.9
LA31	30S/10E-13M2	10/1/2020	3330	8.04	2080	<10	70	774	844	0.7	169	0.1	94	131	5	495	66.4
LA32	30S/11E-18K9	10/6/2020	246	8.03	180	<10	60	68.6	30	4	4.9	<0.1	11	10	<1	21	66.2
LA39	30S/11E-18K_	10/7/2020	657	7.4	360	<10	300	227	37	<0.1	28.2	<0.1	35	34	2	43	72
LA40	30S/10E-13Ba	10/7/2020	8220	6.9	7930	<10	270	4100	2220	<0.2*	192	<0.1	720	560	8	217	67.3
LA41	30S/10E-13Bb	10/8/2020	920	7.1	490	<10	340	263	52	0.1	89.4	<0.1	51	33	2	72	68.5

NOTES: *LA10 chloride result affected by wellbore leakage (see Section 7.5.3); "--" = 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. * = Laboratory PQL limit changed from 0.1 mg/L to 0.2 mg/L in the fall of 2020.

Table 12. CEC Monitoring Results					
Constituent or Parameter	Units	FW5	FW6	FW26	LOWRF Recycled Water[1]
		October 15, 2020			August 6, 2020
Health-based					
17β-estradiol	ng/L	ND (<1)	ND (<1)	ND (<1)	ND (<10)
Triclosan	ng/L	ND (<2)	ND (<2)	ND (<2)	ND (<250)
Caffeine[2]	ng/L	1.3	2	ND (<1)	49
NDMA	ng/L	ND (<2)	ND (<2)	ND (<2)	3.8
Performance-based					
Gemfibrozil	ng/L	ND (<1)	ND (<1)	ND (<1)	48
DEET[2]	ng/L	2.9	31	1.5	320
Iopromide	ng/L	ND (<5)	ND (<5)	ND (<5)	ND (<10)
Sucralose	ng/L	160	2,300	75	45,000
Surrogate					
Ammonia	mg/L	ND (<0.10)	ND (<0.10)	0.20	--
Nitrate-Nitrogen	mg/L	29	2.9	ND (<0.2)	2.1[3]
Total Organic Carbon	mg/L	0.53	1.1	1	--
UV Light Absorption	1/cm	0.015	0.018	0.039	--
Specific Conductance	µmhos/cm	990	990	660	--

[1] 2020 LOWRF CEC Blue Ribbon Report and 2020 LOWRF Annual Report (SLO Co. 2020a, 2020b).
[2] Blank Contamination. Analyte also detected in the laboratory method blank.
[3] August 2020 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 two groundwater samples and in their respective laboratory blanks at concentrations close to the method reporting limit (CEC laboratory results in Appendix C).

DEET (Diethyl-meta-toluamide), a personal care product used for insect repellent, was also detected in all three groundwater samples, with two groundwater samples (FW5 and FW26) and their laboratory blanks at concentrations close to the method reporting limit. The third groundwater sample, from FW6, reported DEET concentrations over ten times greater than the other detections.

Sucralose, an artificial sweetener, was reported at 160 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 FW6 at 2,300 ng/L, and was detected in groundwater from FW26 at 75 ng/L, although the laboratory blank for FW26 also reported sucralose.

Total ammonia has been detected at FW26 since 2017 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 29 mg/L in groundwater from FW5, 2.9 mg/L in FW6, 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 and FW6, based on sucralose and nitrate concentrations, but not likely at FW26. The sucralose detection at FW26 is elevated above the 10-20 ng/L range of common laboratory equipment contamination, but there is no nitrate-nitrogen present.

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 smaller concentration of caffeine was detected at FW5 in 2019 (<1 ng/L) compared to 2020, and there was a slight decrease in sucralose, which would be the opposite trend to be expected given the high concentrations in LOWRF discharges and at FW6 (Table 12).

This was the first CEC sampling event at FW6, which is the sentry well for Broderson recycled water discharges entering the Basin. As previously mentioned, FW6 was originally designated in the LOBP (along with FW26) as a CEC monitoring well, but there was insufficient water for representative CEC testing at FW6 due to drought conditions, so FW5 was used as a replacement. As expected, the CEC results for FW6 show recycled water influence attributed to Broderson discharges. The nitrate-nitrogen concentrations are an order of magnitude less than at FW5 and are similar to LOWRF effluent. Sucralose and DEET concentrations at FW6 are also an order of magnitude greater than FW5, although they are an order of magnitude less than reported for LOWRF effluent. The CEC data are interpreted to show that nitrate-nitrogen, sucralose, and DEET are the best indicators for distinguishing wastewater (as septic discharge) influence from recycled water influence.

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.

5. GROUNDWATER PRODUCTION

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. 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 (2013-2020)

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
2020	527	502	34	1,063

Note: [1]Metered production

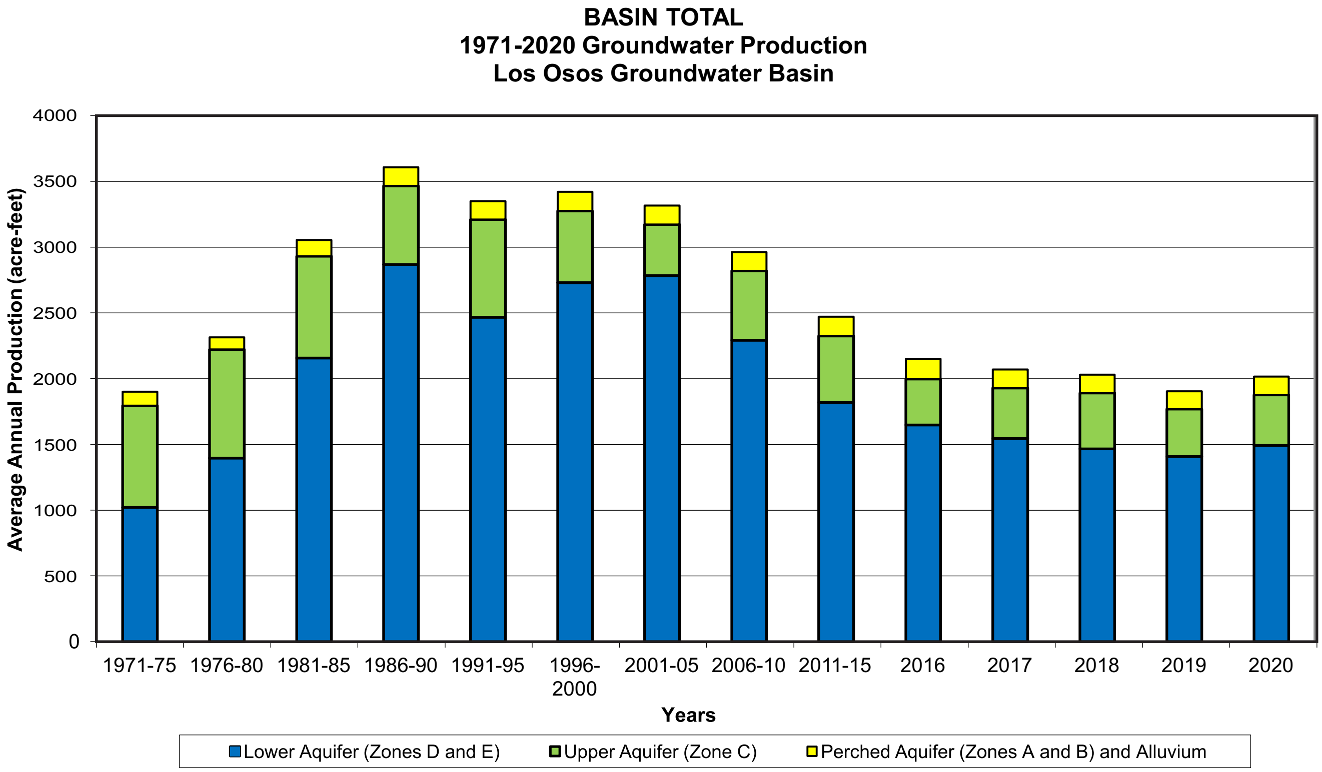
Table 14. Estimated Basin Groundwater Production (2013-2020)					
Year	Purveyors	Domestic	Community	Agriculture	Total
	Acre-Feet[1]				
2013	1,470	200	140	750	2,560
2014	1,246	220	130	800	2,400
2015	1,007	220	140	800	2,170
2016	1,003	220	140	800	2,160
2017	1,050	220	130	670	2,070
2018	1,018	220	120	670	2,030
2019	991	220	60	630	1,900
2020	1,063	220	80	650	2,010

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

Table 14 shows the recent trend in Basin water use, which is an overall decline since 2013, with a slight increase between 2019 and 2020. Purveyor production declined through 2016, which was the last year of an extended drought, and has fluctuated since then. Estimated private domestic water use has been stable, while community facilities use was relatively stable through 2018, then declined in response to recycled water deliveries for golf course irrigation. Estimated agricultural irrigation is shown as declining overall, and mainly due to a reduction in estimated irrigated acreage in 2017 (details in Appendix G).

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 26 percent reduction in Basin production over the last 10 years, although 2020 marks the first annual increase in production since the onset of steady declines in 2007. Purveyor pumping from wells in the Lower Aquifer Wester Area accounted for approximately half of the increased Basin pumping between 2019 and 2020 (Figure 6).

Purveyor municipal production data are based on meter readings and reported to the closest acre-foot. 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, which combines metered and unmetered production estimates, is reported to the closest 10 acre-feet. 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).



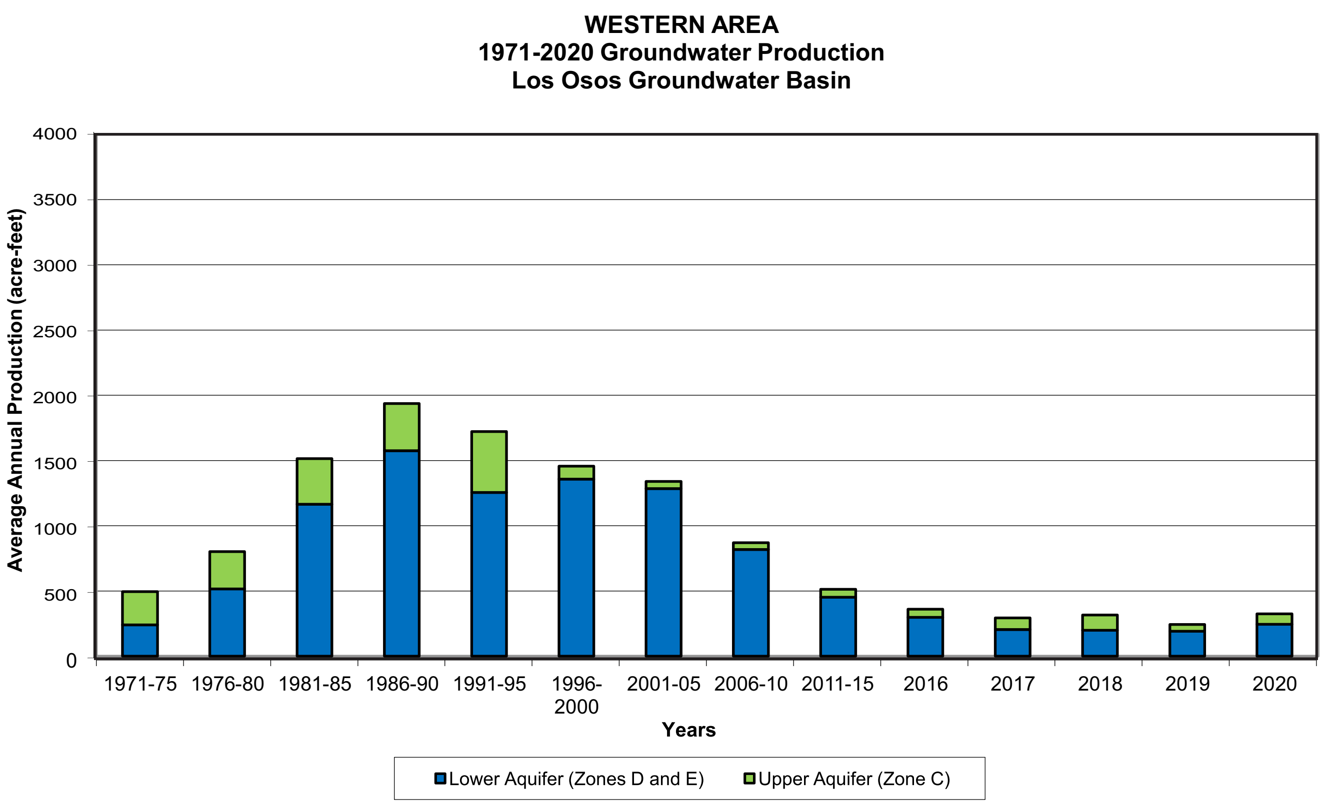


Figure 6
Basin Production 1971-2020
Basin Total and Western Area
Los Osos Goundwater Basin
2020 Annual Report

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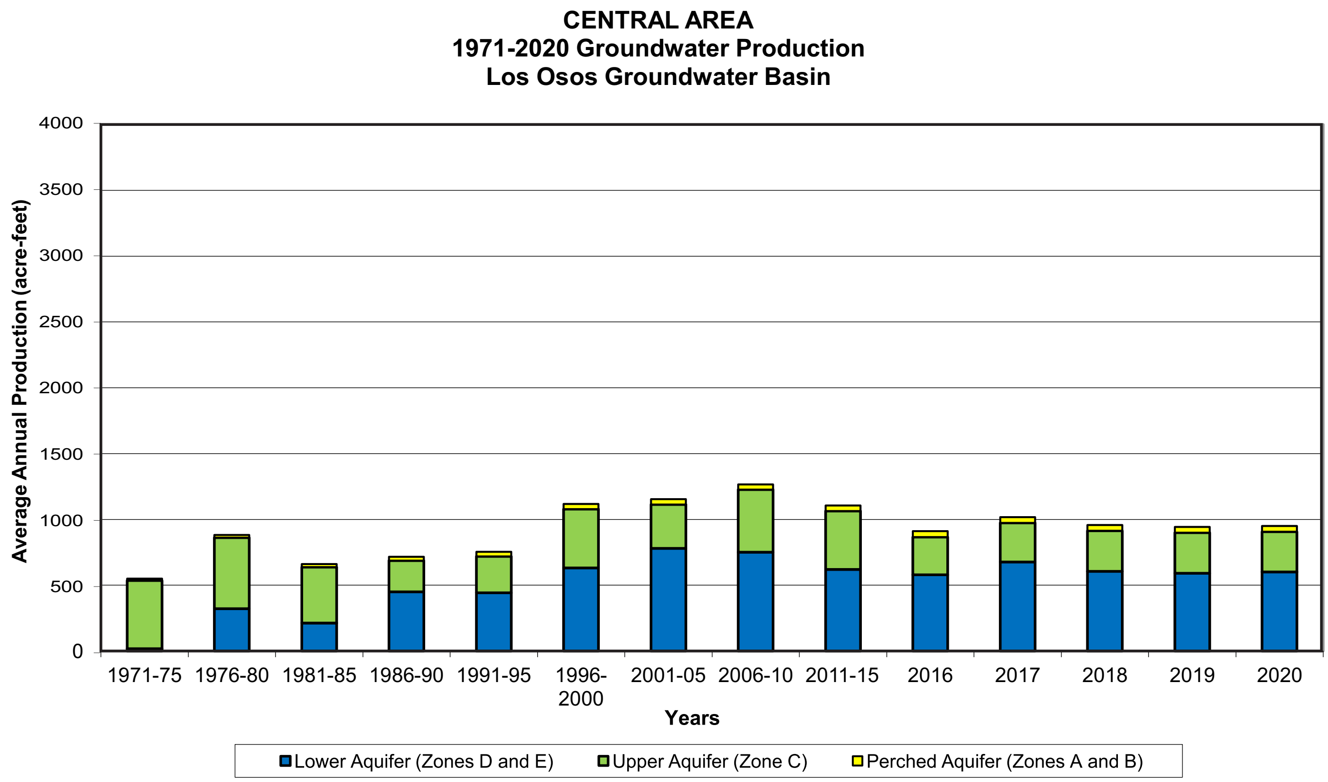

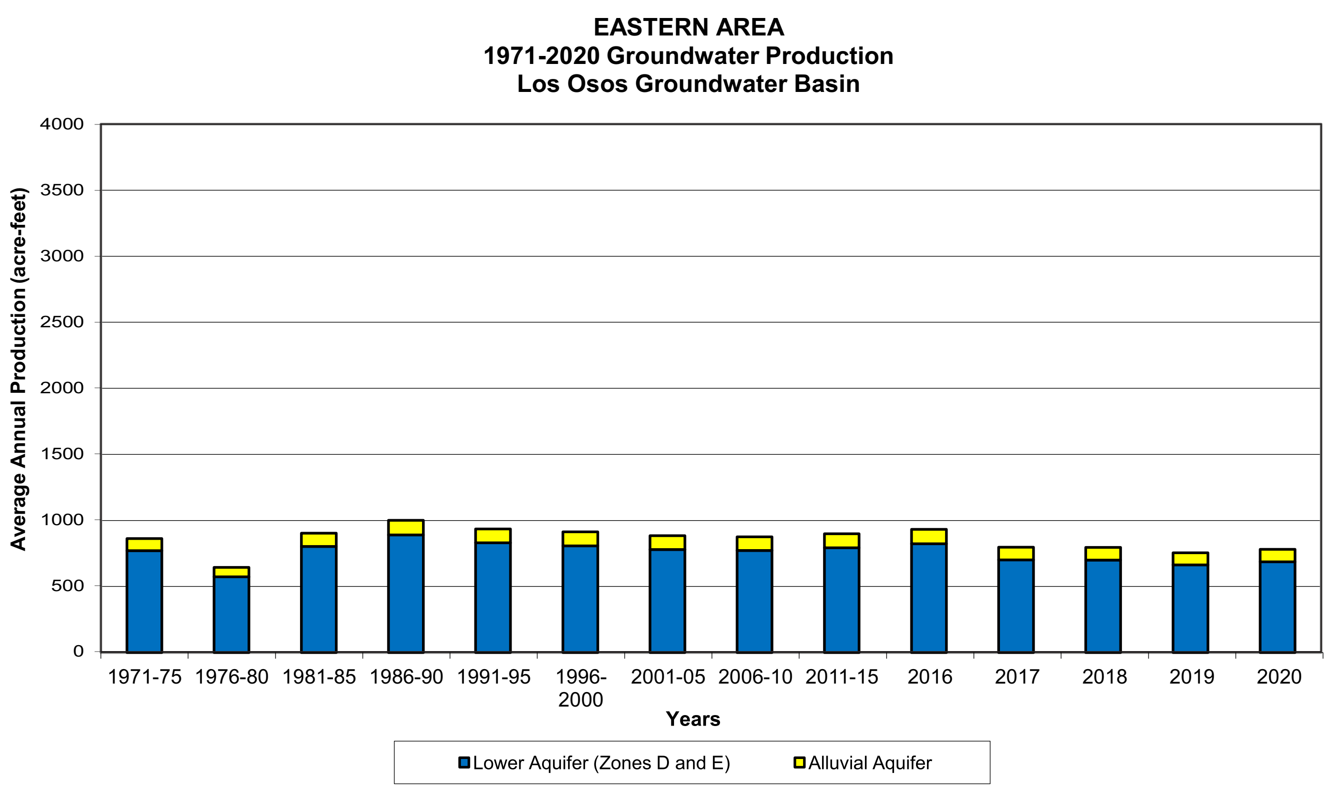

Figure 7
Basin Production 1971-2020
Central and Eastern Areas
Los Osos Groundwater Basin
2020 Annual Report

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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 16.09 inches, with a minimum of 6.83 inches in the 2014 rainfall year and a maximum of 31.78 inches in the 2011 rainfall year. Precipitation for the 2020 rainfall year was reported at 13.92 inches (below average). Records for Station #727 through the calendar year 2020 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.

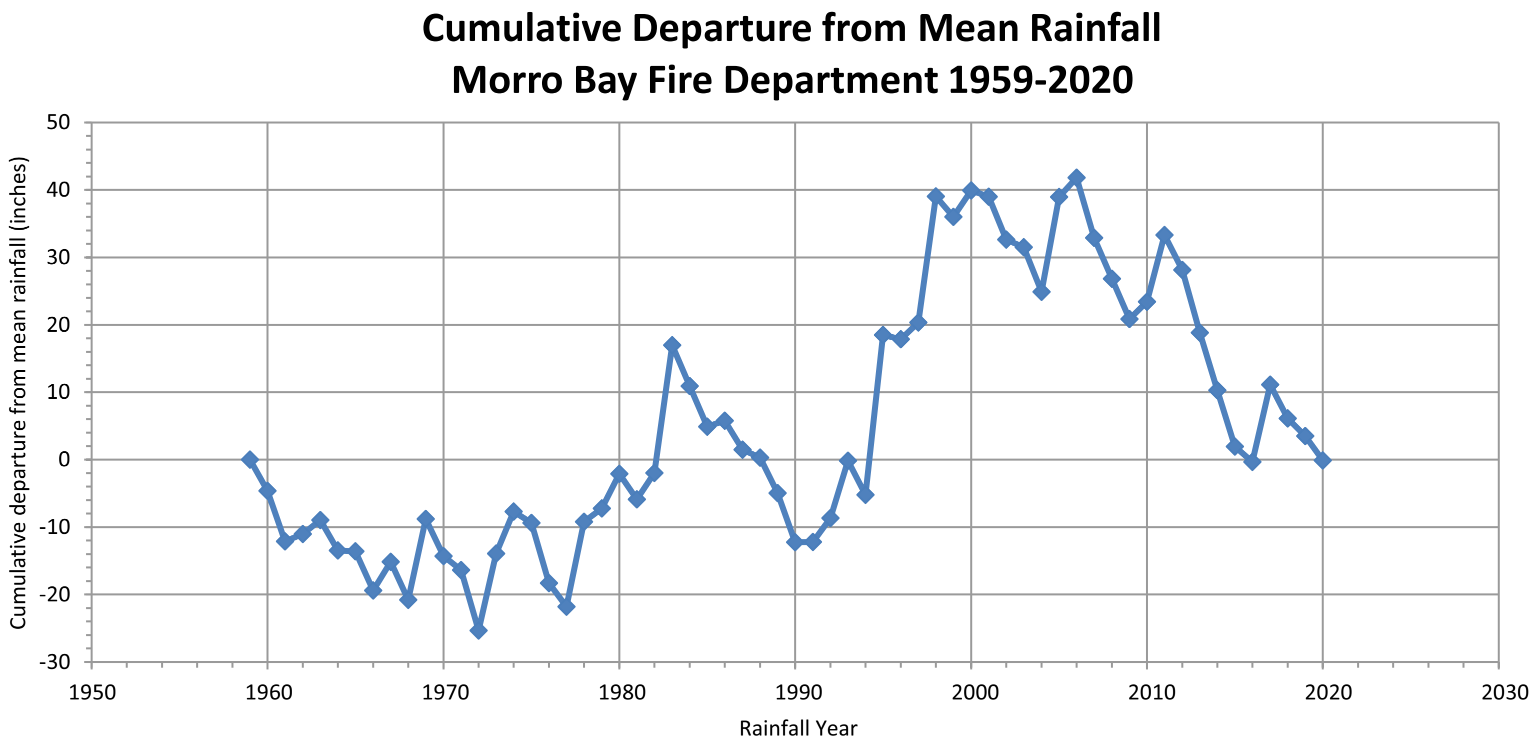
Table 15. Active and Former Precipitation Stations

Station No.	Name	Period of Record (rainfall years)	Average Annual Precipitation (inches)
144.1	Bender	1955-1987	19.17
152	Morro Bay Fire Dept.	1959-2020 (active)	16.1
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	2006-2021 (active)	16.09*

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 2020 (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 2020 with no drought conditions in January. Moderate drought conditions were reported at the end of the calendar year in December 2020 (NDMC/USDA/NOAA, 2020).



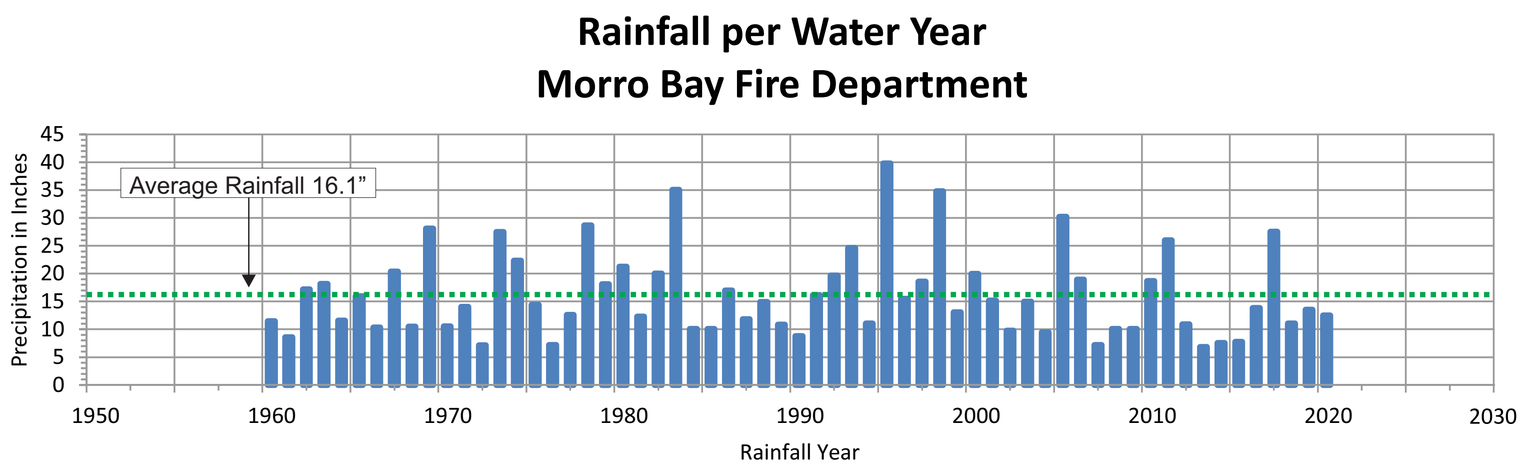


Figure 8
Cumulative Departure from
Mean Rainfall at Morro Bay Fire Department
Los Osos Groundwater Basin
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The Basin model is a steady-state numerical groundwater flow and transport model that assumes a long-term average annual rainfall of 17.5 inches across the Basin. As shown in the cumulative departure curve in Figure 8, the climate has been mostly dry since 2006, with a cumulative drop of 40 inches from the long-term average, equivalent to 2.9 inches per year below average. Station #727 records begin in 2006, therefore, the current average rainfall of 16.09 for that station is interpreted to be below the long-term average for the Basin.

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 ending in 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 34 individual days during the 2020 water year (October 1, 2019 to September 30, 2020), including 23 days of continuous flow between April 5 and April 28, 2020. 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, 2020 Water Year

Date	Maximum Stream Stage County Sensor #751 (feet)
3/16/2020	2.96
4/5/2020	3.60

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 2020 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 2020, 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 2020 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 2020 position of the seawater intrusion front.

- Estimates of groundwater in storage for Spring and Fall 2020, including amount above mean sea level.

- Estimates of changes to groundwater in storage from Spring 2019 to Spring 2020, including the volume of seawater intrusion.

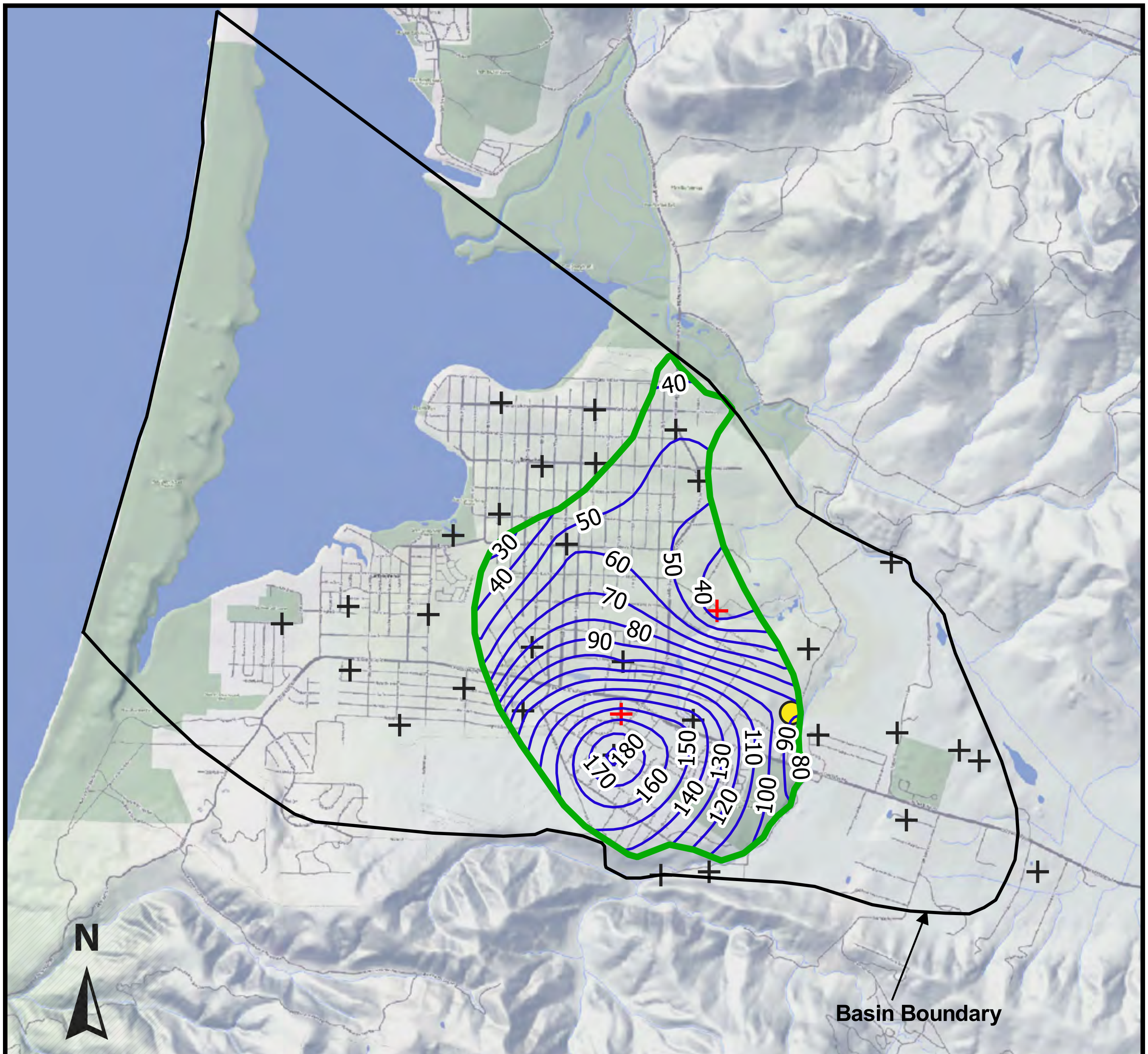
- Basin Yield Metric, Basin Development Metric, Water Level Metric, Chloride Metric, and Nitrate Metric.

- Upper Aquifer Water Level Profile

7.1 Water Level Contour Maps

Water level contour maps for Spring 2020 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 2020 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). With completion of the 2020 wellhead elevation survey, all but a few of the LOBP monitoring network wells now have elevations on-file as reported by a licensed land surveyor or elevations from the original County survey. The County groundwater elevations were adjusted from NGVD 29 to the NAVD 88 datum prior to contouring and groundwater storage calculations.



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 seep used for groundwater elevation

Spring 2020 groundwater elevation data point (contours not applicable outside of Perched Aquifer limits)

Alternate date groundwater elevation data point

Figure 9
Spring 2020 Water Level Contours
Perched Aquifer
Los Osos Groundwater Basin
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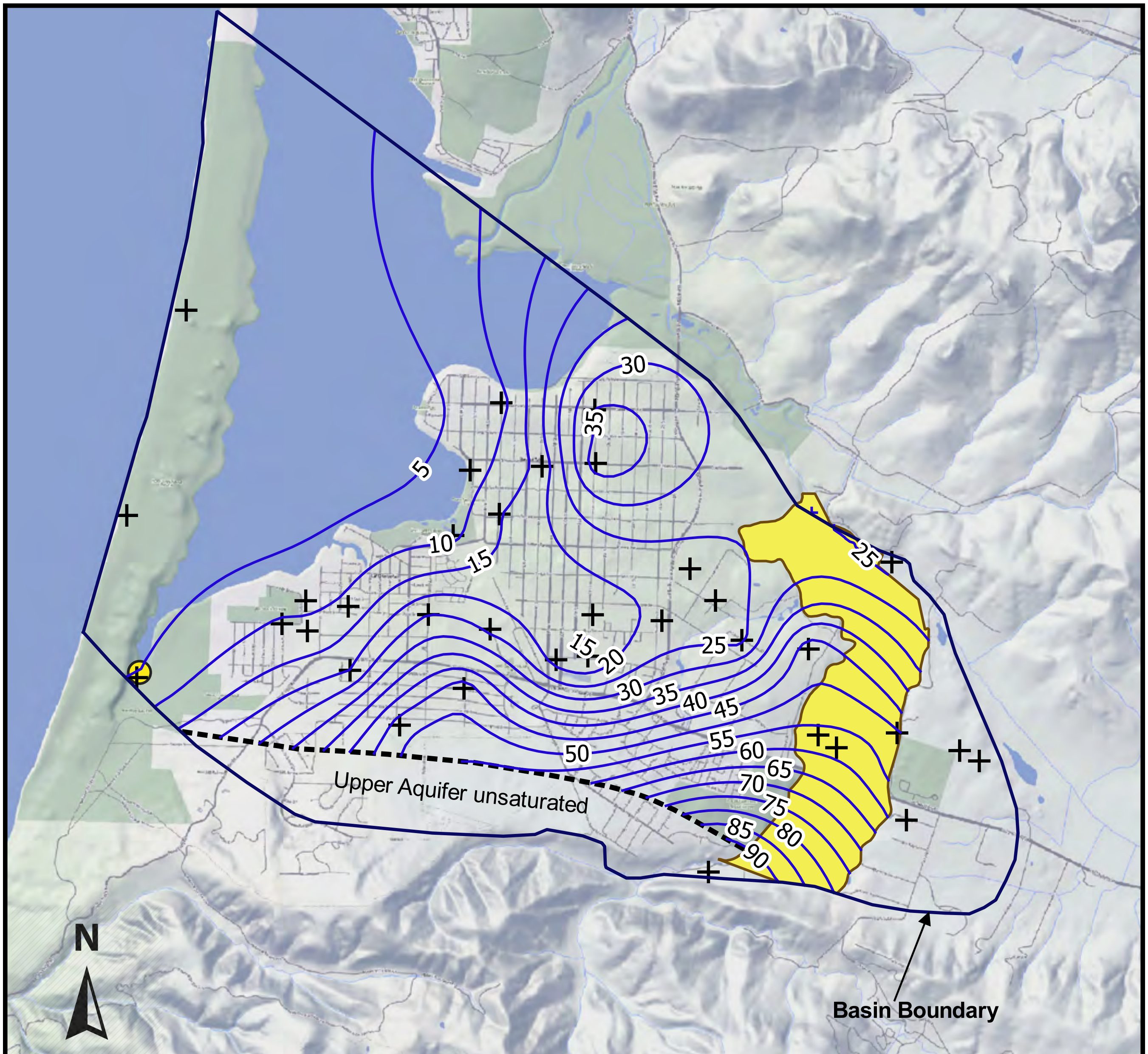

Base Image: Stamen-Terrain

0 2000 4000 6000 8000 ft

Scale: 1 inch ≈ 4,000 feet

Explanation

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

Limits of Alluvial Aquifer

Spring 2020 groundwater elevation data point

Spring seep used for groundwater elevation

Figure 10
Spring 2020 Water Level Contours
Upper Aquifer
Los Osos Groundwater Basin
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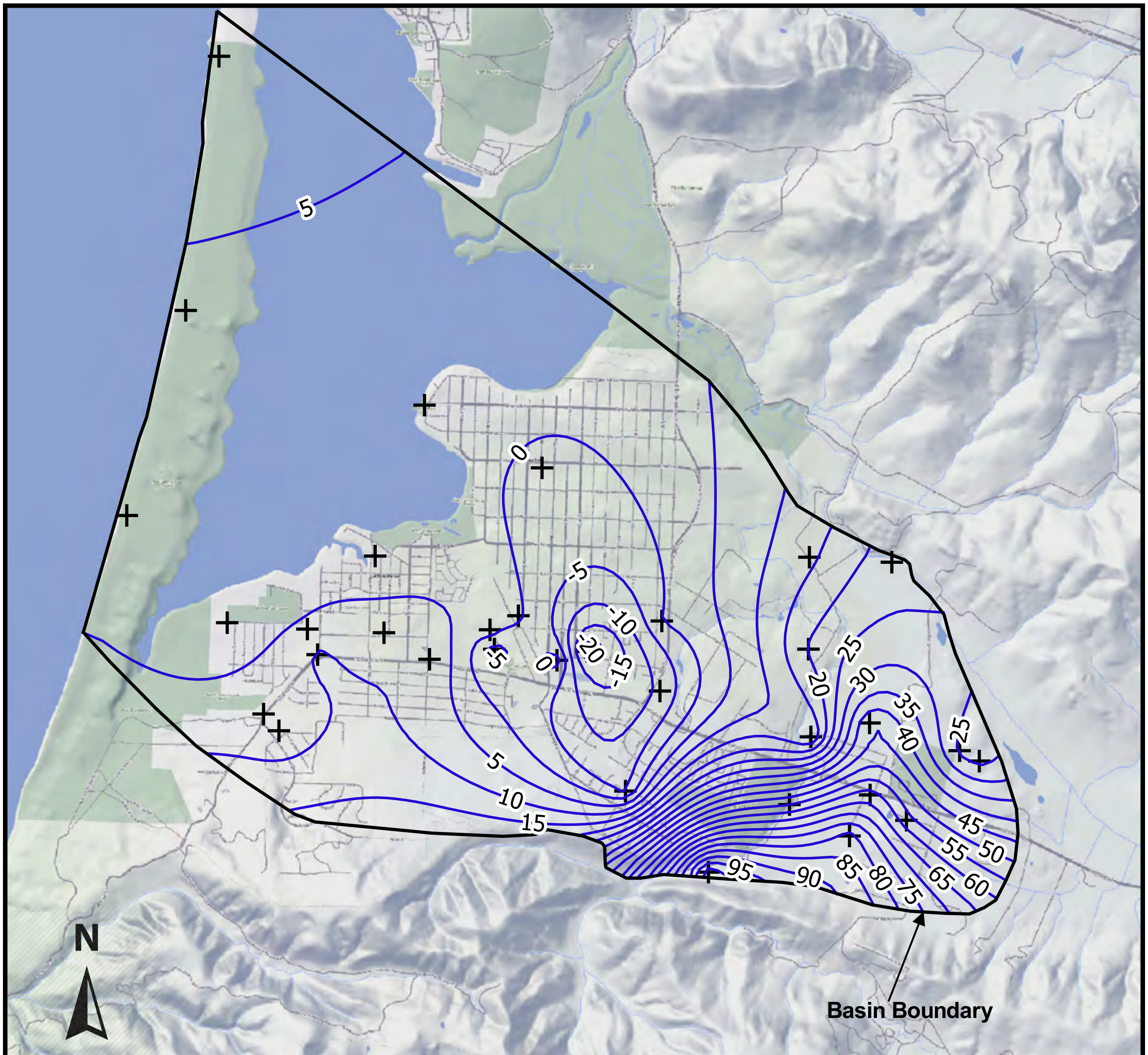

Base Image: Stamen-Terrain

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 2020 groundwater elevation data point

Figure 11
Spring 2020 Water Level Contours
Lower Aquifer
Los Osos Groundwater Basin
2020 Annual Report

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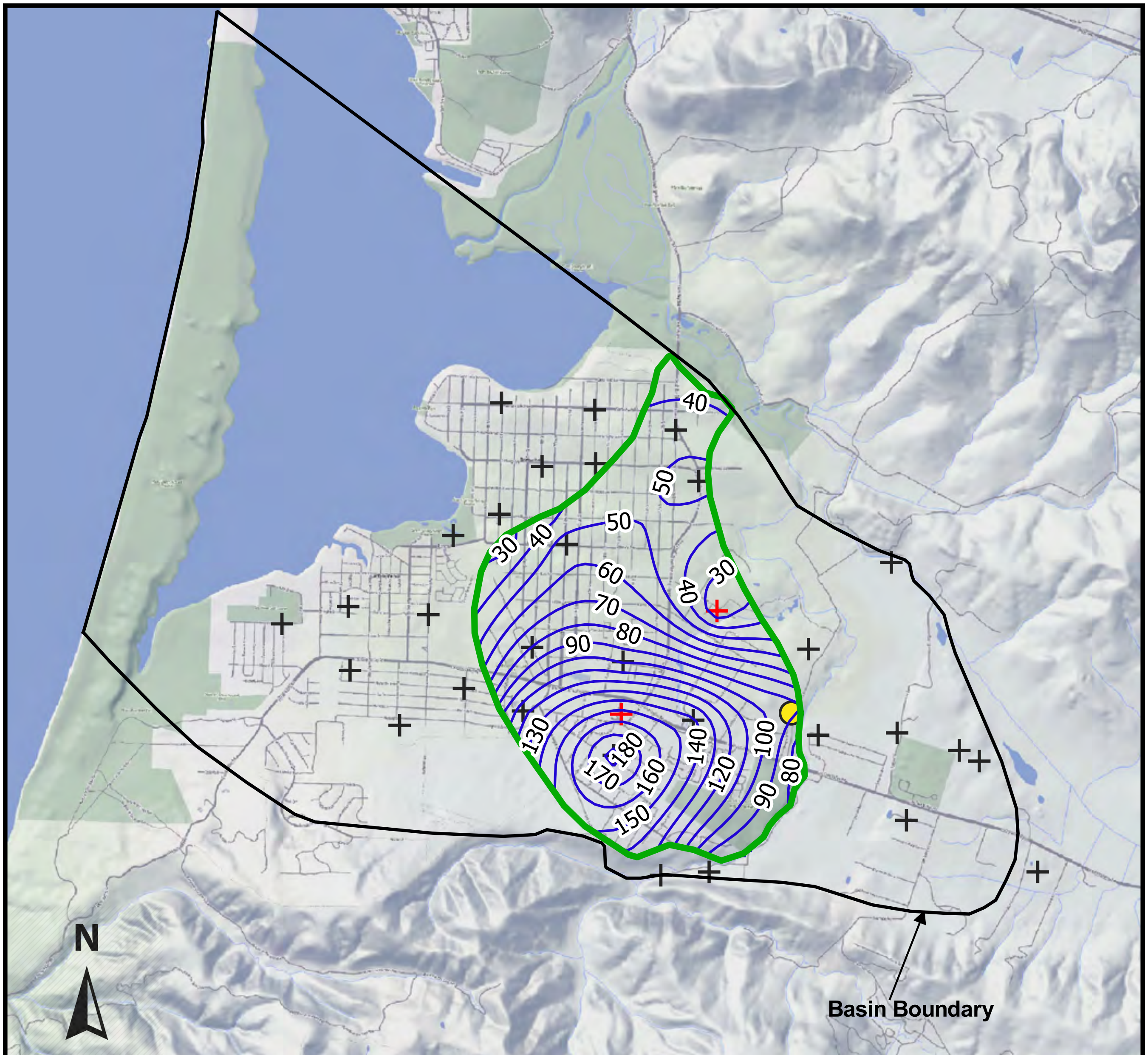

Base Image: Stamen-Terrain

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 (NAVD88 datum)

Spring seep used for groundwater elevation

Fall 2020 groundwater elevation data point
(contours not applicable outside of Perched Aquifer limits)

Alternate date groundwater elevation data point

Figure 12
Fall 2020 Water Level Contours
Perched Aquifer
Los Osos Groundwater Basin
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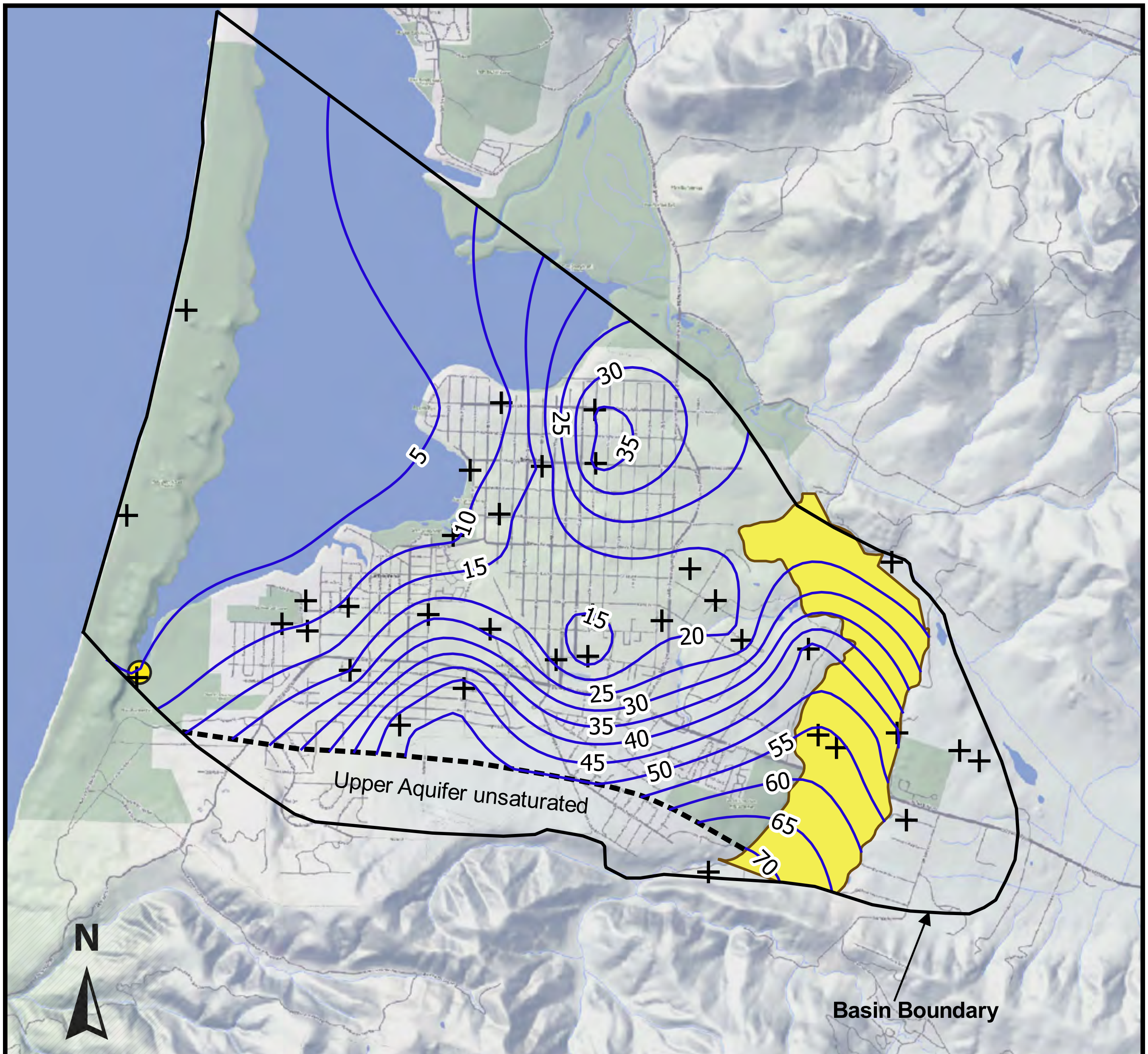

Base Image: Stamen-Terrain

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 2020 groundwater elevation data point

Spring seep used for groundwater elevation

Figure 13
Fall 2020 Water Level Contours
Upper Aquifer
Los Osos Groundwater Basin
2020 Annual Report

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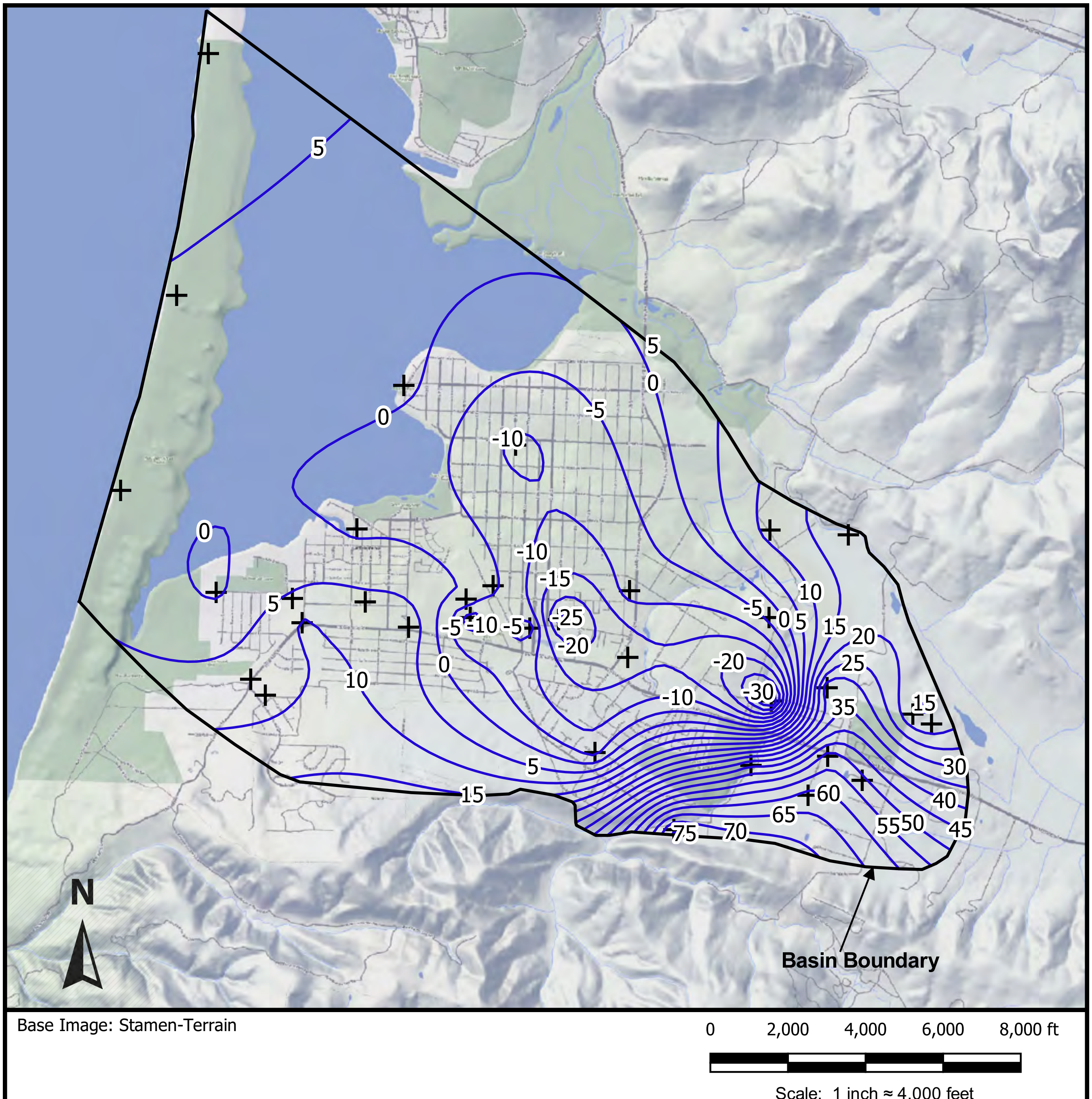

Explanation

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

+ Spring 2020 groundwater elevation data point

Figure 14
Fall 2020 Water Level Contours
Lower Aquifer
Los Osos Groundwater Basin
2020 Annual Report

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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. Overall Perched Aquifer groundwater levels declined approximately 3.64 feet from Spring to Fall 2020.

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 2.0 feet of water level decline from Spring 2020 to Fall 2020.

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 5.5 feet of water level decline from Spring 2020 to Fall 2020.

There is a large pumping depression shown in Fall of 2020 (Figure 14) and some prior years which is centered at a small-diameter, private domestic supply well along the western edge of the Los Osos Creek valley. This well is not capable of producing the level of regional water level drawdown inferred by the contours, and the extent of the pumping depression is likely constrained within a smaller area surrounding the well.

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. An eight-year trend is reported for 2020.

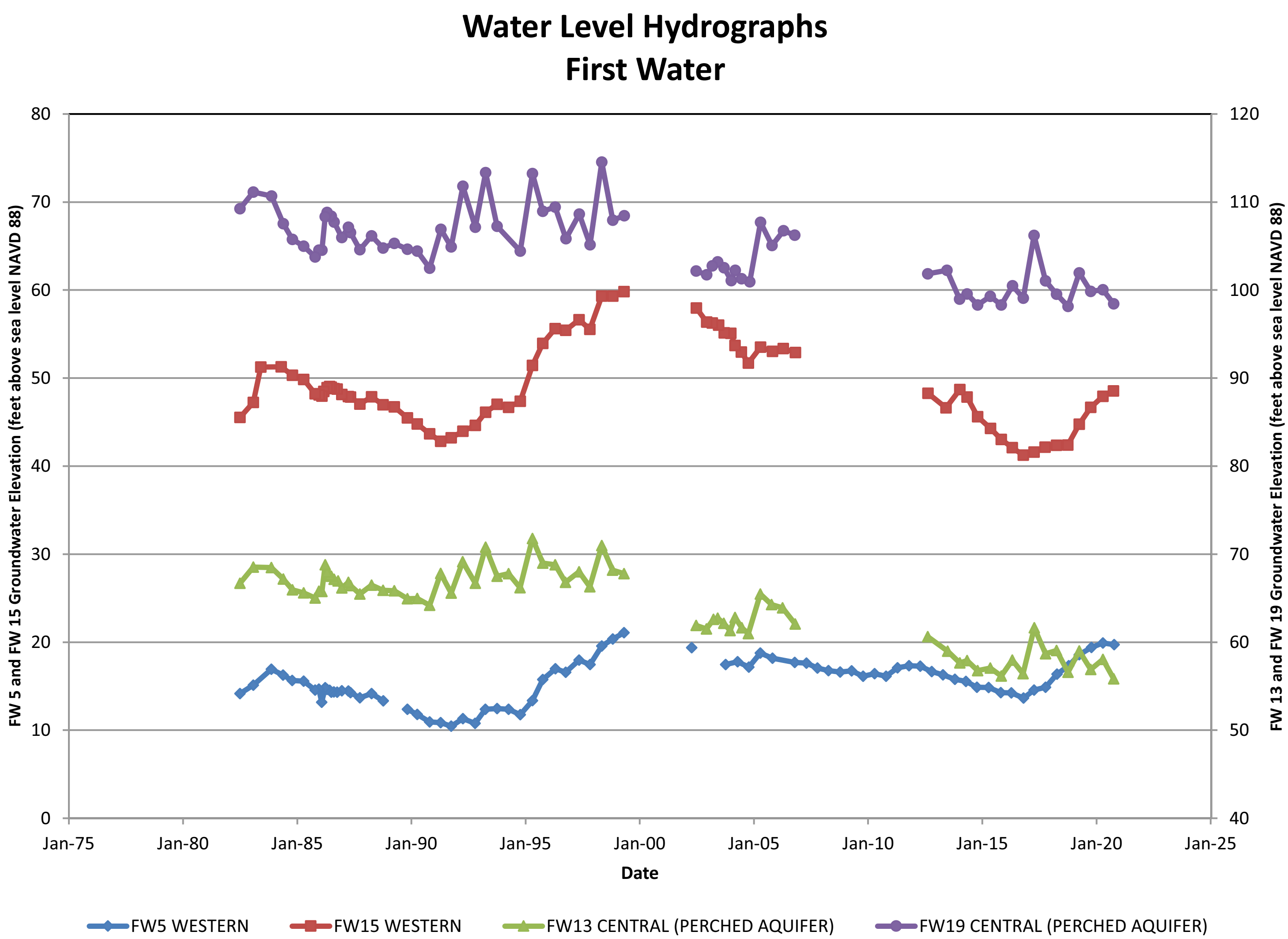

Figure 15
Water Level Hydrographs
Perched Aquifer / First Water
Los Osos Groundwater Basin
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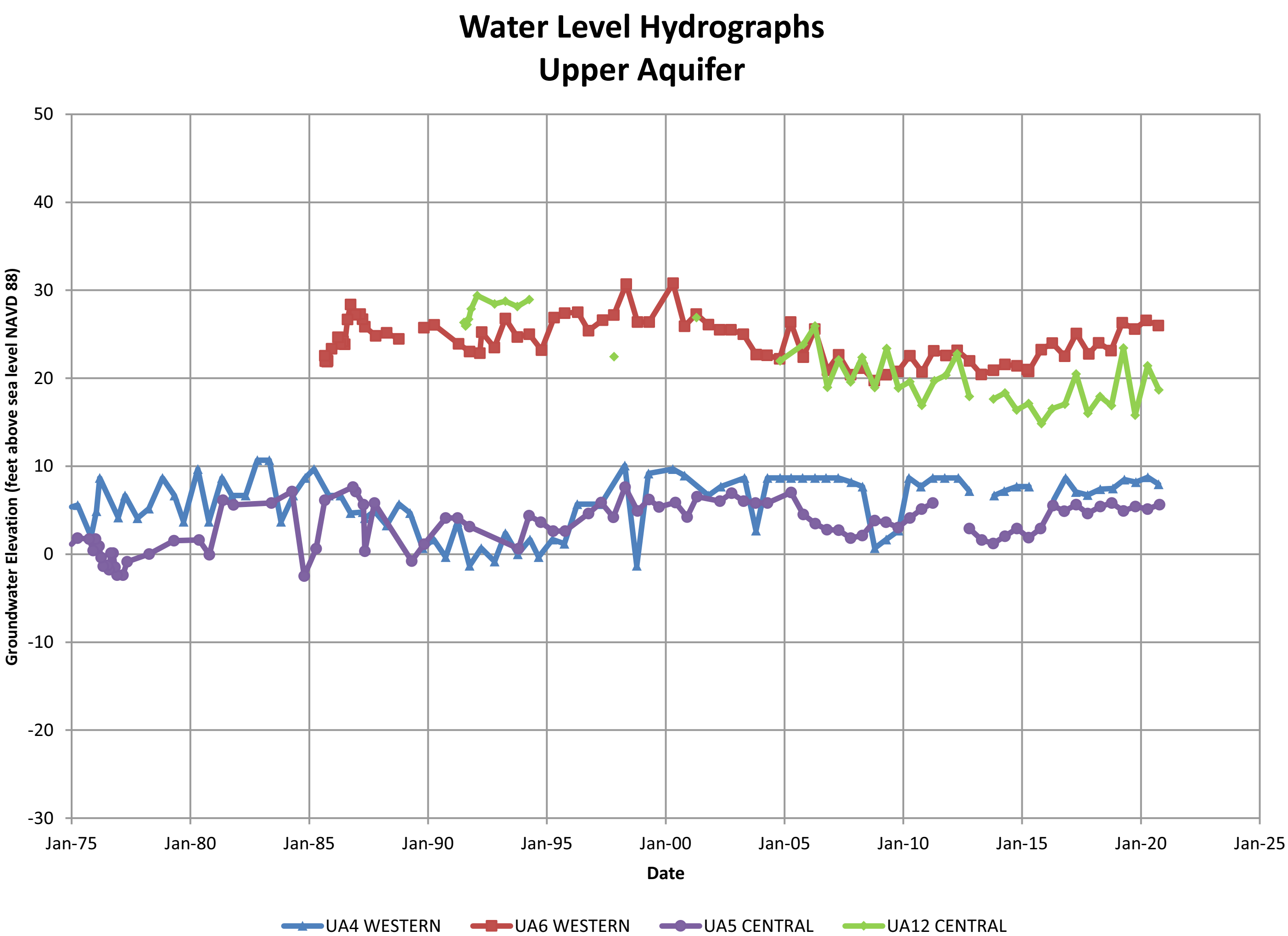

Figure 16
Water Level Hydrographs
Upper Aquifer
Los Osos Groundwater Basin
2020 Annual Report

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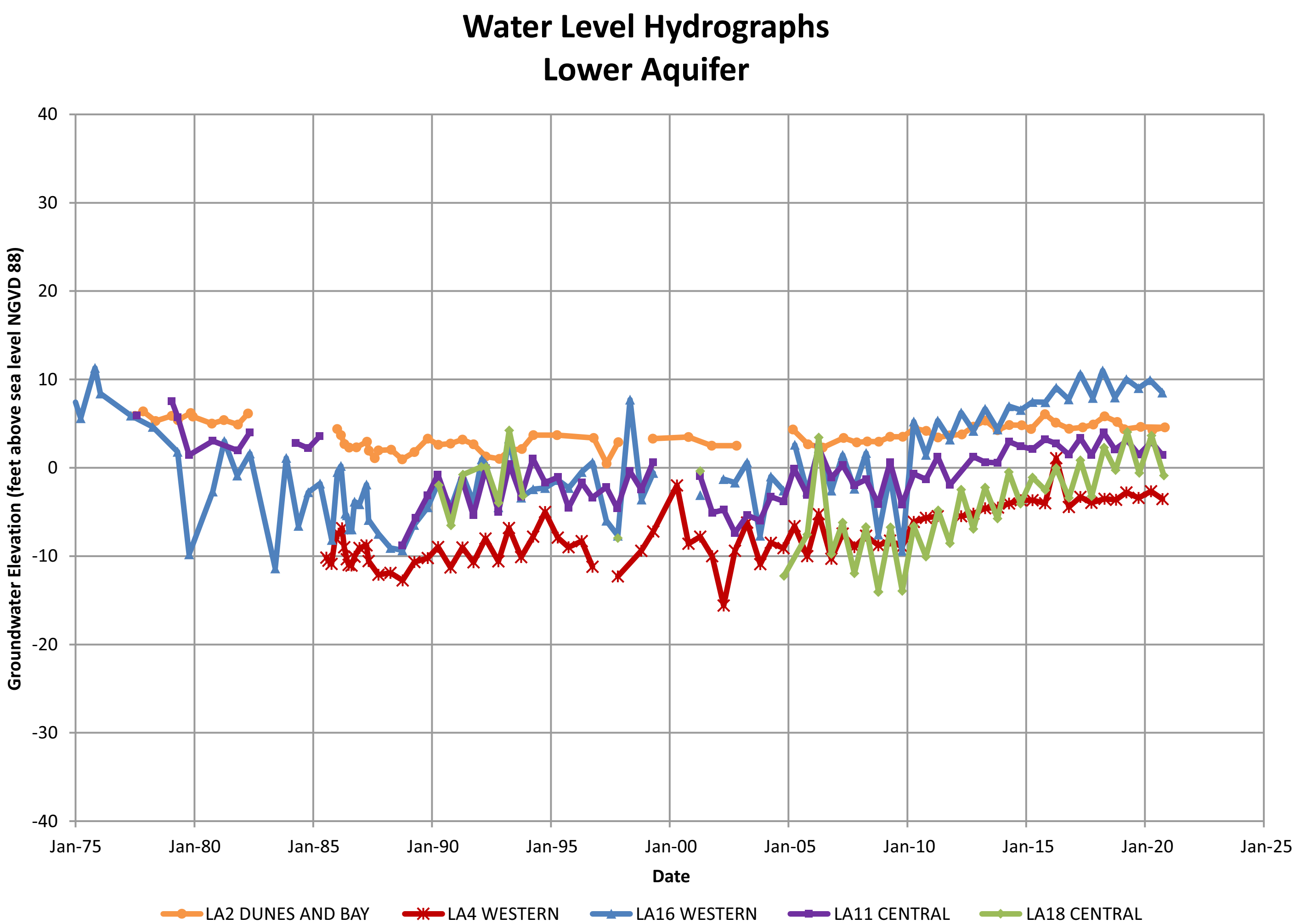

Figure 17
Water Level Hydrographs
Lower Aquifer
Los Osos Groundwater Basin
2020 Annual Report

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The Spring to Spring water level trend for the last eight years (2012-2020), based on First Water hydrographs in Western and Central Area wells was 0.06 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 (2010-2020), based on representative Central and Western wells was an increase of 0.17 feet per year in the Upper Aquifer, and 0.43 feet of rise per year in Lower Aquifer water levels (Figures 16 and 17, respectively).

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 Upper Aquifer near the Broderson leach field in the Western Area of the Basin. Starting in June of 2017, water levels have shown a steady rise of approximately 18 feet, with a brief plateau in December of 2019 (Appendix I). The rise in water level is credited to groundwater mounding on the regional aquitard beneath the Broderson leach field. 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 base of the Upper Aquifer in the Western Area and Central Area of the Basin, respectively. These wells have 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. Overall water level trends have been relatively flat to rising slightly since 2016 (Appendix I).

- 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 40 feet (Appendix I). The relatively large seasonal fluctuations are 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. Overall water level trends have been flat to rising slightly since 2016 (Appendix I).

7.3 Seawater Intrusion

The estimated position of the Fall 2020 seawater intrusion front in Lower Aquifer Zone D is shown in Figure 18, along with selected prior years. There is insufficient information to represent current Lower Aquifer Zone E intrusion in a plan view figure, but a generalized plan view interpretation of Zone E intrusion using data from various years is included in Figure 18. The seawater intrusion front corresponds to the position of the 250 mg/L chloride concentration isopleth, based on water quality samples from Lower Aquifer wells.

The addition of LA41 (Lupine Avenue Zone D) in 2019 contributed to a refinement of the location of the seawater intrusion front in Zone D along the bay, compared to prior years, and resulting in a more westerly (improved) position compared to previous years (Figure 18). Based on the contours, the seawater intrusion front moved several hundred feet inland between Fall 2019 and Fall 2020, although this is interpreted to be the result of localized chloride fluctuations at LA10 rather than broad intrusion front movement. 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.

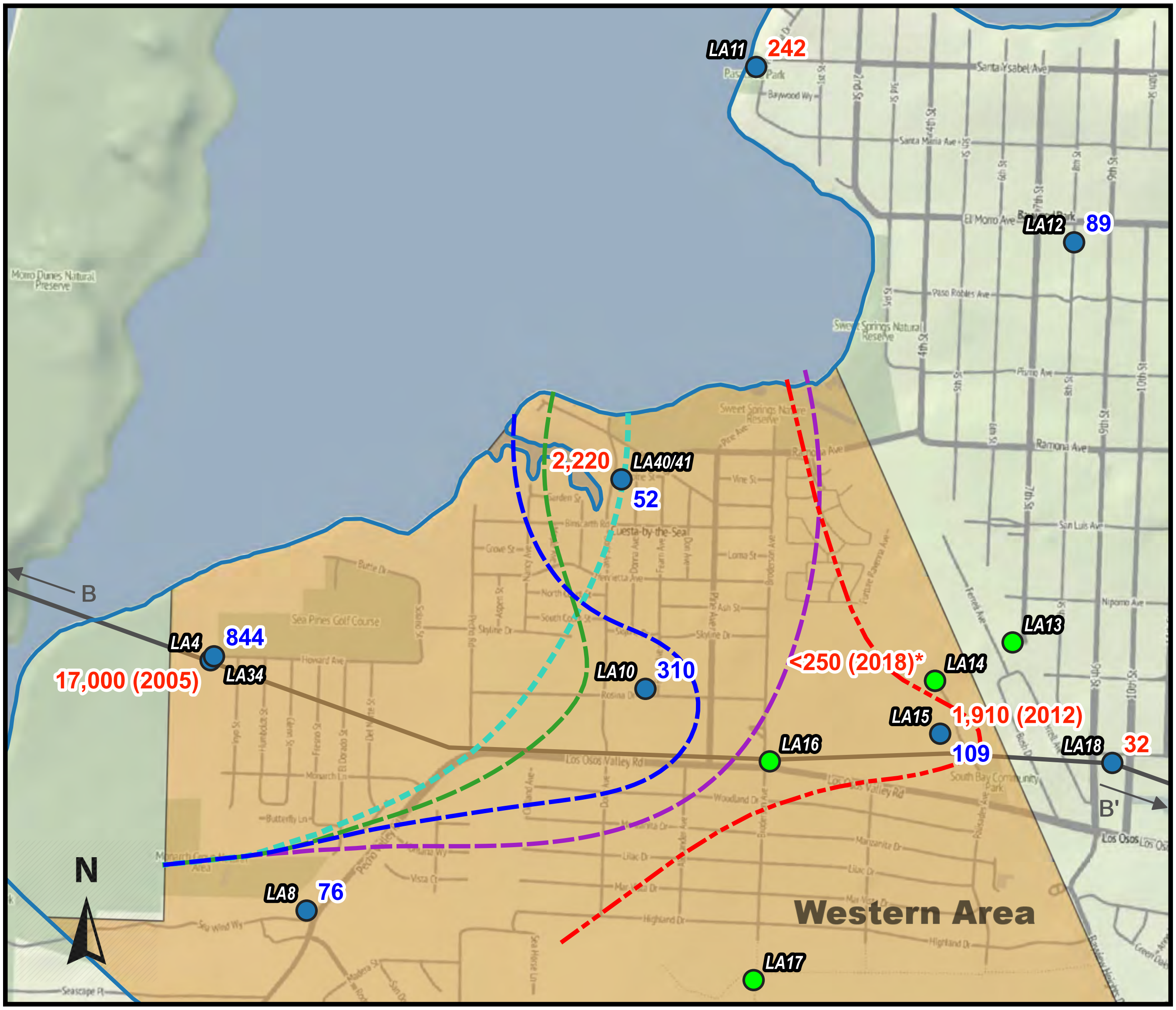
The location of the intrusion front is also shown in cross-section on Figure 19 and Figure 20 (cross-section alignments shown in Figure 1). Figure 19 (Basin cross-section B'B') runs from the sandspit to the eastern Basin boundary. The intrusion front in the Upper Aquifer remains beneath the sandspit, based on the triennial geophysics performed at 13M1 (last done in 2018) and on active bayfront municipal supply well UA3. Zone D intrusion has reached LA10 (Rosina Drive near Fearn Avenue). In Zone E, the intrusion front reached LA15 (Palisades Avenue) in 2013, after which the zone was sealed off from production. There has been no evidence of further inland movement west of Palisades Avenue along the B-B' cross-section, based on triennial geophysics at LA14 (last done in 2018) and on water quality monitoring at Zone E monitoring well LA32 (10th Street). Inland movement of the Zone E front toward LA11, however, is occurring.

Figure 20 (section E-E') runs from Morro Bay on the north to the Los Osos fault on the south, and crosses section B-B' at Los Osos Valley Road (Figure 1). Zone D intrusion is interpreted in section E-E' to have reached LA10 near the middle of the basin, with the lateral extent along the section constrained by LA40 on the north, and by the rising limb of the syncline on the south. The intrusion front is not present along the Basin synclinal axis at the new Lupine Avenue nested monitoring well location, where the chloride concentration in LA41 is 52 mg/l. In Zone E, seawater intrusion is interpreted to be laterally pervasive in the Western Area, based on the elevated concentration in LA40 (Lupine Avenue) and an increasing trend in chloride concentrations at LA11 (Pasadena Drive) which indicates a worsening condition over time. Additional deep monitoring wells are needed to further define the extent and movement of intrusion in both Zone D and Zone E.

Summary tables with historical water quality for lower aquifer wells have been provided to the BMC separately from the Annual Report in prior years, and are now included as Appendix J for reference. One advantage of compiling historical water quality data tables is that trends for individual wells can be reviewed, rather than relying on a single composite well metric.

Four locations were previously identified 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 (CHG, 2020). These locations are shown in Figure 18. Evaluating the feasibility and costs of these modifications is recommended. Additional Lower Aquifer monitoring wells are also recommended to improve seawater intrusion definition in both Zone D and Zone E. Selecting feasible sites for new monitoring wells could be performed in conjunction with the evaluation of potential existing well modifications.

Seawater intrusion in Zone E is anticipated to be halted through a combination of reduced pumping in the Western Area together with increased recharge across the regional aquitard, following development of the groundwater mound beneath the Broderson disposal site. The redistribution of pumping and development the Broderson groundwater mound are both still in progress.



Base Image: Stamen-Terrain

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

Scale: 1 inch ≈ 1,500 feet

Explanation

Cross-section alignment (Figures 5 and 19)

Bulletin 118 Basin Boundary

310
32
Well with Zone D and/or Zone E chloride concentration (mg/L)
(Value for Fall 2020 except where year noted)

Potential Zone E monitoring well
(with well modification)

* LA14 Zone E value based on geophysics

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

Winter 2005 - Zone D (Pre LA40/41)

Fall 2016 - Zone D (Pre LA40/41)

Fall 2019 - Zone D

Fall 2020 - Zone D

Fall 2020 - Zone E (Generalized with data from other years)

Figure 18
Seawater Intrusion Front
Western Area
Lower Aquifer Zone D and E

Los Osos Groundwater Basin
2020 Annual Report

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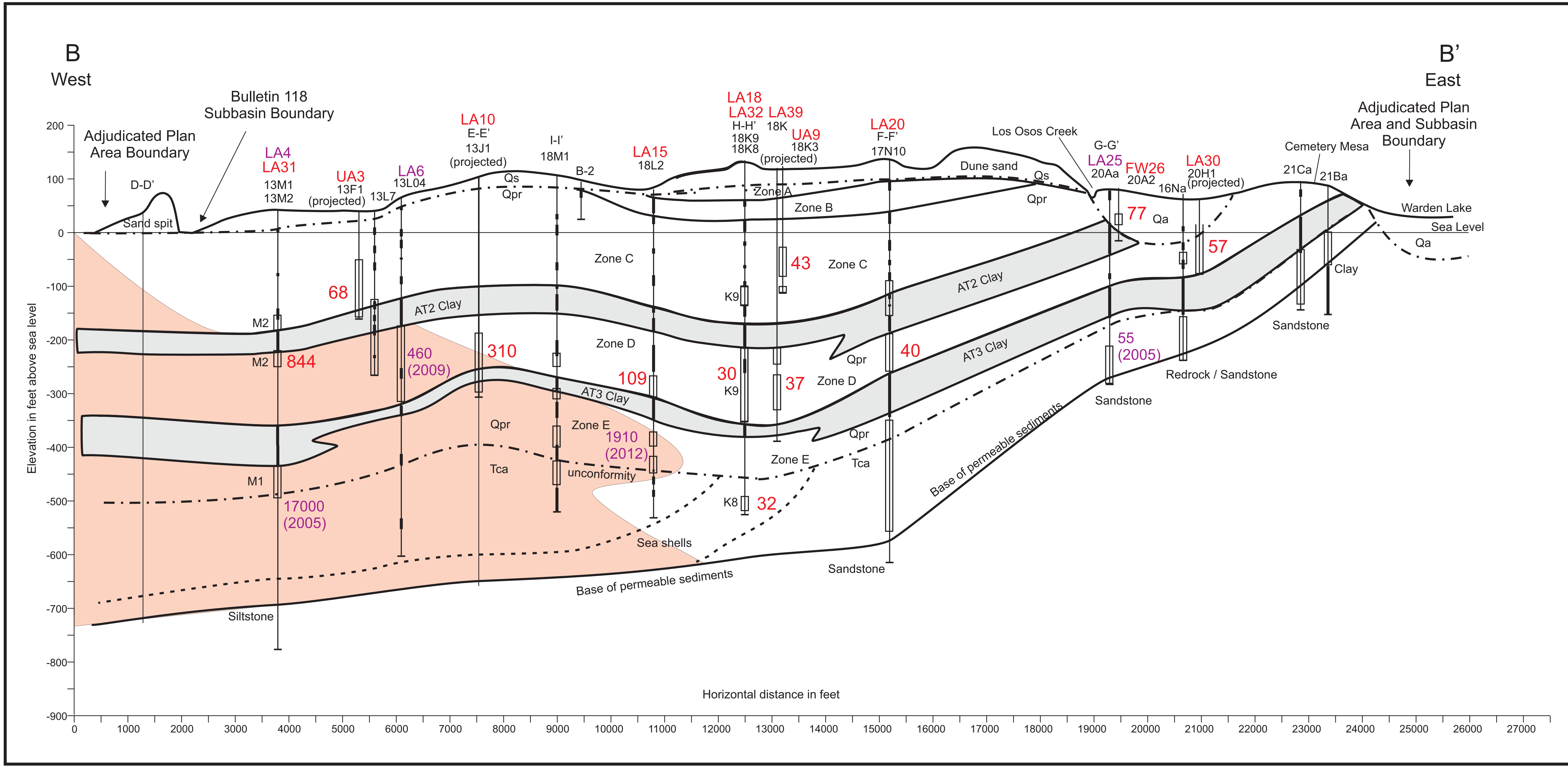

Aquifer Zones:
Zone A - Perched Aquifer
Zone B - Transitional Aquifer
Zone C - Upper Aquifer
Zone D - Lower Aquifer (shallow)
Zone E - Lower Aquifer (deep)

Well data point
18M1 Well ID
Clay layer
Well screen
Clay layers not shown at projected wells

Formation:
Qa - alluvium
Qs - dune sand
Qpr - Paso Robles Formation
Tca - Careaga Formation

Cross-section alignment shown in Figure 1

LA31 - LOBP Monitoring Network ID

310 - Chloride concentration in mg/L (Fall 2020)

Estimated extent of seawater intrusion (Fall 2020)

460 - Historical Chloride concentration in mg/L (year listed)

Figure 19

Seawater Intrusion Front
Cross-Section B-B'
Los Osos Groundwater Basin
2020 Annual Report

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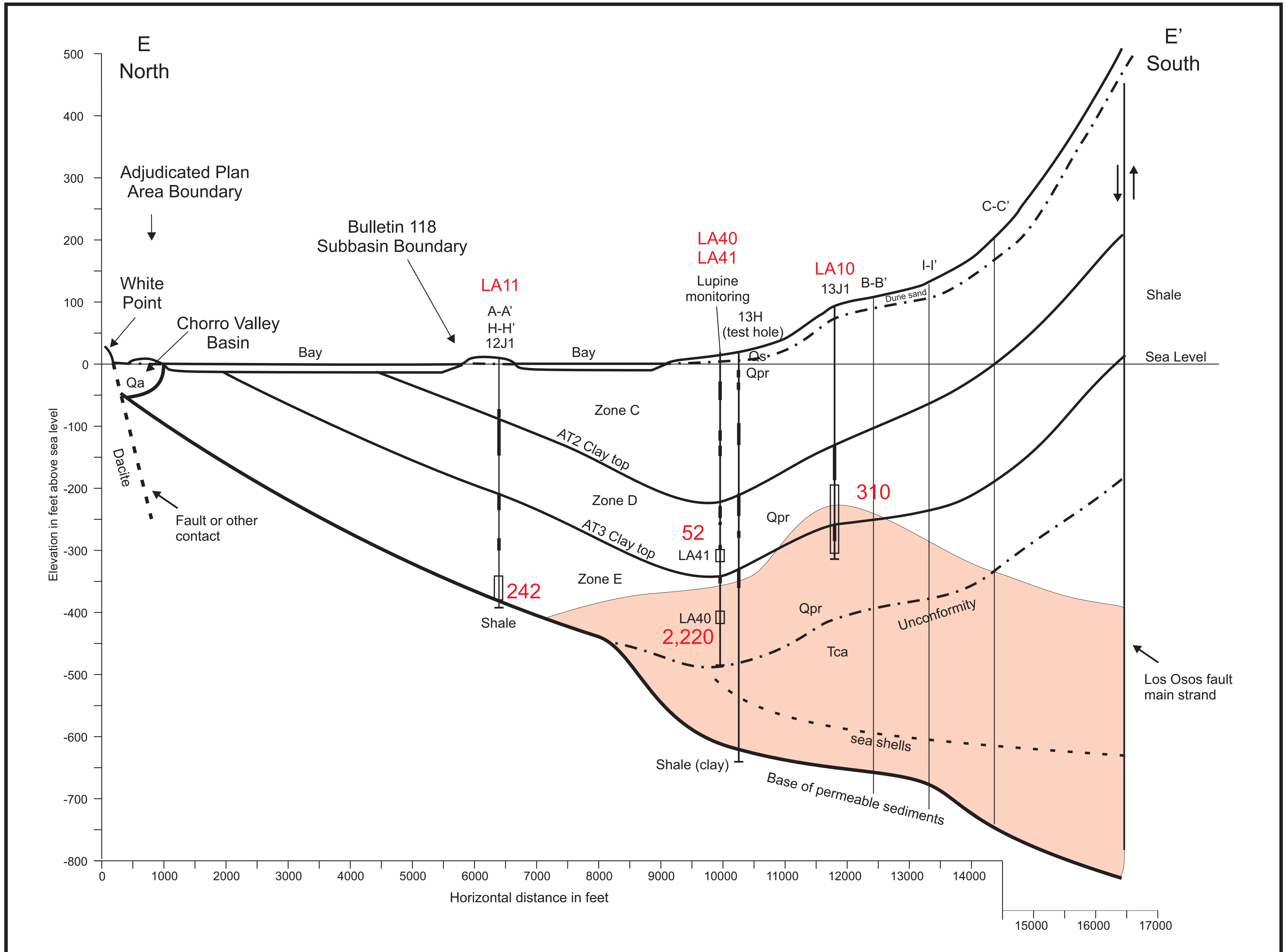

Aquifer Zones:
Zone A - Perched Aquifer
Zone B - Transitional Aquifer
Zone C - Upper Aquifer
Zone D - Lower Aquifer (shallow)
Zone E - Lower Aquifer (deep)

Well data point
12J1 Well ID
Clay layer
Well screen

Formation:
Qa - alluvium
Qs - dune sand
Qpr - Paso Robles Formation
Tca - Careaga Formation

Cross-section alignment shown in Figure 1

LA31 - LOBP Monitoring Network ID

310 - Chloride concentration in mg/L (Fall 2020)

Estimated extent of seawater intrusion (Fall 2020)

Figure 20

Seawater Intrusion Front
Cross-Section E-E'
Los Osos Groundwater Basin
2020 Annual Report

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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 K. Storage estimates were performed for Spring and Fall 2020 and included separate estimates for the following areas and aquifers shown in Figure 21:

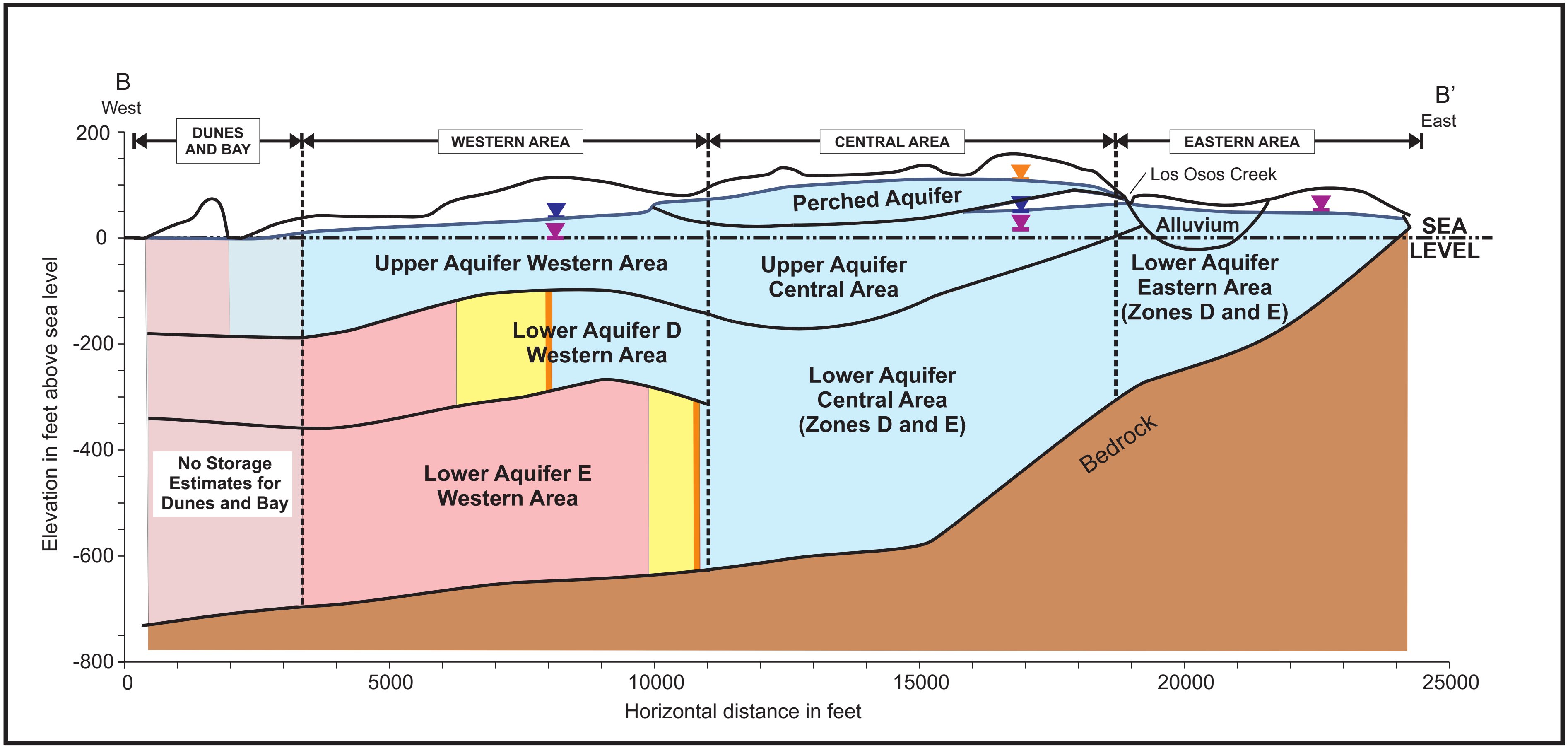
- Perched Aquifer
- Western Area Upper Aquifer
- Western Area Lower Aquifer
- Central Area Upper Aquifer
- Central Area Lower Aquifer
- Eastern Area Alluvial and Lower Aquifer

The various storage compartments are shown conceptually in Figure 21. 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. Detailed lithologic log correlations were provided in the 2018 Annual Report (CHG, 2019b).

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 shown in the 2018 Annual Report.
[2] Used for Central Area storage calculations
[3] Used for Eastern Area storage calculations



Cross-section alignment shown in Figure 18

Explanation

Groundwater in Storage <250 mg/l Chloride 2020

Groundwater in Storage >250 mg/l Chloride 2005

Change in Groundwater in Storage >250 mg/l Chloride Winter 2005-2020

Fall 2020 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 21
Basin Storage Compartments
Los Osos Groundwater Basin
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Beginning in 2018, Basin storage calculations have been based on specific yields for each individual aquifer zone. 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 18 and Figure 21).

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 21). Appendix K includes a list of wells used for 2020 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 2020.

Table 18. Groundwater in Storage Spring and Fall 2020 (<250 mg/L Chloride)

Basin Area	Aquifer	Zone	Spring 2020		Fall 2020	
			Total	Above Sea Level	Total	Above Sea Level
			ACRE-FEET			
Western and Central	Perched	A, B	5,800	5,800	5,400	5,400
	Upper	C	28,800	6,900	28,000	6,200
Western	Lower[1]	D[2]	15,400	<10	14,500	<10
Central	Lower[1]	D, E	55,100	<10	55,100	<10
Eastern	Alluvial and Lower	Alluvial, D, E	19,500	5,000	18,700	4,200
TOTAL			124,600	17,700	121,700	15,800

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 124,600 acre-feet in Spring 2020, with an estimated 17,700 acre-feet above sea level (Table 18). There was a calculated net seasonal storage decline of 2,900 acre-feet between Spring 2020 and Fall 2020, with 900 acre-feet of that being a loss of freshwater storage in Lower Aquifer

Zone D. Changes to freshwater storage in Zone D are based on shifts in the position of the 250 mg/L contour line as shown in Figure 18. Storage losses are recoverable.

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 2019 groundwater in storage with Spring 2020.

Table 19. Change in Storage Spring 2019 to Spring 2020 (<250 mg/L Chloride)

Basin Area	Aquifer	Zone	Spring 2019[1]		Change from Spring 2019 to Spring 2020	
			Total	Above Sea Level	Total	Above Sea Level
			ACRE-FEET			
Western and Central	Perched	A, B	5,700	5,700	100	100
	Upper	C	28,900	7,000	-100	-100
Western	Lower[2]	D[3]	14,300	<10	1,100	0
Central	Lower[2]	D, E	55,100	<10	0	0
Eastern	Alluvial and Lower	Alluvial, D, E	19,400	4,900	100	100
TOTAL			123,400	17,600	1,200	100

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 reported in Table 19, there was an estimated gain of 1,100 acre-feet of freshwater storage in the Lower Aquifer between Spring 2019 and Spring 2020. This increase does not represent a retreat of the seawater intrusion front, but is a result of adding LA41 to the Spring 2020 contoured data set (similar to last year's adjustment of the Spring to Fall storage estimate). There was a gain of 100 acre-feet in storage above sea level in the Basin over the same period, for a net gain of 1,200 acre-feet of storage between Spring 2019 and Spring 2020, a portion of which would also be due to the wellhead survey adjustments. Note that Spring to Spring storage is a measure of annual change, while Spring to Fall storage is a measure of seasonal fluctuation.

7.5 Basin Metrics

LOBP Section 1.3.1 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 2020 is a ratio expressed as follows:

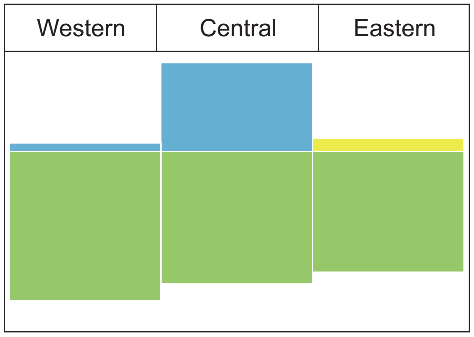
$$\frac{\text{2020 Groundwater Production}}{\text{2020 Sustainable Yield}} * 100$$

Groundwater production in 2020 was 2,010 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). This estimated sustainable yield includes the 8th Street Shallow well (LOBP Program A) which was constructed in 2016 but has not yet been placed in service. An update of developed purveyor infrastructure capacity for year-end 2020 was planned for refining the 2020 sustainable yield estimate, however, that information is pending. Therefore, the 2016 sustainable yield estimate is retained, resulting in a Basin Yield Metric for 2020 of 73. The LOBP objective for the Basin Yield Metric is 80 or less and has been met in each of the last five years.

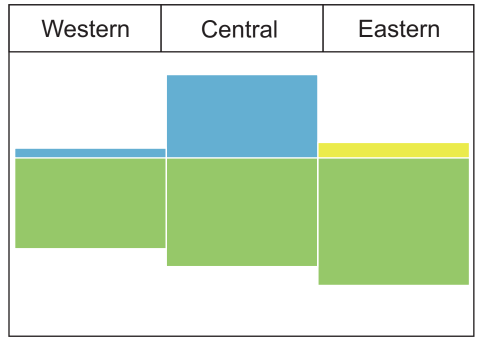
Figure 22 compares the Basin Yield Metric and area production in the Basin since 2005. The Basin Yield Metric has dropped from an average of 125 between 2005 and 2009 to 73 in 2020. Two development scenarios from the LOBP are also provided for comparison in Figure 22.

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.

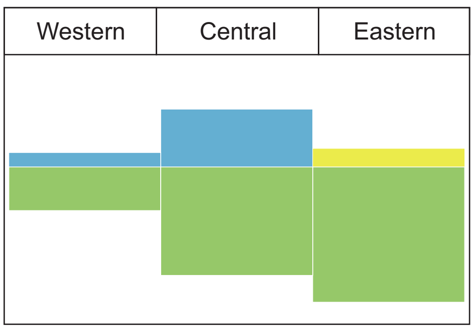
2005-2009
Average Production 3,060 AFY
Basin Yield Metric = 128



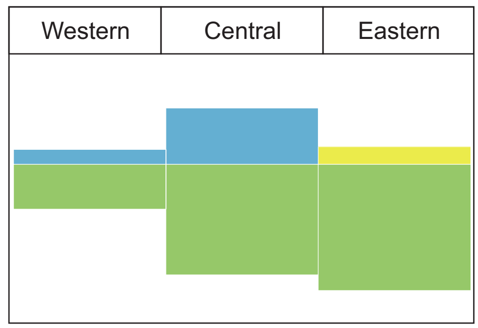
2010-2014
Average Production 2,600 AFY
Basin Yield Metric = 106



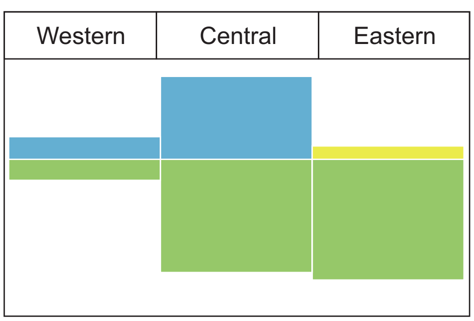
2015-2019
Average Production 2,072 AF
Basin Yield Metric = 75



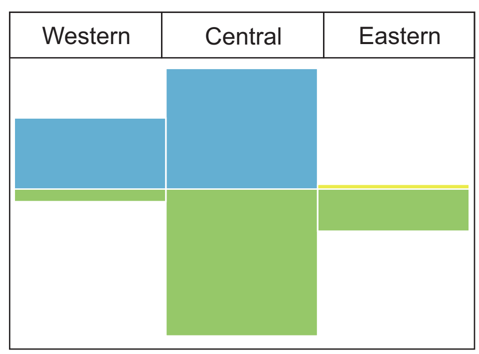
Year 2020
Average Production 2,011 AF
Basin Yield Metric = 73

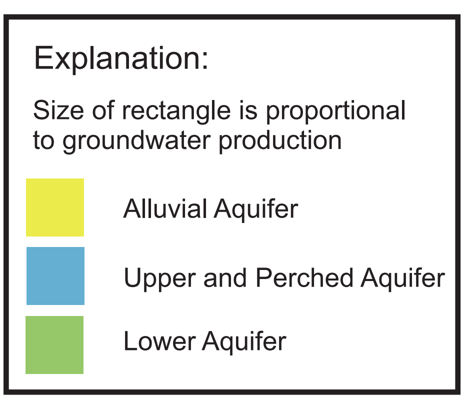


E+AC+U (No Further Development Scenario)
refer to Basin Plan for full description
Average Production 2,230 AFY
Basin Yield Metric = 74



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





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

Figure 22
Basin Yield Metric Comparison
Los Osos Groundwater Basin
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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).

There have been no significant changes to the Basin model since 2009. A peer review was conducted by Stetson Engineers (2010) which characterized the model as an appropriate planning tool that could be utilized as intended, and that would benefit from updates as more data is collected. A peer review of the model is also required by the Stipulated Judgement every 10 years. An update to the model would be recommended prior to a peer review.

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 2020 is a ratio expressed as follows:

$$\frac{\text{2020 Sustainable Yield}}{\text{Maximum Sustainable Yield}} * 100$$

The 2020 sustainable yield is estimated at 2,760 acre-feet[1]. The maximum sustainable yield with all LOBP projects implemented is estimated at 3,500 acre-feet. Therefore, the Basin Development Metric in 2020 is 79, which is the same value as 2019. 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.

[1] 2015 LOBP established the sustainable yield methodology and estimate it to be 2,450 AFY. The subsequent 2015 Stipulated Judgement set the default sustainable yield at 2,400 AFY. On June 30, 2016, the BMC unanimously approved the 2015 Annual Report with a sustainable yield of 2,450 AFY. On June 21, 2017, the BMC unanimously approved the 2016 Annual Report with a sustainable yield of 2,760 AFY, which has remained unchanged since then.

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, now that the location of the second Program C expansion well is established at Bay Oaks Drive, in order to incorporate changes to the LOBP, including revised expectations for recycled water availability.

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 23 graphs historical trends in the metric. Table 20 presents the 2020 Water Level Metric.

Table 20. 2020 Water Level Metric	
Metric Well	**Spring 2020 Groundwater Elevation (feet above sea level - NGVD 29 Datum*)**
LA2	1.47
LA3	-0.51
LA11	0.83
LA14	0.16
LA16	7.12
Water Level Metric (average)	1.8 feet

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

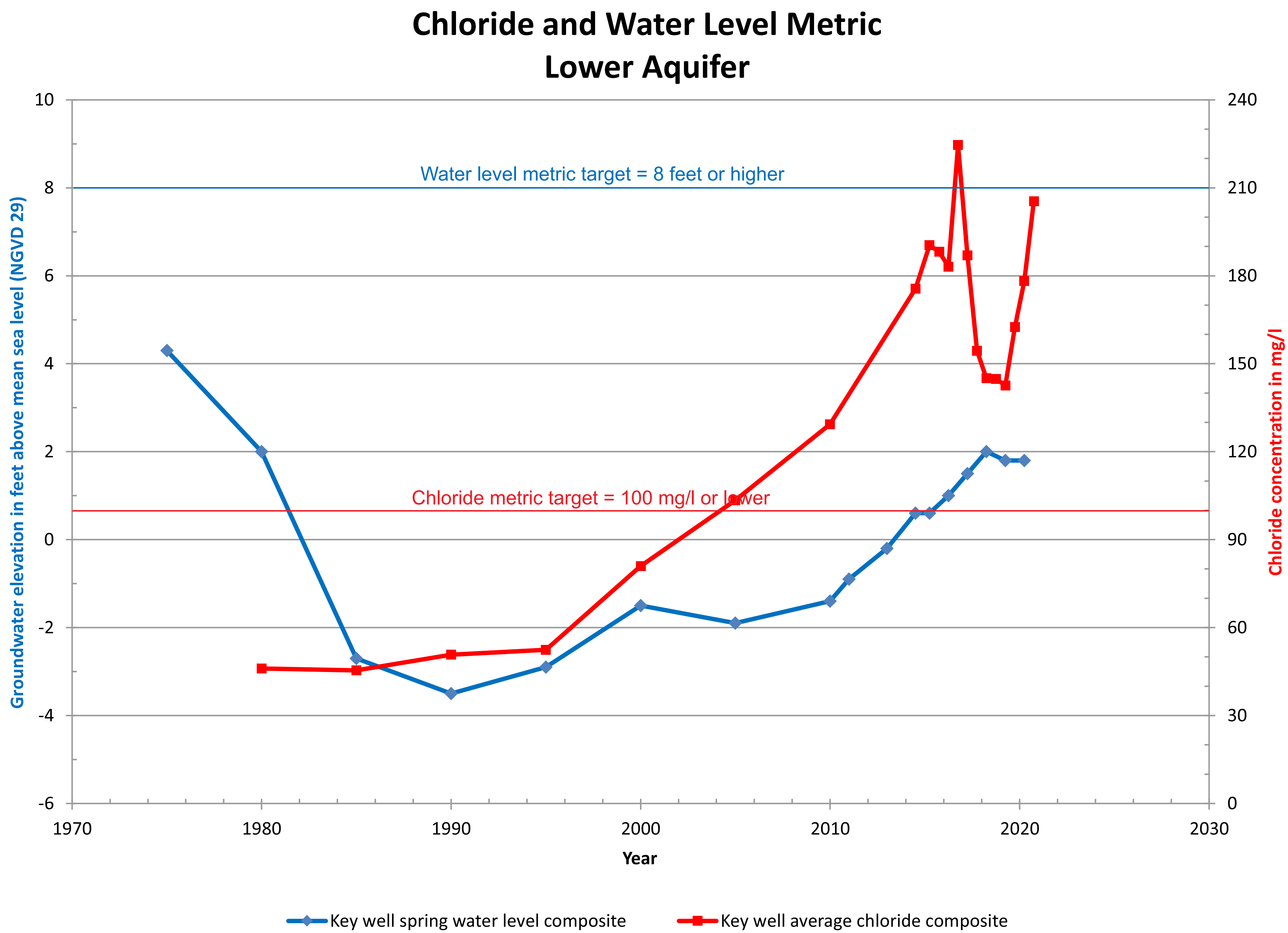

Figure 23
Chloride and Water Level Metric
Los Osos Groundwater Basin
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The Spring 2020 Water Level Metric is 1.8 feet NGVD 29 (approximately 4.6 feet NAVD 88). Mean sea level is approximately 0 feet in the NGVD 29 datum, and 2.8 feet in the NAVD 88 datum 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 2018, but has remained constant through 2020 (Figure 23). 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 is planned for 2021. An expansion of the Lower Aquifer transducer network is also taking place in 2021, which will help to identify groundwater mounding effects from treated wastewater disposal at the Broderson Site and provide support for interpreting Water Level Metric trends.

Chloride Metric

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 2020 Chloride Metric. Figure 23 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 2020, however, water samples collected from LA10 were influenced by an increase in pumping prior to the Spring sampling, which elevating chloride concentrations, and by Upper Aquifer influence from wellbore leakage during the Fall sampling, which reduced chloride concentrations. Therefore, substitute chloride concentration values at LA10 were selected for metric calculations, using purveyor monitoring records, to better represent the Spring and Fall conditions. The Spring value at LA10 was adjusted from 320 mg/L chloride measured April 21, 2020 (with 2.1 mg/L nitrate-nitrogen) to 250 mg/L chloride measured on April 6, 2020 (with 2 mg/L nitrate-nitrogen). The Fall value was adjusted from 115 mg/L chloride (with 4.6 mg/L nitrate-nitrogen) measured October 7, to 310 mg/L chloride (with 2.1 mg/L nitrate-nitrogen) on September 8, 2020, which was the closest date to Fall 2020 without Upper Aquifer influence.

Table 21. 2020 Chloride Metric

Metric Well (Aquifer Zone)	Spring 2020 Chloride Concentrations	Fall 2020 Chloride Concentrations
LA8 (Zone D)	75 mg/L	76 mg/L
LA10 (Zone D/E)	250 mg/L (double counted for average)*	310 mg/L (double counted for average)*
LA11 (Zone E)	222 mg/L	242 mg/L
LA12 (Zone D)	94 mg/L	89 mg/L
Chloride Metric (weighted average)	178 mg/L	205 mg/L

Data Source: LOBP Groundwater Monitoring Program (Appendix C)
*Spring and Fall 2020 values at LA10 were substituted with purveyor data from April 6th (Spring) and September 8th (Fall) to better represent aquifer conditions.

The 2020 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 2020 and Fall 2020 shows an increase in the metric, and the Chloride Metric has increased relative to the target value between Fall 2019 (163 mg/L) and Fall 2020 (205 mg/L), indicating intrusion during 2020 (Figure 23).

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 (Figure 19). 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 (Figure 18).

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. Table 22 presents the Nitrate Metric for 2020. Figure 24 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. 2020 Nitrate Metric	
Metric Well	**Winter 2020 Nitrate-Nitrogen (NO_3-N) Concentrations**
FW2	22 mg/L
FW6	2.7 mg/L
FW10	24 mg/L
FW15	27 mg/L
FW17	22 mg/L
Nitrate Metric (average)	20 mg/L

Data Source: LOWRF Groundwater Monitoring Program (Rincon Consultants, 2021)

The Nitrate Metric was measured at 20 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 2019 (22 mg/L), to Winter 2020 (20 mg/L), an improvement (Figure 24). 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 and have declined to 2.9 mg/L in 2020. 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 have largely stopped nitrate loading in the Basin from septic disposal within the wastewater service area. Nitrate concentrations in First Water (includes portions of the Perched Aquifer and Upper Aquifer) are expected to begin declining over the next decade, and in 2020 the Nitrate Metric reached the lowest point recorded since 2014. The five-year running average, which represents long term trends, also decreased for the first time (Figure 24).

Nitrate concentrations in Lower Aquifer groundwater, however, have also been increasing historically, and a reduction in nitrate loading to the Basin does not prevent the movement of existing nitrate from the Upper Aquifer into the Lower Aquifer, which is expected to continue adversely impacting Lower Aquifer water quality (CHG, 2019a). 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.

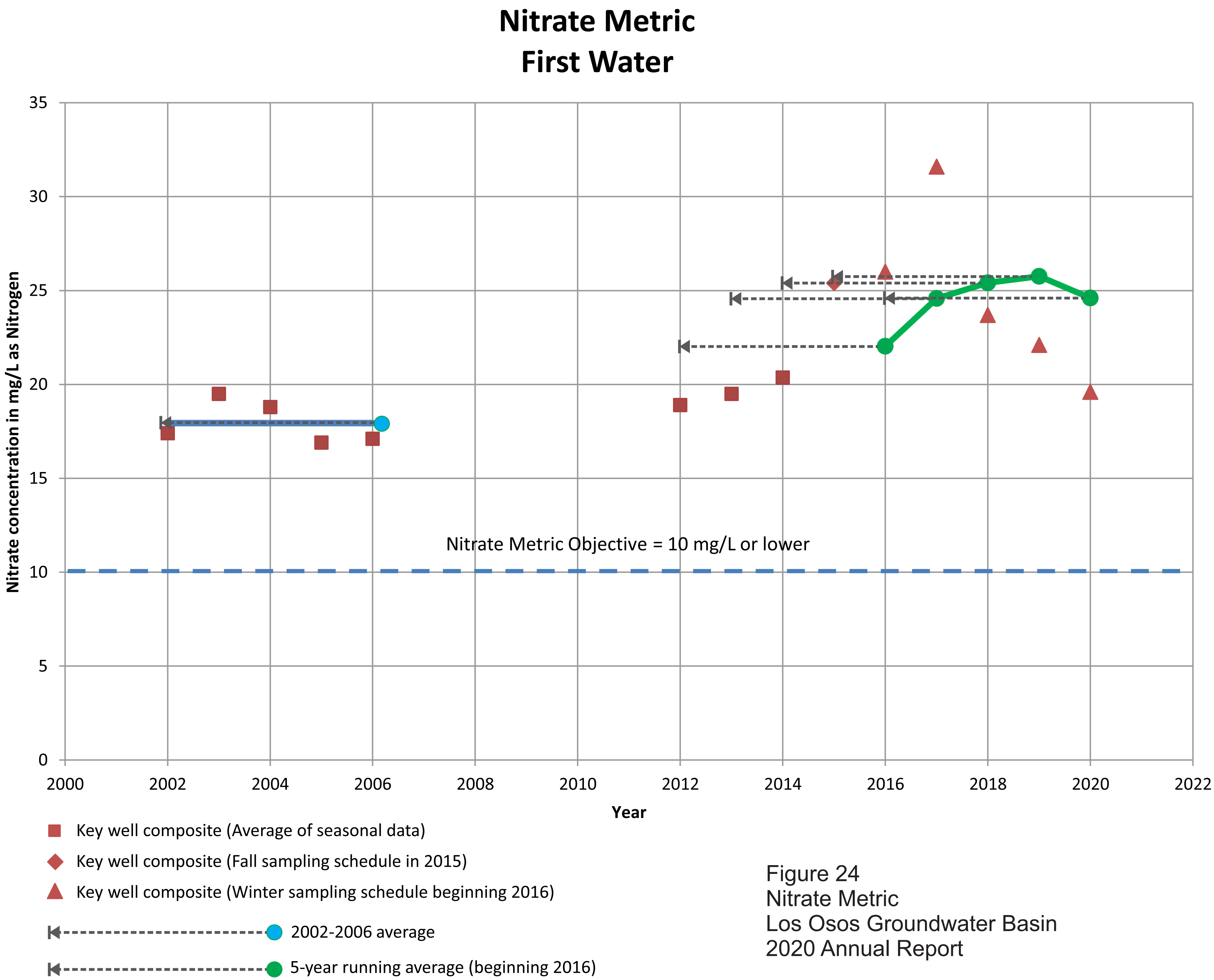

Figure 24
Nitrate Metric
Los Osos Groundwater Basin
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7.5.4 Upper Aquifer Water Level Profile

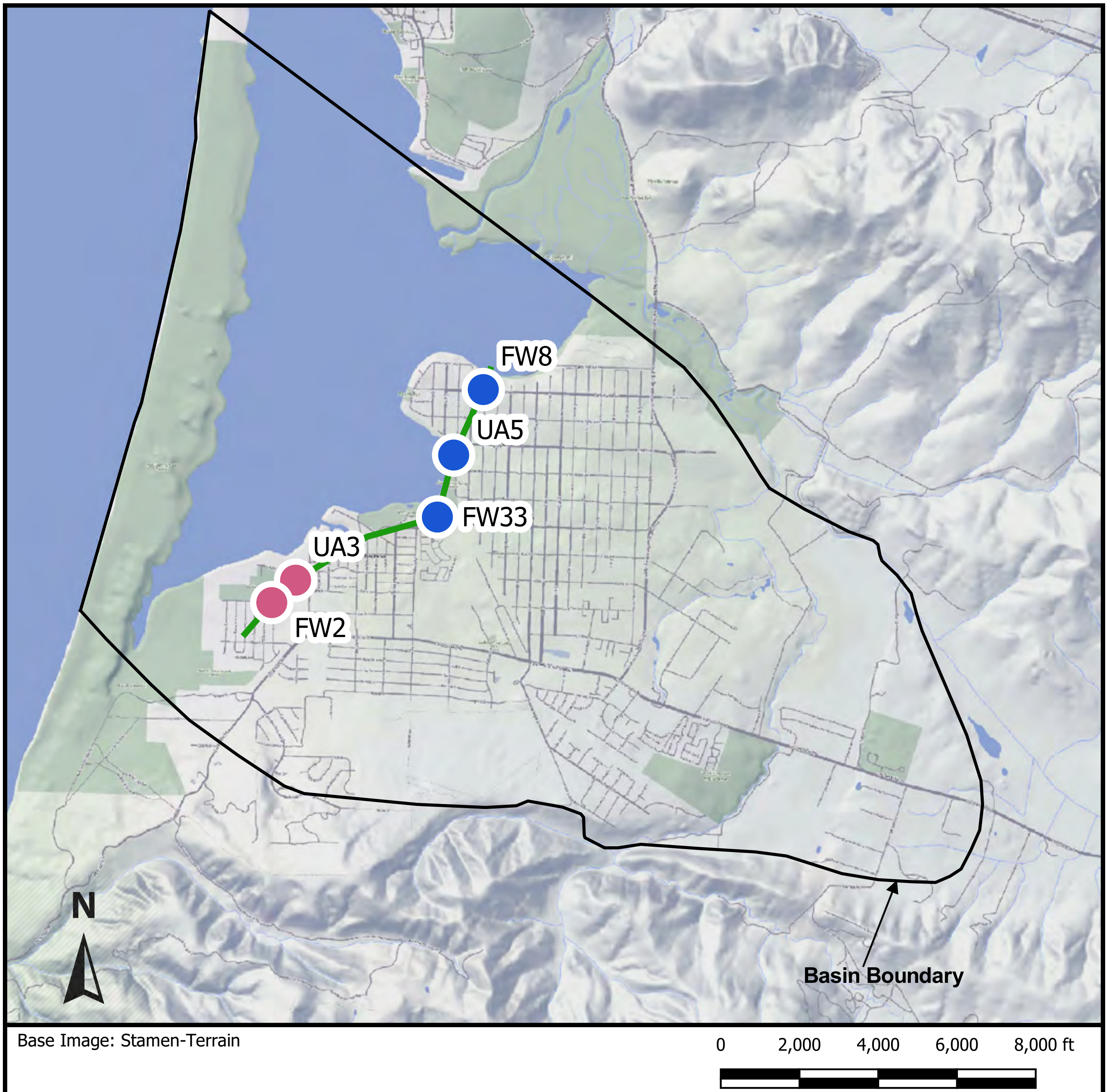
Metrics allow the BMC, regulatory agencies, and the public to evaluate the status of nitrate concentrations and seawater intrusion in the Basin through objective, numerical criteria that can be tracked over time (LOBP, 2015). The Upper Aquifer has a Nitrate Metric, but does not have Water Level Metric 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 2020 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 25 and 26.

Water levels along the Water Level Profile in Spring 2020 were above the Protective Elevation (Figure 26). 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

Explanation

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

Figure 25
Water Level Profile Alignment
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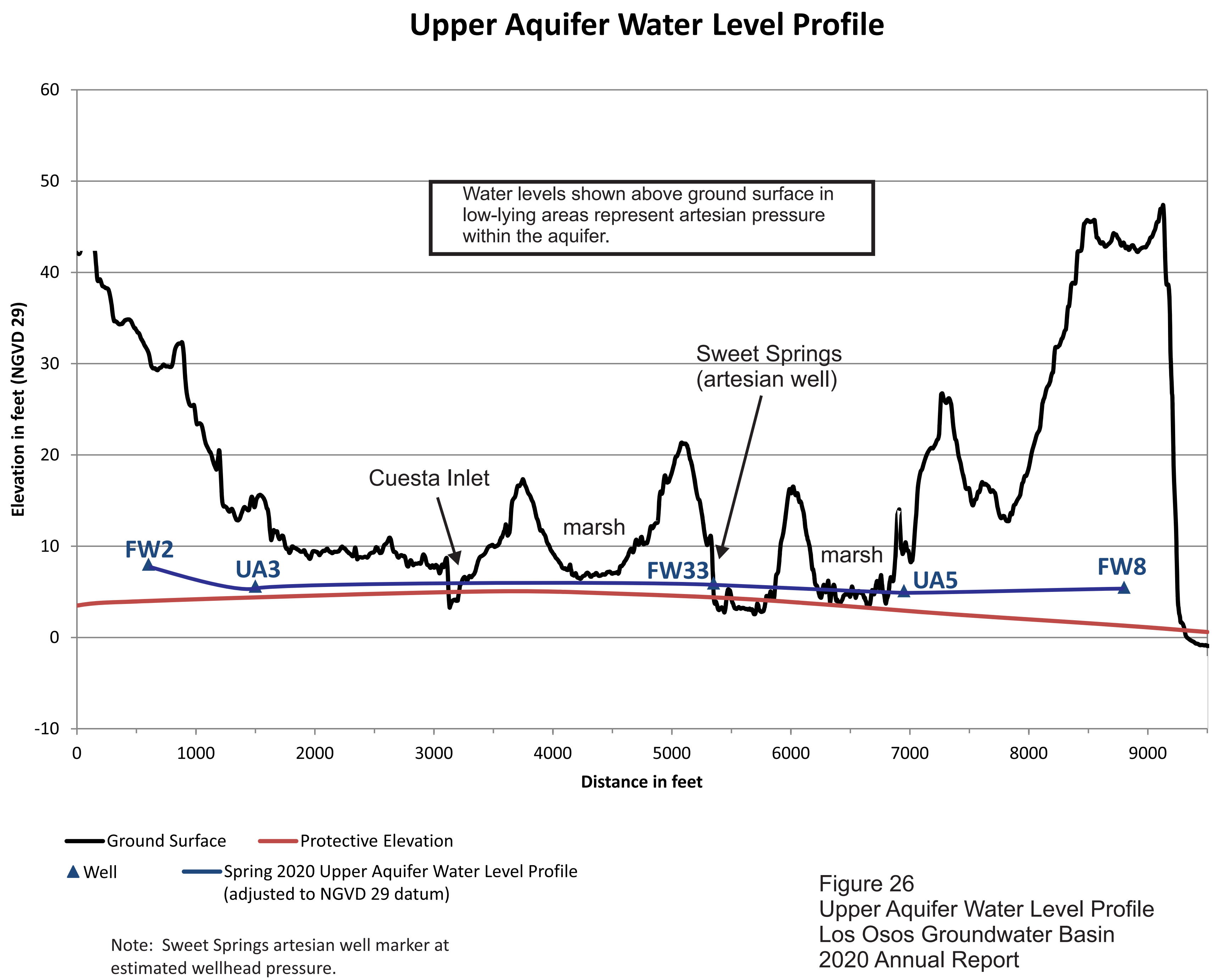

Figure 26
Upper Aquifer Water Level Profile
Los Osos Groundwater Basin
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8. BASIN STATUS

The status of the Basin in 2020 is summarized as follows:

- The Basin received below normal rainfall in 2020. San Luis Obispo County started 2020 with no drought conditions to report in January and ended in December 2020 with moderate drought conditions (NDMC/USDA/NOAA, 2020).

- Groundwater production for the Basin totaled an estimated 2,010 acre-feet in the 2020 calendar year, compared to 1,900 acre-feet in 2019. Purveyor groundwater production increased by approximately 70 acre-feet and community facilities increased by an estimated 20 acre-feet in 2020, compared to 2019. Agricultural irrigation also increased by an estimated 20 acre-feet in 2020, compared to 2019.

- Long-term water level trends over the last 8 years in First Water wells averaged 0.06 feet of decline per year. Long-term water level trends over the last 10 years in Upper Aquifer wells averaged 0.17 feet of rise per year, and in Lower Aquifer wells averaged 0.43 feet of rise per year.

- The seawater intrusion front in Zone D during Fall 2020 is further inland, compared to Fall 2019. There was an estimated net gain of 1,200 acre-feet of Basin freshwater storage between Spring 2019 and Spring 2020, although 1,100 acre-feet of that was due to the addition of LA41 to the contoured data set. Zone E intrusion is also interpreted to moving inland toward LA11.

- The Basin Yield Metric increased from 70 in 2019 to 73 in 2020. The metric has met the LOBP goal of 80 or less for five 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 2019, meaning that no new infrastructure projects affecting Basin sustainable yield have been completed.

- The Water Level Metric remained constant between 2019 and 2020 at 1.8 feet, and remains several feet below the target value of 8 feet.

- The Chloride Metric increased relative to the 100 mg/L target value between Fall 2019 (162 mg/L) and Fall 2020 (205 mg/L), indicating a deterioration in 2020.

- Upper Aquifer water levels were above the Protective Elevation along the bay. 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 22 mg/L NO_3-N in 2019 to 20 mg/L NO_3-N in 2020, indicating improvement in 2020.

9. RECOMMENDATIONS

The following LOBP Groundwater Monitoring Program recommendations from the 2019 Annual Report were completed in 2020, are in progress, or are planned for completion in 2021:

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

- Analyze FW6 for CEC's - ***Completed 2020***

- 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). – ***In progress***

- Re-evaluate Water Level Metric target after completion of wellhead surveys (Section 7.5.3) – ***Planned for Completion 2021***

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).

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

- In conjunction with the above evaluation of well modifications, prepare a list of feasible sites where new Lower Aquifer monitoring wells may be constructed to improve seawater intrusion definition and monitoring in both Zone D and Zone E (Section 7.3).

- Consider updating the Maximum Sustainable Yield now that 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).

- A peer review of the Basin model is required by the Stipulated Judgement every 10 years. An update to the model would be recommended prior to the next peer review (Section 7.5.2).

10. ADAPTIVE MANAGEMENT PROGRAM AND STATUS OF LOBP PROGRAM IMPLEMENTATION

The LOBP 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 water quality degradation, 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 on the Basin. These metrics allow the BMC, regulatory agencies and the public to evaluate the status of nitrate levels, seawater intrusion, and the impact of implementation of the LOBP programs, through objective and numerical criteria that can be tracked over time. The 2020 metric values are summarized in Table 23 for easy reference during discussion and evaluation of the LOBP programs.

Table 23. LOBP Metric Summary			
Metric	**LOBP Goal**	**Calculated Value from 2020 Data**	**Change in Condition from 2019**
Basin Yield Metric: Comparison of current well production to sustainable yield	80 or less	73	Increased (deterioration)
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	Stable (no change)
Chloride Metric: Weighted average chloride concentration in 4 key wells in the Lower Aquifer	100 mg/L or lower	205 mg/L	Increased (deterioration)
Nitrate Metric: Average nitrate concentration in 5 key wells in the Upper Aquifer	10 mg/L or lower	20 mg/L (NO_3-N)	Decreased (improvement)

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 Groundwater Monitoring. The following is an update on additional measures related to Groundwater Monitoring:

Upper Aquifer Water Level Profile. 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.

Updated Metric Evaluation. Included in the Calendar Year 2021 BMC Budget is an initiative to evaluate the existing Basin Monitoring Metrics and to develop recommendations for opportunities to improve those metrics and/or add additional metrics to be able to better assess the health of the Basin. Evaluating and updating the Basin Metrics will take into account monitoring data collected after development of the Basin

Plan, along with new monitoring locations/wells (e.g. Lupine/Cuesta by the Sea Monitoring Well). Any modifications to the LOBP Metrics will require approval by the BMC through the Adaptive Management process.

Contingency Plan Development. As metric trends and Basin hydrologic response to LOBP projects 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. As reported in the 2019 Adaptive Management TM, 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 (CHG, 2019a).

Evaluation of Water Conservation Measures. To improve the understanding of the effectiveness of existing conservation programs and the future conservation potential within the community, the purveyors and the County are considering performing an updated water conservation evaluation to determine the amount of additional water savings that could be achieved through additional conservation efforts and programs.

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 LOCP should be consistent with the water supply estimates provided in the LOBP.
2. The LOCP should acknowledge any infrastructure projects contemplated by the LOBP 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 LOCP/LCP] should provide a growth rate for Los Osos consistent with the adaptive management provision of the LOBP. In particular, the rate of growth must be set so that the monitoring provisions of the LOBP confirm the adequacy of a sustainable water supply in support of any contemplated future growth.

On December 15, 2020, the County Board of Supervisors adopted the LOCP update and Final Environmental Impact Report and tentatively adopted amendments to the Growth Management Ordinance that would establish a residential growth rate for the Los Osos urban area. The LOCP policies are still subject to change based on California Coastal Commission review, which is currently underway[2]. If the LOCP is certified by Coastal Commission with no changes, the Growth Management Ordinance amendments to establish a growth rate for Los Osos are effective upon certification. If the LOCP requires changes, then the growth rate would need to be established at another Board of Supervisors hearing.

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[3]. 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:

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

Two additional programs were included in the LOBP and are recommended for 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. Per the LOBP, a funding mechanism to pay for additional costs required to accommodate the water demand associated with new development will need to be established.

Since additional development has not been approved through the LOCP update, Programs B and D have not been initiated at this point.

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[2]The LOCP and Growth Management Ordinance policies considered by the Board on December 15 are available at: https://agenda.slocounty.ca.gov/iip/sanluisobispo/agendaitem/details/12683

[3]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.

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 93 wells.[4] 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 fifth 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. As described previously, the BMC is considering performing an updated evaluation of the conservation potential for the community. The evaluation would better inform the BMC and the BMC Parties on the potential future water savings that could be achieved through conservation efforts and programs.

Additional information on the status of the current water conservation programs offered by the BMC Parties can be found on their respective websites.

[4]The wells are distributed laterally across the Western, Central and Eastern Areas and vertically among First Water and the Upper and Lower Aquifers. Eighteen existing wells and two new wells have been 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	Partially Complete		
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		

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 further 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 25, along with the actual uses and amounts of reused water from 2020[5].

[5]This Table was reproduced (with slight edits) from Table 2 of the LOBP.

Table 25. Planned Recycled Water Uses in the Urban Water Reinvestment Program		
Potential Use	**LOBP Planned Annual Volume (AFY)**	**Actual Annual Volume in 2020 (AFY)**
Broderson Leach Fields	448	456
Bayridge Estates Leach Fields	33	9
Urban Reuse	63	0
Sea Pines Golf Course	40	67
Los Osos Valley Memorial Park	50	0
Agricultural Reuse	146	0
Total	**780**	**532**

The LOWRF construction was completed in March 2016. Through October 1, 2020, the sewer service area had connected 99.2 percent of parcels that are required to connect. Flows to the wastewater plant in 2020 averaged approximately 495,000 gallons per day, with daily peaks of up to 600,000 gallons (554 AFY)[6]. Average wastewater flows are lower than anticipated. Projecting the average flow per connection for 100 percent of the parcels required to connect results in a total estimated effluent inflow volume of 560 AFY, which is 220 AFY less than the anticipated 780 AFY of recycled water available for the urban water reinvestment program.

Treated water in 2020 was conveyed to the Broderson and Bayridge Estates leach fields, and Sea Pines Golf Course. The anticipated groundwater mound[7] resulting from infiltration of treated wastewater disposal to leach fields at the Broderson site was detected hydraulically downgradient beginning in June 2017. It is additionally envisioned that recycled water for irrigation will be provided to the schools, parks, and various agricultural areas. 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 when funding is available to complete the required retrofits on the various school sites and all other agreement terms and conditions have been met.

The BMC authorized in its Calendar Year 2021 Budget a Recycled Water Beneficial Use Evaluation initiative to improve the understanding and document the opportunities and constraints regarding the use of the recycled water resource. The evaluation to analyze benefits of discharging recycled water to Broderson, Bay Ridge, Sea Pines and/or other future locations (e.g. ag reuse, school landscape irrigation, etc.) and opportunities to increase amount of water sent to the LOWRF.

[6]Wastewater plant influent volumes in 2020 were greater than the final recycled water volumes.
[7]Cleath & Associates, 2000, Hydrogeologic Investigation of the Broderson Site, Phase 2 Impacts Assessment, prepared for Los Osos Community Services District, November 2000.

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 improve 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 LOBP 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 and completed in 2019. Table 26 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 26.

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.

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Table 26. Basin Infrastructure Projects				
Project Name	**Parties Involved**	**Funding Status**	**Capital Cost**	**Status**
Program A				
Water Systems Interconnection	LOCSD/ GSWC			Completed
Upper Aquifer Well (8th Street)	LOCSD	Fully Funded	$320,000	Well was drilled and cased in December 2016. Budget remaining $320,000 to equip the well. Design is 100% complete and project has been included in an IRWM Grant Application. Construction is scheduled to move forward in summer of 2021.
South Bay Well Nitrate Removal	LOCSD			Completed
Palisades Well Modifications	LOCSD			Completed
Blending Project (Skyline Well)	GSWC			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 might be capable of expanding to be the 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			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	Site selection is complete; the environmental work and submittal of the Minor Use Permit to the County will be completed in May 2021. Construction is anticipated to begin Q1 2022.
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	Currently on hold, pending the completion of S&T's water meter cellular updates.

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			Completed
Program U				
Creek Discharge Program	All Parties		TBD	These activities are currently on hold. This initiative was not identified as one of the highest priority items during the BMC's Implementation Plan evaluation of priorities in 2020.
8th and El Moro Urban Storm Water Recovery Project	All Parties		TBD	These activities are currently on hold. This initiative was not identified as one of the highest priority items during the BMC's Implementation Plan evaluation of priorities in 2020.

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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, 2020, 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 Fringe Areas Characterization, Technical Memorandum (CHG, 2018).*
- *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, 2014, 2016-2020; CHG, 2015);

- *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, 2019, 2020);

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

<u>Monitoring Programs</u>:

- *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.*

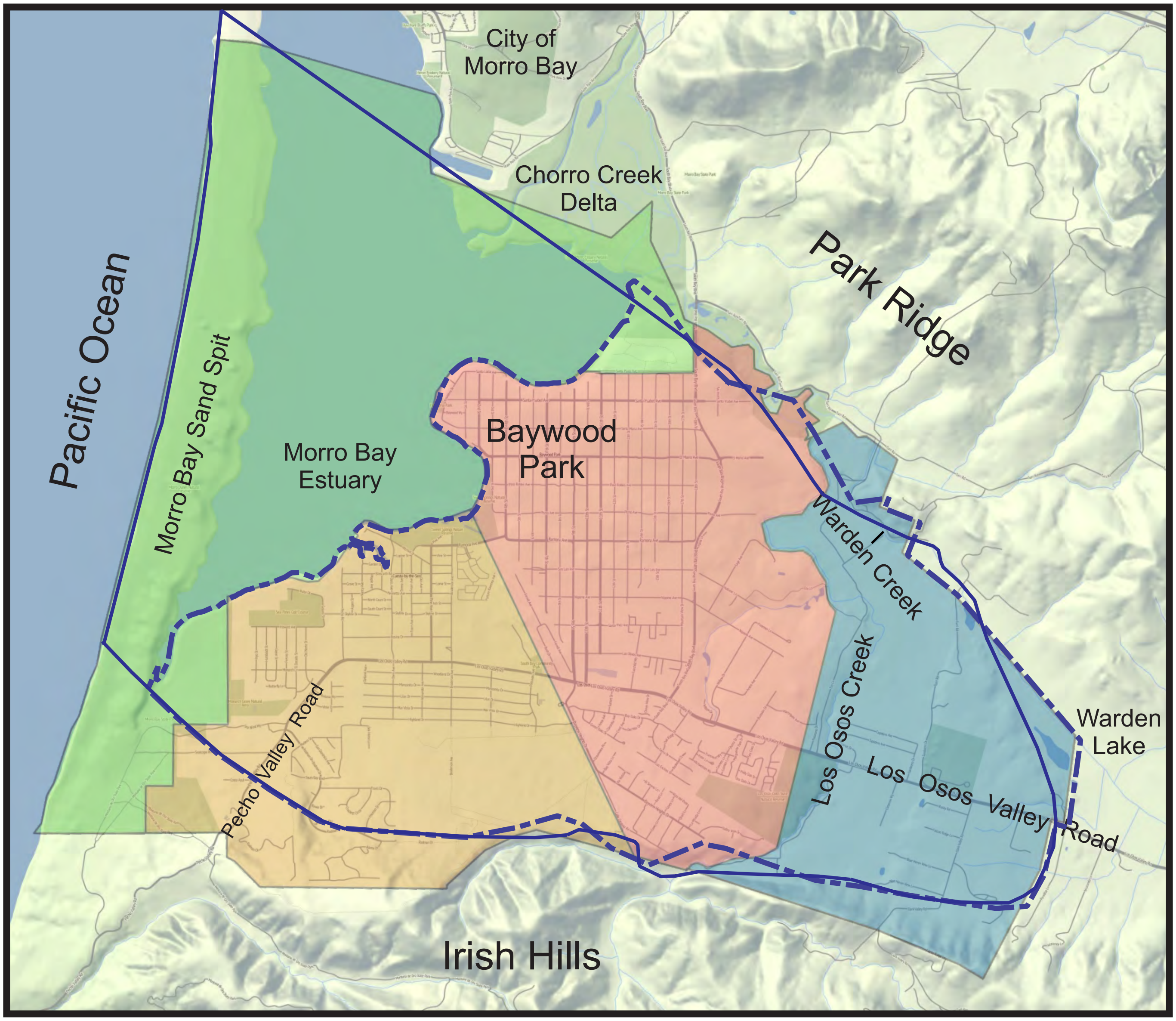
- *Purveyor Water Supply Well Monitoring per SWRCB-Division of Drinking Water requirements. Period of record for individual wells varies; program remains active.*

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

- *2012-2020 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 2020 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
2020 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	143.92	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	94.75	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	214.67	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

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	17.57	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	137.17	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	107.81	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								
UA19	30S/11E-	LOCSD 8th Street - shallow	Central	35.3259	120.8341	25.73	M	LOCSD						x		

*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 Bay	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	37.87	M	S&T	160-300	300	8					
LA6	30S/10E-13L4	GSWC Pecho #1	Western	35.3129	120.8522	74.58	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	141.36	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-13J1	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	88.08	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 (collapsed 440-480)	860	6				x	x
LA18	30S/11E-18K8	10th St. Observation East	Central	35.3130	120.8325	137.13	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	141.22	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, 350-490	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	81.61	MW	SLO CO.			6					x
LA38	30S/11E-21E							PRIVATE								
LA39	30S/11E-18K_	Los Olivos #5	Central			118	M	GSWC	335-365, 385-450	470	12				x	
LA40	30S/10E-	30S/11E-13Ba	Western	35.31966	120.8478	11.93	MW	LOCSD	390-410	490	2.5					x
LA41	30S/10E-	30S/11E-13Bb	Western	35.31966	120.8478	11.93	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
	I = Irrigation

Los Osos Basin Plan
Monitoring Well Network 2020
FIRST WATER

Program Well ID	Well Owner	Basin Plan Monitoring Code	County Water Level Program	LOWRF Groundwater Monitoring Program[1]	**2020 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		L	**L, CEC**
FW6	LOCSD	TL, G, CEC		G	**TL, G, CEC**
FW7	LOCSD	L			**L**
FW8	LOCSD	L		L	**L**
FW9	LOCSD	L		L	**L**
FW10	LOCSD	TL, G		G	**TL**
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	(added in 2015)	L		
FW30	PRIVATE	(added in 2015)		L	**L**
FW31	SLO CO.	(added in 2015)			**L**
FW32	PRIVATE	(added in 2017)			**L**
FW33	PRIVATE	(added in 2018)			**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
SLO CO. = San Luis Obispo County

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

Los Osos Basin Plan
Monitoring Well Network 2020
UPPER AQUIFER

Program Well ID	Well Owner	Basin Plan Monitoring Code	County Water Level Program	LOWRF Groundwater Monitoring Program[1]	**2020 Basin Plan Monitoring Program[2]**
UA1	SLO CO.	L	L		**G**
UA2	SLO CO.	L	L		**G**
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	(added in 2015)	L		
UA17	PRIVATE	(added in 2015)	L		
UA18	PRIVATE	(added in 2015)	L		
UA19	LOCSD	(added in 2019)			**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 2020
LOWER AQUIFER

Program Well ID	Well Owner	Basin Plan Monitoring Code	County Water Level Program	**2020 Basin Plan Monitoring Program**
LA1	SLO CO.	L	L	
LA2	SLO CO.	L	L	**G**
LA3	SLO CO.	L	L	**G**
LA4	PRIVATE	L, GL		**L**
LA5	S&T	L	L	
LA6	GSWC	L, G	L	
LA7	PRIVATE	TL		**TL**
LA8	S&T	L, G		**L , G**
LA9	GSWC	L		**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	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	(added in 2015)		**G**
LA32	LOCSD	(added in 2015)		**G**
LA33	PRIVATE	(added in 2015)		**L**
LA34	SLO CO.	(added in 2015)	L	
LA35	SLO CO.	(added in 2015)		**L**
LA36	PRIVATE	(added in 2015)		**L**
LA37	SLO CO.	(added in 2017)		**TL**
LA38	PRIVATE	(added in 2017)		**L**
LA39	GSWC	(added in 2019)		**L,G**
LA40	LOCSD	(added in 2019)		**L,G**
LA41	LOCSD	(added in 2019)		**L,G**

L = WATER LEVEL
G = GENERAL MINERAL
GL = GEOPHYSICAL LOG (triennial)
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

Well IDs with both April and October water quality monitoring in Italics

APPENDIX C

Field Logs and Laboratory Analytical Reports for 2020 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 2020 Field Logs and Analytical Results

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/13/2020
Operator: A. Berge
Well number and location: 30S/11E-13N (LA8)
Site and wellhead conditions: Overcast, warm. Well has been running since 12:30 PM

Static water depth (feet): 132.7
Well depth (feet): 350
Water column (feet): 217.3
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: 12:34 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:34	flush line	437.1	8.61	18.2	Clear, colorless, odorless
12:35	flush line	424.6	8.29	18.5	Clear, colorless, odorless
12:36	flush line	423.1	8.18	18.4	Clear, colorless, odorless
12:37	flush line	422.8	7.99	18.4	Clear, colorless, odorless
					Sampled @ 12:39 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/13/2020
Operator: J. Carlson
Well number and location: 30S/10E-12J1 (LA11)
Site and wellhead conditions: Sunny and clear, cap in place, site secure.

Static water depth (feet): 5.5
Well depth (feet): 389
Water column (feet): 383.5
Casing diameter (inches): 2
Minimum purge volume (gal) 190
Purge rate (gpm): 1.6
Pumping water level (feet): 6.06
Pump setting (feet): 25
Minimum purge time (min): 120
Time begin purge: 9:49 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
9:49	1	1,240	8.14	17.1	Clear, colorless odorless
8:52	5	1,197	7.54	18	Clear, colorless odorless
9:56	10	1,203	7.38	18.1	Clear, colorless odorless
10:02	20	1,201	7.19	18.7	Clear, colorless odorless
10:21	50	1,361	7.11	19.7	Cloudy, odorless
10:36	75	1,522	7.04	19.9	Slightly cloudy, odorless
10:52	100	1,506	7.08	19.7	Clear, colorless odorless
11:05	120	1,491	7.04	20.1	Clear, colorless odorless
11:22	145	1,481	7.08	19.9	Clear, colorless odorless
11:39	170	1,474	7.08	20.2	Clear, colorless odorless
11:51	190	1,468	7.08	20.1	Clear, colorless odorless
11:54	195	1,470	7.08	20.3	Clear, colorless odorless
					Sampled @ 11:55 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/16/2020
Operator: A. Berge with C. Requa
Well number and location: 30S/11E-7Q3 (LA12)
Site and wellhead conditions: Overcast, cool. Well has been running since 12:20 PM

Static water depth (feet):	28.2
Well depth (feet):	270
Water column (feet):	241.80
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:	11:10 AM

Time	Gallons (from spigot)	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:34	flush line	751	7.60	21.1	Slightly cloudy, odorless
12:36	flush line	755	7.73	21	Clear, colorless, odorless
12:37	flush line	756	7.77	21	Clear, colorless, odorless
					Sampled @ 12:38 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/16/2020
Operator: A. Berge with C. Requa
Well number and location: 30S/11E-18L2 (LA15)
Site and wellhead conditions: Overcast, cool. Well has been running since 8:45 AM

Static water depth (feet): 96
Well depth (feet): 394
Water column (feet): 298
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: 1:04 PM

Time	Gallons (from spigot)	EC (µS/cm)	pH	Temp. (°C)	Comments*
1:04	flush line	704.8	7.60	20.4	Clear, colorless, odorless
1:05	flush line	710.4	7.58	20.4	Clear, colorless, odorless
1:07	flush line	712	7.48	20.6	Clear, colorless, odorless
1:10	flush line	714	7.71	20	Clear, colorless, odorless
					Sampled @ 13:12 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/14/2020
Operator: A. Berge
Well number and location: 30S/11E-18K8 (LA18)
Site and wellhead conditions: Sunny, still. Site secure

Static water depth (feet): 134.89
Well depth (feet): 650
Water column (feet): 515.1
Casing diameter (inches): 2
Minimum purge volume (gal) 252
Purge rate (gpm): 2
Pumping water level (feet): 142.8
Pump setting (feet): 155
Minimum purge time (min): 180
Time begin purge:

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
8:40	1	495.5	8.17	19.3	Clear, colorless, odorless
8:45	5	510.6	7.49	20.8	Clear, colorless, odorless
8:48	10	574	7.28	20.7	Clear, colorless, odorless
8:57	20	582	7.31	21	Clear, colorless, odorless
9:04	30	581.7	7.46	21.3	Clear, colorless, odorless
9:26	50	580.1	7.45	22.1	Clear, colorless, odorless
9:44	80	273.3	7.53	22.3	Clear, colorless, odorless
10:07	120	274.4	7.53	22.3	Clear, colorless, odorless
10:40	170	572.1	7.56	22.2	Clear, colorless, odorless
11:16	220	576.5	7.52	22.3	Clear, colorless, odorless
11:36	255	579.6	7.54	22.1	Clear, colorless, odorless
					Sampled @ 11:38 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/14/2020
Operator: A. Berge
Well number and location: 30S/11E-17E8 (LA22)
Site and wellhead conditions: Sunny and clear. Site secure.

Static water depth (feet): 104.69
Well depth (feet): 380
Water column (feet): 275.3
Casing diameter (inches): 2
Minimum purge volume (gal) 134
Purge rate (gpm): 2
Pumping water level (feet): --
Pump setting (feet): 120
Minimum purge time (min): 90
Time begin purge: 12:29 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:29	1	502.4	8.07	19.7	Clear, colorless, odorless
12:31	5	499.1	8.08	19.5	Clear, colorless, odorless
12:34	10	499	7.84	19.7	Slightly cloudy, odorless
12:44	30	457	8.13	19.5	Clear, colorless, odorless
12:57	50	450.6	7.92	19.5	Clear, colorless, odorless
13:16	80	447.6	8.07	19.4	Clear, colorless, odorless
13:30	100	450.7	7.70	19.6	Clear, colorless, odorless
13:44	120	447.8	7.86	19.4	Clear, colorless, odorless
13:54	140	447.4	7.95	19.7	Clear, colorless, odorless
					Sampled @ 13:56

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/9/2020
Operator: A. Berge
Well number and location: 30S/11E-20H1 (LA30)
Site and wellhead conditions: Rainy, cold. Well static.

Static water depth (feet): 6.59
Well depth (feet): 140
Water column (feet): 133.41
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: 11:40 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
11:40	1	854.6	8.20	12.8	Turbid, odorless
11:42	5	837.8	7.81	12.3	Slightly cloudy, odorless
11:43	10	814.3	7.73	15.5	Clear, colorless, odorless
11:45	15	817.1	7.65	16.7	Clear, colorless, odorless
11:47	25	813.4	7.66	17.1	Clear, colorless, odorless
11:50	35	816.5	7.63	17.2	Clear, slight odor
11:52	40	819.9	7.62	17.4	Clear, slight odor
					Sampled @ 11:52 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/9/2020
Operator: A. Berge
Well number and location: 30S/10E-13M2 (LA31)
Site and wellhead conditions: Drizzling and cold. Site secure.

Static water depth (feet): 36.05
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: 10:43 AM

Time	Gallons	EC (μS/cm)	pH	Temp. (°C)	Comments*
10:43	1	2,120	8.08	13.5	Clear, colorless, odorless
10:44	5	1,941	8.02	16.6	Pump turning on and off, clear, colorless, odorless
10:46	10	2,040	7.99	15.6	Clear, colorless, odorless
10:48	15	2,050	7.92	15.2	Pump turning on and off, clear, colorless, odorless
10:50	25	1,966	7.89	16.2	Clear, colorless, odorless
10:54	30	2,010	7.90	15.9	Pump turning on and off, clear, colorless, odorless
11:02	45	2,580	7.73	17.5	Clear, colorless, odorless
11:03	75	2,670	7.76	17.5	Clear, colorless, odorless
					Sampled @ 11:04 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/16/2020
Operator: A. Berge with C. Requa
Well number and location: 30S/11E-18K9 (LA32)
Site and wellhead conditions: Overcast and cool. Well has been running since 12:46 PM

Static water depth (feet): 148.5
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: 12:49 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:49	flush line	287.7	8.36	19.2	Clear, colorless, odorless
12:51	flush line	271.1	8.10	19.1	Clear, colorless, odorless
12:52	flush line	261	8.05	18.9	Clear, colorless, odorless
12:53	flush line	258	8.00	19.2	Clear, colorless, odorless
12:55	flush line	257.9	8.10	19.2	Clear, colorless, odorless
					Sampled @ 12:57 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/6/2020
Operator: J. Carlson
Well number and location: 30S/11E-13Ba (LA40)
Site and wellhead conditions: Ground wet, sunny and clear. Site secure.

Static water depth (feet): 8.42
Well depth (feet): 487.5
Water column (feet): 479.08
Casing diameter (inches): 2.26
Minimum purge volume (gal) 240
Purge rate (gpm): 0.50
Pumping water level (feet): 9.61
Pump setting (feet): 150.00
Minimum purge time (min): 420
Time begin purge: 11:16 AM

Time	Gallons	EC (mS/cm)	pH	Temp. (°C)	Comments*
11:16	1	4.6	6.93	18.3	Clear, colorless, odorless
11:27	5	4.9	6.92	18.3	Clear, colorless, odorless
11:33	10	5	6.87	18.3	Clear, colorless, odorless
11:53	20	5	6.80	18.6	Clear, colorless, odorless
12:12	30	4.9	6.85	18.8	Clear, colorless, odorless
12:30	40	4.83	6.83	19.8	Clear, colorless, odorless
12:53	50	4.9	6.94	19.7	Clear, colorless, odorless
13:19	60	4.83	6.95	19.9	Clear, colorless, odorless. Pump temp. shut down
13:59	70	4.68	6.98	19.5	Clear, colorless, odorless
14:21	80	4.42	6.94	19.2	Clear, colorless, odorless
14:46	90	5.26	6.95	19.5	Clear, colorless, odorless
15:09	100	5.67	6.96	19.4	Clear, colorless, odorless
15:33	110	5.91	6.95	19.5	Clear, colorless, odorless
15:56	120	6.13	6.98	19.4	Clear, colorless, odorless
16:17	130	6.57	6.96	19.5	Clear, colorless, odorless

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/6/2020
Operator: J. Carlson
Well number and location: 30S/11E-13Ba (LA40)
Site and wellhead conditions: Ground wet, sunny and clear. Site secure.

Static water depth (feet): 8.42
Well depth (feet): 487.5
Water column (feet): 479.08
Casing diameter (inches): 2.26
Minimum purge volume (gal) 240
Purge rate (gpm): 0.50
Pumping water level (feet): 9.61
Pump setting (feet): 150.00
Minimum purge time (min): 420
Time begin purge: 11:16 AM

Time	Gallons	EC (mS/cm)	pH	Temp. (°C)	Comments*
16:35	140	6.58	6.95	19.4	Clear, colorless, odorless
4/7/2020					
8:21	150	6.84	6.98	17.5	Clear, colorless, odorless
8:38	160	6.91	6.95	18.4	Clear, colorless, odorless
8:53	170	6.91	6.89	19	Clear, colorless, odorless
9:08	180	6.84	6.91	19.2	Clear, colorless, odorless
9:27	190	6.92	6.97	19.8	Clear, colorless, odorless
9:47	200	6.91	6.97	20.5	Clear, colorless, odorless
0:00	210	6.87	6.95	20.6	Clear, colorless, odorless
10:34	220	6.91	6.86	20.6	Clear, colorless, odorless
10:46	230	6.85	6.84	20.8	Clear, colorless, odorless
11:10	240	6.89	6.87	20.2	Clear, colorless, odorless
					Sampled @ 11:11 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/7/2020
Operator: J. Carlson
Well number and location: 30S/11E-13Bb (LA41)
Site and wellhead conditions: Ground wet, sunny and clear. Site secure.

Static water depth (feet): 9.3
Well depth (feet): 350
Water column (feet): 340.70
Casing diameter (inches): 2.50
Minimum purge volume (gal) 220
Purge rate (gpm): 0.60
Pumping water level (feet): 87.07
Pump setting (feet): 150
Minimum purge time (min): 420
Time begin purge:

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
13:02	1	981.0	7.20	18.3	Clear, colorless, odorless
13:07	5	919.0	7.18	18.5	Clear, colorless, odorless
13:17	10	924	7.26	19	Clear, colorless, odorless
13:32	20	918	7.06	19.6	Clear, colorless, odorless
13:48	30	903	7.37	19.6	Clear, colorless, odorless
14:09	40	874	7.05	20.1	Clear, colorless, odorless
14:33	50	881	7.27	20.6	Clear, colorless, odorless
15:00	60	888	7.18	21.2	Clear, colorless, odorless
15:20	70	896	7.18	19.8	Slightly cloudy, colorless, odorless
15:43	80	898	7.20	20.4	Clear, colorless, odorless
16:06	90	897	7.20	20.1	Clear, colorless, odorless
16:28	100	896	7.15	19.6	Clear, colorless, odorless
16:48	110	888	7.14	19.5	Clear, colorless, odorless
4/8/2020					
8:46	120	881	7.36	17.4	Clear, colorless, odorless

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/7/2020
Operator: J. Carlson
Well number and location: 30S/11E-13Bb (LA41)
Site and wellhead conditions: Ground wet, sunny and clear. Site secure.

Static water depth (feet): 9.3
Well depth (feet): 350
Water column (feet): 340.70
Casing diameter (inches): 2.50
Minimum purge volume (gal) 220
Purge rate (gpm): 0.60
Pumping water level (feet): 87.07
Pump setting (feet): 150
Minimum purge time (min): 420
Time begin purge:

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
8:57	130	888	7.15	17.8	Clear, colorless, odorless
9:17	140	887	7.09	18.5	Clear, colorless, odorless
9:38	150	883	7.08	18.6	Clear, colorless, odorless
10:00	160	883	7.08	18.8	Clear, colorless, odorless
10:23	170	881	7.14	18.8	Slightly cloudy, colorless, odorless
10:44	180	881	7.13	18.9	Slightly cloudy, colorless, odorless
11:04	190	879	7.12	19.1	Slightly cloudy, colorless, odorless
11:25	200	879	7.12	19.3	Clear, colorless, odorless
11:44	210	876	7.10	19.2	Clear, colorless, odorless
12:05	220	879	7.09	19.4	Clear, colorless, odorless
					Sampled @ 12:07 PM

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

May 5, 2020

Lab ID : CC 2081077-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : April 13, 2020-12:39
Sampled By : Andrea Berge
Received On : April 13, 2020-13:09
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	104	--	mg/L		200.7	04/14/20:204119	200.7	04/15/20:205778
Calcium	17	1	mg/L		200.7	04/14/20:204119	200.7	04/15/20:205778
Magnesium	15	1	mg/L		200.7	04/14/20:204119	200.7	04/15/20:205778
Potassium	2	1	mg/L		200.7	04/14/20:204119	200.7	04/15/20:205778
Sodium	37	1	mg/L		200.7	04/14/20:204119	200.7	04/15/20:205778
Total Cations	3.7	--	meq/L		200.7	04/14/20:204119	200.7	04/15/20:205778
Boron	0.1	0.1	mg/L		200.7	04/14/20:204119	200.7	04/15/20:205778
Copper	30	10	ug/L		200.7	04/14/20:204119	200.7	04/15/20:205778
Iron	ND	30	ug/L		200.7	04/14/20:204119	200.7	04/14/20:205695
Manganese	ND	10	ug/L		200.7	04/14/20:204119	200.7	04/14/20:205695
Zinc	ND	20	ug/L		200.7	04/14/20:204119	200.7	04/14/20:205695
SAR	1.6	--	--		200.7	04/14/20:204119	200.7	04/15/20:205778
Total Alkalinity (as CaCO3)	50	10	mg/L		2320B	04/21/20:204422	2320B	04/22/20:206190
Hydroxide as OH	ND	10	mg/L		2320B	04/21/20:204422	2320B	04/22/20:206190
Carbonate as CO3	ND	10	mg/L		2320B	04/21/20:204422	2320B	04/22/20:206190
Bicarbonate as HCO3	60	10	mg/L		2320B	04/21/20:204422	2320B	04/22/20:206190
Sulfate	14.5	0.5	mg/L		300.0	04/14/20:204137	300.0	04/14/20:205706
Chloride	75	1	mg/L		300.0	04/14/20:204137	300.0	04/14/20:205706
Nitrate as NO3	32.6	0.4	mg/L		300.0	04/14/20:204137	300.0	04/14/20:205706
Nitrite as N	ND	0.2	mg/L		300.0	04/14/20:204137	300.0	04/14/20:205706
Nitrate + Nitrite as N	7.4	0.1	mg/L		300.0	04/14/20:204137	300.0	04/14/20:205706
Fluoride	ND	0.1	mg/L		300.0	04/14/20:204137	300.0	04/14/20:205706
Total Anions	3.9	--	meq/L		2320B	04/21/20:204422	2320B	04/22/20:206190
pH (Field)	8.0	--	units		4500-H B	04/13/20:204393	4500HB	04/13/20:206095
Specific Conductance	443	1	umhos/cm		2510B	04/17/20:204251	2510B	04/17/20:205892
Total Dissolved Solids	300	20	mg/L		2540CE	04/15/20:204135	2540C	04/16/20:205795
MBAS Screen	Negative	0.1	mg/L		5540C	04/14/20:204376	5540C	04/14/20:206043
Aggressiveness Index	11.3	--	--		4500-H B	04/13/20:204393	4500HB	04/13/20:206095
Langelier Index (20°C)	-0.5	--	--		4500-H B	04/13/20:204393	4500HB	04/13/20:206095
Nitrate Nitrogen	7.4	0.1	mg/L		300.0	04/14/20:204137	300.0	04/14/20:205706

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

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CA ELAP Certification No. 2810

May 6, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 24C1 (LA9-Cabrillo) LA 9
Project : Los Osos BMC Monitoring

Lab ID : CC 2081161-003
Customer ID : 8-514

Sampled On : April 21, 2020-10:25
Sampled By : Zac Reineke
Received On : April 21, 2020-13:14
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	75.2	--	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Calcium	12	1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Magnesium	11	1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Potassium	1	1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Sodium	34	1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Total Cations	3.0	--	meq/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Boron	ND	0.1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Copper	ND	10	ug/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Iron	150	30	ug/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Manganese	ND	10	ug/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Zinc	70	20	ug/L		200.7	04/24/20:204600	200.7	04/27/20:206510
SAR	1.7	--	--		200.7	04/24/20:204600	200.7	04/24/20:206407
Total Alkalinity (as CaCO3)	40	10	mg/L		2320B	04/29/20:204783	2320B	04/30/20:206675
Hydroxide as OH	ND	10	mg/L		2320B	04/29/20:204783	2320B	04/30/20:206675
Carbonate as CO3	ND	10	mg/L		2320B	04/29/20:204783	2320B	04/30/20:206675
Bicarbonate as HCO3	50	10	mg/L		2320B	04/29/20:204783	2320B	04/30/20:206675
Sulfate	8.4	0.5	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Chloride	80	1	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Nitrate as NO3	40.4	0.4	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Nitrite as N	ND	0.2	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Nitrate + Nitrite as N	9.1	0.1	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Fluoride	ND	0.1	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Total Anions	3.9	--	meq/L		2320B	04/29/20:204783	2320B	04/30/20:206675
pH (Field)	6.7	--	units		4500-H B	04/21/20:204735	4500HB	04/21/20:206580
Specific Conductance	492	1	umhos/cm		2510B	05/06/20:205028	2510B	05/06/20:206973
Total Dissolved Solids	290	20	mg/L		2540CE	04/23/20:204544	2540C	04/24/20:206378
MBAS Screen	Negative	0.1	mg/L		5540C	04/22/20:204668	5540C	04/22/20:206468
Aggressiveness Index	9.8	--	--		4500-H B	04/21/20:204735	4500HB	04/21/20:206580
Langelier Index (20°C)	-2.1	--	--		4500-H B	04/21/20:204735	4500HB	04/21/20:206580
Nitrate Nitrogen	9.1	0.1	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283

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

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May 6, 2020

Lab ID : CC 2081161-003
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : April 21, 2020-10:25
Sampled By : Zac Reineke
Received On : April 21, 2020-13:14
Matrix : Ground Water

Description : 24C1 (LA9-Cabrillo) LA 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	66		°F			04/21/20 10:25	2550B	04/21/20 10:25
Conductivity	0.52		umhos/cm			04/21/20 10:25	2510B	04/21/20 10:25

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

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May 6, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 13J1 (LA10-Rosina) LA 10
Project : Los Osos BMC Monitoring

Lab ID : CC 2081161-002
Customer ID : 8-514

Sampled On : April 21, 2020-10:00
Sampled By : Zac Reineke
Received On : April 21, 2020-13:14
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	353	--	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Calcium	59	1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Magnesium	50	1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Potassium	2	1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Sodium	32	1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Total Cations	8.5	--	meq/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Boron	ND	0.1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Copper	ND	10	ug/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Iron	160	30	ug/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Manganese	ND	10	ug/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Zinc	ND	20	ug/L		200.7	04/24/20:204600	200.7	04/27/20:206510
SAR	0.7	--	--		200.7	04/24/20:204600	200.7	04/24/20:206407
Total Alkalinity (as CaCO3)	70	10	mg/L		2320B	04/28/20:204716	2320B	04/28/20:206627
Hydroxide as OH	ND	10	mg/L		2320B	04/28/20:204716	2320B	04/28/20:206627
Carbonate as CO3	ND	10	mg/L		2320B	04/28/20:204716	2320B	04/28/20:206627
Bicarbonate as HCO3	80	10	mg/L		2320B	04/28/20:204716	2320B	04/28/20:206627
Sulfate	14.2	0.5	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Chloride	320	6*	mg/L		300.0	04/22/20:204526	300.0	04/23/20:206283
Nitrate as NO3	9.2	0.4	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Nitrite as N	ND	0.2	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Nitrate + Nitrite as N	2.1	0.1	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Fluoride	ND	0.1	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Total Anions	10.8	--	meq/L		2320B	04/28/20:204716	2320B	04/28/20:206627
pH (Field)	6.8	--	units		4500-H B	04/21/20:204735	4500HB	04/21/20:206580
Specific Conductance	1310	1	umhos/cm		2510B	05/06/20:205028	2510B	05/06/20:206973
Total Dissolved Solids	970	20	mg/L		2540CE	04/23/20:204544	2540C	04/24/20:206378
MBAS Screen	Negative	0.1	mg/L		5540C	04/22/20:204668	5540C	04/22/20:206468
Aggressiveness Index	10.8	--	--		4500-H B	04/21/20:204735	4500HB	04/21/20:206580
Langelier Index (20°C)	-1.1	--	--		4500-H B	04/21/20:204735	4500HB	04/21/20:206580
Nitrate Nitrogen	2.1	0.1	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283

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

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May 6, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 13J1 (LA10-Rosina) LA 10
Project : Los Osos BMC Monitoring

Lab ID : CC 2081161-002
Customer ID : 8-514

Sampled On : April 21, 2020-10:00
Sampled By : Zac Reineke
Received On : April 21, 2020-13:14
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		°F			04/21/20 10:00	2550B	04/21/20 10:00
Conductivity	1.26		umhos/cm			04/21/20 10:00	2510B	04/21/20 10:00

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

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May 5, 2020

Lab ID : CC 2081100-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : April 14, 2020-11:55
Sampled By : James Carlson
Received On : April 14, 2020-14:41
Matrix : Ground Water

Description : 12J1 (LA11) LA 11
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	667	--	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Calcium	81	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Magnesium	113	5*	mg/L		200.7	04/17/20:204296	200.7	04/20/20:206099
Potassium	5	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Sodium	83	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Total Cations	17.1	--	meq/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Boron	0.2	0.1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Copper	ND	10	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Iron	140	30	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Manganese	40	10	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Zinc	ND	20	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
SAR	1.4	--	--		200.7	04/17/20:204296	200.7	04/17/20:205976
Total Alkalinity (as CaCO3)	290	10	mg/L		2320B	04/22/20:204482	2320B	04/22/20:206294
Hydroxide as OH	ND	10	mg/L		2320B	04/22/20:204482	2320B	04/22/20:206294
Carbonate as CO3	ND	10	mg/L		2320B	04/22/20:204482	2320B	04/22/20:206294
Bicarbonate as HCO3	350	10	mg/L		2320B	04/22/20:204482	2320B	04/22/20:206294
Sulfate	187	0.5	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774
Chloride	222	5*	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774
Nitrate as NO3	ND	0.4	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774
Nitrite as N	ND	0.1	mg/L		4500NO2B	04/15/20:204166	4500NO2B	04/15/20:205747
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774
Fluoride	0.1	0.1	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774
Total Anions	15.9	--	meq/L		2320B	04/22/20:204482	2320B	04/22/20:206294
pH	7.0	--	units		4500-H B	04/23/20:204552	4500HB	04/23/20:206305
Specific Conductance	1580	1	umhos/cm		2510B	04/17/20:204251	2510B	04/17/20:205892
Total Dissolved Solids	950	20	mg/L		2540CE	04/16/20:204210	2540C	04/17/20:205907
MBAS Screen	Negative	0.1	mg/L		5540C	04/15/20:204377	5540C	04/15/20:206071
Aggressiveness Index	11.8	--	--		4500-H B	04/23/20:204552	4500HB	04/23/20:206305
Langelier Index (20°C)	-0.1	--	--		4500-H B	04/23/20:204552	4500HB	04/23/20:206305
Nitrate Nitrogen	ND	0.1	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774

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

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May 5, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 7Q3 (LA12) LA 12
Project : Los Osos BMC Monitoring

Lab ID : CC 2081128-001
Customer ID : 8-514

Sampled On : April 16, 2020-12:38
Sampled By : Andrea Berge
Received On : April 16, 2020-13:38
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	301	--	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Calcium	48	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Magnesium	44	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Potassium	2	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Sodium	52	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Total Cations	8.3	--	meq/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Boron	0.1	0.1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Copper	ND	10	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Iron	50	30	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Manganese	50	10	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Zinc	ND	20	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
SAR	1.3	--	--		200.7	04/17/20:204296	200.7	04/17/20:205976
Total Alkalinity (as CaCO3)	250	10	mg/L		2320B	04/27/20:204626	2320B	04/27/20:206530
Hydroxide as OH	ND	10	mg/L		2320B	04/27/20:204626	2320B	04/27/20:206530
Carbonate as CO3	ND	10	mg/L		2320B	04/27/20:204626	2320B	04/27/20:206530
Bicarbonate as HCO3	310	10	mg/L		2320B	04/27/20:204626	2320B	04/27/20:206530
Sulfate	54.7	0.5	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Chloride	94	1	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Nitrate as NO3	ND	0.4	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Nitrite as N	ND	0.2	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Fluoride	ND	0.1	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Total Anions	8.9	--	meq/L		2320B	04/27/20:204626	2320B	04/27/20:206530
pH (Field)	7.8	--	units		4500-H B	04/16/20:204393	4500HB	04/16/20:206095
Specific Conductance	883	1	umhos/cm		2510B	04/28/20:204689	2510B	04/28/20:206509
Total Dissolved Solids	500	20	mg/L		2540CE	04/20/20:204361	2540C	04/21/20:206116
MBAS Screen	Negative	0.1	mg/L		5540C	04/17/20:204387	5540C	04/17/20:206077
Aggressiveness Index	12.3	--	--		4500-H B	04/16/20:204393	4500HB	04/16/20:206095
Langelier Index (20°C)	0.4	--	--		4500-H B	04/16/20:204393	4500HB	04/16/20:206095
Nitrate Nitrogen	ND	0.1	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960

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

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May 5, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 18L2 (LA15) LA 15
Project : Los Osos BMC Monitoring

Lab ID : CC 2081128-003
Customer ID : 8-514

Sampled On : April 16, 2020-13:12
Sampled By : Andrea Berge
Received On : April 16, 2020-13:38
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	299	--	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Calcium	49	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Magnesium	43	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Potassium	2	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Sodium	37	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Total Cations	7.6	--	meq/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Boron	ND	0.1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Copper	ND	10	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Iron	ND	30	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Manganese	ND	10	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Zinc	ND	20	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
SAR	0.9	--	--		200.7	04/17/20:204296	200.7	04/17/20:205976
Total Alkalinity (as CaCO3)	210	10	mg/L		2320B	04/27/20:204626	2320B	04/27/20:206530
Hydroxide as OH	ND	10	mg/L		2320B	04/27/20:204626	2320B	04/27/20:206530
Carbonate as CO3	ND	10	mg/L		2320B	04/27/20:204626	2320B	04/27/20:206530
Bicarbonate as HCO3	260	10	mg/L		2320B	04/27/20:204626	2320B	04/27/20:206530
Sulfate	32.5	0.5	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Chloride	109	1	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Nitrate as NO3	3.4	0.4	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Nitrite as N	ND	0.2	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Nitrate + Nitrite as N	0.8	0.1	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Fluoride	ND	0.1	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Total Anions	8.1	--	meq/L		2320B	04/27/20:204626	2320B	04/27/20:206530
pH (Field)	7.7	--	units		4500-H B	04/16/20:204393	4500HB	04/16/20:206095
Specific Conductance	832	1	umhos/cm		2510B	04/28/20:204689	2510B	04/28/20:206509
Total Dissolved Solids	460	20	mg/L		2540CE	04/20/20:204361	2540C	04/21/20:206116
MBAS Screen	Negative	0.1	mg/L		5540C	04/17/20:204387	5540C	04/17/20:206077
Aggressiveness Index	12.1	--	--		4500-H B	04/16/20:204393	4500HB	04/16/20:206095
Langelier Index (20°C)	0.2	--	--		4500-H B	04/16/20:204393	4500HB	04/16/20:206095
Nitrate Nitrogen	0.8	0.1	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960

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

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May 6, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 18K8 (LA18) LA 18
Project : Los Osos BMC Monitoring

Lab ID : CC 2081102-001
Customer ID : 8-514

Sampled On : April 14, 2020-11:38
Sampled By : Andrea Berge
Received On : April 14, 2020-15:00
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	269	--	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Calcium	55	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Magnesium	32	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Potassium	2	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Sodium	26	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Total Cations	6.6	--	meq/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Boron	ND	0.1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Copper	ND	10	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Iron	ND	30	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Manganese	80	10	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Zinc	ND	20	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
SAR	0.7	--	--		200.7	04/17/20:204296	200.7	04/17/20:205976
Total Alkalinity (as CaCO3)	240	10	mg/L		2320B	04/22/20:204482	2320B	04/22/20:206294
Hydroxide as OH	ND	10	mg/L		2320B	04/22/20:204482	2320B	04/22/20:206294
Carbonate as CO3	ND	10	mg/L		2320B	04/22/20:204482	2320B	04/22/20:206294
Bicarbonate as HCO3	290	10	mg/L		2320B	04/22/20:204482	2320B	04/22/20:206294
Sulfate	40.2	0.5	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774
Chloride	33	1	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774
Nitrate as NO3	ND	0.4	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774
Nitrite as N	ND	0.1	mg/L		4500NO2B	04/15/20:204166	4500NO2B	04/15/20:205747
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774
Fluoride	0.2	0.1	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774
Total Anions	6.5	--	meq/L		2320B	04/22/20:204482	2320B	04/22/20:206294
pH (Field)	7.5	--	units		4500-H B	04/14/20:204393	4500HB	04/14/20:206095
Specific Conductance	629	1	umhos/cm		2510B	04/17/20:204251	2510B	04/17/20:205892
Total Dissolved Solids	400	20	mg/L		2540CE	04/16/20:204210	2540C	04/17/20:205907
MBAS Screen	Negative	0.1	mg/L		5540C	04/15/20:204377	5540C	04/15/20:206071
Aggressiveness Index	12.0	--	--		4500-H B	04/14/20:204393	4500HB	04/14/20:206095
Langelier Index (20°C)	0.2	--	--		4500-H B	04/14/20:204393	4500HB	04/14/20:206095
Nitrate Nitrogen	ND	0.1	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774

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

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May 6, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 17N10 (South B07) LA 20
Project : Los Osos BMC Monitoring

Lab ID : CC 2081161-004
Customer ID : 8-514

Sampled On : April 21, 2020-10:50
Sampled By : Zac Reineke
Received On : April 21, 2020-13:14
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	230	--	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Calcium	36	1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Magnesium	34	1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Potassium	2	1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Sodium	42	1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Total Cations	6.5	--	meq/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Boron	ND	0.1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Copper	ND	10	ug/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Iron	ND	30	ug/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Manganese	ND	10	ug/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Zinc	ND	20	ug/L		200.7	04/24/20:204600	200.7	04/27/20:206510
SAR	1.2	--	--		200.7	04/24/20:204600	200.7	04/24/20:206407
Total Alkalinity (as CaCO3)	240	10	mg/L		2320B	04/29/20:204783	2320B	04/30/20:206675
Hydroxide as OH	ND	10	mg/L		2320B	04/29/20:204783	2320B	04/30/20:206675
Carbonate as CO3	ND	10	mg/L		2320B	04/29/20:204783	2320B	04/30/20:206675
Bicarbonate as HCO3	300	10	mg/L		2320B	04/29/20:204783	2320B	04/30/20:206675
Sulfate	26.9	0.5	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Chloride	50	1	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Nitrate as NO3	3.2	0.4	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Nitrite as N	ND	0.2	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Nitrate + Nitrite as N	0.7	0.1	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Fluoride	0.1	0.1	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Total Anions	6.9	--	meq/L		2320B	04/29/20:204783	2320B	04/30/20:206675
pH (Field)	7.0	--	units		4500-H B	04/21/20:204735	4500HB	04/21/20:206580
Specific Conductance	705	1	umhos/cm		2510B	05/06/20:205028	2510B	05/06/20:206973
Total Dissolved Solids	400	20	mg/L		2540CE	04/23/20:204544	2540C	04/24/20:206378
MBAS Screen	Negative	0.1	mg/L		5540C	04/22/20:204668	5540C	04/22/20:206468
Aggressiveness Index	11.3	--	--		4500-H B	04/21/20:204735	4500HB	04/21/20:206580
Langelier Index (20°C)	-0.5	--	--		4500-H B	04/21/20:204735	4500HB	04/21/20:206580
Nitrate Nitrogen	0.7	0.1	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283

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

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May 6, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 17N10 (South B07) LA 20
Project : Los Osos BMC Monitoring

Lab ID : CC 2081161-004
Customer ID : 8-514

Sampled On : April 21, 2020-10:50
Sampled By : Zac Reineke
Received On : April 21, 2020-13:14
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		°F			04/21/20 10:50	2550B	04/21/20 10:50
Conductivity	0.68		umhos/cm			04/21/20 10:50	2510B	04/21/20 10:50

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

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May 6, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 17E8 (LA22)   LA 22
Project : Los Osos BMC Monitoring

Lab ID : CC 2081102-002
Customer ID : 8-514

Sampled On : April 14, 2020-13:56
Sampled By : Andrea Berge
Received On : April 14, 2020-15:00
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	164	--	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Calcium	26	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Magnesium	24	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Potassium	1	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Sodium	27	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Total Cations	4.5	--	meq/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Boron	ND	0.1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Copper	ND	10	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Iron	ND	30	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Manganese	ND	10	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Zinc	ND	20	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
SAR	0.9	--	--		200.7	04/17/20:204296	200.7	04/17/20:205976
Total Alkalinity (as CaCO3)	130	10	mg/L		2320B	04/22/20:204482	2320B	04/22/20:206294
Hydroxide as OH	ND	10	mg/L		2320B	04/22/20:204482	2320B	04/22/20:206294
Carbonate as CO3	ND	10	mg/L		2320B	04/22/20:204482	2320B	04/22/20:206294
Bicarbonate as HCO3	160	10	mg/L		2320B	04/22/20:204482	2320B	04/22/20:206294
Sulfate	14.9	0.5	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774
Chloride	48	1	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774
Nitrate as NO3	28.1	0.4	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774
Nitrite as N	ND	0.1	mg/L		4500NO2B	04/15/20:204166	4500NO2B	04/15/20:205747
Nitrate + Nitrite as N	6.3	0.1	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774
Fluoride	ND	0.1	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774
Total Anions	4.7	--	meq/L		2320B	04/22/20:204482	2320B	04/22/20:206294
pH (Field)	8.0	--	units		4500-H B	04/14/20:204393	4500HB	04/14/20:206095
Specific Conductance	482	1	umhos/cm		2510B	04/17/20:204251	2510B	04/17/20:205892
Total Dissolved Solids	280	20	mg/L		2540CE	04/16/20:204210	2540C	04/17/20:205907
MBAS Screen	Negative	0.1	mg/L		5540C	04/15/20:204377	5540C	04/15/20:206071
Aggressiveness Index	11.9	--	--		4500-H B	04/14/20:204393	4500HB	04/14/20:206095
Langelier Index (20°C)	0.09	--	--		4500-H B	04/14/20:204393	4500HB	04/14/20:206095
Nitrate Nitrogen	6.3	0.1	mg/L		300.0	04/15/20:204187	300.0	04/16/20:205774

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

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CA ELAP Certification No. 2810

April 23, 2020

Lab ID : CC 2081053-002
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 20H1 LA30
Project : Los Osos BMC Monitoring

LA 30

Sampled On : April 9, 2020-11:52
Sampled By : Andrea Berge
Received On : April 9, 2020-12:20
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	390	--	mg/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Calcium	69	1	mg/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Magnesium	53	1	mg/L		200.7	04/11/20:204013	200.7	04/14/20:205693
Potassium	1	1	mg/L		200.7	04/11/20:204013	200.7	04/13/20:205642
Sodium	40	1	mg/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Total Cations	9.6	--	meq/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Boron	ND	0.1	mg/L		200.7	04/11/20:204013	200.7	04/13/20:205642
Copper	ND	10	ug/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Iron	990	30	ug/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Manganese	270	10	ug/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Zinc	ND	20	ug/L		200.7	04/11/20:204013	200.7	04/11/20:205560
SAR	0.9	--	--		200.7	04/11/20:204013	200.7	04/11/20:205560
Total Alkalinity (as CaCO3)	320	10	mg/L		2320B	04/21/20:204422	2320B	04/21/20:206190
Hydroxide as OH	ND	10	mg/L		2320B	04/21/20:204422	2320B	04/21/20:206190
Carbonate as CO3	ND	10	mg/L		2320B	04/21/20:204422	2320B	04/21/20:206190
Bicarbonate as HCO3	400	10	mg/L		2320B	04/21/20:204422	2320B	04/21/20:206190
Sulfate	103	0.5	mg/L		300.0	04/10/20:204053	300.0	04/10/20:205586
Chloride	56	1	mg/L		300.0	04/10/20:204053	300.0	04/10/20:205586
Nitrate as NO3	ND	0.4	mg/L		300.0	04/10/20:204053	300.0	04/10/20:205586
Nitrite as N	ND	0.2	mg/L		300.0	04/10/20:204053	300.0	04/10/20:205586
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	04/10/20:204053	300.0	04/10/20:205586
Fluoride	0.2	0.1	mg/L		300.0	04/10/20:204053	300.0	04/10/20:205586
Total Anions	10.3	--	meq/L		2320B	04/21/20:204422	2320B	04/21/20:206190
pH	7.3	--	units		4500-H B	04/16/20:204239	4500HB	04/16/20:205864
Specific Conductance	1000	1	umhos/cm		2510B	04/22/20:204451	2510B	04/22/20:206173
Total Dissolved Solids	580	20	mg/L		2540CE	04/13/20:204035	2540C	04/14/20:205650
MBAS Screen	Negative	0.1	mg/L		5540C	04/10/20:204081	5540C	04/10/20:205617
Aggressiveness Index	12.0	--	--		4500-H B	04/16/20:204239	4500HB	04/16/20:205864
Langelier Index (20°C)	0.2	--	--		4500-H B	04/16/20:204239	4500HB	04/16/20:205864
Nitrate Nitrogen	ND	0.1	mg/L		300.0	04/10/20:204053	300.0	04/10/20:205586

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

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April 23, 2020

Lab ID : CC 2081053-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : April 9, 2020-11:09
Sampled By : Andrea Berge
Received On : April 9, 2020-12:20
Matrix : Ground Water

Description : 13M2 LA31
Project : Los Osos BMC Monitoring

LA 31

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	519	--	mg/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Calcium	86	1	mg/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Magnesium	74	1	mg/L		200.7	04/11/20:204013	200.7	04/14/20:205693
Potassium	4	1	mg/L		200.7	04/11/20:204013	200.7	04/13/20:205642
Sodium	258	1	mg/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Total Cations	21.7	--	meq/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Boron	0.1	0.1	mg/L		200.7	04/11/20:204013	200.7	04/13/20:205642
Copper	ND	10	ug/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Iron	60	30	ug/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Manganese	ND	10	ug/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Zinc	ND	20	ug/L		200.7	04/11/20:204013	200.7	04/11/20:205560
SAR	4.9	--	--		200.7	04/11/20:204013	200.7	04/11/20:205560
Total Alkalinity (as CaCO3)	50	10	mg/L		2320B	04/21/20:204422	2320B	04/21/20:206190
Hydroxide as OH	ND	10	mg/L		2320B	04/21/20:204422	2320B	04/21/20:206190
Carbonate as CO3	ND	10	mg/L		2320B	04/21/20:204422	2320B	04/21/20:206190
Bicarbonate as HCO3	70	10	mg/L		2320B	04/21/20:204422	2320B	04/21/20:206190
Sulfate	152	0.5	mg/L		300.0	04/10/20:204053	300.0	04/10/20:205586
Chloride	738	15*	mg/L		300.0	04/10/20:204053	300.0	04/11/20:205586
Nitrate as NO3	2.8	0.4	mg/L		300.0	04/10/20:204053	300.0	04/10/20:205586
Nitrite as N	ND	0.2	mg/L		300.0	04/10/20:204053	300.0	04/10/20:205586
Nitrate + Nitrite as N	0.6	0.1	mg/L		300.0	04/10/20:204053	300.0	04/10/20:205586
Fluoride	ND	0.1	mg/L		300.0	04/10/20:204053	300.0	04/10/20:205586
Total Anions	25.2	--	meq/L		2320B	04/21/20:204422	2320B	04/21/20:206190
pH	6.2	--	units		4500-H B	04/14/20:204116	4500HB	04/14/20:205673
Specific Conductance	2970	1	umhos/cm		2510B	04/15/20:204130	2510B	04/15/20:205694
Total Dissolved Solids	1740	20	mg/L		2540CE	04/13/20:204035	2540C	04/14/20:205650
MBAS Screen	Negative	0.1	mg/L		5540C	04/10/20:204081	5540C	04/10/20:205617
Aggressiveness Index	10.2	--	--		4500-H B	04/14/20:204116	4500HB	04/14/20:205673
Langelier Index (20°C)	-1.7	--	--		4500-H B	04/14/20:204116	4500HB	04/14/20:205673
Nitrate Nitrogen	0.6	0.1	mg/L		300.0	04/10/20:204053	300.0	04/10/20:205586

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

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May 5, 2020

Lab ID : CC 2081128-002
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 18K9 (LA32)
Project : Los Osos BMC Monitoring

LA 32

Sampled On : April 16, 2020-12:57
Sampled By : Andrea Berge
Received On : April 16, 2020-13:38
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	72.7	--	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Calcium	11	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Magnesium	11	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Potassium	ND	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Sodium	20	1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Total Cations	2.3	--	meq/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Boron	ND	0.1	mg/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Copper	ND	10	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Iron	ND	30	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Manganese	ND	10	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
Zinc	ND	20	ug/L		200.7	04/17/20:204296	200.7	04/17/20:205976
SAR	1.0	--	--		200.7	04/17/20:204296	200.7	04/17/20:205976
Total Alkalinity (as CaCO3)	50	10	mg/L		2320B	04/27/20:204626	2320B	04/27/20:206530
Hydroxide as OH	ND	10	mg/L		2320B	04/27/20:204626	2320B	04/27/20:206530
Carbonate as CO3	ND	10	mg/L		2320B	04/27/20:204626	2320B	04/27/20:206530
Bicarbonate as HCO3	60	10	mg/L		2320B	04/27/20:204626	2320B	04/27/20:206530
Sulfate	5.4	0.5	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Chloride	35	1	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Nitrate as NO3	26.5	0.4	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Nitrite as N	ND	0.2	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Nitrate + Nitrite as N	6.0	0.1	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Fluoride	ND	0.1	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960
Total Anions	2.5	--	meq/L		2320B	04/27/20:204626	2320B	04/27/20:206530
pH (Field)	8.1	--	units		4500-H B	04/16/20:204393	4500HB	04/16/20:206095
Specific Conductance	272	1	umhos/cm		2510B	04/28/20:204689	2510B	04/28/20:206509
Total Dissolved Solids	190	20	mg/L		2540CE	04/20/20:204361	2540C	04/21/20:206116
MBAS Screen	Negative	0.1	mg/L		5540C	04/17/20:204387	5540C	04/17/20:206077
Aggressiveness Index	11.2	--	--		4500-H B	04/16/20:204393	4500HB	04/16/20:206095
Langelier Index (20°C)	-0.6	--	--		4500-H B	04/16/20:204393	4500HB	04/16/20:206095
Nitrate Nitrogen	6.0	0.1	mg/L		300.0	04/17/20:204308	300.0	04/17/20:205960

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

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May 6, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 18K (LA39-L05) LA 39
Project : Los Osos BMC Monitoring

Lab ID : CC 2081161-001
Customer ID : 8-514

Sampled On : April 21, 2020-08:00
Sampled By : Zac Reineke
Received On : April 21, 2020-13:14
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	236	--	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Calcium	37	1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Magnesium	35	1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Potassium	2	1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Sodium	42	1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Total Cations	6.6	--	meq/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Boron	ND	0.1	mg/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Copper	ND	10	ug/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Iron	ND	30	ug/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Manganese	ND	10	ug/L		200.7	04/24/20:204600	200.7	04/24/20:206407
Zinc	ND	20	ug/L		200.7	04/24/20:204600	200.7	04/27/20:206510
SAR	1.2	--	--		200.7	04/24/20:204600	200.7	04/24/20:206407
Total Alkalinity (as CaCO3)	240	10	mg/L		2320B	04/28/20:204716	2320B	04/28/20:206627
Hydroxide as OH	ND	10	mg/L		2320B	04/28/20:204716	2320B	04/28/20:206627
Carbonate as CO3	ND	10	mg/L		2320B	04/28/20:204716	2320B	04/28/20:206627
Bicarbonate as HCO3	300	10	mg/L		2320B	04/28/20:204716	2320B	04/28/20:206627
Sulfate	28.4	0.5	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Chloride	37	1	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Nitrate as NO3	0.8	0.4	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Nitrite as N	ND	0.2	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Nitrate + Nitrite as N	0.2	0.1	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Fluoride	0.1	0.1	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283
Total Anions	6.6	--	meq/L		2320B	04/28/20:204716	2320B	04/28/20:206627
pH (Field)	6.9	--	units		4500-H B	04/21/20:204735	4500HB	04/21/20:206580
Specific Conductance	674	1	umhos/cm		2510B	04/29/20:204724	2510B	04/29/20:206579
Total Dissolved Solids	370	20	mg/L		2540CE	04/23/20:204544	2540C	04/24/20:206378
MBAS Screen	Negative	0.1	mg/L		5540C	04/22/20:204668	5540C	04/22/20:206468
Aggressiveness Index	11.2	--	--		4500-H B	04/21/20:204735	4500HB	04/21/20:206580
Langelier Index (20°C)	-0.6	--	--		4500-H B	04/21/20:204735	4500HB	04/21/20:206580
Nitrate Nitrogen	0.2	0.1	mg/L		300.0	04/22/20:204526	300.0	04/22/20:206283

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

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May 6, 2020

Lab ID : CC 2081161-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : April 21, 2020-08:00
Sampled By : Zac Reineke
Received On : April 21, 2020-13:14
Matrix : Ground Water

Description : 18K (LA39-L05) LA 39
Project : Los Osos BMC Monitoring

Sample Result - Support

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
Field Test								
Temperature	69		°F			04/21/20 08:00	2550B	04/21/20 08:00
Conductivity	0.75		umhos/cm			04/21/20 08:00	2510B	04/21/20 08:00

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

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TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

May 6, 2020

Lab ID : CC 2080997-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : April 7, 2020-11:11
Sampled By : James Carlson
Received On : April 7, 2020-15:40
Matrix : Ground Water

Description : Zone E Well (LA40) LA 40
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	3300	--	mg/L		200.7	04/11/20:204013	200.7	04/15/20:205767
Calcium	569	5*	mg/L		200.7	04/11/20:204013	200.7	04/15/20:205767
Magnesium	458	5*	mg/L		200.7	04/11/20:204013	200.7	04/15/20:205767
Potassium	7	1	mg/L		200.7	04/11/20:204013	200.7	04/13/20:205642
Sodium	203	1	mg/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Total Cations	75.1	--	meq/L		200.7	04/11/20:204013	200.7	04/15/20:205767
Boron	ND	0.1	mg/L		200.7	04/11/20:204013	200.7	04/13/20:205642
Copper	ND	10	ug/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Iron	ND	30	ug/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Manganese	190	10	ug/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Zinc	ND	20	ug/L		200.7	04/11/20:204013	200.7	04/11/20:205560
SAR	1.5	--	--		200.7	04/11/20:204013	200.7	04/15/20:205767
Total Alkalinity (as CaCO3)	190	10	mg/L		2320B	04/08/20:203891	2320B	04/09/20:205437
Hydroxide as OH	ND	10	mg/L		2320B	04/08/20:203891	2320B	04/09/20:205437
Carbonate as CO3	ND	10	mg/L		2320B	04/08/20:203891	2320B	04/09/20:205437
Bicarbonate as HCO3	240	10	mg/L		2320B	04/08/20:203891	2320B	04/09/20:205437
Sulfate	202	0.5	mg/L		300.0	04/23/20:204590	300.0	04/23/20:206374
Chloride	2190	20*	mg/L		300.0	04/23/20:204590	300.0	04/23/20:206374
Nitrate as NO3	1.4	0.9	mg/L		4500NO3F	04/08/20:203854	4500NO3F	04/08/20:205396
Nitrite as N	ND	0.1	mg/L		4500NO2B	04/08/20:203856	4500NO2B	04/08/20:205387
Nitrate + Nitrite as N	0.3	0.2	mg/L		4500NO3F	04/08/20:203854	4500NO3F	04/08/20:205396
Fluoride	ND	0.1	mg/L		300.0	04/23/20:204590	300.0	04/23/20:206374
Total Anions	69.9	--	meq/L		2320B	04/08/20:203891	2320B	04/09/20:205437
pH	7.6	--	units		4500-H B	04/09/20:203965	4500HB	04/09/20:205468
Specific Conductance	7360	1	umhos/cm		2510B	04/09/20:203915	2510B	04/09/20:205417
Total Dissolved Solids	6340	20*	mg/L		2540CE	04/08/20:203879	2540C	04/09/20:205424
MBAS Extraction	ND	0.1	mg/L		5540C	04/08/20:204085	5540C	04/08/20:205621
Aggressiveness Index	13.0	--	--		4500-H B	04/09/20:203965	4500HB	04/09/20:205468
Langelier Index (20°C)	1.0	--	--		4500-H B	04/09/20:203965	4500HB	04/09/20:205468
Nitrate Nitrogen	0.3	0.2	mg/L		4500NO3F	04/08/20:203854	4500NO3F	04/08/20:205396

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

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April 23, 2020

Lab ID : CC 2081030-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : April 8, 2020-12:07
Sampled By : James Carlson
Received On : April 8, 2020-13:05
Matrix : Ground Water

Description : Zone D Well (LA41) LA 41
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	204	--	mg/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Calcium	44	1	mg/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Magnesium	23	1	mg/L		200.7	04/11/20:204013	200.7	04/14/20:205693
Potassium	2	1	mg/L		200.7	04/11/20:204013	200.7	04/13/20:205642
Sodium	101	1	mg/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Total Cations	8.5	--	meq/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Boron	ND	0.1	mg/L		200.7	04/11/20:204013	200.7	04/13/20:205642
Copper	ND	10	ug/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Iron	260	30	ug/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Manganese	60	10	ug/L		200.7	04/11/20:204013	200.7	04/11/20:205560
Zinc	ND	20	ug/L		200.7	04/11/20:204013	200.7	04/11/20:205560
SAR	3.1	--	--		200.7	04/11/20:204013	200.7	04/11/20:205560
Total Alkalinity (as CaCO3)	260	10	mg/L		2320B	04/20/20:204219	2320B	04/20/20:206123
Hydroxide as OH	ND	10	mg/L		2320B	04/20/20:204219	2320B	04/20/20:206123
Carbonate as CO3	ND	10	mg/L		2320B	04/20/20:204219	2320B	04/20/20:206123
Bicarbonate as HCO3	310	10	mg/L		2320B	04/20/20:204219	2320B	04/20/20:206123
Sulfate	109	0.5	mg/L		300.0	04/21/20:204457	300.0	04/22/20:206178
Chloride	68	1	mg/L		300.0	04/10/20:204044	300.0	04/10/20:205572
Nitrate as NO3	1.4	0.4	mg/L		300.0	04/10/20:204044	300.0	04/10/20:205572
Nitrite as N	ND	0.2	mg/L		300.0	04/10/20:204044	300.0	04/10/20:205572
Nitrate + Nitrite as N	0.3	0.1	mg/L		300.0	04/10/20:204044	300.0	04/10/20:205572
Fluoride	0.1	0.1	mg/L		300.0	04/10/20:204044	300.0	04/10/20:205572
Total Anions	9.3	--	meq/L		2320B	04/20/20:204219	2320B	04/20/20:206123
pH	7.8	--	units		4500-H B	04/16/20:204239	4500HB	04/16/20:205864
Specific Conductance	943	1	umhos/cm		2510B	04/21/20:204394	2510B	04/21/20:206094
Total Dissolved Solids	560	20	mg/L		2540CE	04/10/20:203986	2540C	04/13/20:205592
MBAS Extraction	ND	0.1	mg/L		5540C	04/09/20:204388	5540C	04/09/20:206078
Aggressiveness Index	12.3	--	--		4500-H B	04/16/20:204239	4500HB	04/16/20:205864
Langelier Index (20°C)	0.4	--	--		4500-H B	04/16/20:204239	4500HB	04/16/20:205864
Nitrate Nitrogen	0.3	0.1	mg/L		300.0	04/10/20:204044	300.0	04/10/20:205572

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

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Fall 2020 Field Logs and Analytical Results

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/7/2020
Operator: A. Berge
Well number and location: 30S/11E-20M2 (FW28)
Site and wellhead conditions: Foggy and cool. Well is pumping on and off upon arrival.

Static water depth (feet): 52.1 (recovering)
Well depth (feet): 102
Water column (feet): 49.9
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: 10:55 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
10:55	1	794	7.82	15.4	Cloudy orange, odorless
10:57	5	790.7	7.77	15.1	Clear, colorless, odorless
10:58	10	790.1	7.57	15.1	Clear, colorless, odorless
11:00	20	789.9	7.49	15.2	Clear, colorless, odorless
					Sampled @ 11:01 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 11/5/2020
Operator: B. Pfeifle & S. Harris
Well number and location: 30S/10E-11A1 (UA1)
Site and wellhead conditions: Sunny, steel cover in place

Static water depth (feet): 12.5
Well depth (feet): 160
Water column (feet): 147.5
Casing diameter (inches): 2
Minimum purge volume (gal) 75
Purge rate (gpm): 2.30
Pumping water level (feet): 17.5
Pump setting (feet): 60
Minimum purge time (min): 40
Time begin purge: 9:55 AM

Time	Gallons	EC (μS/cm)	pH	Temp. (°C)	Comments*
9:57	0.1	33.7	7.45	22.5	Clear, colorless, sulfur odor
10:01	10	35.3	7.64	20	Clear, colorless, sulfur odor
10:05	20	35.5	7.63	19.7	Light grey, turbid, sulfur odor
10:10	30	35.4	7.73	19.4	Clear, colorless, odorless
10:15	40	35.6	7.65	19.7	Clear, colorless, odorless
10:19	50	35.5	7.63	19.7	Clear, colorless, odorless
10:24	60	35.6	7.55	19.7	Clear, colorless, odorless
10:29	70	35.7	7.57	19.6	Clear, colorless, odorless
10:31	75	35.7	7.55	19.6	Clear, colorless, odorless
					Sampled @ 10:31

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/12/2020
Operator: A. Berge
Well number and location: 30S/11E-17E10 (UA13)
Site and wellhead conditions: Sunny and hot. Well has been running since 7:00 AM

Static water depth (feet): 94.9
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: 2:07 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
14:07	flush line	467.3	7.84	20.2	Clear, colorless, odorless
14:10	flush line	465.7	7.79	19.6	Clear, colorless, odorless
14:12	flush line	465.1	7.52	19.3	Clear, colorless, odorless
					Sampled @ 14:14 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 11/2/2020
Operator: B. Pfeifle & S. Harris
Well number and location: 30S/10E-11A2 (LA2)
Site and wellhead conditions: Sunny, clear, dry

Static water depth (feet): 11.5
Well depth (feet): 244
Water column (feet): 232.53
Casing diameter (inches): 2
Minimum purge volume (gal) 114
Purge rate (gpm): 2.80
Pumping water level (feet): 21
Pump setting (feet): 60
Minimum purge time (min): 50
Time begin purge: 9:02 AM

Time	Gallons	EC (mS/cm)	pH	Temp. (°C)	Comments*
9:02	0.1	8.54	7.17	21.5	Slight sulfur odor, clear, odorless
9:04	5	10.71	7.15	19.8	Slight sulfur odor, clear, odorless
9:06	10	10.97	7.23	19.8	Slight sulfur odor, clear, odorless
9:07	15	10.99	7.22	19.6	Slight sulfur odor, clear, odorless
9:09	20	12.23	7.22	19.5	Slight sulfur odor, clear, odorless
9:13	30	13.15	7.04	19.8	Slight sulfur odor, light grey, turbid
9:16	40	13.23	7.26	19.8	No sulfur odor, light grey, turbid, sand present
9:20	50	13.16	7.30	19.6	Slightly turbid, no more sand present
9:24	60	13.2	7.32	20	Clear, colorless, odorless
9:28	70	13.01	7.33	19.9	Clear, colorless, odorless
9:31	80	12.1	7.33	19.9	Clear, colorless, odorless
9:35	90	12.87	7.34	19.8	Clear, colorless, odorless
9:38	100	12.79	7.35	19.7	Clear, colorless, odorless
9:42	110	12.72	7.35	19.8	Clear, colorless, odorless
9:47	120	12.65	7.35	19.9	Clear, colorless, odorless
					Sampled @ 9:47

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/1/2020
Operator: A. Berge with C. Cote
Well number and location: 30S/11E-13N (LA8)
Site and wellhead conditions: Cloudy and cool. Well has been running since 10:00 AM

Static water depth (feet):	134.3
Well depth (feet):	350
Water column (feet):	215.7
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:	10:00 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
10:32	flush line	423.6	8.53	19.6	Clear, colorless, odorless
10:34	flush line	415.4	8.16	18.8	Clear, colorless, odorless
10:37	flush line	412	8.19	19.3	Clear, colorless, odorless
10:40	flush line	410.7	7.93	18.9	Clear, colorless, odorless
10:42	flush line	410.7	7.90	18.8	Clear, colorless, odorless
					Sampled @ 10:42 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/1/2020
Operator: J. Carlson
Well number and location: 30S/10E-12J1 (LA11)
Site and wellhead conditions: Sunny and still. Site secure

Static water depth (feet): 7
Well depth (feet): 389
Water column (feet): 382
Casing diameter (inches): 2
Minimum purge volume (gal) 200
Purge rate (gpm): 0.8
Pumping water level (feet):
Pump setting (feet): 25
Minimum purge time (min): 160
Time begin purge: 10:20 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
10:21	1	1,236	7.96	21	Clear, colorless, odorless
10:24	5	1,195	7.48	20.2	Clear, colorless, odorless
10:28	10	1,212	7.23	19.4	Clear, colorless, odorless
10:36	20	1,201	7.18	20.1	Clear, colorless, odorless
10:53	45	1,280	7.15	21.7	Slightly cloudy, colorless, odorless
11:00	55	1,507	7.04	21.3	Slightly cloudy, colorless, odorless
11:14	75	1,577	7.11	21.6	Clear, colorless, odorless
11:34	100	1,539	7.05	21.8	Clear, colorless, odorless
11:47	120	1,527	7.04	21.7	Clear, colorless, odorless
12:04	145	1,520	7.06	21.6	Clear, colorless, odorless
12:20	170	1,506	7.07	21.2	Clear, colorless, odorless
12:34	190	1,503	7.09	21.30	Clear, colorless, odorless
12:38	195	1,495	7.06	21.10	Clear, colorless, odorless
12:41	200	1,495	7.06	21.10	Clear, colorless, odorless
					Sampled @ 12:41 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/5/2020
Operator: A. Berge with N. Pall
Well number and location: 30S/11E-7Q3 (LA12)
Site and wellhead conditions: Foggy, cool. Well has been running since 9:00 AM

Static water depth (feet): 38.3
Well depth (feet): 270
Water column (feet): 232
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: 11:10 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
11:10	flush line	706	8.16	21.4	Clear, colorless, odorless
11:12	flush line	696	8.04	21	Clear, colorless, odorless
11:15	flush line	696	7.90	21.1	Clear, colorless, faint sulfur odor
11:20	flush line	701	7.87	21.1	Clear, colorless, very faint sulfur odor
					Sampled @ 11:21 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/5/2020
Operator: A. Berge with N. Pall
Well number and location: 30S/11E-18L2 (LA15)
Site and wellhead conditions: Foggy and cool. Well has been on since 9:30 AM

Static water depth (feet): 101.8
Well depth (feet): 394
Water column (feet): 292
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: 1:14 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
13:15	flush line	678	8.05	20.7	Clear, colorless, odorless
13:17	flush line	671.3	7.97	20.7	Clear, colorless, odorless
13:20	flush line	670.2	7.87	20.7	Clear, colorless, odorless
13:22	flush line	671.5	7.75	20.7	Clear, colorless, odorless
					Sampled @ 13:23

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/22/2020
Operator: J. Carlson
Well number and location: 30S/11E-18K8 (LA18)
Site and wellhead conditions: Overcast, site secure

Static water depth (feet): 139.41
Well depth (feet): 650
Water column (feet): 511
Casing diameter (inches): 2
Minimum purge volume (gal) 250
Purge rate (gpm): 1.5
Pumping water level (feet): 147.4
Pump setting (feet): 160
Minimum purge time (min): 170
Time begin purge: 9:20 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
9:20	1	438.3	6.85	19.2	Clear, colorless, odorless
9:22	5	420.9	6.97	20.4	Clear, colorless, odorless
9:25	10	435.5	7.08	20.1	Clear, colorless, odorless
9:31	20	528.1	7.16	20.8	Clear, colorless, odorless
9:38	30	547.8	7.28	20.8	Clear, colorless, odorless
9:50	50	563.1	7.38	21.5	Clear, colorless, odorless
10:11	80	558.8	7.43	22.3	Clear, colorless, odorless
10:43	120	557.1	7.48	22.6	Clear, colorless, odorless
11:15	170	556.1	7.54	22.3	Clear, colorless, odorless
11:48	220	557.2	7.54	22.5	Clear, colorless, odorless
12:01	240	559.1	7.62	22.8	Clear, colorless, odorless
12:07	250	559.7	7.58	22.8	Clear, colorless, odorless
					Sampled @ 12:10

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/6/2020
Operator: A. Berge
Well number and location: 30S/11E-17E8 (LA22)
Site and wellhead conditions: Overcast and cool. Gate unlocked, monument and wells secure.

Static water depth (feet): 124.39
Well depth (feet): 390
Water column (feet): 265.6
Casing diameter (inches): 2
Minimum purge volume (gal) 125
Purge rate (gpm): 2
Pumping water level (feet): 126.7
Pump setting (feet): 140
Minimum purge time (min): 90
Time begin purge: 9:19 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
9:19	1	155.7	9.01	17	Clear, colorless, odorless
9:23	5	460.9	8.07	19.2	Clear, colorless, odorless
9:26	10	465	7.99	19.5	Clear, colorless, odorless
9:29	15	458	7.94	19.9	Clear, colorless, odorless
9:36	25	440.5	7.82	20	Clear, colorless, odorless
9:43	35	437.8	7.72	20	Clear, colorless, odorless
9:50	50	435.4	7.65	20	Clear, colorless, odorless
9:52	55	438.7	7.47	20	Clear, colorless, odorless
10:07	75	438.2	7.58	20	Clear, colorless, odorless
10:23	95	439.7	7.54	20.1	Clear, colorless, odorless
10:39	115	437.7	7.53	20	Clear, colorless, odorless
10:47	125	437.7	7.48	20.1	Clear, colorless, odorless
					Sampled @ 10:50 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/1/2020
Operator: A. Berge
Well number and location: 30S/11E-20H1 (LA30)
Site and wellhead conditions: Sunny and hot. Well owner present.

Static water depth (feet): 26.79
Well depth (feet): 140
Water column (feet): 113.21
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: 1:38 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
13:38	1	769.7	7.61	29.1	Slightly cloudy, faint odor
13:41	5	767.6	7.60	22	Cloudy, faint odor
13:43	10	764.2	7.54	21	Cloudy and brown, faint odor
13:45	20	769.4	7.55	19.3	Slightly less cloudy, odorless
13:47	30	767.8	7.55	19.4	Faintly cloudy, odorless
13:49	40	769	7.55	19.4	Clear, colorless, odorless
					Sampled @ 13:50 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/1/2020
Operator: A. Berge
Well number and location: 30S/10E-13M2 (LA31)
Site and wellhead conditions: Hot, slightly breezy, sunny. Well has been used to irrigate today.

Static water depth (feet): 37.51
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: 9:40 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
9:40	1	2,560	8.26	20.2	Clear, colorless, odorless
9:42	10	2,540	8.17	19.4	Clear, colorless, odorless
9:45	15	2,570	8.11	19.1	Clear, colorless, odorless
9:46	20	2,600	8.04	19.1	Clear, colorless, odorless
					Sampled @ 9:48 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/6/2020
Operator: A. Berge with N. Pall
Well number and location: 30S/11E-18K9 (LA32)
Site and wellhead conditions: Overcast, windy. Well has been running for 3.5 hours.

Static water depth (feet): 147.5
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: 11:33 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
11:33	1	236.9	7.96	19.3	Slightly cloudy, odorless
11:35	3	234.3	8.03	19	Mostly clear, colorless odorless.

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/6/2020
Operator: J. Carlson
Well number and location: Lupine Zone E (LA-40)
Overcast and breezy; site secure.
*measurements taken from the top of casing

Static water depth* (feet): 9.9
Well depth (feet): 350
Water column (feet): 477.6
Casing diameter (inches): 2.16
Minimum purge volume (gal) 270.0
Pumping water level (feet): 82.9
Purge Rate (GPM): ~.4 - .6
Pump setting (feet): 150
Time begin purge: 11:15 AM

Time	Gallons	EC (mS)	pH	Temp. (°C)	Comments*
11:15 AM	1	5.19	7.18	18.0	clear, colorless, sulfur odor
11:26 AM	10	5.82	7.04	18.3	clear, colorless, sulfur odor
11:39 AM	20	5.79	6.94	18.6	clear, colorless, sulfur odor
12:13 PM	40	5.52	6.93	19.5	clear, colorless, sulfur odor
12:52 PM	60	5.09	6.96	19.9	clear, colorless, sulfur odor
1:35 PM	80	6.83	6.90	20.3	clear, colorless, sulfur odor
2:19 PM	100	7.39	6.95	20.2	clear, colorless, sulfur odor
Purge stopped at 2:19 PM 10/6/2020 and continued at 8:57 AM 10/7/2020					
9:13 AM	120	7.45	7.01	18.3	clear, colorless, slight sulfur odor
9:49 AM	140	7.39	6.97	19.0	clear, colorless, slight sulfur odor
10:32 AM	160	7.36	6.98	19.4	clear, colorless, slight sulfur odor
11:15 AM	180	7.48	6.92	19.7	clear, colorless, slight sulfur odor
12:15 PM	200	7.48	6.94	19.6	clear, colorless, slight sulfur odor
12:39 PM	210	7.55	6.90	19.9	clear, colorless, slight sulfur odor
1:04 PM	220	7.55	6.90	20.1	clear, colorless, slight sulfur odor
1:25 PM	230	7.54	6.90	20.1	clear, colorless, slight sulfur odor
1:48 PM	240	7.55	6.97	19.9	clear, colorless, slight sulfur odor
2:22 PM	250	7.48	6.90	19.6	clear, colorless, slight sulfur odor
Sampled @ 2:22 PM					

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/7/2020
Operator: J. Carlson
Well number and location: Lupine Zone D (LA41)
Site and wellhead conditions: Overcast and cool. Site secure.

Static water depth (feet): 12.36
Well depth (feet): 350
Water column (feet): 337.64
Casing diameter (inches): 2.16
Minimum purge volume (gal) 200.0
Pumping water level (feet): 95.8
Purge Rate (GPM): 0.5
Pump setting (feet): 150
Time begin purge: 3:08 PM

Time	Gallons	EC (µS)	pH	Temp. (°C)	Comments*
3:08 PM	1	1310	8.24	17.7	clear, colorless, odorless
3:16 PM	10	848	7.67	18.5	clear, colorless, odorless
3:35 PM	20	843	7.29	19.0	clear, colorless, odorless
3:53 PM	30	829	7.26	19.4	clear, colorless, odorless
4:14 PM	40	820	7.18	19.6	clear, colorless, odorless
4:42 PM	50	813	7.16	19.9	clear, colorless, odorless
Purge stopped at 4:42 PM 10/7/2020 and continued at 7:28 AM 10/8/2020					
7:38 AM	60	821	7.34	18.1	clear, colorless, odorless
7:51 AM	70	820	7.18	18.3	clear, colorless, odorless
8:08 AM	80	815	7.13	18.5	clear, colorless, odorless
8:29 AM	90	815	7.11	18.6	clear, colorless, odorless
8:47 AM	100	818	7.09	19.1	clear, colorless, odorless
9:08 AM	110	807	7.10	19.3	clear, colorless, odorless
9:28 AM	120	809	7.11	19.30	clear, colorless, odorless
10:00 AM	130	806	7.09	19.3	clear, colorless, odorless
10:14 AM	140	814	7.07	19.5	clear, colorless, odorless
10:32 AM	150	807	7.08	19.7	clear, colorless, odorless
10:51 AM	160	809	7.09	19.7	clear, colorless, odorless
11:10 AM	170	808	7.09	19.8	clear, colorless, odorless
11:29 AM	180	803	7.10	19.9	clear, colorless, odorless
11:48 AM	190	807	7.08	20.1	clear, colorless, odorless
12:08 PM	200	807	7.1	20.3	clear, colorless, odorless
Sampled @ 12:10 PM					

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

October 28, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 20A2 (FW26)
Project : Los Osos BMC

FW 26

Lab ID : CC 2083447-001
Customer ID : 8-514

Sampled On : October 14, 2020-13:22
Sampled By : Andrea Berge
Received On : October 14, 2020-14:59
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	226	2.5	mg/L		200.7	10/16/20:212188	200.7	10/16/20:216712
Calcium	33	1	mg/L		200.7	10/16/20:212188	200.7	10/16/20:216712
Magnesium	35	1	mg/L		200.7	10/16/20:212188	200.7	10/16/20:216712
Potassium	ND	1	mg/L		200.7	10/16/20:212188	200.7	10/16/20:216712
Sodium	37	1	mg/L		200.7	10/16/20:212188	200.7	10/16/20:216712
Total Cations	6.1	---	meq/L		200.7	10/16/20:212188	200.7	10/16/20:216712
Boron	ND	0.1	mg/L		200.7	10/16/20:212188	200.7	10/16/20:216712
Copper	ND	10	ug/L		200.7	10/16/20:212188	200.7	10/16/20:216712
Iron	2640	30	ug/L		200.7	10/16/20:212188	200.7	10/16/20:216712
Manganese	510	10	ug/L		200.7	10/16/20:212188	200.7	10/16/20:216712
Zinc	ND	20	ug/L		200.7	10/16/20:212188	200.7	10/16/20:216712
SAR	1.1	0.1	--		200.7	10/16/20:212188	200.7	10/16/20:216712
Total Alkalinity (as CaCO3)	180	10	mg/L		2320B	10/18/20:212231	2320B	10/18/20:216737
Hydroxide as OH	ND	10	mg/L		2320B	10/18/20:212231	2320B	10/18/20:216737
Carbonate as CO3	ND	10	mg/L		2320B	10/18/20:212231	2320B	10/18/20:216737
Bicarbonate as HCO3	230	10	mg/L		2320B	10/18/20:212231	2320B	10/18/20:216737
Sulfate	29.4	0.5	mg/L		300.0	10/15/20:212168	300.0	10/15/20:216624
Chloride	77	1	mg/L		300.0	10/15/20:212168	300.0	10/15/20:216624
Nitrate as NO3	ND	0.4	mg/L		300.0	10/15/20:212168	300.0	10/15/20:216624
Nitrite as N	ND	0.2	mg/L		300.0	10/15/20:212168	300.0	10/15/20:216624
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/15/20:212168	300.0	10/15/20:216624
Fluoride	0.1	0.1	mg/L		300.0	10/15/20:212168	300.0	10/15/20:216624
Total Anions	6.6	---	meq/L		2320B	10/18/20:212231	2320B	10/18/20:216737
pH (Field)	7.0	--	units		4500-H B	10/14/20:212363	4500HB	10/14/20:216892
Specific Conductance	682	1	umhos/cm		2510B	10/20/20:212305	2510B	10/20/20:216815
Total Dissolved Solids	390	20	mg/L		2540CE	10/16/20:212172	2540C	10/19/20:216763
MBAS Screen	Negative	0.1	mg/L		5540C	10/15/20:212435	5540C	10/15/20:216991
Aggressiveness Index	11.2	1	--		4500-H B	10/14/20:212363	4500HB	10/14/20:216892
Langelier Index (20°C)	-0.7	1	--		4500-H B	10/14/20:212363	4500HB	10/14/20:216892
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/15/20:212168	300.0	10/15/20:216624

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

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October 26, 2020

Lab ID : CC 2083332-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 7, 2020-11:01
Sampled By : Andrea Berge
Received On : October 7, 2020-13:03
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	419	2.5	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Calcium	74	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Magnesium	57	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Potassium	2	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Sodium	42	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Total Cations	10.3	---	meq/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Boron	0.1	0.1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Copper	ND	10	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Iron	310	30	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Manganese	380	10	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Zinc	ND	20	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
SAR	0.9	0.1	--		200.7	10/09/20:211884	200.7	10/09/20:216319
Total Alkalinity (as CaCO3)	340	10	mg/L		2320B	10/15/20:212130	2320B	10/15/20:216716
Hydroxide as OH	ND	10	mg/L		2320B	10/15/20:212130	2320B	10/15/20:216716
Carbonate as CO3	ND	10	mg/L		2320B	10/15/20:212130	2320B	10/15/20:216716
Bicarbonate as HCO3	410	10	mg/L		2320B	10/15/20:212130	2320B	10/15/20:216716
Sulfate	93.8	0.5	mg/L		300.0	10/08/20:211888	300.0	10/08/20:216233
Chloride	63	1	mg/L		300.0	10/08/20:211888	300.0	10/08/20:216233
Nitrate as NO3	ND	0.4	mg/L		300.0	10/08/20:211888	300.0	10/08/20:216233
Nitrite as N	ND	0.2	mg/L		300.0	10/08/20:211888	300.0	10/08/20:216233
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/08/20:211888	300.0	10/08/20:216233
Fluoride	0.3	0.1	mg/L		300.0	10/08/20:211888	300.0	10/08/20:216233
Total Anions	10.5	---	meq/L		2320B	10/15/20:212130	2320B	10/15/20:216716
pH (Field)	7.5	--	units		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Specific Conductance	1020	1	umhos/cm		2510B	10/20/20:212305	2510B	10/20/20:216815
Total Dissolved Solids	610	20	mg/L		2540CE	10/12/20:211954	2540C	10/13/20:216408
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/20:212191	5540C	10/08/20:216643
Aggressiveness Index	12.3	1	--		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Langelier Index (20°C)	0.4	1	--		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/08/20:211888	300.0	10/08/20:216233

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

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October 26, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 20M2 (FW28) FW 28
Project : Los Osos BMC Monitoring

Lab ID : CC 2083332-001
Customer ID : 8-514

Sampled On : October 7, 2020-11:01
Sampled By : Andrea Berge
Received On : October 7, 2020-13:03
Matrix : Ground Water

Sample Result - Support

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Field Test								
pH (Field)	7.49		units			10/07/20 11:01	4500HB	10/07/20 11:01

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

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November 20, 2020

Lab ID : CC 2083734-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : November 5, 2020-10:31
Sampled By : Bryce P.
Received On : November 5, 2020-15:11
Matrix : Ground Water

Description : 11A1 (UA1)
Project : Los Osos BMC Monitoring

UA 1

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	5790	12*	mg/L		200.7	11/09/20:213192	200.7	11/11/20:218212
Calcium	393	5*	mg/L		200.7	11/09/20:213192	200.7	11/11/20:218212
Magnesium	1170	20*	mg/L		200.7	11/09/20:213192	200.7	11/11/20:218212
Potassium	530	10*	mg/L		200.7	11/09/20:213192	200.7	11/11/20:218212
Sodium	9980	50*	mg/L		200.7	11/09/20:213192	200.7	11/19/20:218676
Total Cations	564	---*	meq/L		200.7	11/09/20:213192	200.7	11/11/20:218212
Boron	2.7	0.1	mg/L		200.7	11/09/20:213192	200.7	11/09/20:218067
Copper	ND	10	ug/L		200.7	11/09/20:213192	200.7	11/09/20:218067
Iron	50	30	ug/L		200.7	11/09/20:213192	200.7	11/09/20:218067
Manganese	1120	10	ug/L		200.7	11/09/20:213192	200.7	11/09/20:218067
Zinc	ND	20	ug/L		200.7	11/09/20:213192	200.7	11/09/20:218067
SAR	57.0	0.1*	--		200.7	11/09/20:213192	200.7	11/11/20:218212
Total Alkalinity (as CaCO3)	130	10	mg/L		2320B	11/11/20:213369	2320B	11/12/20:218244
Hydroxide as OH	ND	10	mg/L		2320B	11/11/20:213369	2320B	11/12/20:218244
Carbonate as CO3	ND	10	mg/L		2320B	11/11/20:213369	2320B	11/12/20:218244
Bicarbonate as HCO3	160	10	mg/L		2320B	11/11/20:213369	2320B	11/12/20:218244
Sulfate	2310	25*	mg/L		300.0	11/13/20:213533	300.0	11/14/20:218405
Chloride	15100	300*	mg/L		300.0	11/13/20:213533	300.0	11/14/20:218405
Nitrate as NO3	ND	0.9	mg/L		4500NO3F	11/06/20:213151	4500NO3F	11/06/20:217929
Nitrite as N	ND	0.4	mg/L		4500NO3F	11/06/20:213152	4500NO2B	11/06/20:217925
Nitrate + Nitrite as N	ND	0.2	mg/L		4500NO3F	11/06/20:213151	4500NO3F	11/06/20:217929
Fluoride	ND	5*	mg/L		300.0	11/13/20:213533	300.0	11/14/20:218405
Total Anions	477	---	meq/L		2320B	11/11/20:213369	2320B	11/12/20:218244
pH	7.6	--	units		4500-H B	11/17/20:213580	4500HB	11/17/20:218467
Specific Conductance	45200	1	umhos/cm		2510B	11/16/20:213508	2510B	11/16/20:218387
Total Dissolved Solids	31300	20*	mg/L		2540CE	11/10/20:213267	2540C	11/11/20:218155
MBAS Screen	Negative	0.1	mg/L		5540C	11/06/20:213276	5540C	11/06/20:218088
Aggressiveness Index	12.7	1	--		4500-H B	11/17/20:213580	4500HB	11/17/20:218467
Langelier Index (20°C)	0.6	1	--		4500-H B	11/17/20:213580	4500HB	11/17/20:218467
Nitrate Nitrogen	ND	0.2	mg/L		4500NO3F	11/06/20:213151	4500NO3F	11/06/20:217929

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

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October 26, 2020

Lab ID : CC 2083333-005
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 7, 2020-10:20
Sampled By : Seth Stocking
Received On : October 7, 2020-13:03
Matrix : Ground Water

Description : 13F4 (4A3-Skyline) UA 3
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	130	2.5	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Calcium	24	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Magnesium	17	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Potassium	1	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Sodium	57	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Total Cations	5.1	---	meq/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Boron	ND	0.1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Copper	ND	10	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Iron	ND	30	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Manganese	ND	10	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Zinc	ND	20	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
SAR	2.2	0.1	--		200.7	10/09/20:211884	200.7	10/09/20:216319
Total Alkalinity (as CaCO3)	70	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Hydroxide as OH	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Carbonate as CO3	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Bicarbonate as HCO3	80	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Sulfate	24.2	0.5	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Chloride	68	1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrate as NO3	81.2	0.4	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrite as N	ND	0.2	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrate + Nitrite as N	18.3	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Fluoride	ND	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Total Anions	5.0	---	meq/L		2320B	10/10/20:211931	2320B	10/11/20:216292
pH (Field)	7.3	--	units		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Specific Conductance	594	1	umhos/cm		2510B	10/19/20:212238	2510B	10/19/20:216720
Total Dissolved Solids	370	20	mg/L		2540CE	10/12/20:211954	2540C	10/13/20:216408
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/20:212191	5540C	10/08/20:216643
Aggressiveness Index	10.9	1	--		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Langelier Index (20°C)	-0.9	1	--		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Nitrate Nitrogen	18.3	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232

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

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October 26, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 13F4 (4A3-Skyline) UA 3
Project : Los Osos BMC Monitoring

Lab ID : CC 2083333-005
Customer ID : 8-514

Sampled On : October 7, 2020-10:20
Sampled By : Seth Stocking
Received On : October 7, 2020-13:03
Matrix : Ground Water

Sample Result - Support

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Field Test								
Temperature	67		°F			10/07/20 10:20	2550B	10/07/20 10:20
Conductivity	0.58		umhos/cm			10/07/20 10:20	2510B	10/07/20 10:20
pH (Field)	7.3		units			10/07/20 10:20	4500HB	10/07/20 10:20

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

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October 26, 2020

Lab ID : CC 2083333-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 7, 2020-08:20
Sampled By : Seth Stocking
Received On : October 7, 2020-13:03
Matrix : Ground Water

Description : 18K3 (4A9 - Los Olivos #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	2.5	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Calcium	15	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Magnesium	11	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Potassium	ND	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Sodium	28	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Total Cations	2.9	---	meq/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Boron	ND	0.1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Copper	ND	10	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Iron	ND	30	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Manganese	ND	10	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Zinc	ND	20	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
SAR	1.3	0.1	--		200.7	10/09/20:211884	200.7	10/09/20:216319
Total Alkalinity (as CaCO3)	50	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Hydroxide as OH	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Carbonate as CO3	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Bicarbonate as HCO3	60	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Sulfate	8.6	0.5	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Chloride	43	1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrate as NO3	40.0	0.4	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrite as N	ND	0.2	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrate + Nitrite as N	9.0	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Fluoride	ND	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Total Anions	3.0	---	meq/L		2320B	10/10/20:211931	2320B	10/11/20:216292
pH (Field)	7.5	--	units		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Specific Conductance	362	1	umhos/cm		2510B	10/19/20:212238	2510B	10/19/20:216720
Total Dissolved Solids	240	20	mg/L		2540CE	10/12/20:211954	2540C	10/13/20:216408
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/20:212191	5540C	10/08/20:216643
Aggressiveness Index	10.8	1	--		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Langelier Index (20°C)	-1.1	1	--		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Nitrate Nitrogen	9.0	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232

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

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October 26, 2020

Lab ID : CC 2083333-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 7, 2020-08:20
Sampled By : Seth Stocking
Received On : October 7, 2020-13:03
Matrix : Ground Water

Description : 18K3 (4A9 - Los Olivos #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	67		°F			10/07/20 08:20	2550B	10/07/20 08:20
Conductivity	0.40		umhos/cm			10/07/20 08:20	2510B	10/07/20 08:20
pH (Field)	7.5		units			10/07/20 08:20	4500HB	10/07/20 08:20

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

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October 28, 2020

Lab ID : CC 2083405-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 17E10 (VA13)
Project : Los Osos BMC Monitoring

UA 13

Sampled On : October 12, 2020-14:14
Sampled By : Andrea Berge
Received On : October 12, 2020-14:47
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	163	2.5	mg/L		200.7	10/15/20:212121	200.7	10/15/20:216658
Calcium	24	1	mg/L		200.7	10/15/20:212121	200.7	10/15/20:216658
Magnesium	25	1	mg/L		200.7	10/15/20:212121	200.7	10/15/20:216658
Potassium	1	1	mg/L		200.7	10/15/20:212121	200.7	10/15/20:216658
Sodium	39	1	mg/L		200.7	10/15/20:212121	200.7	10/15/20:216658
Total Cations	5.0	---	meq/L		200.7	10/15/20:212121	200.7	10/15/20:216658
Boron	ND	0.1	mg/L		200.7	10/15/20:212121	200.7	10/15/20:216658
Copper	ND	10	ug/L		200.7	10/15/20:212121	200.7	10/15/20:216658
Iron	50	30	ug/L		200.7	10/15/20:212121	200.7	10/15/20:216658
Manganese	ND	10	ug/L		200.7	10/15/20:212121	200.7	10/15/20:216658
Zinc	ND	20	ug/L		200.7	10/15/20:212121	200.7	10/15/20:216658
SAR	1.3	0.1	--		200.7	10/15/20:212121	200.7	10/15/20:216658
Total Alkalinity (as CaCO3)	90	10	mg/L		2320B	10/15/20:212130	2320B	10/15/20:216716
Hydroxide as OH	ND	10	mg/L		2320B	10/15/20:212130	2320B	10/15/20:216716
Carbonate as CO3	ND	10	mg/L		2320B	10/15/20:212130	2320B	10/15/20:216716
Bicarbonate as HCO3	110	10	mg/L		2320B	10/15/20:212130	2320B	10/15/20:216716
Sulfate	22.4	0.5	mg/L		300.0	10/13/20:212035	300.0	10/13/20:216475
Chloride	54	1	mg/L		300.0	10/13/20:212035	300.0	10/13/20:216475
Nitrate as NO3	61.0	0.4	mg/L		300.0	10/13/20:212035	300.0	10/13/20:216475
Nitrite as N	ND	0.2	mg/L		300.0	10/13/20:212035	300.0	10/13/20:216475
Nitrate + Nitrite as N	13.8	0.1	mg/L		300.0	10/13/20:212035	300.0	10/13/20:216475
Fluoride	ND	0.1	mg/L		300.0	10/13/20:212035	300.0	10/13/20:216475
Total Anions	4.8	---	meq/L		2320B	10/15/20:212130	2320B	10/15/20:216716
pH (Field)	7.5	--	units		4500-H B	10/12/20:212363	4500HB	10/12/20:216892
Specific Conductance	544	1	umhos/cm		2510B	10/19/20:212238	2510B	10/19/20:216720
Total Dissolved Solids	340	20	mg/L		2540CE	10/14/20:212057	2540C	10/15/20:216561
MBAS Screen	Negative	0.1	mg/L		5540C	10/13/20:212203	5540C	10/13/20:216988
Aggressiveness Index	11.2	1	--		4500-H B	10/12/20:212363	4500HB	10/12/20:216892
Langelier Index (20°C)	-0.6	1	--		4500-H B	10/12/20:212363	4500HB	10/12/20:216892
Nitrate Nitrogen	13.8	0.1	mg/L		300.0	10/13/20:212035	300.0	10/13/20:216475

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

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November 20, 2020	Lab ID : CC 2083734-002
	Customer ID : 8-514
Cleath-Harris Geologists	
Attn: Spencer Harris	Sampled On : November 5, 2020-09:47
75 Zaca Lane	Sampled By : Bryce P.
Suite 110	Received On : November 5, 2020-15:11
San Luis Obispo, CA 93401	Matrix : Ground Water
Description : 11A2 (LA2) LA 2	
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	6700	12*	mg/L		200.7	11/09/20:213192	200.7	11/11/20:218212
Calcium	1140	5*	mg/L		200.7	11/09/20:213192	200.7	11/11/20:218212
Magnesium	936	5*	mg/L		200.7	11/09/20:213192	200.7	11/11/20:218212
Potassium	38	1	mg/L		200.7	11/09/20:213192	200.7	11/09/20:218067
Sodium	1560	10*	mg/L		200.7	11/09/20:213192	200.7	11/11/20:218212
Total Cations	203	---*	meq/L		200.7	11/09/20:213192	200.7	11/11/20:218212
Boron	ND	0.1	mg/L		200.7	11/09/20:213192	200.7	11/09/20:218067
Copper	10	10	ug/L		200.7	11/09/20:213192	200.7	11/09/20:218067
Iron	90	30	ug/L		200.7	11/09/20:213192	200.7	11/09/20:218067
Manganese	290	10	ug/L		200.7	11/09/20:213192	200.7	11/09/20:218067
Zinc	ND	20	ug/L		200.7	11/09/20:213192	200.7	11/09/20:218067
SAR	8.3	0.1*	--		200.7	11/09/20:213192	200.7	11/11/20:218212
Total Alkalinity (as CaCO3)	180	10	mg/L		2320B	11/11/20:213369	2320B	11/12/20:218244
Hydroxide as OH	ND	10	mg/L		2320B	11/11/20:213369	2320B	11/12/20:218244
Carbonate as CO3	ND	10	mg/L		2320B	11/11/20:213369	2320B	11/12/20:218244
Bicarbonate as HCO3	220	10	mg/L		2320B	11/11/20:213369	2320B	11/12/20:218244
Sulfate	777	12*	mg/L		300.0	11/13/20:213533	300.0	11/14/20:218405
Chloride	5890	120*	mg/L		300.0	11/13/20:213533	300.0	11/14/20:218405
Nitrate as NO3	ND	0.9	mg/L		4500NO3F	11/06/20:213151	4500NO3F	11/06/20:217929
Nitrite as N	ND	0.4	mg/L		4500NO3F	11/06/20:213152	4500NO2B	11/06/20:217925
Nitrate + Nitrite as N	ND	0.2	mg/L		4500NO3F	11/06/20:213151	4500NO3F	11/06/20:217929
Fluoride	ND	2.5*	mg/L		300.0	11/13/20:213533	300.0	11/14/20:218405
Total Anions	186	---	meq/L		2320B	11/11/20:213369	2320B	11/12/20:218244
pH	7.7	--	units		4500-H B	11/17/20:213580	4500HB	11/17/20:218467
Specific Conductance	18000	1	umhos/cm		2510B	11/12/20:213387	2510B	11/12/20:218213
Total Dissolved Solids	15300	20*	mg/L		2540CE	11/10/20:213267	2540C	11/11/20:218155
MBAS Screen	Negative	0.1	mg/L		5540C	11/06/20:213276	5540C	11/06/20:218088
Aggressiveness Index	13.4	1	--		4500-H B	11/17/20:213580	4500HB	11/17/20:218467
Langelier Index (20°C)	1.4	1	--		4500-H B	11/17/20:213580	4500HB	11/17/20:218467
Nitrate Nitrogen	ND	0.2	mg/L		4500NO3F	11/06/20:213151	4500NO3F	11/06/20:217929

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

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October 16, 2020

Lab ID : CC 2083225-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 1, 2020-10:42
Sampled By : Andrea Berge
Received On : October 1, 2020-14:20
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	108	2.5	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Calcium	17	1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Magnesium	16	1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Potassium	1	1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Sodium	40	1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Total Cations	3.9	---	meq/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Boron	ND	0.1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Copper	30	10	ug/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Iron	ND	30	ug/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Manganese	ND	10	ug/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Zinc	ND	20	ug/L		200.7	10/05/20:211679	200.7	10/05/20:216030
SAR	1.7	0.1	--		200.7	10/05/20:211679	200.7	10/05/20:216030
Total Alkalinity (as CaCO3)	50	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Hydroxide as OH	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Carbonate as CO3	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Bicarbonate as HCO3	60	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Sulfate	14.4	0.5	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Chloride	76	1	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Nitrate as NO3	33.3	0.4	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Nitrite as N	ND	0.2	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Nitrate + Nitrite as N	7.5	0.1	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Fluoride	ND	0.1	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Total Anions	4.0	---	meq/L		2320B	10/10/20:211931	2320B	10/11/20:216292
pH (Field)	7.9	--	units		4500-H B	10/01/20:211709	4500HB	10/01/20:215996
Specific Conductance	464	1	umhos/cm		2510B	10/12/20:211950	2510B	10/12/20:216318
Total Dissolved Solids	300	20	mg/L		2540CE	10/05/20:211670	2540C	10/06/20:216015
MBAS Screen	Negative	0.1	mg/L		5540C	10/02/20:211848	5540C	10/02/20:216169
Aggressiveness Index	11.2	1	--		4500-H B	10/01/20:211709	4500HB	10/01/20:215996
Langelier Index (20°C)	-0.6	1	--		4500-H B	10/01/20:211709	4500HB	10/01/20:215996
Nitrate Nitrogen	7.5	0.1	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924

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

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October 16, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 13N (LA8)
Project : Los Osos BMC Monitoring

LA 8

Lab ID : CC 2083225-001
Customer ID : 8-514

Sampled On : October 1, 2020-10:42
Sampled By : Andrea Berge
Received On : October 1, 2020-14:20
Matrix : Ground Water

Sample Result - Support

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Field Test								
pH (Field)	7.9		units			10/01/20 10:42	4500HB	10/01/20 10:42

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

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October 26, 2020

Lab ID : CC 2083333-004
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 7, 2020-10:00
Sampled By : Seth Stocking
Received On : October 7, 2020-13:03
Matrix : Ground Water

Description : 24CI (LA9-Cabrillo) 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	102	2.5	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Calcium	16	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Magnesium	15	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Potassium	1	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Sodium	40	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Total Cations	3.8	---	meq/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Boron	ND	0.1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Copper	10	10	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Iron	40	30	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Manganese	ND	10	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Zinc	30	20	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
SAR	1.7	0.1	--		200.7	10/09/20:211884	200.7	10/09/20:216319
Total Alkalinity (as CaCO3)	50	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Hydroxide as OH	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Carbonate as CO3	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Bicarbonate as HCO3	60	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Sulfate	13.1	0.5	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Chloride	75	1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrate as NO3	29.2	0.4	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrite as N	ND	0.2	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrate + Nitrite as N	6.6	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Fluoride	ND	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Total Anions	3.8	---	meq/L		2320B	10/10/20:211931	2320B	10/11/20:216292
pH (Field)	7.4	--	units		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Specific Conductance	460	1	umhos/cm		2510B	10/19/20:212238	2510B	10/19/20:216720
Total Dissolved Solids	270	20	mg/L		2540CE	10/12/20:211954	2540C	10/13/20:216408
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/20:212191	5540C	10/08/20:216643
Aggressiveness Index	10.7	1	--		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Langelier Index (20°C)	-1.1	1	--		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Nitrate Nitrogen	6.6	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232

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

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October 26, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 24CI (LA9-Cabrillo) LA 9
Project : Los Osos BMC Monitoring

Lab ID : CC 2083333-004
Customer ID : 8-514

Sampled On : October 7, 2020-10:00
Sampled By : Seth Stocking
Received On : October 7, 2020-13:03
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		°F			10/07/20 10:00	2550B	10/07/20 10:00
Conductivity	0.48		umhos/cm			10/07/20 10:00	2510B	10/07/20 10:00
pH (Field)	7.4		units			10/07/20 10:00	4500HB	10/07/20 10:00

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

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October 26, 2020

Lab ID : CC 2083333-006
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 7, 2020-10:50
Sampled By : Seth Stocking
Received On : October 7, 2020-13:03
Matrix : Ground Water

Description : 13J4 (LA10-Rosina) LA 10
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	183	2.5	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Calcium	29	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Magnesium	27	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Potassium	1	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Sodium	33	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Total Cations	5.1	---	meq/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Boron	ND	0.1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Copper	ND	10	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Iron	810	30	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Manganese	10	10	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Zinc	ND	20	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
SAR	1.1	0.1	--		200.7	10/09/20:211884	200.7	10/09/20:216319
Total Alkalinity (as CaCO3)	60	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Hydroxide as OH	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Carbonate as CO3	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Bicarbonate as HCO3	70	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Sulfate	11.3	0.5	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Chloride	115	2*	mg/L		300.0	10/08/20:211833	300.0	10/09/20:216232
Nitrate as NO3	20.6	0.4	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrite as N	ND	0.2	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrate + Nitrite as N	4.6	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Fluoride	ND	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Total Anions	5.0	---	meq/L		2320B	10/10/20:211931	2320B	10/11/20:216292
pH (Field)	7.6	--	units		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Specific Conductance	618	1	umhos/cm		2510B	10/19/20:212238	2510B	10/19/20:216720
Total Dissolved Solids	430	20	mg/L		2540CE	10/12/20:211954	2540C	10/13/20:216408
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/20:212191	5540C	10/08/20:216643
Aggressiveness Index	11.2	1	--		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Langelier Index (20°C)	-0.6	1	--		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Nitrate Nitrogen	4.6	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232

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

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October 26, 2020

Lab ID : CC 2083333-006
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 7, 2020-10:50
Sampled By : Seth Stocking
Received On : October 7, 2020-13:03
Matrix : Ground Water

Description : 13J4 (LA10-Rosina) LA 10
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	70		°F			10/07/20 10:50	2550B	10/07/20 10:50
Conductivity	0.56		umhos/cm			10/07/20 10:50	2510B	10/07/20 10:50
pH (Field)	7.6		units			10/07/20 10:50	4500HB	10/07/20 10:50

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

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October 16, 2020

Lab ID : CC 2083224-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 1, 2020-12:44
Sampled By : James Carlson
Received On : October 1, 2020-14:20
Matrix : Ground Water

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

LA 11

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	763	2.5	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Calcium	85	1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Magnesium	134	5*	mg/L		200.7	10/05/20:211679	200.7	10/06/20:216098
Potassium	5	1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Sodium	88	1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Total Cations	19.2	---	meq/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Boron	0.2	0.1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Copper	ND	10	ug/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Iron	60	30	ug/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Manganese	40	10	ug/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Zinc	ND	20	ug/L		200.7	10/05/20:211679	200.7	10/05/20:216030
SAR	1.4	0.1	--		200.7	10/05/20:211679	200.7	10/05/20:216030
Total Alkalinity (as CaCO3)	280	10	mg/L		2320B	10/06/20:211734	2320B	10/06/20:216079
Hydroxide as OH	ND	10	mg/L		2320B	10/06/20:211734	2320B	10/06/20:216079
Carbonate as CO3	ND	10	mg/L		2320B	10/06/20:211734	2320B	10/06/20:216079
Bicarbonate as HCO3	350	10	mg/L		2320B	10/06/20:211734	2320B	10/06/20:216079
Sulfate	183	0.5	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Chloride	242	5*	mg/L		300.0	10/02/20:211619	300.0	10/03/20:215924
Nitrate as NO3	ND	0.4	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Nitrite as N	ND	0.2	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Fluoride	0.1	0.1	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Total Anions	16.4	---	meq/L		2320B	10/06/20:211734	2320B	10/06/20:216079
pH (Field)	7.1	--	units		4500-H B	10/01/20:211709	4500HB	10/01/20:215996
Specific Conductance	1650	1	umhos/cm		2510B	10/07/20:211759	2510B	10/07/20:216063
Total Dissolved Solids	1040	20	mg/L		2540CE	10/05/20:211670	2540C	10/06/20:216015
MBAS Screen	Negative	0.1	mg/L		5540C	10/02/20:211848	5540C	10/02/20:216169
Aggressiveness Index	11.9	1	--		4500-H B	10/01/20:211709	4500HB	10/01/20:215996
Langelier Index (20°C)	-0.03	1	--		4500-H B	10/01/20:211709	4500HB	10/01/20:215996
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924

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

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CA ELAP Certification No. 2810

October 16, 2020

Lab ID : CC 2083224-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 1, 2020-12:44
Sampled By : James Carlson
Received On : October 1, 2020-14:20
Matrix : Ground Water

Description : 12J1 (LA11)

LA 11

Project : Los Osos BMC Monitoring

Sample Result - Support

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
Field Test								
pH (Field)	7.06		units			10/01/20 12:44	4500HB	10/01/20 12:44

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

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October 20, 2020

Lab ID : CC 2083243-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 5, 2020-11:21
Sampled By : Andrea Berge
Received On : October 5, 2020-14:57
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	321	2.5	mg/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Calcium	51	1	mg/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Magnesium	47	1	mg/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Potassium	2	1	mg/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Sodium	57	1	mg/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Total Cations	8.9	---	meq/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Boron	0.2	0.1	mg/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Copper	ND	10	ug/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Iron	30	30	ug/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Manganese	50	10	ug/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Zinc	ND	20	ug/L		200.7	10/06/20:211749	200.7	10/06/20:216098
SAR	1.4	0.1	--		200.7	10/06/20:211749	200.7	10/06/20:216098
Total Alkalinity (as CaCO3)	250	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Hydroxide as OH	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Carbonate as CO3	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Bicarbonate as HCO3	300	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Sulfate	49.6	0.5	mg/L		300.0	10/06/20:211784	300.0	10/06/20:216087
Chloride	89	1	mg/L		300.0	10/06/20:211784	300.0	10/06/20:216087
Nitrate as NO3	ND	0.4	mg/L		300.0	10/06/20:211784	300.0	10/06/20:216087
Nitrite as N	ND	0.2	mg/L		300.0	10/06/20:211784	300.0	10/06/20:216087
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/06/20:211784	300.0	10/06/20:216087
Fluoride	ND	0.1	mg/L		300.0	10/06/20:211784	300.0	10/06/20:216087
Total Anions	8.5	---	meq/L		2320B	10/10/20:211931	2320B	10/11/20:216292
pH (Field)	7.9	--	units		4500-H B	10/05/20:212046	4500HB	10/05/20:216494
Specific Conductance	891	1	umhos/cm		2510B	10/12/20:211950	2510B	10/12/20:216318
Total Dissolved Solids	510	20	mg/L		2540CE	10/07/20:211766	2540C	10/08/20:216160
MBAS Screen	Negative	0.1	mg/L		5540C	10/06/20:212183	5540C	10/06/20:216639
Aggressiveness Index	12.4	1	--		4500-H B	10/05/20:212046	4500HB	10/05/20:216494
Langelier Index (20°C)	0.5	1	--		4500-H B	10/05/20:212046	4500HB	10/05/20:216494
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/06/20:211784	300.0	10/06/20:216087

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

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October 20, 2020

Lab ID : CC 2083243-002
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 5, 2020-13:23
Sampled By : Andrea Berge
Received On : October 5, 2020-14:57
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	319	2.5	mg/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Calcium	52	1	mg/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Magnesium	46	1	mg/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Potassium	2	1	mg/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Sodium	41	1	mg/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Total Cations	8.2	---	meq/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Boron	ND	0.1	mg/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Copper	ND	10	ug/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Iron	ND	30	ug/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Manganese	ND	10	ug/L		200.7	10/06/20:211749	200.7	10/06/20:216098
Zinc	ND	20	ug/L		200.7	10/06/20:211749	200.7	10/06/20:216098
SAR	1.0	0.1	--		200.7	10/06/20:211749	200.7	10/06/20:216098
Total Alkalinity (as CaCO3)	200	10	mg/L		2320B	10/11/20:211935	2320B	10/11/20:216346
Hydroxide as OH	ND	10	mg/L		2320B	10/11/20:211935	2320B	10/11/20:216346
Carbonate as CO3	ND	10	mg/L		2320B	10/11/20:211935	2320B	10/11/20:216346
Bicarbonate as HCO3	250	10	mg/L		2320B	10/11/20:211935	2320B	10/11/20:216346
Sulfate	29.7	0.5	mg/L		300.0	10/06/20:211784	300.0	10/06/20:216087
Chloride	109	1	mg/L		300.0	10/06/20:211784	300.0	10/06/20:216087
Nitrate as NO3	2.9	0.4	mg/L		300.0	10/06/20:211784	300.0	10/06/20:216087
Nitrite as N	ND	0.2	mg/L		300.0	10/06/20:211784	300.0	10/06/20:216087
Nitrate + Nitrite as N	0.7	0.1	mg/L		300.0	10/06/20:211784	300.0	10/06/20:216087
Fluoride	ND	0.1	mg/L		300.0	10/06/20:211784	300.0	10/06/20:216087
Total Anions	7.8	---	meq/L		2320B	10/11/20:211935	2320B	10/11/20:216346
pH (Field)	7.8	--	units		4500-H B	10/05/20:212046	4500HB	10/05/20:216494
Specific Conductance	841	1	umhos/cm		2510B	10/12/20:211950	2510B	10/12/20:216318
Total Dissolved Solids	450	20	mg/L		2540CE	10/07/20:211766	2540C	10/08/20:216160
MBAS Screen	Negative	0.1	mg/L		5540C	10/06/20:212183	5540C	10/06/20:216639
Aggressiveness Index	12.2	1	--		4500-H B	10/05/20:212046	4500HB	10/05/20:216494
Langelier Index (20°C)	0.4	1	--		4500-H B	10/05/20:212046	4500HB	10/05/20:216494
Nitrate Nitrogen	0.7	0.1	mg/L		300.0	10/06/20:211784	300.0	10/06/20:216087

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

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CA ELAP Certification No. 2810

November 6, 2020

Lab ID : CC 2083535-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 22, 2020-12:10
Sampled By : James Carlson
Received On : October 22, 2020-13:02
Matrix : Ground Water

LA 18

Description : 18K8 (LA18)
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	247	2.5	mg/L		200.7	10/23/20:212521	200.7	10/23/20:217143
Calcium	51	1	mg/L		200.7	10/23/20:212521	200.7	10/23/20:217143
Magnesium	29	1	mg/L		200.7	10/23/20:212521	200.7	10/23/20:217143
Potassium	3	1	mg/L		200.7	10/23/20:212521	200.7	10/23/20:217143
Sodium	26	1	mg/L		200.7	10/23/20:212521	200.7	10/23/20:217143
Total Cations	6.1	---	meq/L		200.7	10/23/20:212521	200.7	10/23/20:217143
Boron	ND	0.1	mg/L		200.7	10/23/20:212521	200.7	10/23/20:217143
Copper	ND	10	ug/L		200.7	10/23/20:212521	200.7	10/23/20:217143
Iron	30	30	ug/L		200.7	10/23/20:212521	200.7	10/23/20:217143
Manganese	80	10	ug/L		200.7	10/23/20:212521	200.7	10/23/20:217143
Zinc	ND	20	ug/L		200.7	10/23/20:212521	200.7	10/23/20:217143
SAR	0.7	0.1	--		200.7	10/23/20:212521	200.7	10/23/20:217143
Total Alkalinity (as CaCO3)	240	10	mg/L		2320B	10/27/20:212629	2320B	10/27/20:217344
Hydroxide as OH	ND	10	mg/L		2320B	10/27/20:212629	2320B	10/27/20:217344
Carbonate as CO3	ND	10	mg/L		2320B	10/27/20:212629	2320B	10/27/20:217344
Bicarbonate as HCO3	300	10	mg/L		2320B	10/27/20:212629	2320B	10/27/20:217344
Sulfate	38.2	0.5	mg/L		300.0	10/23/20:212536	300.0	10/23/20:217179
Chloride	32	1	mg/L		300.0	10/23/20:212536	300.0	10/23/20:217179
Nitrate as NO3	ND	0.4	mg/L		300.0	10/23/20:212536	300.0	10/23/20:217179
Nitrite as N	ND	0.2	mg/L		300.0	10/23/20:212536	300.0	10/23/20:217179
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/23/20:212536	300.0	10/23/20:217179
Fluoride	0.3	0.1	mg/L		300.0	10/23/20:212536	300.0	10/23/20:217179
Total Anions	6.6	---	meq/L		2320B	10/27/20:212629	2320B	10/27/20:217344
pH	7.5	--	units		4500-H B	10/26/20:212525	4500HB	10/26/20:217208
Specific Conductance	669	1	umhos/cm		2510B	10/28/20:212649	2510B	10/28/20:217282
Total Dissolved Solids	370	20	mg/L		2540CE	10/26/20:212578	2540C	10/27/20:217244
MBAS Screen	Negative	0.1	mg/L		5540C	10/23/20:212563	5540C	10/23/20:217156
Aggressiveness Index	12.0	1	--		4500-H B	10/26/20:212525	4500HB	10/26/20:217208
Langelier Index (20°C)	0.1	1	--		4500-H B	10/26/20:212525	4500HB	10/26/20:217208
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/23/20:212536	300.0	10/23/20:217179

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

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October 26, 2020

Lab ID : CC 2083333-003
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 7, 2020-08:50
Sampled By : Seth Stocking
Received On : October 7, 2020-13:03
Matrix : Ground Water

Description : 17N10 (LA20 South Bay #1) 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	227	2.5	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Calcium	35	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Magnesium	34	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Potassium	2	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Sodium	42	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Total Cations	6.4	---	meq/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Boron	ND	0.1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Copper	ND	10	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Iron	ND	30	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Manganese	ND	10	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Zinc	ND	20	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
SAR	1.2	0.1	--		200.7	10/09/20:211884	200.7	10/09/20:216319
Total Alkalinity (as CaCO3)	240	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Hydroxide as OH	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Carbonate as CO3	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Bicarbonate as HCO3	290	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Sulfate	27.0	0.5	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Chloride	40	1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrate as NO3	2.9	0.4	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrite as N	ND	0.2	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrate + Nitrite as N	0.7	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Fluoride	0.2	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Total Anions	6.5	---	meq/L		2320B	10/10/20:211931	2320B	10/11/20:216292
pH (Field)	7.5	--	units		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Specific Conductance	654	1	umhos/cm		2510B	10/19/20:212238	2510B	10/19/20:216720
Total Dissolved Solids	350	20	mg/L		2540CE	10/12/20:211954	2540C	10/13/20:216408
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/20:212191	5540C	10/08/20:216643
Aggressiveness Index	11.8	1	--		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Langelier Index (20°C)	-0.03	1	--		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Nitrate Nitrogen	0.7	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232

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

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October 26, 2020

Lab ID : CC 2083333-003
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 7, 2020-08:50
Sampled By : Seth Stocking
Received On : October 7, 2020-13:03
Matrix : Ground Water

Description : 17N10 (LA20 South Bay #1) LA 20
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	71		°F			10/07/20 08:50	2550B	10/07/20 08:50
Conductivity	0.68		umhos/cm			10/07/20 08:50	2510B	10/07/20 08:50
pH (Field)	7.5		units			10/07/20 08:50	4500HB	10/07/20 08:50

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

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October 20, 2020

Lab ID : CC 2083265-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 6, 2020-10:50
Sampled By : Andrea Berge
Received On : October 6, 2020-13:07
Matrix : Ground Water

Description : 1768 (LA22)
Project : Los Osos BMC Monitoring

LA 22

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	2.5	mg/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Calcium	28	1	mg/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Magnesium	27	1	mg/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Potassium	1	1	mg/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Sodium	30	1	mg/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Total Cations	4.9	---	meq/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Boron	ND	0.1	mg/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Copper	ND	10	ug/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Iron	ND	30	ug/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Manganese	ND	10	ug/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Zinc	ND	20	ug/L		200.7	10/08/20:211826	200.7	10/08/20:216226
SAR	1.0	0.1	--		200.7	10/08/20:211826	200.7	10/08/20:216226
Total Alkalinity (as CaCO3)	130	10	mg/L		2320B	10/11/20:211935	2320B	10/11/20:216346
Hydroxide as OH	ND	10	mg/L		2320B	10/11/20:211935	2320B	10/11/20:216346
Carbonate as CO3	ND	10	mg/L		2320B	10/11/20:211935	2320B	10/11/20:216346
Bicarbonate as HCO3	160	10	mg/L		2320B	10/11/20:211935	2320B	10/11/20:216346
Sulfate	14.7	0.5	mg/L		300.0	10/07/20:211823	300.0	10/07/20:216157
Chloride	47	1	mg/L		300.0	10/07/20:211823	300.0	10/07/20:216157
Nitrate as NO3	29.6	0.4	mg/L		300.0	10/07/20:211823	300.0	10/07/20:216157
Nitrite as N	ND	0.2	mg/L		300.0	10/07/20:211823	300.0	10/07/20:216157
Nitrate + Nitrite as N	6.7	0.1	mg/L		300.0	10/07/20:211823	300.0	10/07/20:216157
Fluoride	ND	0.1	mg/L		300.0	10/07/20:211823	300.0	10/07/20:216157
Total Anions	4.7	---	meq/L		2320B	10/11/20:211935	2320B	10/11/20:216346
pH (Field)	7.5	--	units		4500-H B	10/06/20:212046	4500HB	10/06/20:216494
Specific Conductance	506	1	umhos/cm		2510B	10/12/20:211950	2510B	10/12/20:216318
Total Dissolved Solids	340	20	mg/L		2540CE	10/08/20:211824	2540C	10/09/20:216245
MBAS Screen	Negative	0.1	mg/L		5540C	10/07/20:212184	5540C	10/07/20:216642
Aggressiveness Index	11.5	1	--		4500-H B	10/06/20:212046	4500HB	10/06/20:216494
Langelier Index (20°C)	-0.4	1	--		4500-H B	10/06/20:212046	4500HB	10/06/20:216494
Nitrate Nitrogen	6.7	0.1	mg/L		300.0	10/07/20:211823	300.0	10/07/20:216157

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

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October 16, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 20H1 (LA30)
Project : Los Osos BMC Monitoring

LA 30

Lab ID : CC 2083225-003
Customer ID : 8-514

Sampled On : October 1, 2020-13:50
Sampled By : Andrea Berge
Received On : October 1, 2020-14:20
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	428	2.5	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Calcium	71	1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Magnesium	61	1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Potassium	1	1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Sodium	40	1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Total Cations	10.3	---	meq/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Boron	ND	0.1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Copper	ND	10	ug/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Iron	1860	30	ug/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Manganese	260	10	ug/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Zinc	ND	20	ug/L		200.7	10/05/20:211679	200.7	10/05/20:216030
SAR	0.8	0.1	--		200.7	10/05/20:211679	200.7	10/05/20:216030
Total Alkalinity (as CaCO3)	330	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Hydroxide as OH	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Carbonate as CO3	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Bicarbonate as HCO3	400	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Sulfate	107	0.5	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Chloride	57	1	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Nitrate as NO3	ND	0.4	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Nitrite as N	ND	0.2	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Fluoride	0.2	0.1	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Total Anions	10.4	---	meq/L		2320B	10/10/20:211931	2320B	10/11/20:216292
pH (Field)	7.6	--	units		4500-H B	10/01/20:211709	4500HB	10/01/20:215996
Specific Conductance	1000	1	umhos/cm		2510B	10/12/20:211950	2510B	10/12/20:216318
Total Dissolved Solids	600	20	mg/L		2540CE	10/05/20:211670	2540C	10/06/20:216015
MBAS Screen	Negative	0.1	mg/L		5540C	10/02/20:211848	5540C	10/02/20:216169
Aggressiveness Index	12.4	1	--		4500-H B	10/01/20:211709	4500HB	10/01/20:215996
Langelier Index (20°C)	0.5	1	--		4500-H B	10/01/20:211709	4500HB	10/01/20:215996
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924

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

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October 16, 2020

Lab ID : CC 2083225-003
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 1, 2020-13:50
Sampled By : Andrea Berge
Received On : October 1, 2020-14:20
Matrix : Ground Water

Description : 20H1 (LA30)
Project : Los Osos BMC Monitoring

LA 30

Sample Result - Support

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Field Test								
pH (Field)	7.55		units			10/01/20 13:50	4500HB	10/01/20 13:50

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

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October 16, 2020

Lab ID : CC 2083225-002
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 13M2 (LA31)
Project : Los Osos BMC Monitoring

LA 31

Sampled On : October 1, 2020-09:48
Sampled By : Andrea Berge
Received On : October 1, 2020-14:20
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	774	2.5	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Calcium	94	1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Magnesium	131	5*	mg/L		200.7	10/05/20:211679	200.7	10/06/20:216098
Potassium	5	1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Sodium	495	5*	mg/L		200.7	10/05/20:211679	200.7	10/06/20:216098
Total Cations	37.1	---	meq/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Boron	0.1	0.1	mg/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Copper	ND	10	ug/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Iron	30	30	ug/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Manganese	ND	10	ug/L		200.7	10/05/20:211679	200.7	10/05/20:216030
Zinc	ND	20	ug/L		200.7	10/05/20:211679	200.7	10/05/20:216030
SAR	7.7	0.1	--		200.7	10/05/20:211679	200.7	10/05/20:216030
Total Alkalinity (as CaCO3)	60	10	mg/L		2320B	10/06/20:211734	2320B	10/06/20:216079
Hydroxide as OH	ND	10	mg/L		2320B	10/06/20:211734	2320B	10/06/20:216079
Carbonate as CO3	ND	10	mg/L		2320B	10/06/20:211734	2320B	10/06/20:216079
Bicarbonate as HCO3	70	10	mg/L		2320B	10/06/20:211734	2320B	10/06/20:216079
Sulfate	169	0.5	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Chloride	844	17*	mg/L		300.0	10/02/20:211619	300.0	10/03/20:215924
Nitrate as NO3	3.3	0.4	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Nitrite as N	ND	0.2	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Nitrate + Nitrite as N	0.7	0.1	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Fluoride	ND	0.1	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924
Total Anions	28.5	---	meq/L		2320B	10/06/20:211734	2320B	10/06/20:216079
pH (Field)	8.0	--	units		4500-H B	10/01/20:211709	4500HB	10/01/20:215996
Specific Conductance	3330	1	umhos/cm		2510B	10/07/20:211759	2510B	10/07/20:216063
Total Dissolved Solids	2080	20	mg/L		2540CE	10/05/20:211670	2540C	10/06/20:216015
MBAS Screen	Negative	0.1	mg/L		5540C	10/02/20:211848	5540C	10/02/20:216169
Aggressiveness Index	12.1	1	--		4500-H B	10/01/20:211709	4500HB	10/01/20:215996
Langelier Index (20°C)	0.2	1	--		4500-H B	10/01/20:211709	4500HB	10/01/20:215996
Nitrate Nitrogen	0.7	0.1	mg/L		300.0	10/02/20:211619	300.0	10/02/20:215924

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

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October 16, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 13M2 (LA31)
Project : Los Osos BMC Monitoring

LA 31

Lab ID : CC 2083225-002
Customer ID : 8-514

Sampled On : October 1, 2020-09:48
Sampled By : Andrea Berge
Received On : October 1, 2020-14:20
Matrix : Ground Water

Sample Result - Support

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
Field Test								
pH (Field)	8.04		units			10/01/20 09:48	4500HB	10/01/20 09:48

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

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October 20, 2020

Lab ID : CC 2083265-002
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
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San Luis Obispo, CA 93401

Sampled On : October 6, 2020-11:37
Sampled By : Andrea Berge
Received On : October 6, 2020-13:07
Matrix : Ground Water

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

LA 32

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	68.6	2.5	mg/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Calcium	11	1	mg/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Magnesium	10	1	mg/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Potassium	ND	1	mg/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Sodium	21	1	mg/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Total Cations	2.3	---	meq/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Boron	ND	0.1	mg/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Copper	ND	10	ug/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Iron	260	30	ug/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Manganese	10	10	ug/L		200.7	10/08/20:211826	200.7	10/08/20:216226
Zinc	100	20	ug/L		200.7	10/08/20:211826	200.7	10/08/20:216226
SAR	1.1	0.1	--		200.7	10/08/20:211826	200.7	10/08/20:216226
Total Alkalinity (as CaCO3)	50	10	mg/L		2320B	10/11/20:211935	2320B	10/11/20:216346
Hydroxide as OH	ND	10	mg/L		2320B	10/11/20:211935	2320B	10/11/20:216346
Carbonate as CO3	ND	10	mg/L		2320B	10/11/20:211935	2320B	10/11/20:216346
Bicarbonate as HCO3	60	10	mg/L		2320B	10/11/20:211935	2320B	10/11/20:216346
Sulfate	4.9	0.5	mg/L		300.0	10/07/20:211820	300.0	10/07/20:216156
Chloride	30	1	mg/L		300.0	10/07/20:211820	300.0	10/07/20:216156
Nitrate as NO3	17.5	0.4	mg/L		300.0	10/07/20:211820	300.0	10/07/20:216156
Nitrite as N	ND	0.2	mg/L		300.0	10/07/20:211820	300.0	10/07/20:216156
Nitrate + Nitrite as N	4.0	0.1	mg/L		300.0	10/07/20:211820	300.0	10/07/20:216156
Fluoride	ND	0.1	mg/L		300.0	10/07/20:211820	300.0	10/07/20:216156
Total Anions	2.2	---	meq/L		2320B	10/11/20:211935	2320B	10/11/20:216346
pH (Field)	8.0	--	units		4500-H B	10/06/20:212046	4500HB	10/06/20:216494
Specific Conductance	246	1	umhos/cm		2510B	10/12/20:211950	2510B	10/12/20:216318
Total Dissolved Solids	180	20	mg/L		2540CE	10/08/20:211824	2540C	10/09/20:216245
MBAS Screen	Negative	0.1	mg/L		5540C	10/07/20:212184	5540C	10/07/20:216642
Aggressiveness Index	11.1	1	--		4500-H B	10/06/20:212046	4500HB	10/06/20:216494
Langelier Index (20°C)	-0.7	1	--		4500-H B	10/06/20:212046	4500HB	10/06/20:216494
Nitrate Nitrogen	4.0	0.1	mg/L		300.0	10/07/20:211820	300.0	10/07/20:216156

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

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October 26, 2020

Lab ID : CC 2083333-002
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 7, 2020-08:30
Sampled By : Seth Stocking
Received On : October 7, 2020-13:03
Matrix : Ground Water

Description : 18K (LA39-Los Olivos #5) LA 39
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	227	2.5	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Calcium	35	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Magnesium	34	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Potassium	2	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Sodium	43	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Total Cations	6.5	---	meq/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Boron	ND	0.1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Copper	ND	10	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Iron	ND	30	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Manganese	ND	10	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Zinc	ND	20	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
SAR	1.2	0.1	--		200.7	10/09/20:211884	200.7	10/09/20:216319
Total Alkalinity (as CaCO3)	250	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Hydroxide as OH	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Carbonate as CO3	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Bicarbonate as HCO3	300	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Sulfate	28.2	0.5	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Chloride	37	1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrate as NO3	ND	0.4	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrite as N	ND	0.2	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Fluoride	0.1	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232
Total Anions	6.6	---	meq/L		2320B	10/10/20:211931	2320B	10/11/20:216292
pH (Field)	7.4	--	units		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Specific Conductance	657	1	umhos/cm		2510B	10/19/20:212238	2510B	10/19/20:216720
Total Dissolved Solids	360	20	mg/L		2540CE	10/12/20:211954	2540C	10/13/20:216408
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/20:212191	5540C	10/08/20:216643
Aggressiveness Index	11.7	1	--		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Langelier Index (20°C)	-0.1	1	--		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/08/20:211833	300.0	10/08/20:216232

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

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October 26, 2020

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 18K (LA39-Los Olivos #5) LA 39
Project : Los Osos BMC Monitoring

Lab ID : CC 2083333-002
Customer ID : 8-514

Sampled On : October 7, 2020-08:30
Sampled By : Seth Stocking
Received On : October 7, 2020-13:03
Matrix : Ground Water

Sample Result - Support

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Field Test								
Temperature	72		°F			10/07/20 08:30	2550B	10/07/20 08:30
Conductivity	0.67		umhos/cm			10/07/20 08:30	2510B	10/07/20 08:30
pH (Field)	7.4		units			10/07/20 08:30	4500HB	10/07/20 08:30

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

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October 28, 2020

Lab ID : CC 2083358-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : Zone E Well (LA40) LA 40
Project : Los Osos BMC Monitoring

Sampled On : October 7, 2020-14:22
Sampled By : James Carlson
Received On : October 7, 2020-15:30
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	4100	25*	mg/L		200.7	10/09/20:211884	200.7	10/12/20:216411
Calcium	720	10*	mg/L		200.7	10/09/20:211884	200.7	10/12/20:216411
Magnesium	560	10*	mg/L		200.7	10/09/20:211884	200.7	10/12/20:216411
Potassium	8	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Sodium	217	1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Total Cations	91.7	---*	meq/L		200.7	10/09/20:211884	200.7	10/12/20:216411
Boron	ND	0.1	mg/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Copper	ND	10	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Iron	70	30	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Manganese	310	10	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
Zinc	ND	20	ug/L		200.7	10/09/20:211884	200.7	10/09/20:216319
SAR	1.5	0.1*	--		200.7	10/09/20:211884	200.7	10/12/20:216411
Total Alkalinity (as CaCO3)	220	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Hydroxide as OH	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Carbonate as CO3	ND	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Bicarbonate as HCO3	270	10	mg/L		2320B	10/10/20:211931	2320B	10/11/20:216292
Sulfate	192	2.5*	mg/L		300.0	10/22/20:212478	300.0	10/22/20:217048
Chloride	2220	45*	mg/L		300.0	10/22/20:212478	300.0	10/23/20:217048
Nitrate as NO3	ND	0.9	mg/L		4500NO3F	10/08/20:211872	4500NO3F	10/08/20:216219
Nitrite as N	ND	0.4	mg/L		4500NO3F	10/08/20:211873	4500NO2B	10/08/20:216166
Nitrate + Nitrite as N	ND	0.2	mg/L		4500NO3F	10/08/20:211872	4500NO3F	10/08/20:216219
Fluoride	ND	0.5*	mg/L		300.0	10/22/20:212478	300.0	10/22/20:217048
Total Anions	71.0	---	meq/L		2320B	10/10/20:211931	2320B	10/11/20:216292
pH (Field)	6.9	--	units		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Specific Conductance	8220	1	umhos/cm		2510B	10/19/20:212238	2510B	10/19/20:216720
Total Dissolved Solids	7930	20*	mg/L		2540CE	10/12/20:211954	2540C	10/13/20:216408
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/20:212191	5540C	10/08/20:216643
Aggressiveness Index	12.5	1	--		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Langelier Index (20°C)	0.5	1	--		4500-H B	10/07/20:212046	4500HB	10/07/20:216494
Nitrate Nitrogen	ND	0.2	mg/L		4500NO3F	10/08/20:211872	4500NO3F	10/08/20:216219

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October 28, 2020

Lab ID : CC 2083365-001
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401

Sampled On : October 8, 2020-12:10
Sampled By : James Carlson
Received On : October 8, 2020-13:18
Matrix : Ground Water

Description : Zone D Well (LA41) LA 41
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	263	2.5	mg/L		200.7	10/12/20:211967	200.7	10/12/20:216411
Calcium	51	1	mg/L		200.7	10/12/20:211967	200.7	10/12/20:216411
Magnesium	33	1	mg/L		200.7	10/12/20:211967	200.7	10/12/20:216411
Potassium	2	1	mg/L		200.7	10/12/20:211967	200.7	10/12/20:216411
Sodium	72	1	mg/L		200.7	10/12/20:211967	200.7	10/12/20:216411
Total Cations	8.4	---	meq/L		200.7	10/12/20:211967	200.7	10/12/20:216411
Boron	ND	0.1	mg/L		200.7	10/12/20:211967	200.7	10/12/20:216411
Copper	ND	10	ug/L		200.7	10/12/20:211967	200.7	10/12/20:216411
Iron	130	30	ug/L		200.7	10/12/20:211967	200.7	10/12/20:216411
Manganese	30	10	ug/L		200.7	10/12/20:211967	200.7	10/12/20:216411
Zinc	ND	20	ug/L		200.7	10/12/20:211967	200.7	10/12/20:216411
SAR	1.9	0.1	--		200.7	10/12/20:211967	200.7	10/12/20:216411
Total Alkalinity (as CaCO3)	280	10	mg/L		2320B	10/14/20:212073	2320B	10/14/20:216567
Hydroxide as OH	ND	10	mg/L		2320B	10/14/20:212073	2320B	10/14/20:216567
Carbonate as CO3	ND	10	mg/L		2320B	10/14/20:212073	2320B	10/14/20:216567
Bicarbonate as HCO3	340	10	mg/L		2320B	10/14/20:212073	2320B	10/14/20:216567
Sulfate	89.4	0.5	mg/L		300.0	10/09/20:211922	300.0	10/09/20:216345
Chloride	52	1	mg/L		300.0	10/09/20:211922	300.0	10/09/20:216345
Nitrate as NO3	0.4	0.4	mg/L		300.0	10/09/20:211922	300.0	10/09/20:216345
Nitrite as N	ND	0.2	mg/L		300.0	10/09/20:211922	300.0	10/09/20:216345
Nitrate + Nitrite as N	0.1	0.1	mg/L		300.0	10/09/20:211922	300.0	10/09/20:216345
Fluoride	0.1	0.1	mg/L		300.0	10/09/20:211922	300.0	10/09/20:216345
Total Anions	8.9	---	meq/L		2320B	10/14/20:212073	2320B	10/14/20:216567
pH (Field)	7.1	--	units		4500-H B	10/08/20:212046	4500HB	10/08/20:216494
Specific Conductance	920	1	umhos/cm		2510B	10/16/20:212164	2510B	10/16/20:216620
Total Dissolved Solids	490	20	mg/L		2540CE	10/13/20:212011	2540C	10/14/20:216496
MBAS Extraction	ND	0.1	mg/L		5540C	10/09/20:212204	5540C	10/09/20:216659
Aggressiveness Index	11.7	1	--		4500-H B	10/08/20:212046	4500HB	10/08/20:216494
Langelier Index (20°C)	-0.2	1	--		4500-H B	10/08/20:212046	4500HB	10/08/20:216494
Nitrate Nitrogen	0.1	0.1	mg/L		300.0	10/09/20:211922	300.0	10/09/20:216345

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CEC Testing

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/14/2020
Operators: A. Berge and J. Carlson
Well number and location: 30S/11E-13Q2 (FW5)
Site and wellhead conditions: Hot and still, site secure.

Static water depth (feet): 81.54
Well depth (feet): 105
Water column (feet): 23.46
Casing diameter (inches): 2
Minimum purge volume (gal) 11
Purge rate (gpm): 0.7
Pumping water level (feet): --
Pump setting (feet): 100
Minimum purge time (min): 40
Time begin purge: 9:26 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
9:26	1	828.6	7.79	21.5	Dark brown - orange, sandy, odorless
9:35	7	854.3	6.65	19.4	Cloudy, odorless
9:40	10.5	850.7	6.69	19.2	Slightly cloudy, odorless
9:45	14	853.8	6.49	19..3	Slightly cloudy, odorless
9:48	17.5	855.4	6.54	19.1	Slightly less cloudy, odorless
9:52	21	857.4	6.52	19	Slightly less cloudy, odorless
9:57	24.5	859.4	6.53	19.1	Faintly cloudy, odorless
10:01	28	861.2	6.50	19.2	Faintly cloudy, odorless
10:06	31.5	862.9	6.48	19.3	Faintly cloudy, odorless
10:10	35	863.1	6.40	19	Mostly clear, odorless
					Sampled @ 10:12 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/14/2020
Operators: A. Berge and J. Carlson
Well number and location: 30S/10E-24A (FW6)
Site and wellhead conditions: Sunny and hot. Monument locked and secure.

Static water depth (feet): 144.51
Well depth (feet): 165.93
Water column (feet): 21.42
Casing diameter (inches): 2
Minimum purge volume (gal) 10
Purge rate (gpm): 0.4
Pumping water level (feet): --
Pump setting (feet): 163
Minimum purge time (min): 15
Time begin purge: 11:40 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
11:40	1	868	7.73	21.2	Cloudy, odorless
11:44	3	881.9	6.90	20.6	Slightly cloudy, odorless
11:51	5	885.7	6.72	20.7	Clear, colorless, odorless
11:56	10	888.3	6.60	20.7	Clear, colorless, odorless
					Sampled @ 11:57 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/14/2020
Operators: A. Berge and J. Carlson
Well number and location: 30S/11E-20A2 (FW26)
Site and wellhead conditions: Sunny and hot. Well static and secure under cover

Static water depth (feet): 22.87
Well depth (feet): 60
Water column (feet): 37.13
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: 1:04 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
13:05	10	601.5	7.43	19	Initially black, cloudy, sulfury odor
13:08	20	595	7.08	18.4	Clear, colorless, slight odor
13:10	40	595	7.09	17.6	Clear, colorless, slight odor
13:11	60	592.7	7.04	17.5	Clear, colorless, slight odor
13:12	80	591.3	7.04	17.4	Clear, colorless, odorless
13:13	100	590.9	6.99	17.4	Clear, colorless, odorless
13:15	150	593	7.04	17.7	Clear, colorless, slight odor
13:19	200	588.8	7.04	17.7	Clear, colorless, slight odor
13:21	250	593	7.04	17.7	Clear, colorless, slight odor
					Sampled @ 13:22

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

Certificate of Analysis

FINAL REPORT

Work Orders:	0J15024	**Report Date:**	12/21/2020
		Received Date:	10/15/2020
Project:	Los Osos CEC Monitoring	**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:**	

DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • HW-DOH # • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015

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 10/15/20 with the Chain-of-Custody document. The samples were received in good condition, at 2.8 °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

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FINAL REPORT

Cleath-Harris Geologists, Inc.
75 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Project Number: Los Osos CEC Monitoring

Project Manager: Spencer Harris

Reported: 12/21/2020 10:55

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
FW5 (13Q2)	A.Berge/James Carlson	0J15024-01	Water	10/14/20 10:12	
FW6 (24A)	A.Berge/James Carlson	0J15024-02	Water	10/14/20 11:57	
FW26 (20A2)	A.Berge/James Carlson	0J15024-03	Water	10/14/20 13:22	

Analyses Accreditation Summary

Analyte	CAS #	Not By NELAP	ANAB ISO 17025
SM 5910B in Water			
UV 254		✓	

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Project Number: Los Osos CEC Monitoring

Project Manager: Spencer Harris

Reported: 12/21/2020 10:55

Sample Results

Sample: FW5 (13Q2) — Sampled: 10/14/20 10:12 by A.Berge/James Carlson

0J15024-01 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods						
Method: EPA 350.1 — **Instr:** AA06						
Batch ID: W0J1286 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 10/22/20 15:58 — **Analyst:** YMT						
Ammonia as N	ND	0.10	mg/l	1	10/23/20	
Method: SM 2510B — **Instr:** AA02						
Batch ID: W0J1089 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 10/20/20 10:18 — **Analyst:** sbn						
Specific Conductance (EC)	**990**	2.0	umhos/cm	1	10/20/20	
Method: SM 5310B — **Instr:** TOC02						
Batch ID: W0J1126 — **Preparation:** SM 5310B_comb — **Prepared:** 10/20/20 13:56 — **Analyst:** jlp						
Total Organic Carbon (TOC)	**0.53**	0.30	mg/l	1	10/20/20	
Method: SM 5910B — **Instr:** UVVIS04						
Batch ID: W0J0921 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 10/15/20 16:51 — **Analyst:** ssi						
UV 254	**0.015**	0.009	1/cm	1	10/15/20 17:43	
Nitrosamines by isotopic dilution GC/MS CI Mode						
Method: EPA 1625M — **Instr:** GCMS09						
Batch ID: W0J1155 — **Preparation:** EPA 3535/SPE — **Prepared:** 10/21/20 08:25 — **Analyst:** mld						
N-Nitrosodimethylamine	ND	2.0	ng/l	1	10/22/20	
PPCPs - Hormones by LC/MSMS-APCI						
Method: EPA 1694M-APCI — **Instr:** LCMS02						
Batch ID: W0J1373 — **Preparation:** EPA 3535/SPE — **Prepared:** 10/26/20 08:48 — **Analyst:** kan						
17-b-Estradiol	ND	1.0	ng/l	1	12/03/20	
PPCPs - Pharmaceuticals by LC/MSMS-ESI-						
Method: EPA 1694M-ESI- — **Instr:** LCMS02						
Batch ID: W0J1372 — **Preparation:** EPA 3535/SPE — **Prepared:** 10/26/20 08:47 — **Analyst:** kan						
Gemfibrozil	ND	1.0	ng/l	1	12/03/20	
Iopromide	ND	5.0	ng/l	1	12/03/20	
Triclosan	ND	2.0	ng/l	1	12/03/20	

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Sample Results

(Continued)

Sample: FW5 (13Q2) Sampled: 10/14/20 10:12 by A.Berge/James Carlson

0J15024-01RE1 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods						
Method: EPA 353.2		**Instr:** AA01				
Batch ID: W0J0851 **Preparation:** _NONE (WETCHEM)		**Prepared:** 10/14/20 16:56				**Analyst:** sar
Nitrate as N	**29**	1.0	mg/l	5	10/15/20 11:59	
PPCPs - Pharmaceuticals by LC/MSMS-ESI+						
Method: EPA 1694M-ESI+		**Instr:** LCMS02				
Batch ID: W0J1371 **Preparation:** EPA 3535/SPE		**Prepared:** 10/26/20 08:47				**Analyst:** kan
Caffeine	**1.3**	1.0	ng/l	1	12/05/20	B
DEET	**2.9**	1.0	ng/l	1	12/05/20	B
Sucralose	**160**	5.0	ng/l	1	12/05/20	

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Project Number: Los Osos CEC Monitoring

Project Manager: Spencer Harris

Reported: 12/21/2020 10:55

Sample Results

(Continued)

Sample: FW6 (24A) — 0J15024-02 (Water) — Sampled: 10/14/20 11:57 by A.Berge/James Carlson

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods						
Method: EPA 350.1 — **Instr:** AA06						
Batch ID: W0J1286 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 10/22/20 15:58 — **Analyst:** YMT						
Ammonia as N	ND	0.10	mg/l	1	10/23/20	
Method: EPA 353.2 — **Instr:** AA01						
Batch ID: W0J0851 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 10/14/20 16:56 — **Analyst:** SAR						
Nitrate as N	**2.9**	0.20	mg/l	1	10/15/20 11:52	
Method: SM 2510B — **Instr:** AA02						
Batch ID: W0J1089 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 10/20/20 10:18 — **Analyst:** sbn						
Specific Conductance (EC)	**990**	2.0	umhos/cm	1	10/20/20	
Method: SM 5310B — **Instr:** TOC02						
Batch ID: W0J1126 — **Preparation:** SM 5310B_comb — **Prepared:** 10/20/20 13:56 — **Analyst:** jlp						
Total Organic Carbon (TOC)	**1.1**	0.30	mg/l	1	10/20/20	
Method: SM 5910B — **Instr:** UVVIS04						
Batch ID: W0J0921 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 10/15/20 16:51 — **Analyst:** ssi						
UV 254	**0.018**	0.009	1/cm	1	10/15/20 17:43	
Nitrosamines by isotopic dilution GC/MS CI Mode						
Method: EPA 1625M — **Instr:** GCMS09						
Batch ID: W0J1155 — **Preparation:** EPA 3535/SPE — **Prepared:** 10/21/20 08:25 — **Analyst:** mld						
N-Nitrosodimethylamine	ND	2.0	ng/l	1	10/22/20	
PPCPs - Hormones by LC/MSMS-APCI						
Method: EPA 1694M-APCI — **Instr:** LCMS02						
Batch ID: W0J1373 — **Preparation:** EPA 3535/SPE — **Prepared:** 10/26/20 08:48 — **Analyst:** kan						
17-b-Estradiol	ND	1.0	ng/l	1	12/03/20	
PPCPs - Pharmaceuticals by LC/MSMS-ESI-						
Method: EPA 1694M-ESI- — **Instr:** LCMS02						
Batch ID: W0J1372 — **Preparation:** EPA 3535/SPE — **Prepared:** 10/26/20 08:47 — **Analyst:** kan						
Gemfibrozil	ND	1.0	ng/l	1	12/02/20	
Iopromide	ND	10	ng/l	1	12/02/20	R-01
Triclosan	ND	2.0	ng/l	1	12/02/20	

Sample: FW6 (24A) — 0J15024-02RE1 (Water) — Sampled: 10/14/20 11:57 by A.Berge/James Carlson

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
PPCPs - Pharmaceuticals by LC/MSMS-ESI+						
Method: EPA 1694M-ESI+ — **Instr:** LCMS02						
Batch ID: W0J1371 — **Preparation:** EPA 3535/SPE — **Prepared:** 10/26/20 08:47 — **Analyst:** kan						
Caffeine	**2.0**	1.0	ng/l	1	12/05/20	B
DEET	**31**	1.0	ng/l	1	12/05/20	
Sucralose	**2300**	5.0	ng/l	1	12/05/20	E-01

Cleath-Harris Geologists, Inc. 75 Zaca Lane, Suite 110 San Luis Obispo, CA 93401	**Project Number:** Los Osos CEC Monitoring **Project Manager:** Spencer Harris	**Reported:** 12/21/2020 10:55

Sample Results

(Continued)

Sample: FW26 (20A2) — 0J15024-03 (Water) — Sampled: 10/14/20 13:22 by A.Berge/James Carlson

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods						
Method: EPA 350.1 — **Instr:** AA06						
Batch ID: W0J1286 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 10/22/20 15:58 — **Analyst:** YMT						
Ammonia as N	**0.20**	0.10	mg/l	1	10/23/20	
Method: EPA 353.2 — **Instr:** AA01						
Batch ID: W0J0851 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 10/14/20 16:56 — **Analyst:** SAR						
Nitrate as N	ND	0.20	mg/l	1	10/15/20 11:53	
Method: SM 2510B — **Instr:** AA02						
Batch ID: W0J1089 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 10/20/20 10:18 — **Analyst:** sbn						
Specific Conductance (EC)	**660**	2.0	umhos/cm	1	10/20/20	
Method: SM 5310B — **Instr:** TOC02						
Batch ID: W0J1126 — **Preparation:** SM 5310B_comb — **Prepared:** 10/20/20 13:56 — **Analyst:** jlp						
Total Organic Carbon (TOC)	**1.0**	0.30	mg/l	1	10/20/20	
Method: SM 5910B — **Instr:** UVVIS04						
Batch ID: W0J0921 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 10/15/20 16:51 — **Analyst:** ssi						
UV 254	**0.039**	0.009	1/cm	1	10/15/20 17:43	
Nitrosamines by isotopic dilution GC/MS CI Mode						
Method: EPA 1625M — **Instr:** GCMS09						
Batch ID: W0J1155 — **Preparation:** EPA 3535/SPE — **Prepared:** 10/21/20 08:25 — **Analyst:** mld						
N-Nitrosodimethylamine	ND	2.0	ng/l	1	10/22/20	
PPCPs - Hormones by LC/MSMS-APCI						
Method: EPA 1694M-APCI — **Instr:** LCMS02						
Batch ID: W0J1373 — **Preparation:** EPA 3535/SPE — **Prepared:** 10/26/20 08:48 — **Analyst:** kan						
17-b-Estradiol	ND	1.0	ng/l	1	12/03/20	
PPCPs - Pharmaceuticals by LC/MSMS-ESI-						
Method: EPA 1694M-ESI- — **Instr:** LCMS02						
Batch ID: W0J1372 — **Preparation:** EPA 3535/SPE — **Prepared:** 10/26/20 08:47 — **Analyst:** kan						
Gemfibrozil	ND	1.0	ng/l	1	12/02/20	
Iopromide	ND	5.0	ng/l	1	12/02/20	
Triclosan	ND	2.0	ng/l	1	12/02/20	

Sample: FW26 (20A2) — 0J15024-03RE1 (Water) — Sampled: 10/14/20 13:22 by A.Berge/James Carlson

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
PPCPs - Pharmaceuticals by LC/MSMS-ESI+						
Method: EPA 1694M-ESI+ — **Instr:** LCMS02						
Batch ID: W0J1371 — **Preparation:** EPA 3535/SPE — **Prepared:** 10/26/20 08:47 — **Analyst:** kan						
Caffeine	ND	1.0	ng/l	1	12/05/20	
DEET	**1.5**	1.0	ng/l	1	12/05/20	B
Sucralose	**75**	5.0	ng/l	1	12/05/20	B

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FINAL REPORT

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Project Number: Los Osos CEC Monitoring

Project Manager: Spencer Harris

Reported: 12/21/2020 10:55

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: W0J0851 - EPA 353.2										
Blank (W0J0851-BLK1)				**Prepared: 10/14/20 Analyzed: 10/15/20**						
Nitrate as N	ND	0.20	mg/l							
LCS (W0J0851-BS1)				**Prepared: 10/14/20 Analyzed: 10/15/20**						
Nitrate as N	0.978	0.20	mg/l	1.00		98	90-110			
Matrix Spike (W0J0851-MS1)	**Source: 0J14113-01**			**Prepared: 10/14/20 Analyzed: 10/15/20**						
Nitrate as N	10.5	0.20	mg/l	2.00	8.57	97	90-110			
Matrix Spike (W0J0851-MS2)	**Source: 0J15024-03**			**Prepared: 10/14/20 Analyzed: 10/15/20**						
Nitrate as N	2.03	0.20	mg/l	2.00	ND	102	90-110			
Matrix Spike Dup (W0J0851-MSD1)	**Source: 0J14113-01**			**Prepared: 10/14/20 Analyzed: 10/15/20**						
Nitrate as N	10.5	0.20	mg/l	2.00	8.57	97	90-110	0	20	
Matrix Spike Dup (W0J0851-MSD2)	**Source: 0J15024-03**			**Prepared: 10/14/20 Analyzed: 10/15/20**						
Nitrate as N	2.03	0.20	mg/l	2.00	ND	102	90-110	0	20	
Batch: W0J0921 - SM 5910B										
Blank (W0J0921-BLK1)				**Prepared & Analyzed: 10/15/20**						
UV 254	ND	0.009	1/cm							
LCS (W0J0921-BS1)				**Prepared & Analyzed: 10/15/20**						
UV 254	0.084	0.009	1/cm	0.0880		95	90-110			
Duplicate (W0J0921-DUP1)	**Source: 0J15024-01**			**Prepared & Analyzed: 10/15/20**						
UV 254	0.015	0.009	1/cm		0.015			0	10	
Batch: W0J1089 - SM 2510B										
Blank (W0J1089-BLK1)				**Prepared & Analyzed: 10/20/20**						
Specific Conductance (EC)	ND	2.0	umhos/cm							
LCS (W0J1089-BS1)				**Prepared & Analyzed: 10/20/20**						
Specific Conductance (EC)	453	2.0	umhos/cm	445		102	95-105			
Duplicate (W0J1089-DUP1)	**Source: 0J14090-01**			**Prepared & Analyzed: 10/20/20**						
Specific Conductance (EC)	1920	6.0	umhos/cm		1920			0.1	5	
Batch: W0J1126 - SM 5310B										
Blank (W0J1126-BLK1)				**Prepared & Analyzed: 10/20/20**						
Total Organic Carbon (TOC)	ND	0.30	mg/l							
LCS (W0J1126-BS1)				**Prepared & Analyzed: 10/20/20**						
Total Organic Carbon (TOC)	1.11	0.30	mg/l	1.00		111	85-115			
Matrix Spike (W0J1126-MS1)	**Source: 0J15078-02**			**Prepared & Analyzed: 10/20/20**						
Total Organic Carbon (TOC)	7.44	0.30	mg/l	5.00	2.65	96	76-115			
Matrix Spike Dup (W0J1126-MSD1)	**Source: 0J15078-02**			**Prepared & Analyzed: 10/20/20**						
Total Organic Carbon (TOC)	7.36	0.30	mg/l	5.00	2.65	94	76-115	1	20	
Batch: W0J1286 - EPA 350.1										
Blank (W0J1286-BLK1)				**Prepared: 10/22/20 Analyzed: 10/23/20**						
Ammonia as N	ND	0.10	mg/l							

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Project Number: Los Osos CEC Monitoring

Project Manager: Spencer Harris

Reported: 12/21/2020 10:55

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: W0J1286 - EPA 350.1 (Continued)										
Blank (W0J1286-BLK2)				**Prepared: 10/22/20 Analyzed: 10/23/20**						
Ammonia as N	ND	0.10	mg/l							
LCS (W0J1286-BS1)				**Prepared: 10/22/20 Analyzed: 10/23/20**						
Ammonia as N	0.254	0.10	mg/l	0.250		101	90-110			
LCS (W0J1286-BS2)				**Prepared: 10/22/20 Analyzed: 10/23/20**						
Ammonia as N	0.259	0.10	mg/l	0.250		103	90-110			
Matrix Spike (W0J1286-MS1)	**Source: 0J21061-01**			**Prepared: 10/22/20 Analyzed: 10/23/20**						
Ammonia as N	0.276	0.10	mg/l	0.250	ND	111	90-110			MS-01
Matrix Spike (W0J1286-MS2)	**Source: 0J21061-03**			**Prepared: 10/22/20 Analyzed: 10/23/20**						
Ammonia as N	0.289	0.10	mg/l	0.250	0.0200	108	90-110			
Matrix Spike Dup (W0J1286-MSD1)	**Source: 0J21061-01**			**Prepared: 10/22/20 Analyzed: 10/23/20**						
Ammonia as N	0.275	0.10	mg/l	0.250	ND	110	90-110	0.7	15	
Matrix Spike Dup (W0J1286-MSD2)	**Source: 0J21061-03**			**Prepared: 10/22/20 Analyzed: 10/23/20**						
Ammonia as N	0.289	0.10	mg/l	0.250	0.0200	107	90-110	0.3	15	

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: W0J1155 - EPA 1625M										
Blank (W0J1155-BLK1)				**Prepared & Analyzed: 10/21/20**						
N-Nitrosodimethylamine	ND	2.0	ng/l							
LCS (W0J1155-BS1)				**Prepared & Analyzed: 10/21/20**						
N-Nitrosodimethylamine	1.86	2.0	ng/l	2.00		93	50-150			
LCS Dup (W0J1155-BSD1)				**Prepared & Analyzed: 10/21/20**						
N-Nitrosodimethylamine	1.78	2.0	ng/l	2.00		89	50-150	4	50	

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Project Manager: Spencer Harris

Reported: 12/21/2020 10:55

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: W0J1373 - EPA 1694M-APCI										
Blank (W0J1373-BLK1)				**Prepared: 10/26/20 Analyzed: 12/03/20**						
17-a-Ethynylestradiol	ND	1.0	ng/l							
17-b-Estradiol	ND	1.0	ng/l							
Estrone	ND	1.0	ng/l							
Progesterone	ND	1.0	ng/l							
Testosterone	ND	1.0	ng/l							
LCS (W0J1373-BS1)				**Prepared: 10/26/20 Analyzed: 12/03/20**						
17-a-Ethynylestradiol	8.17	1.0	ng/l	10.0		82	68-159			
17-b-Estradiol	8.89	1.0	ng/l	10.0		89	65-146			
Estrone	9.46	1.0	ng/l	10.0		95	59-141			
Progesterone	7.06	1.0	ng/l	10.0		71	58-154			
Testosterone	11.6	1.0	ng/l	10.0		116	60-172			
LCS Dup (W0J1373-BSD1)				**Prepared: 10/26/20 Analyzed: 12/03/20**						
17-a-Ethynylestradiol	9.42	1.0	ng/l	10.0		94	68-159	14	30	
17-b-Estradiol	10.9	1.0	ng/l	10.0		109	65-146	20	30	
Estrone	10.6	1.0	ng/l	10.0		106	59-141	11	30	
Progesterone	7.49	1.0	ng/l	10.0		75	58-154	6	30	
Testosterone	13.6	1.0	ng/l	10.0		136	60-172	16	30	

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Project Number: Los Osos CEC Monitoring

Project Manager: Spencer Harris

Reported: 12/21/2020 10:55

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: W0J1372 - EPA 1694M-ESI-										
Blank (W0J1372-BLK1)				**Prepared: 10/26/20 Analyzed: 12/02/20**						
Bisphenol A	10.7	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 (W0J1372-BS1)				**Prepared: 10/26/20 Analyzed: 12/02/20**						
Bisphenol A	11.7	1.0	ng/l	10.0		117	53-168			
Diclofenac	11.0	1.0	ng/l	10.0		110	37-218			
Gemfibrozil	8.44	1.0	ng/l	10.0		84	76-122			
Ibuprofen	6.04	1.0	ng/l	10.0		60	67-139			BS-L
Iopromide	55.4	5.0	ng/l	50.0		111	0.1-163			
Naproxen	13.0	1.0	ng/l	10.0		130	64-138			
Salicylic Acid	3470	50	ng/l	100		NR	56-229			BS-H
Triclosan	9.48	2.0	ng/l	10.0		95	76-139			
LCS Dup (W0J1372-BSD1)				**Prepared: 10/26/20 Analyzed: 12/02/20**						
Bisphenol A	11.0	1.0	ng/l	10.0		110	53-168	6	30	
Diclofenac	8.04	1.0	ng/l	10.0		80	37-218	31	30	Q-12
Gemfibrozil	9.26	1.0	ng/l	10.0		93	76-122	9	30	
Ibuprofen	5.78	1.0	ng/l	10.0		58	67-139	4	30	BS-L
Iopromide	61.9	5.0	ng/l	50.0		124	0.1-163	11	30	
Naproxen	11.0	1.0	ng/l	10.0		110	64-138	17	30	
Salicylic Acid	843	50	ng/l	100		843	56-229	122	30	BS-H
Triclosan	13.5	2.0	ng/l	10.0		135	76-139	35	30	Q-12

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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: W0J1371 - EPA 1694M-ESI+										
Blank (W0J1371-BLK1)				**Prepared: 10/26/20 Analyzed: 12/04/20**						
Acetaminophen	ND	20	ng/l							
Amoxicillin	ND	10	ng/l							A-01
Atenolol	ND	1.0	ng/l							
Atorvastatin	ND	1.0	ng/l							
Azithromycin	ND	10	ng/l							
Carbamazepine	ND	1.0	ng/l							
Ciprofloxacin	26.9	5.0	ng/l							B
Cotinine	ND	2.0	ng/l							
Diazepam	ND	1.0	ng/l							
Fluoxetine	ND	1.0	ng/l							
Meprobamate	ND	1.0	ng/l							
Methadone	ND	1.0	ng/l							
Primidone	ND	1.0	ng/l							
Sulfamethoxazole	ND	1.0	ng/l							
TCEP	ND	1.0	ng/l							
TCPP	4.05	1.0	ng/l							B-06
TDCPP	9.91	2.0	ng/l							B
Trimethoprim	ND	1.0	ng/l							
Blank (W0J1371-BLK2)				**Prepared: 10/26/20 Analyzed: 12/05/20**						
Caffeine	1.14	1.0	ng/l							B
DEET	1.09	1.0	ng/l							B
Phenytoin (Dilantin)	ND	1.0	ng/l							
Sucralose	13.2	5.0	ng/l							B
LCS (W0J1371-BS1)				**Prepared: 10/26/20 Analyzed: 12/04/20**						
Acetaminophen	192	20	ng/l	200		96	66-156			
Amoxicillin	ND	10	ng/l	100			14-167			A-01
Atenolol	9.71	1.0	ng/l	10.0		97	56-164			
Atorvastatin	1.72	1.0	ng/l	10.0		17	0.1-173			
Azithromycin	82.4	10	ng/l	100		82	52-166			
Carbamazepine	8.59	1.0	ng/l	10.0		86	60-135			
Ciprofloxacin	56.6	5.0	ng/l	50.0		113	51-168			
Cotinine	10.3	2.0	ng/l	10.0		103	68-155			
Diazepam	7.89	1.0	ng/l	10.0		79	58-127			
Fluoxetine	7.49	1.0	ng/l	10.0		75	55-150			
Meprobamate	10.5	1.0	ng/l	10.0		105	11-166			
Methadone	7.87	1.0	ng/l	10.0		79	62-137			
Primidone	9.90	1.0	ng/l	10.0		99	54-147			
Sulfamethoxazole	9.56	1.0	ng/l	10.0		96	60-133			
TCEP	8.91	1.0	ng/l	10.0		89	25-149			

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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: W0J1371 - EPA 1694M-ESI+ (Continued)										
LCS (W0J1371-BS1)				**Prepared: 10/26/20 Analyzed: 12/04/20**						
TCPP	13.7	1.0	ng/l	10.0		137	24-149			
TDCPP	25.2	2.0	ng/l	10.0		252	20-158			BS-04
Trimethoprim	9.97	1.0	ng/l	10.0		100	67-139			
LCS (W0J1371-BS2)				**Prepared: 10/26/20 Analyzed: 12/05/20**						
Caffeine	10.1	1.0	ng/l	10.0		101	55-152			
DEET	11.0	1.0	ng/l	10.0		110	45-135			
Phenytoin (Dilantin)	8.58	1.0	ng/l	10.0		86	69-138			
Sucralose	41.6	5.0	ng/l	50.0		83	50-150			
LCS Dup (W0J1371-BSD1)				**Prepared: 10/26/20 Analyzed: 12/04/20**						
Acetaminophen	216	20	ng/l	200		108	66-156	12	30	
Amoxicillin	ND	10	ng/l	100			14-167		30	A-01
Atenolol	11.3	1.0	ng/l	10.0		113	56-164	15	30	
Atorvastatin	3.34	1.0	ng/l	10.0		33	0.1-173	64	30	Q-12
Azithromycin	88.0	10	ng/l	100		88	52-166	7	30	
Carbamazepine	8.64	1.0	ng/l	10.0		86	60-135	0.6	30	
Ciprofloxacin	46.0	5.0	ng/l	50.0		92	51-168	21	30	
Cotinine	12.1	2.0	ng/l	10.0		121	68-155	16	30	
Diazepam	8.31	1.0	ng/l	10.0		83	58-127	5	30	
Fluoxetine	10.0	1.0	ng/l	10.0		100	55-150	29	30	
Meprobamate	11.3	1.0	ng/l	10.0		113	11-166	7	30	
Methadone	8.94	1.0	ng/l	10.0		89	62-137	13	30	
Primidone	9.54	1.0	ng/l	10.0		95	54-147	4	30	
Sulfamethoxazole	11.0	1.0	ng/l	10.0		110	60-133	14	30	
TCEP	12.1	1.0	ng/l	10.0		121	25-149	30	30	
TCPP	18.2	1.0	ng/l	10.0		182	24-149	28	30	BS-04
TDCPP	12.4	2.0	ng/l	10.0		124	20-158	68	30	A-01a
Trimethoprim	14.0	1.0	ng/l	10.0		140	67-139	34	30	BS-04
LCS Dup (W0J1371-BSD2)				**Prepared: 10/26/20 Analyzed: 12/05/20**						
Caffeine	11.0	1.0	ng/l	10.0		110	55-152	9	30	
DEET	11.3	1.0	ng/l	10.0		113	45-135	3	30	
Phenytoin (Dilantin)	10.1	1.0	ng/l	10.0		101	69-138	16	30	
Sucralose	41.9	5.0	ng/l	50.0		84	50-150	0.7	30	

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Notes and Definitions

Item	Definition
A-01	No IS and QC recoveries. Sample result is suspect.
A-01a	The analyte failed BS and RPD criteria and was reported based upon the 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.
BS-L	The recovery of this analyte in the BS/LCS was below the control limit. Sample result is suspect.
E-01	The concentration indicated for this analyte is an estimated value above the calibration range.
MS-01	The spike recovery for this QC sample is outside of established control limits possibly due to sample matrix interference.
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.
R-01	The Reporting Limit for this analyte has been raised to account for matrix interference.
%REC	Percent Recovery
Dil	Dilution
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.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

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.

APPENDIX D

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. https://water.ca.gov/Programs/Groundwater-Management/Groundwater-Elevation-Monitoring--CASGEM
- 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. https://water.ca.gov/Programs/Groundwater-Management/Groundwater-Elevation-Monitoring--CASGEM
- 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.

<u>Graduated Steel Tape</u>
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.

<u>Electric Tape</u>

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.
- 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 E

New Surveys

Table E1- Reference Point Elevation Survey
September 2020

Basin Plan Well ID	Well Name	Original Elevation Estimate	2020 Survey Elevation	Difference
FW18	30S/11E-18P	150	143.92	-6.08
FW20	30S/11E-8Mb	95	94.75	-0.25
FW26*	30S/11E-20A2	76.89	79.25	2.36
FW31	30S/11E-19A	213	214.67	1.67
FW32	30S/11E-21D14	60	62.58	2.58
UA3	30S/10E-13F1	19	17.57	-1.43
UA8*	30S/11E-18K7	135.65	137.17	1.52
UA13	30S/11E-17E10	106	107.81	1.81
LA5	30S/10E-13L7	37	37.87	0.87
LA6	30S/10E-13L4	68	74.58	6.58
LA8	30S/10E-13N	138.5	141.36	2.86
LA15	30S/11E-18L2	85	88.08	3.08
LA18*	30S/11E-18K8	135.74	137.13	1.39
LA20	30S/11E-17N10	140	141.22	1.22
LA25	30S/11E-20Aa	82	80.14	-1.86
LA27	30S/11E-16Nb	63.5	64.74	1.24
LA28	30S/11E-16Na	61	67.18	6.18
LA37	30S/11E-21B1	81.4	81.61	0.21
LA38*	30S/11E-21E	121.66	123.06	1.4
LA40**	30S/10E-13Ba	12.3	11.47	-0.83
LA41**	30S/10E-13Bb	12.3	11.46	-0.84

*Original estimate from County survey (NGVD 29)

**Surveyed as one well with reference points assigned to each nested casing

Average change in elevation from NAVD 88 estimates	1.1
Average change from County well survey (NGVD 29)	1.7

APPENDIX F

Land Use and Water Use Areas
(from LOBP)

Figure 5. Land Uses in the Plan Area

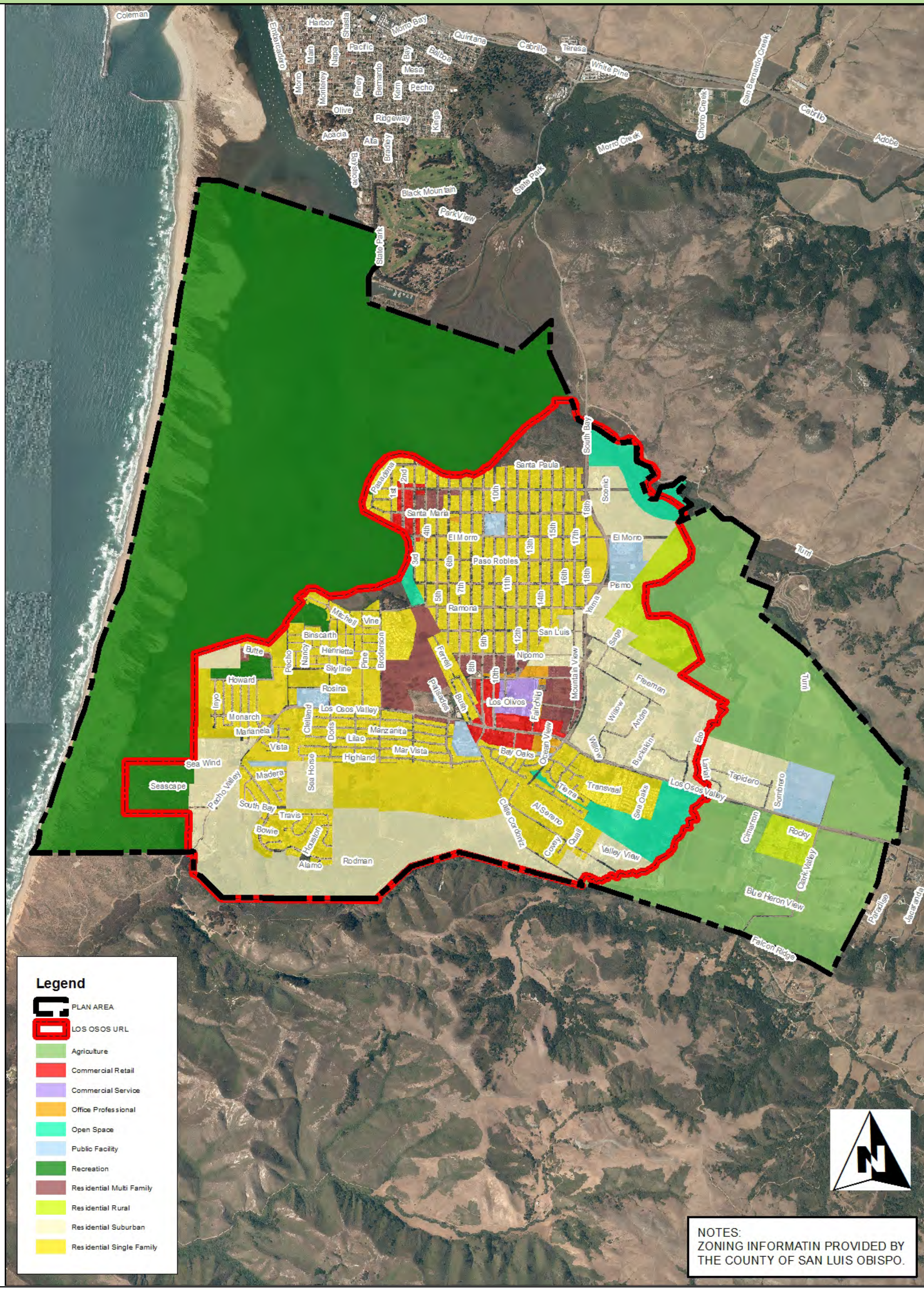
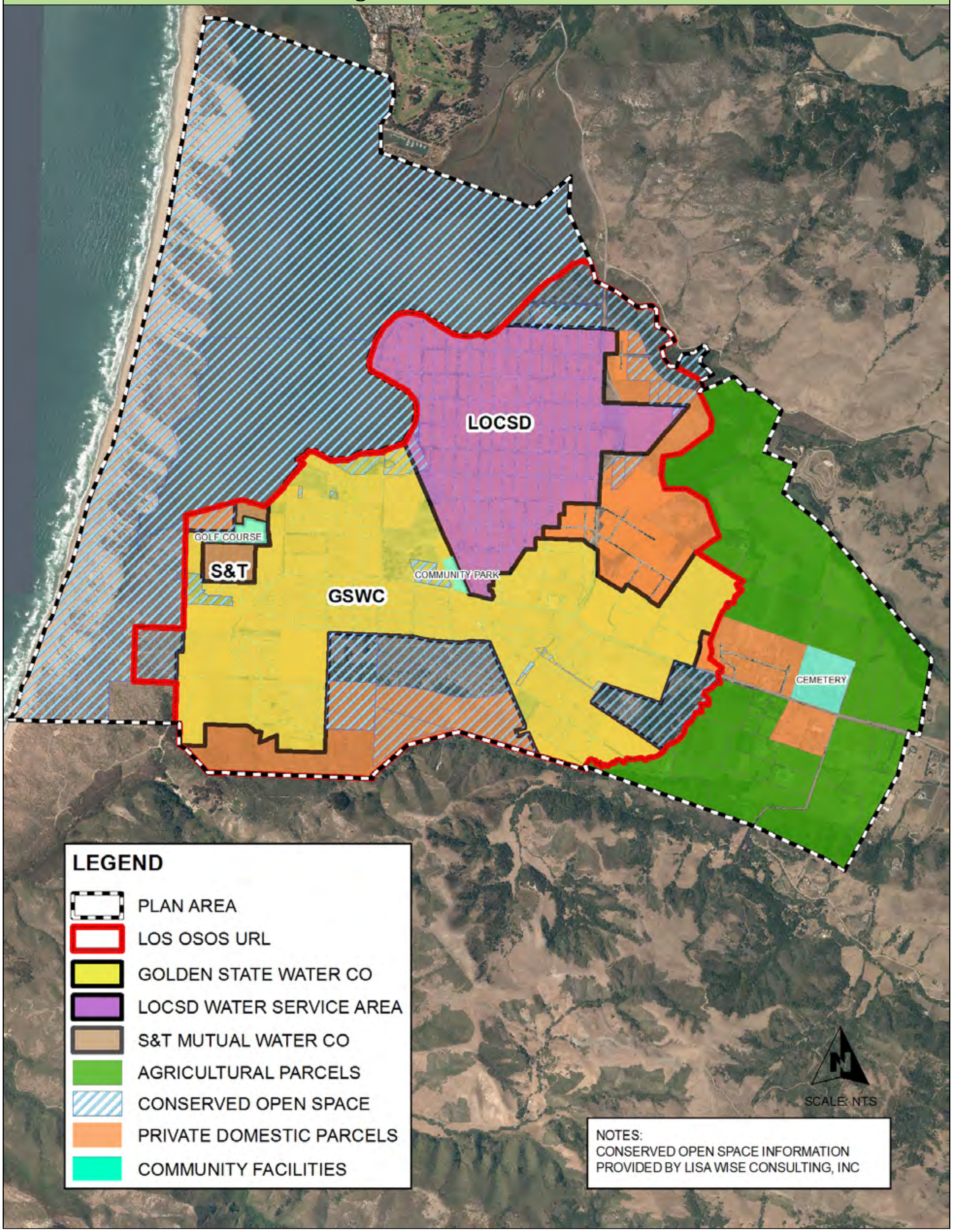


Figure 10. Water Use Areas



APPENDIX G

2020 Agricultural Water Use Estimates

Agriculture and Turf Applied Irrigation Water Estimate - 2020

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 (2020).
- 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):

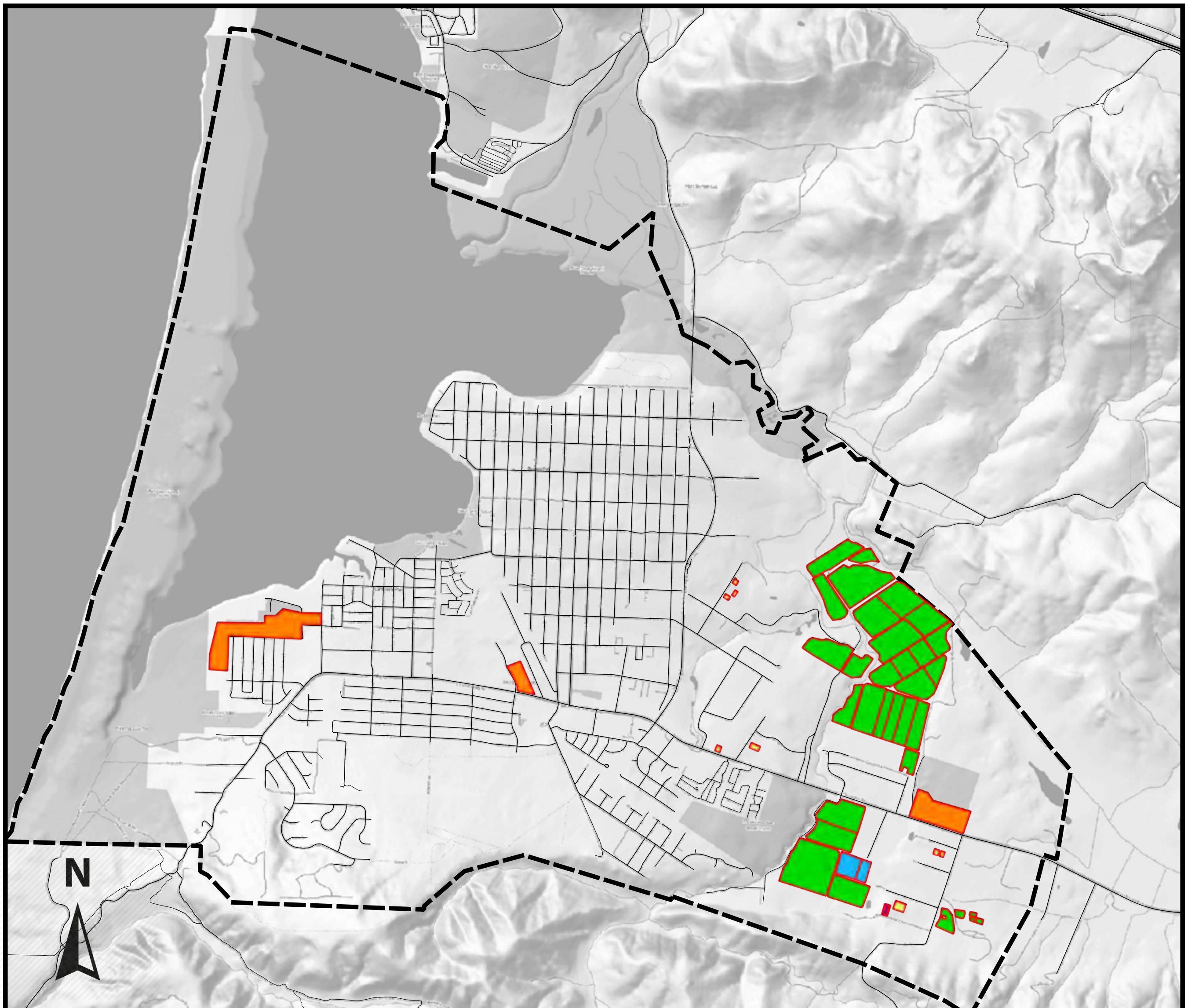
$$\text{Applied Irrigation Water} = (ETc - ER) / (EF)$$

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 2019. 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 2019 dataset was used as the basis for irrigated acreage in the adjudicated area and updated for 2020 using Normalized Difference Vegetation Index (NDVI) satellite images. Irrigated fields that were included in previous Ag Commissioner's datasets but were not included in the most recently available (2019) dataset and showed evidence of irrigation in 2020 NDVI images were added to a modified 2019 shapefile. 2020 crop acreages were then estimated using this updated dataset for use in soil moisture budget modeling.

A land use survey map for 2020 is shown in Figure G-1. Tabulation of the irrigated acreages is presented in Table G-1.



Base Image: Stamen Terrain in Greyscale

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

Scale: 1 inch ≈ 4,000 feet

Explanation

Crop Type - 2019 County of SLO Data (Modified for 2020)

- Nursery
- Pasture
- Vegetables
- Vineyard

- Adjudicated Plan Area

- Community Facilities with Turf Areas

Figure G1

2020 Crop Types
Los Osos Groundwater Basin

2020 Annual Report

Cleath-Harris Geologists

Table G-1
2020 County Crop Survey
Eastern Area

Crop Type	Acres
Nursery	4
Pasture[1]	9
Vegetables	278
Vineyard	1
Total	291

[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. A calibration 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). Calibration factor development is shown in Table G-3.

Table G-3
Calibration of Soil Moisture Methodology to Prior 2006-2008 Estimate

Description	Units	Average 2006-2008	2017
Irrigation demand vegetables	inches	22.53	24.92[1]
Irrigation demand pasture	inches	37.24	41.27[2]
Calibration Factor[3]	factor	**0.92**	0.92
Applied irrigation vegetables	feet	2.04	2.26
Applied irrigation pasture	feet	3.37	3.74
Vegetables acreage[4]	acres	339	282.2
Vegetables applied water	acre-feet	692	637.8
Pasture acreage[4]	acres	18.3	8.7
Pasture applied water	acre-feet	61.7	32.5
TOTAL applied ag irrigation	acre-feet	**754**	670
TOTAL from CHG (2009b)	acre-feet	**750**	--

[1]From Table F-3;
[2]From Table F-4;
[3]Efficiency factor used to calibrate 2006-2008 total
[4]2006-2008 acreage from CHG, 2009b (excludes memorial park);
"--" = no value for this cell
2017 acreage from County GIS 2016 (1 vineyard and 1.8 nursery acres counted as 2.2 acres in vegetables, based on equivalent water demand conversion using 2012 County Master Water Plan Table A1 [Carollo, 2012]).

There is a reduction in irrigation water demand between 2006-2008 (750 AFY) and 2017 (670 AF) shown in Table G-3 due to a reduction in irrigated acreage. This reduction may have occurred between 2006-2008 and 2017, although it may also have been from changing the source for irrigated acreage estimates from aerial images (2006-2008 and subsequent years through 2016) to the County agricultural database (beginning in 2017). The County database is field checked with growers and is the appropriate data source.

Results of the soil-moisture budget method for estimating applied irrigation for agriculture and community facilities are included in tables below.

Tables G-4 and G-5 present irrigation demand as crop evapotranspiration for calendar years 2018 through 2020. The soil-moisture budget results show crop evapotranspiration for vegetables and pasture/turf in 2020 coming up from 2020, reflecting decreased rainfall during the 2020 calendar year.

Table G-4
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
2020	24.19	52.88	34.03	9.76

*calendar year

Table G-5
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
2020	42.30	52.88	52.88	9.76

*calendar year

Table G-6 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 2020 is 650 acre-feet (an increase of 20 acre-feet from 2019).

Table G-6
Applied Irrigation for Agriculture

Description	Units	2018	2019	2020
Irrigation demand vegetables	inches	24.55[1]	23.71[1]	24.19
Irrigation demand pasture	inches	38.99[2]	36.79[2]	42.30
Irrigation Calibration Factor[3]	factor	0.92	0.92	0.92
Applied irrigation vegetables	feet	2.22	2.15	2.19
Applied irrigation pasture	feet	3.53	3.33	3.83
Vegetables acreage[4]	acres	286.5	281.6	282.6
Vegetables applied water	acre-feet	636	605.4	618.9
Pasture acreage[4]	acres	8.7	8.7	8.7
Pasture applied water	acre-feet	30.7	29.1	33.5
TOTAL applied agricultural irrigation (closest 10 acre-feet)	acre-feet	670	630	650

[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-7 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-7
2020 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	3.83	3.83	3.83	3.83
TOTAL Applied Irrigation	acre-feet	47.9	91.9	4.6	144

*includes estimated 71 acre-feet of recycled water (10 acre-feet net production)

APPENDIX H

Precipitation and Streamflow Data

Note: Rainfall data for 2020 was downloaded from the Station # 727 County Gage Site for report use, summary tables have not yet been published as of this report.

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

NOTE: Raw Data Compiled from County Website (wr.slocountywater.org)

Daily Precipitation, Landfill # 727, 2019-2020

Day	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*
1						0.36						
2												
3						0.12						
4						0.76						
5										1.36		
6						0.08				0.04		
7						0.08			0.20	0.16		
8						0.16			0.16	0.04		
9							0.12			0.32		
10									1.44			
11		0.04							0.36			
12												
13						0.04						
14												
15								0.04	0.52			
16							0.04		1.00			
17									0.04		0.08	
18						0.04					0.04	
19									0.04			
20												
21												
22						1.44			0.40			
23									0.36			
24									0.08			
25						1.04			0.28			
26	0.04					0.20	0.04					
27					1.16							
28					0.48							0.04
29					0.04	0.12						
30					0.48	0.04						
31												
Total	***0.04***	***0.04***	***0.00***	***0.00***	***2.16***	***4.48***	***0.20***	***0.04***	***4.88***	***1.92***	***0.12***	***0.04***
Cumu Total	***0.04***	***0.08***	***0.08***	***0.08***	***2.24***	***6.72***	***6.92***	***6.96***	***11.84***	***13.76***	***13.88***	***13.92***

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**

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

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

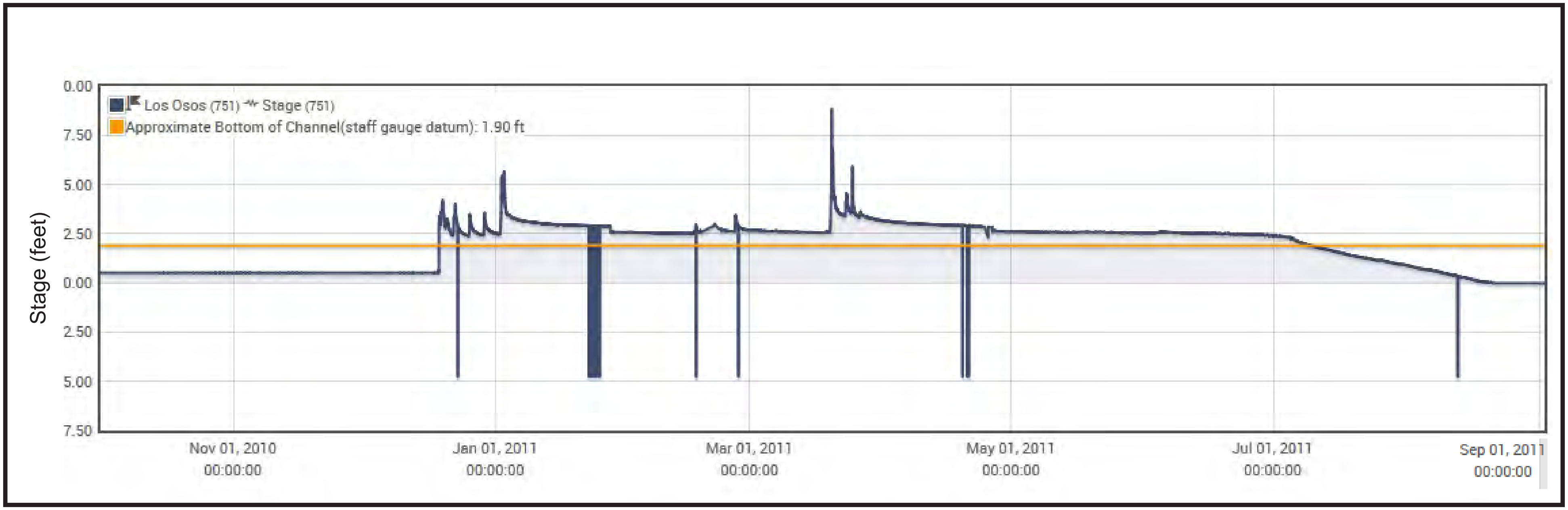
DAILY PRECIPITATION

(inches)

Station Name and no. **Los Osos Landfill # 727** Season **2005-2006**

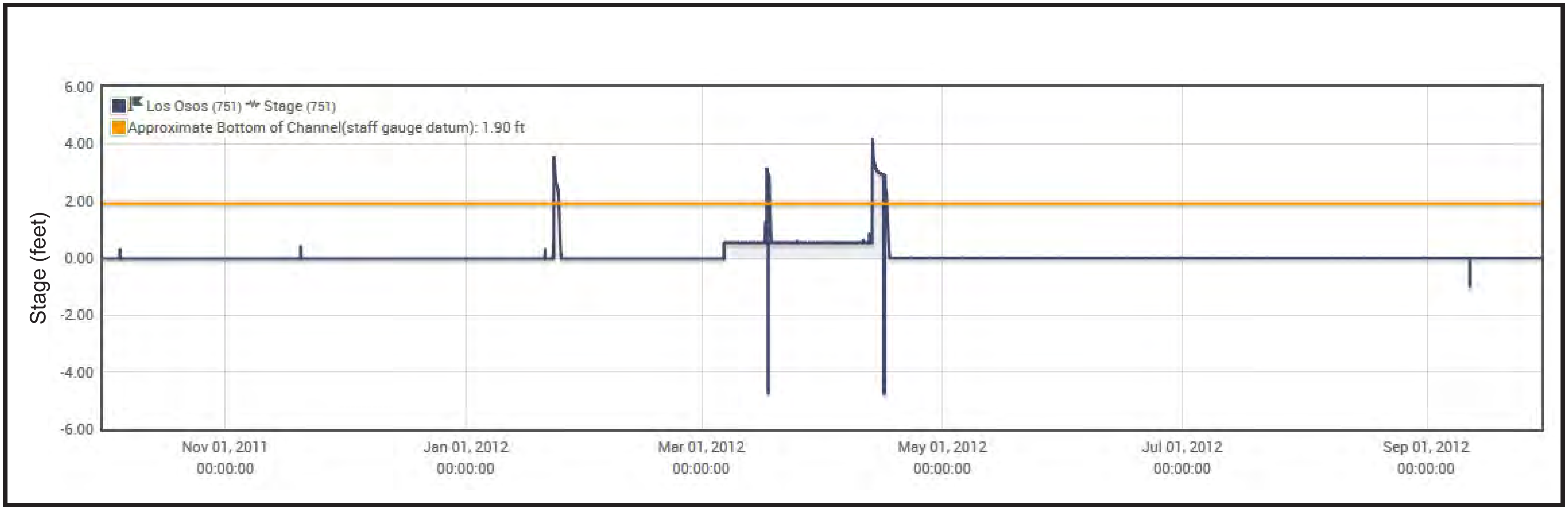
Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Day
1							1.61						**1**
2			0.63			0.55	2.32			0.24			**2**
3								0.04		1.18			**3**
4										0.59			**4**
5										0.39			**5**
6													**6**
7										0.08			**7**
8						0.47							**8**
9					0.59				0.04				**9**
10									0.28	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**



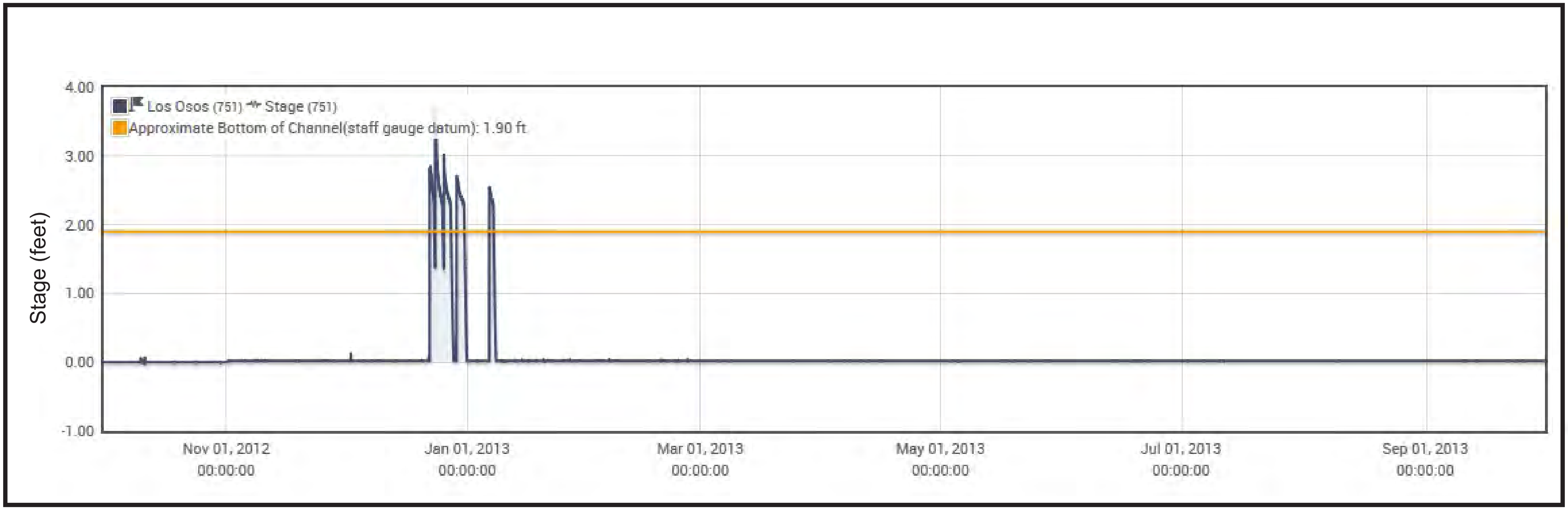
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H1
Stream Stage for 2011 Water Year
Los Osos Creek, Gage #751



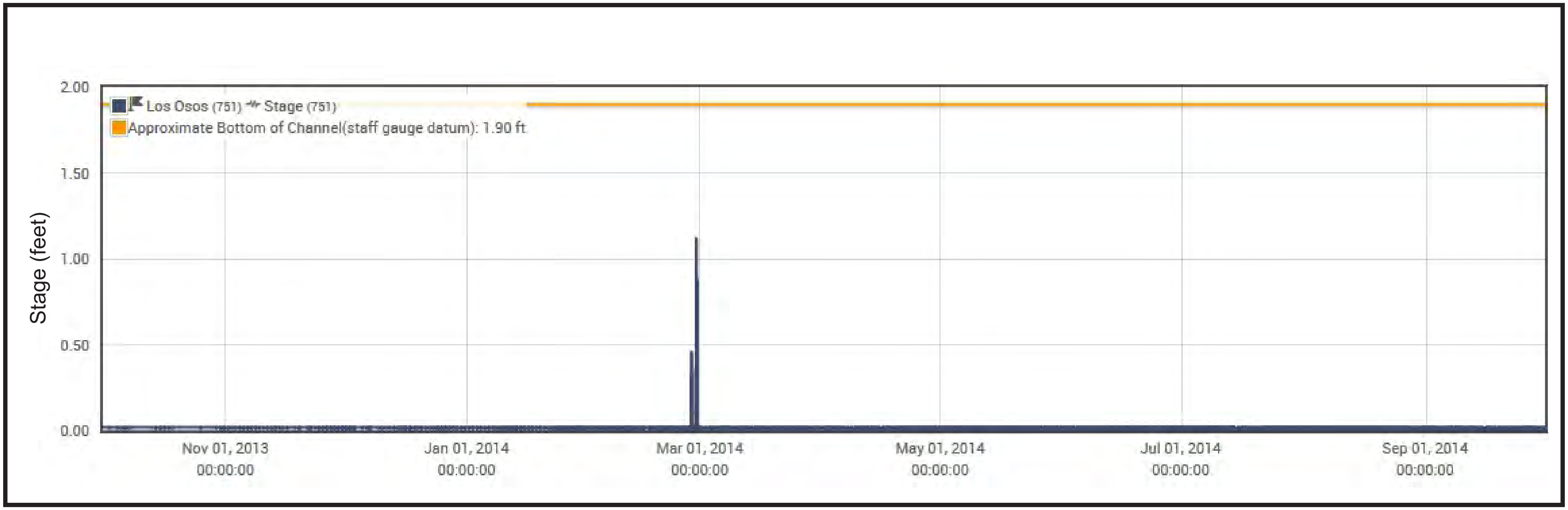
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H2
Stream Stage for 2012 Water Year
Los Osos Creek, Gage #751



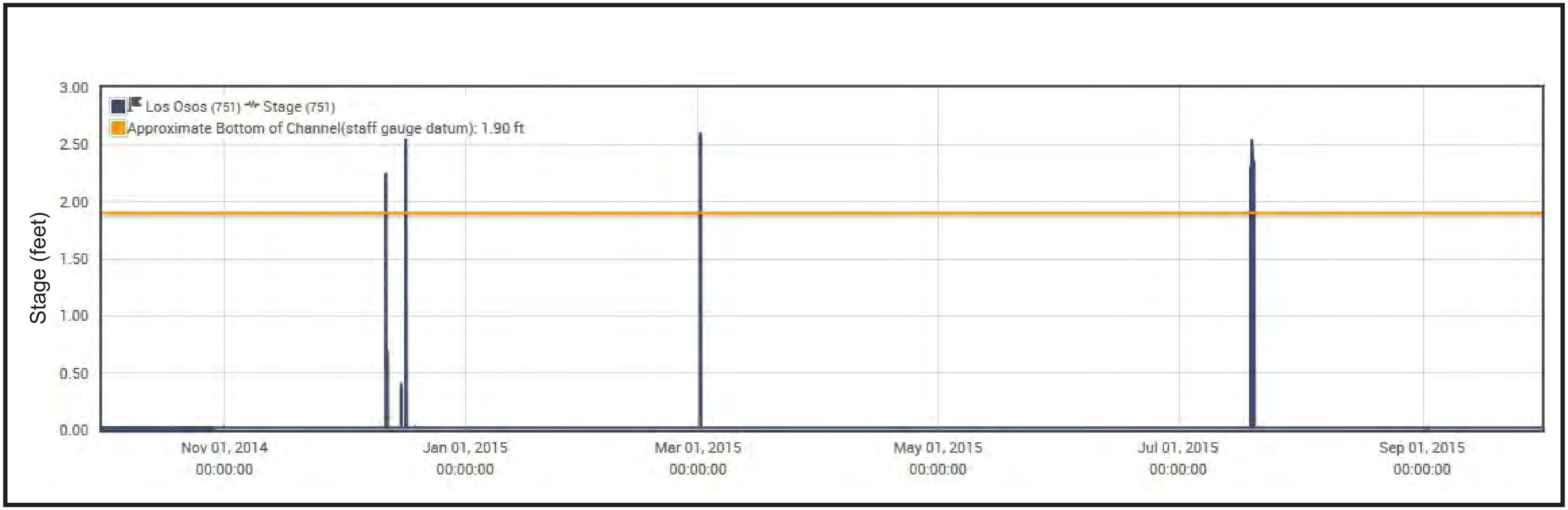
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H3
Stream Stage for 2013 Water Year
Los Osos Creek, Gage #751



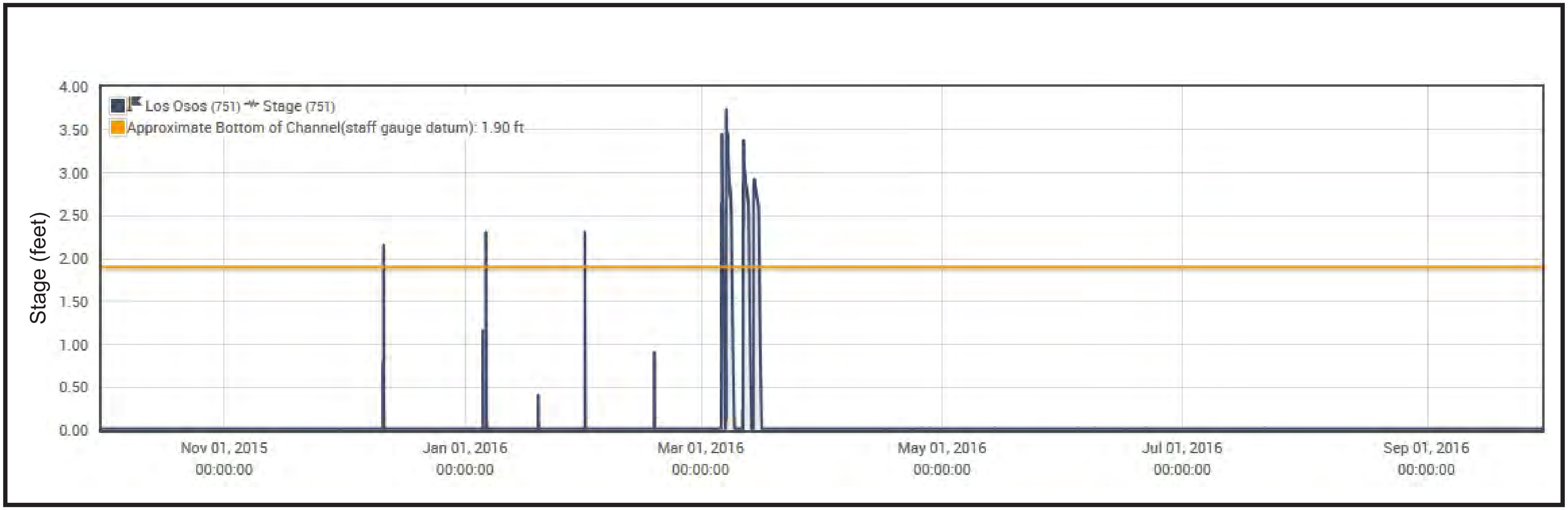
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H4
Stream Stage for 2014 Water Year
Los Osos Creek, Gage #751



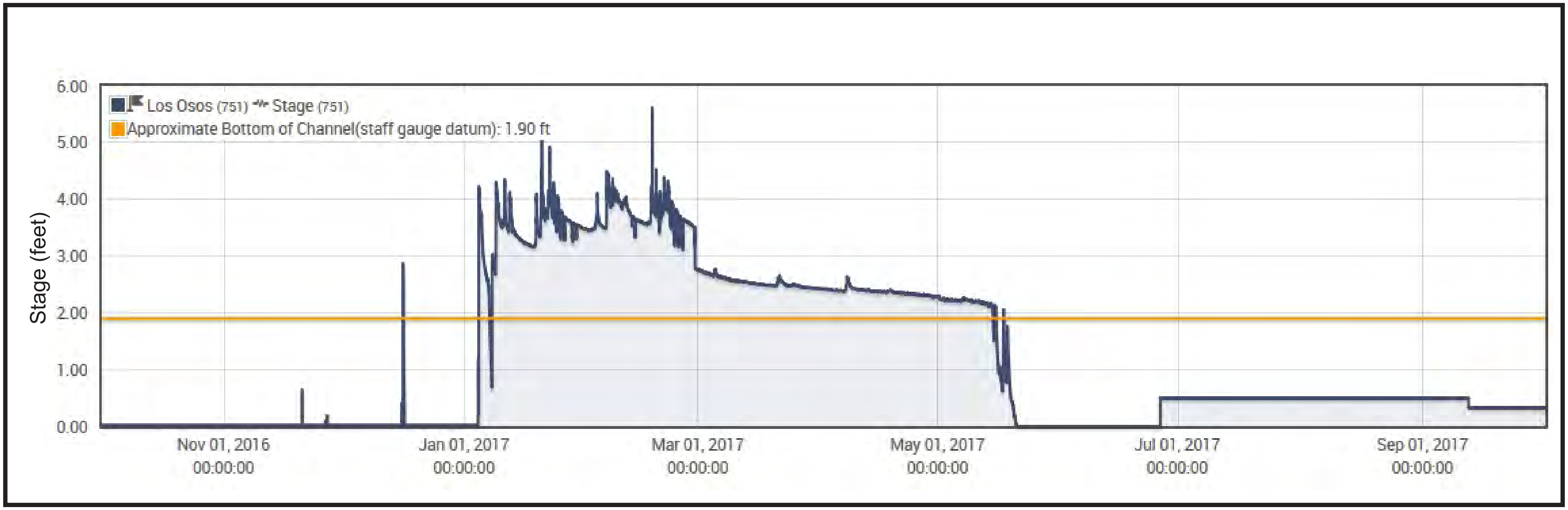
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H5
Stream Stage for 2015 Water Year
Los Osos Creek, Gage #751



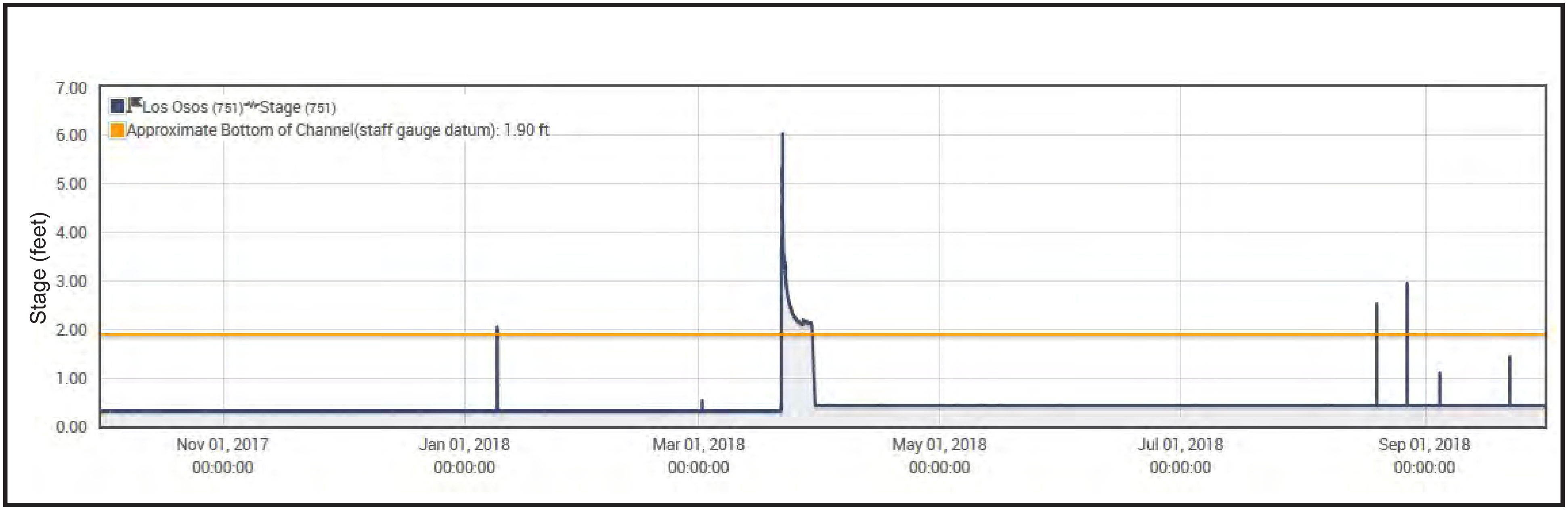
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H6
Stream Stage for 2016 Water Year
Los Osos Creek, Gage #751



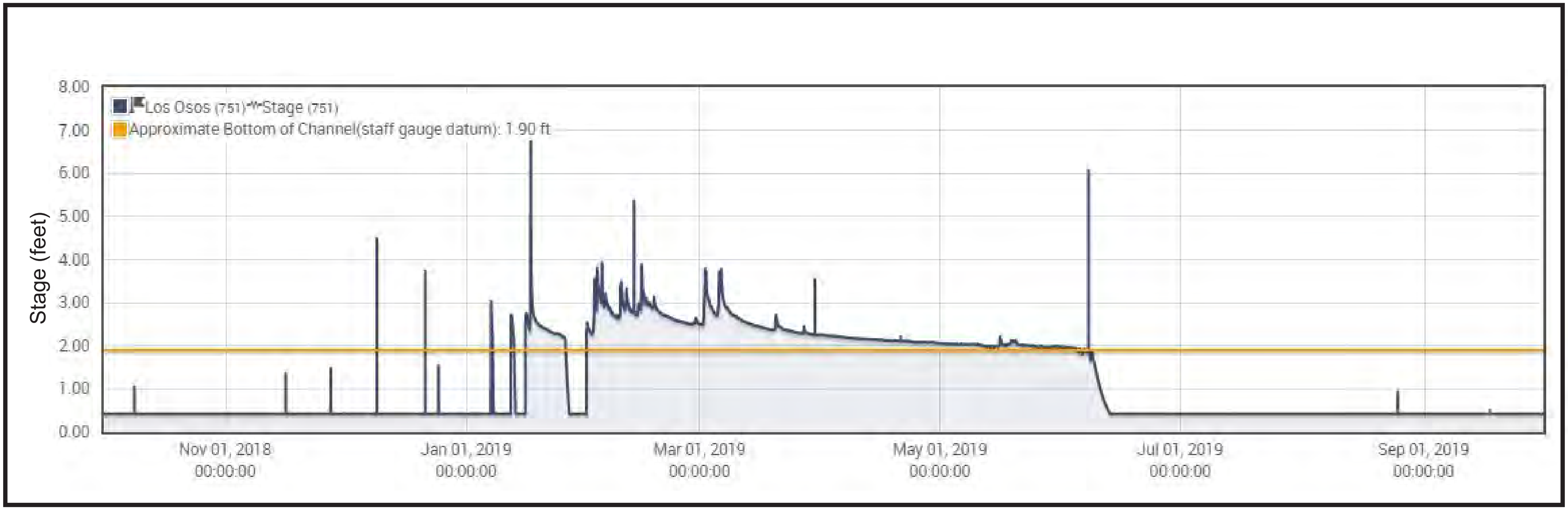
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H7
Stream Stage for 2017 Water Year
Los Osos Creek, Gage #751



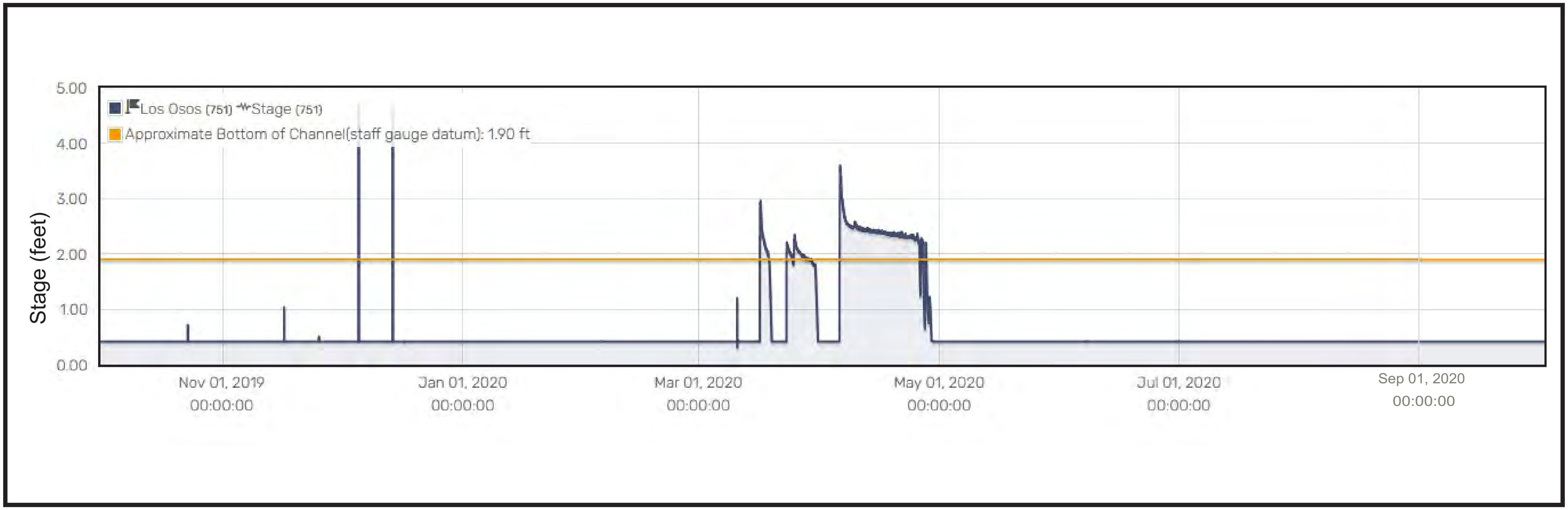
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

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



Source: County of San Luis Obispo Public Works Department, Stream Gage #751

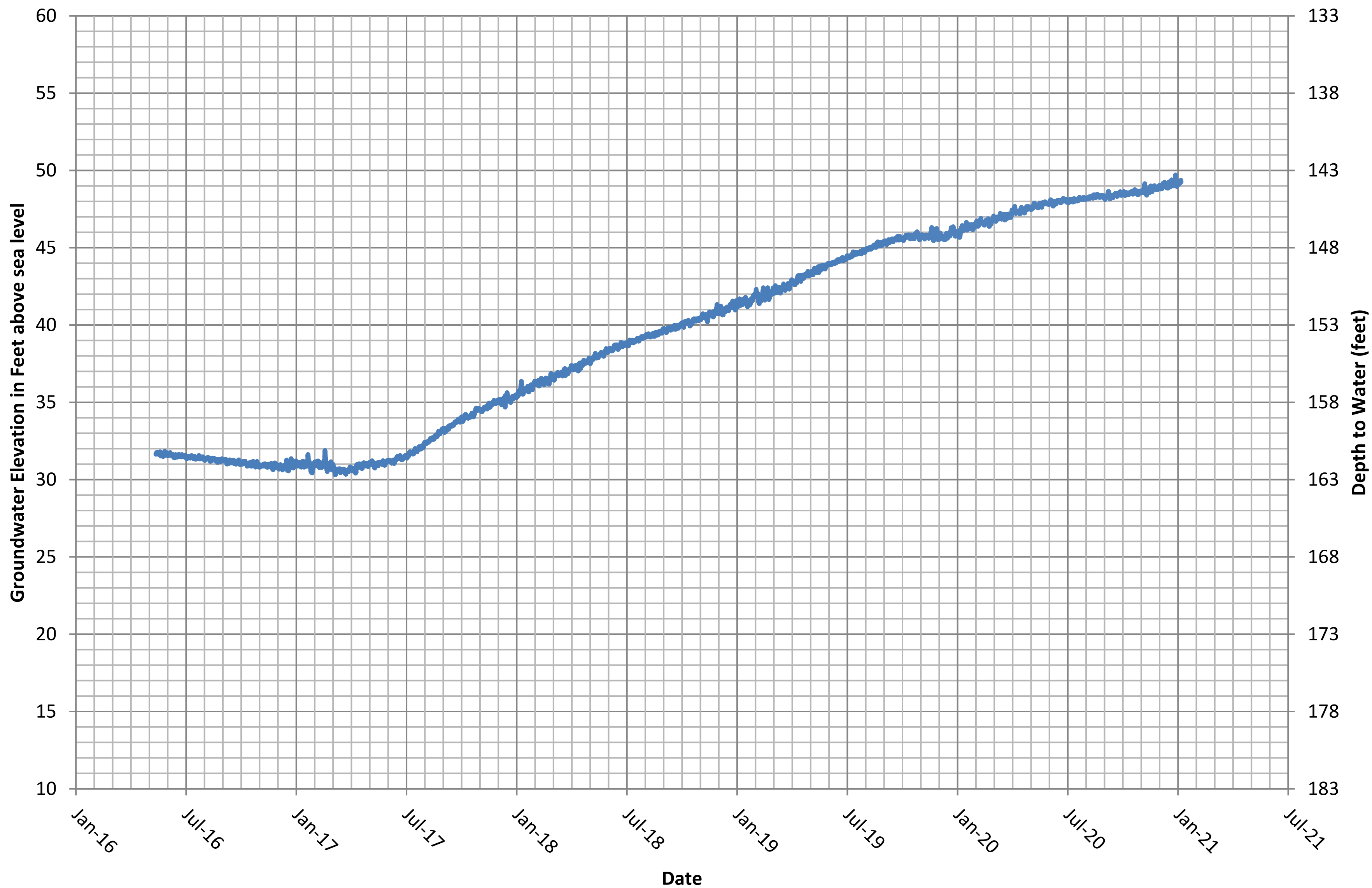
Figure H10
Stream Stage for 2020 Water Year
Los Osos Creek, Gage #751

APPENDIX I

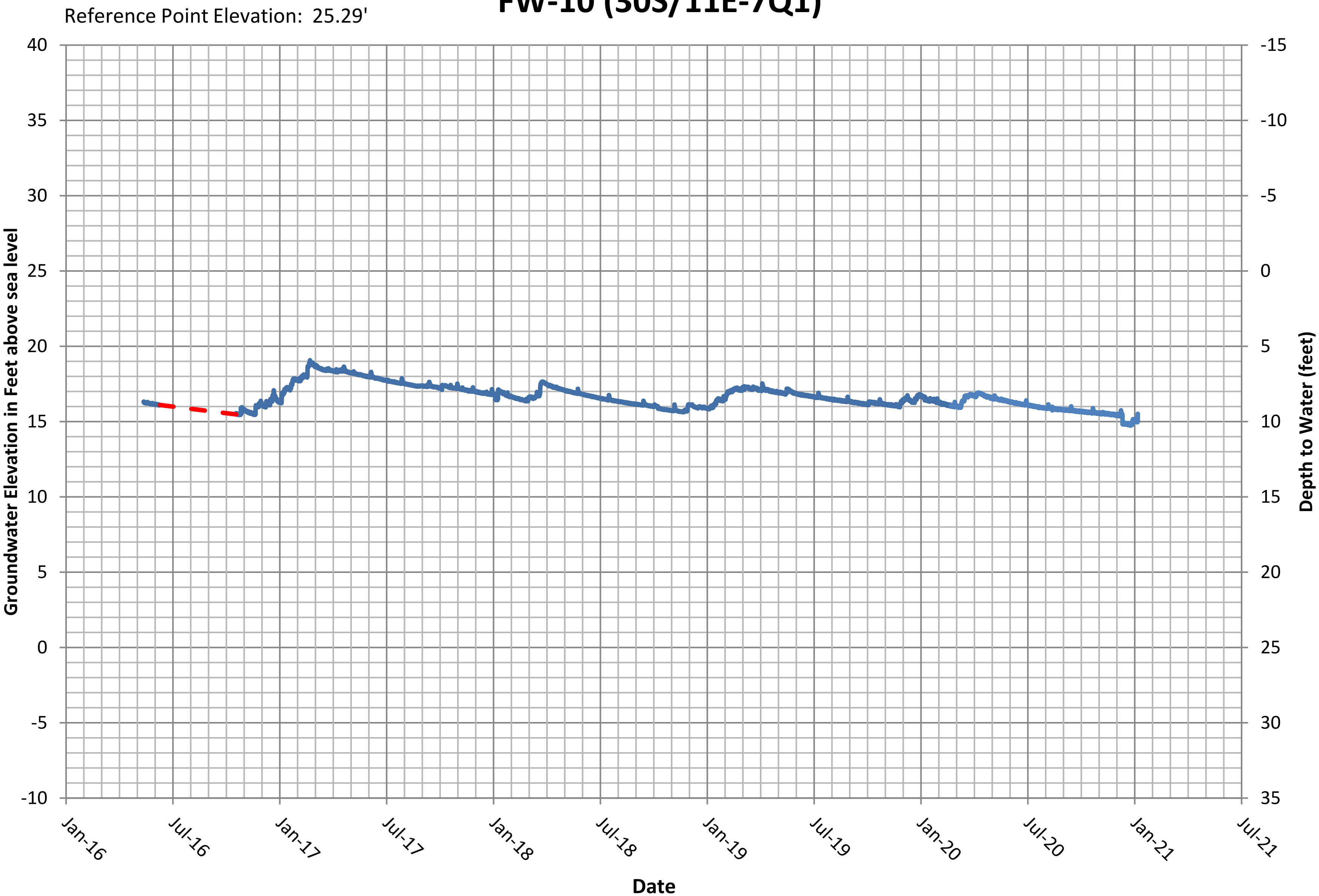
Transducer Hydrographs

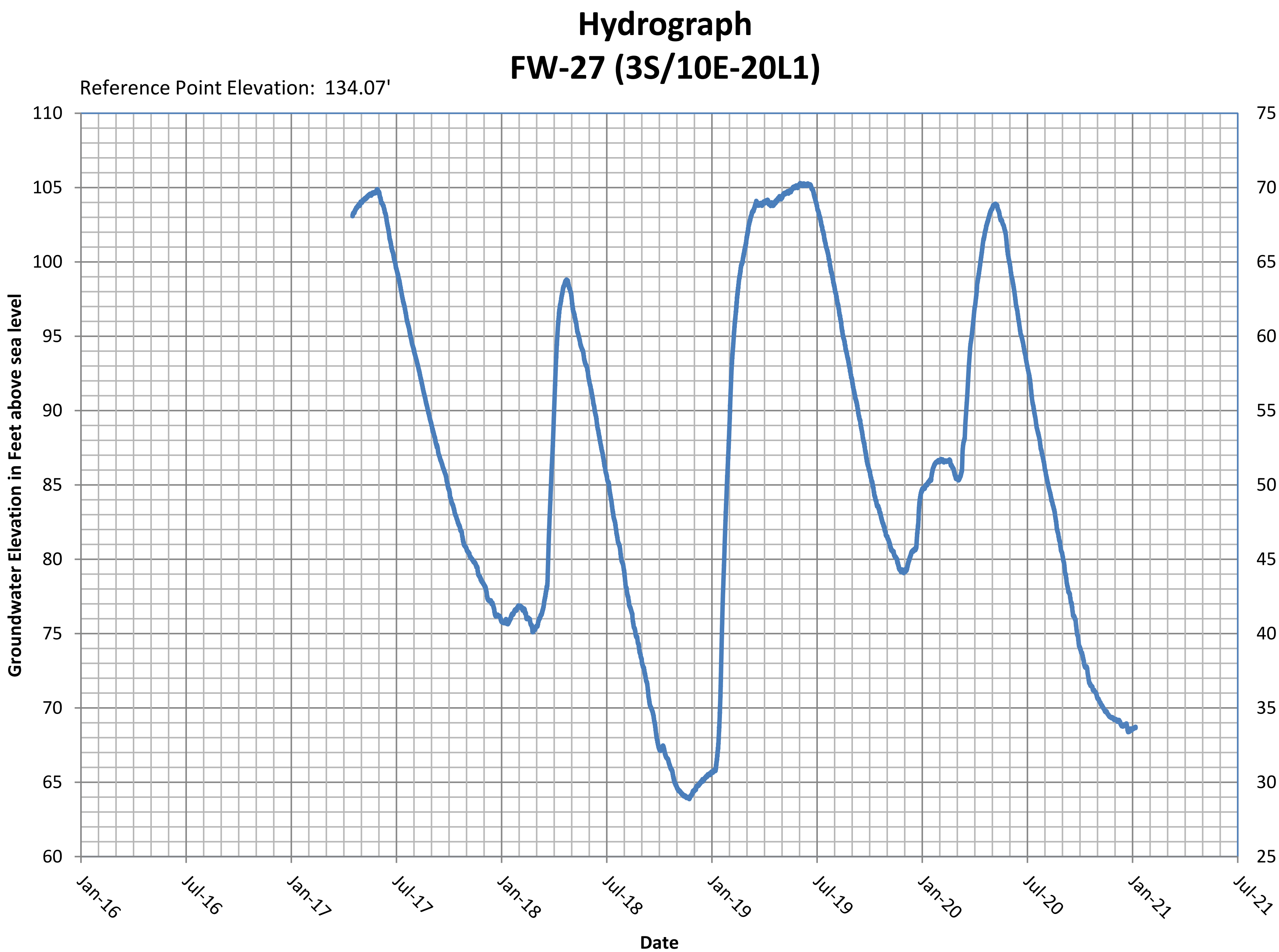
Hydrograph
FW-6 (30S/10E-24A)

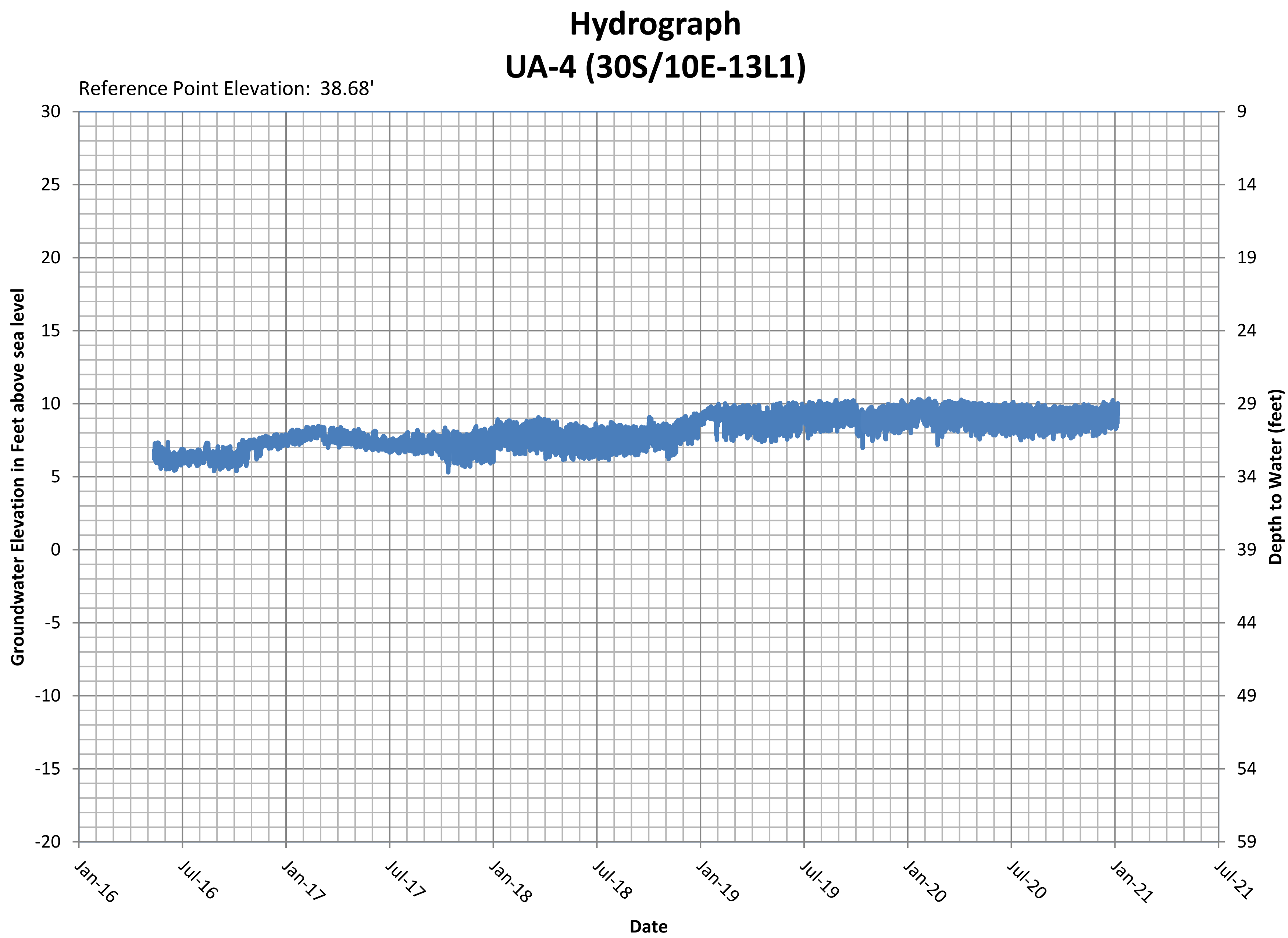
Reference Point Elevation: 193.04'



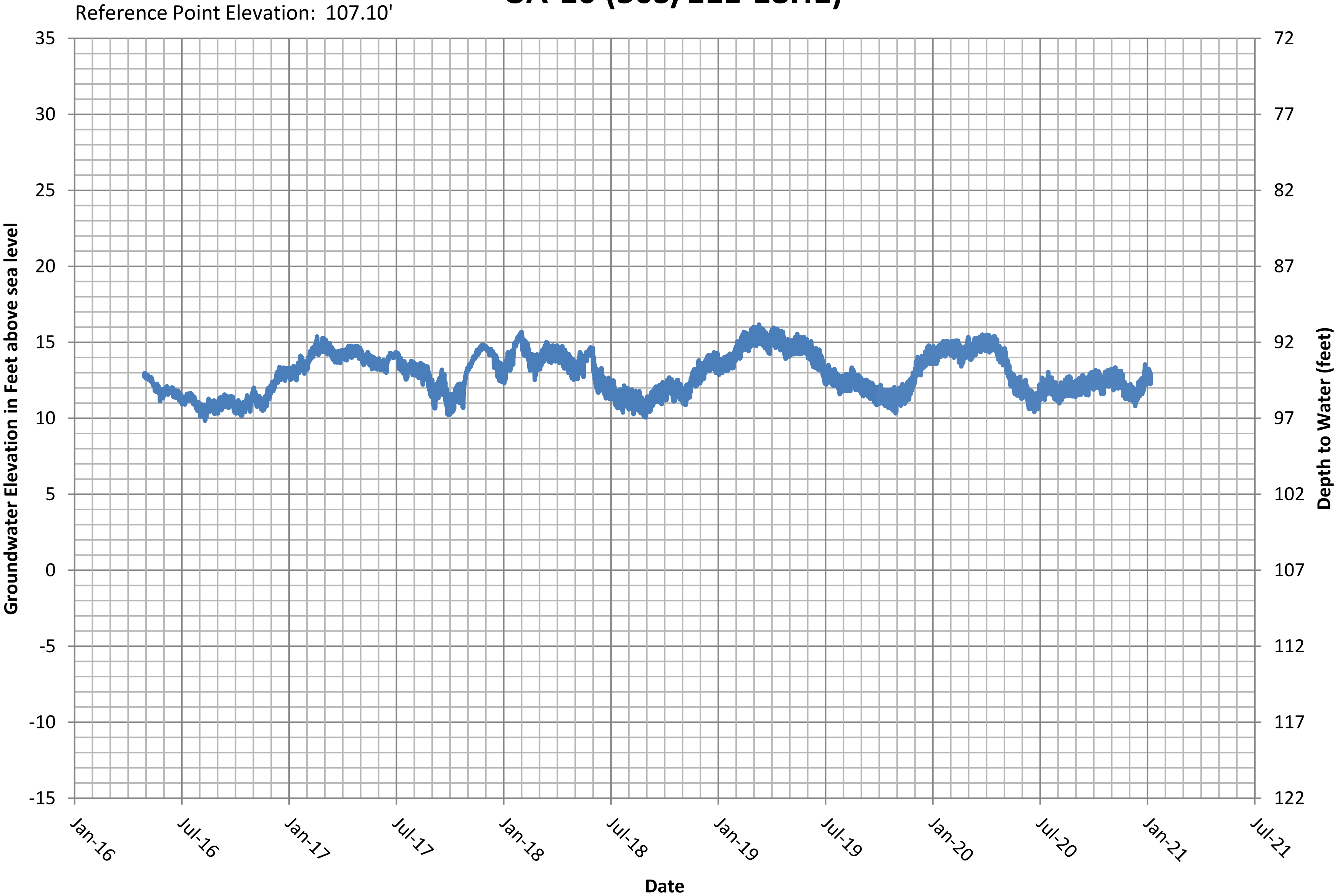
Hydrograph
FW-10 (30S/11E-7Q1)

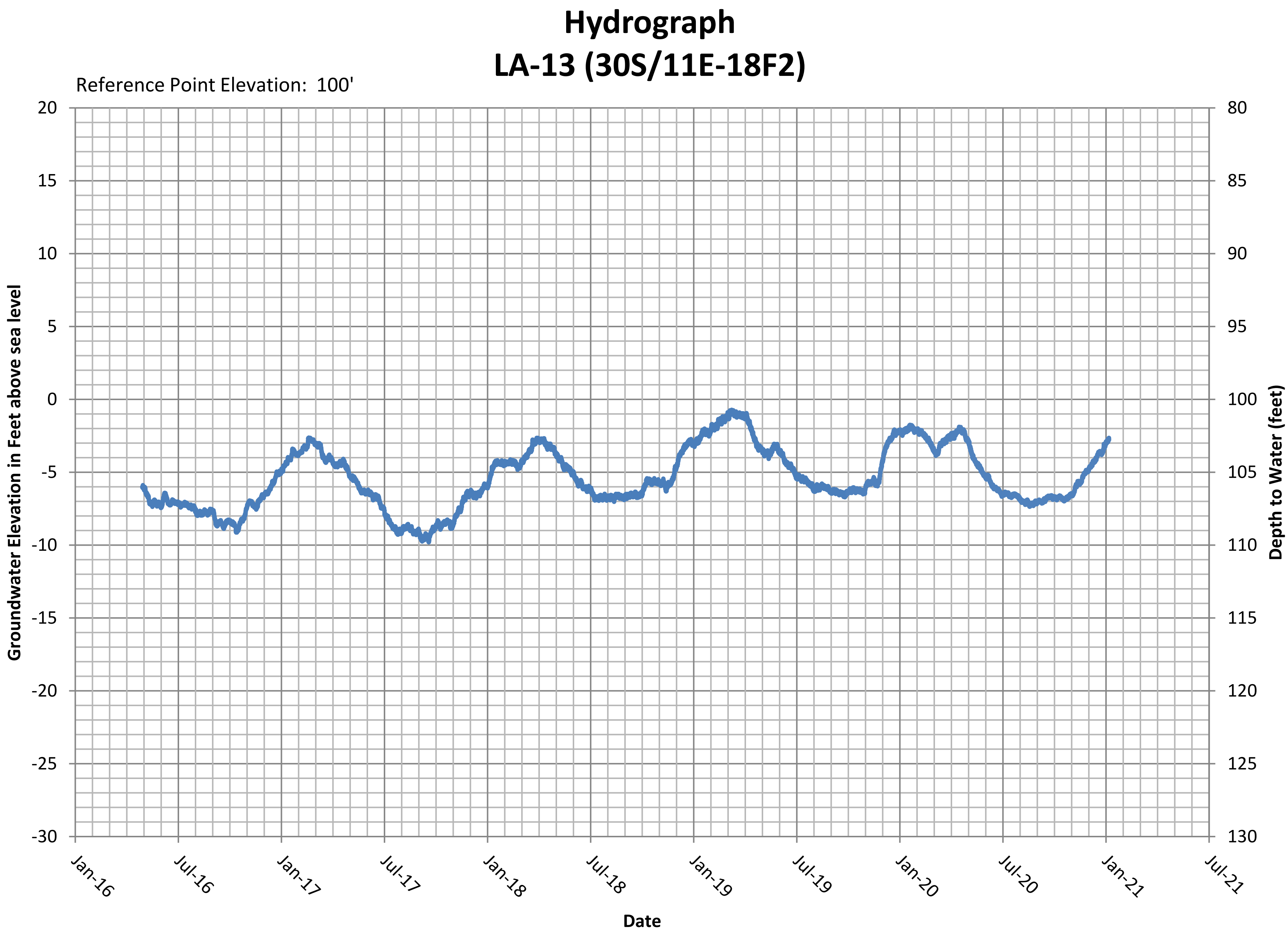



Hydrograph
FW-27 (3S/10E-20L1)
Reference Point Elevation: 134.07'
Groundwater Elevation in Feet above sea level
Depth to Water (feet)
Date
110
105
100
95
90
85
80
75
70
65
60
75
70
65
60
55
50
45
40
35
30
25
Jan-16
Jul-16
Jan-17
Jul-17
Jan-18
Jul-18
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21


Hydrograph
UA-4 (30S/10E-13L1)
Reference Point Elevation: 38.68'
Groundwater Elevation in Feet above sea level
30
25
20
15
10
5
0
-5
-10
-15
-20
Depth to Water (feet)
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
Jan-21
Jul-21
Date

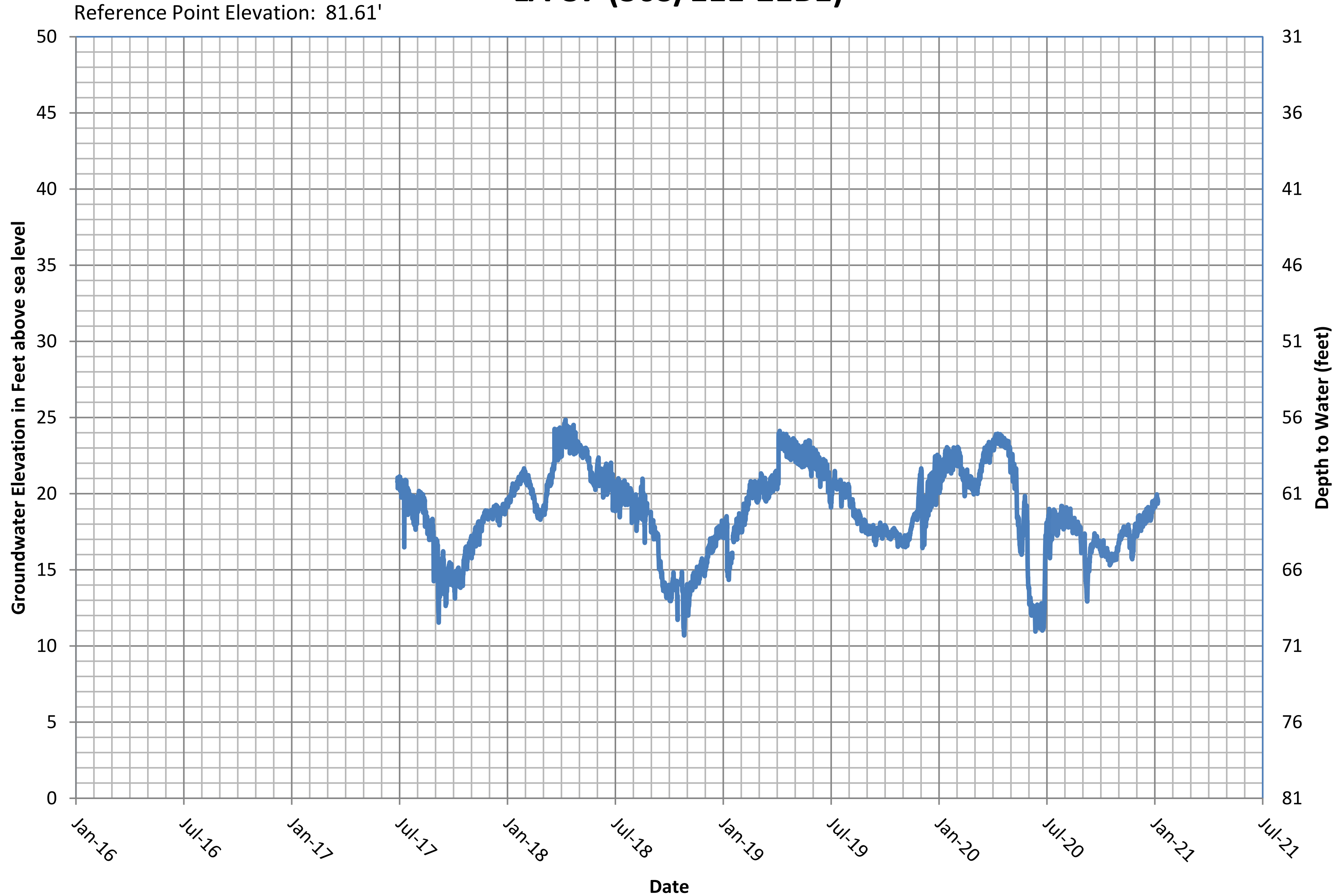
Hydrograph
UA-10 (30S/11E-18H1)





Hydrograph
LA-13 (30S/11E-18F2)
Reference Point Elevation: 100'
Groundwater Elevation in Feet above sea level
Depth to Water (feet)
Date
20
15
10
5
0
-5
-10
-15
-20
-25
-30
80
85
90
95
100
105
110
115
120
125
130
Jan-16
Jul-16
Jan-17
Jul-17
Jan-18
Jul-18
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21

Hydrograph
LA-37 (30S/11E-21B1)



APPENDIX J

Historical Water Quality for Lower Aquifer Wells

Water Quality Results - Lower Aquifer Monitoring

Station ID	Well Name	Basin Plan Well ID	Aquifer Zone	Date	HCO3 mg/l	Total Hardness mg/l	Cond umhos/cm	pH	TDS mg/l	Cl mg/l	NO3-N mg/l	SO4 mg/l	Ca mg/l	Mg mg/l	K mg/l	Na mg/l
30S/10E-11A2	Sand Spit #1 East	LA2	D	3/14/2005	180	4600	16000	7.3	8900	5400	ND	430	770	640	20	1300
				10/21/2015	150	6640	17700	7.4	13100	6300	ND	740	1030	990	31	1560
				11/5/2020	220	6700	18000	7.7	15300	5890	ND	777	1140	936	38	1560
30S/10E-12J1	MBO5 DWR Obs.	LA11	E	2/14/2005	350	370	1300	8.1	840	77	ND	190	51	58	6.1	110
				11/20/2009	300	360	1150	7.5	732	83	ND	190	51	58	4.4	95
				7/24/2014	360	489	1290	7.7	780	105	ND	212	69	77	5	88
				4/22/2015	360	475	1290	7.8	810	112	ND	189	65	76	5	88
				10/1/2015	250	486	1280	7.3	840	117	ND	188	68	77	4	85
				4/20/2016	330	524	1370	n/a	840	151	ND	193	73	40	5	83
				10/10/2016	350	497	1370	7.1	930	173	ND	189	69	79	4	81
				4/11/2017	350	541	1380	7.5	880	167	ND	186	75	86	4	81
				10/4/2017	300	543	1370	7	850	162	ND	191	76	86	5	90
				4/10/2018	350	595	1390	7.6	820	173	ND	192	85	93	5	97
				10/2/2018	350	497	1340	7.4	870	160	ND	160	69	79	3	87
				4/9/2019	350	539	1430	7.4	860	196	ND	189	76	85	4	85
				10/2/2019	250	290	1520	7.6	1000	187	ND	189	80	90	5	91
				4/14/2020	350	667	1580	7	950	222	ND	187	81	113	5	83
				10/1/2020	350	763	1650	7.1	1040	242	ND	183	85	134	5	88
30S/10E-13Bb	Lupine Zone D	LA41	D	11/7/2019	210	312	1310	7.7	760	136	3.1	188	69	34	4	140
				4/8/2020	310	204	943	7.1	560	68	0.3	109	44	23	2	101
				10/8/2020	340	263	920	7.1	490	52	0.1	89.4	51	33	2	72
30S/10E-13Ba	Lupine Zone E	LA40	E	11/6/2019	210	2090	5330	7	4750	1460	1.3	224	388	272	6	182
				4/7/2020	240	3300	7360	7.6	6340	2190	0.3	202	569	458	7	203
				10/7/2020	270	4100	8220	6.9	7930	2220	ND	192	720	560	8	217
30S/10E-13J1* Highlighted chloride values have been adjusted for wellbore leakage	GSWC Rosina	LA10	D,E	12/20/2004	72	230	720	7.1	410	150	1.6	14	38	33	1.4	29
				1/14/2010	35	260	778	6	435	200	1.6	13	41	38	1.5	33
				7/24/2014	80	418	1200	7.3	910	303	1.7	16	67	61	2	39
				4/22/2015	80	431	1230	7.1	750	331	1.9	20	69	63	2	39
				10/5/2015	70	460	1280	7	950	329	1.7	19	74	67	2	41
				4/26/2016	80	412	1170	7.1	840	299	1.8	18	66	60	2	37
				10/12/2016	60	509	1430	6.8	1100	389	1.8	26.7	82	74	2	44
				4/10/2017	80	327	957	6.9	720	300	2.6	14.7	52	48	2	35
				10/12/2017	80	245	702	6.9	510	220	3.4	12.5	39	36	2	33
				4/24/2018	70	188	620	7.4	400	190	4.3	12.3	29	28	1	29
				10/9/2018	70	265	730	7.1	450	210	3.2	12.7	42	39	2	34
				4/15/2019	80	251	744	7	600	174	1.9	10.4	38	38	2	31
				10/14/2019	80	332	961	7.1	830	229	2	12.7	54	48	1	33
				4/21/2020	80	353	1310	6.4	970	250	2.1	14.2	59	50	2	32
				10/7/2020	70	183	618	7.6	430	310	4.6	11.3	29	27	1	33

Water Quality Results - Lower Aquifer Monitoring

Station ID	Well Name	Basin Plan Well ID	Aquifer Zone	Date	HCO3	Total Hardness	Cond	pH	TDS	Cl	NO3-N	SO4	Ca	Mg	K	Na
					mg/l	mg/l	umhos/cm		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
30S/10E-13M2	Howard East	LA31	C,D	11/22/2004	51	810	2900	7.3	1500	810	0.5	140	60	120	4.7	210
				12/9/2009	55	1100	3740	7.1	2170	1100	0.5	220	160	160	4.8	370
				8/4/2014	60	757	3340	7.1	2450	990	0.6	178	117	113	5	382
				4/21/2015	60	739	3430	7.3	1930	950	0.6	178	117	113	5	382
				10/6/2015	30	756	3370	7.1	2140	960	0.5	185	115	114	5	342
				4/20/2016	50	726	3520	7.2	2190	941	0.7	179	113	108	5	400
				10/19/2016	70	722	3420	7.4	2190	943	0.6	182	113	107	4	398
				4/17/2017	60	733	3380	6.8	2060	907	0.6	178	114	109	4	413
				10/5/2017	60	738	3350	7.5	2190	960	0.7	160	116	109	5	411
				4/24/2018	70	664	3370	7.2	2020	946	0.6	2.8	103	99	4	367
				10/17/2018	60	740	3400	7.3	2180	834	0.6	153	115	110	5	414
				4/3/2019	70	640	3290	7.8	2010	940	0.6	179	103	93	4	341
				10/3/2019	70	574	3120	7.4	2120	827	0.7	169	90	85	4	340
				4/9/2020	70	519	2970	7.8	1740	738	0.6	152	86	74	4	258
				10/1/2020	70	774	3330	8	2080	**844**	0.7	169	94	131	5	495
30S/10E-13N	S&T #5	LA8	D	11/23/2004	42	80	390	6.9	200	67	5.9	9.2	13	12	1.7	38
				11/19/2009	41	89	386	6.8	267	73	6.1	11	15	13	1.4	38
				7/24/2014	50	100	438	7.4	270	76	7	10	17	14	2	38
				4/21/2015	50	98	445	6.9	280	77	7.7	11	16	14	2	38
				10/6/2015	40	98	422	7.2	310	75	6.8	10	16	14	1	38
				4/20/2016	20	97.5	446	7	320	76	7.2	12	16	14	1	38
				10/13/2016	50	104	470	8	320	79	7.2	12	17	15	1	40
				4/11/2017	50	100	434	7.4	270	77	7.3	12.4	17	14	1	38
				10/2/2017	30	95	438	7.2	290	78	7.6	13.2	15	14	1	36
				4/11/2018	60	104	440	7	260	79	7.9	13.5	17	15	1	39
				10/3/2018	60	107	430	6.5	340	66	6.7	12.9	18	15	2	40
				4/3/2019	50	100	434	6.3	250	75	7.3	12.7	17	14	1	36
				10/7/2019	60	95	446	7.6	250	77	7.7	14.4	15	14	1	37
				4/13/2020	60	104	443	8	300	75	7.4	14.5	17	15	2	37
				10/1/2020	60	108	464	7.9	300	**76**	7.5	14.4	17	16	1	40
30S/10E-14B2	Sand Spit #3 Deep	LA3	D	3/15/2005	100	3600	30000	8	17000	8500	ND	960	1200	130	34	4300
				10/21/2015	ND	7140	29500	11	24700	10000	ND	530	2830	20	80	4040
30S/10E-24C1	GSWC Cabrillo	LA9	D	12/20/2004	64	130	610	7	310	110	4.5	19	22	19	1.6	50
				11/20/2009	60	150	611	7.1	347	130	4.1	22	23	22	1.6	52
				7/24/2014	40	69	339	7.6	240	46	8.4	6	11	10	1	32
				4/22/2015	70	117	530	7.3	320	95	5.5	16	19	17	2	45
				10/5/2015	50	75	349	7.6	270	50	7.6	7	12	11	1	34
				4/26/2016	70	115	499	7	300	90	5.6	16	18	17	2	44
				10/12/2016	70	111	506	7.1	320	93	5.5	15.1	18	16	1	44
				4/10/2017	70	111	490	7	310	89	5.7	15.9	18	16	1	43
				10/12/2017	70	117	484	7	270	89	6	16.3	19	17	2	46
				4/24/2018	70	115	486	7.8	300	90	6.2	16.7	18	17	1	43
				10/9/2018	60	135	477	6.9	280	76	5.8	17.2	21	20	2	50
				4/15/2019	70	112	488	7.1	310	92	5.7	15.6	17	17	2	45
				10/14/2019	no sample (off-line)											
				4/21/2020	300	75.2	674	6.71	370	37	0.2	28.4	3	35	2	42
				10/7/2020	60	102	460	7.4	270	**75**	6.6	13.1	16	15	1	40

Water Quality Results - Lower Aquifer Monitoring

Station ID	Well Name	Basin Plan Well ID	Aquifer Zone	Date	HCO3	Total Hardness	Cond	pH	TDS	Cl	NO3-N	SO4	Ca	Mg	K	Na
					mg/l	mg/l	umhos/cm		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
30S/11E-7Q3	LOCSD 8th St.	LA12	D	11/18/2004	250	270	790	7.5	410	73	ND	39	44	40	2.3	48
				11/19/2009	220	290	782	7.4	465	92	ND	46	46	42	1.9	53
				7/23/2014	290	303	876	7.6	460	91	ND	43	49	44	2	54
				4/21/2015	290	305	897	7.7	500	101	ND	55	48	45	2	59
				10/6/2015	280	298	828	7.4	490	91	ND	46	47	44	2	55
				4/20/2016	190	307	907	7.7	520	91	ND	49	49	45	2	54
				10/11/2016	280	278	827	4.9	490	93	ND	46.2	44	41	2	52
				4/10/2017	300	294	839	7.3	480	91	ND	49.5	47	43	2	54
				10/4/2017	220	305	826	6.5	470	92	ND	45	48	45	2	56
				4/10/2018	300	319	814	7.7	440	93	ND	46.2	52	46	2	56
				10/2/2018	290	283	822	7.3	470	78	ND	50.1	46	41	1	53
				4/9/2019	300	301	844	7.5	480	94	ND	49.7	48	44	2	53
				10/2/2019	290	312	877	8	530	91	ND	50.9	49	46	2	56
				4/16/2020	310	301	883	7.8	500	94	ND	54.7	48	44	2	52
				10/5/2020	300	321	891	7.9	510	89	ND	49.6	51	47	2	57
30S/11E-17E8	So. Bay Obs. Middle	LA22	D	1/14/2005	150	150	440	7.5	290	34	2.2	11	24	22	1.4	28
				11/20/2009	120	160	455	7.3	255	42	4.3	12	25	23	1.3	29
				7/23/2014	150	166	500	7.6	270	43	6.3	10	27	24	2	28
				4/21/2015	150	157	481	7.6	270	49	7.1	13	25	23	1	28
				10/1/2015	120	164	475	7.4	290	44	6.6	10	26	24	1	28
				4/19/2016	150	164	476	6.9	290	45	6.9	12	26	24	1	29
				10/13/2016	140	161	521	7.3	290	46	6.9	11.9	25	24	1	29
				4/13/2017	150	164	466	7.3	300	46	6.7	13.2	26	24	1	29
				10/11/2017	150	168	476	7.7	260	47	7.2	14	26	25	1	29
				4/16/2018	150	165	473	6.4	310	47	6.7	14.2	25	25	1	29
				10/10/2018	150	160	471	7.5	250	43	6.1	15	26	23	1	28
				4/10/2019	180	153	466	7.2	290	46	5.8	13.6	25	22	1	28
				10/9/2019	150	155	485	7.3	270	49	7	14.9	24	23	1	28
				4/14/2020	160	164	482	8	280	48	6.3	14.9	26	24	1	27
				10/6/2020	160	181	506	7.5	340	47	6.7	14.7	28	27	1	30
30S/11E-17N10	GSWC So. Bay #1	LA20	C,D,E	Jan 2003	250	--	510	7.1	290	37	ND	21	41	25	1.3	35
				11/20/2009	230	220	638	7.3	357	41	0.5	30	35	33	1.7	37
				7/24/2014	280	232	646	7.7	370	37	0.5	24	37	34	2	41
				4/22/2015	290	234	653	7.4	360	43	0.6	27	36	35	2	42
				10/5/2015	280	227	614	7.2	370	38	0.5	23	35	34	2	41
				4/26/2016	230	227	629	7.1	360	39	0.6	27	35	34	2	40
				10/12/2016	290	221	631	7	370	40	0.6	25.2	34	33	2	40
				4/10/2017	280	227	624	7.2	380	39	0.6	26.7	35	34	2	40
				10/12/2017	260	240	583	6.6	320	41	0.7	27.9	37	36	2	43
				4/24/2018	200	166	515	7.4	330	43	3.2	23.2	27	24	2	31
				10/9/2018	290	273	632	7.2	340	38	0.6	29.2	42	41	3	47
				4/15/2019	200	181	559	7.4	310	42	3.1	21.7	28	27	2	34
				10/14/2019	290	221	626	7.2	380	41	0.7	29	34	33	2	40
				4/21/2020	300	230	705	7	400	50	0.7	26.9	36	34	2	42
				10/7/2020	290	227	654	7.5	350	40	0.7	27	35	34	2	42

Water Quality Results - Lower Aquifer Monitoring

Station ID	Well Name	Basin Plan Well ID	Aquifer Zone	Date	HCO3	Total Hardness	Cond	pH	TDS	Cl	NO3-N	SO4	Ca	Mg	K	Na
					mg/l	mg/l	umhos/cm		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
30S/11E-18K8	10th St. Obs. East (Deep)	LA18	E	1/19/2005	260	290	650	7.5	370	33	ND	38	62	33	2.5	28
				11/20/2009	230	220	620	7.5	378	32	ND	40	51	24	1.8	23
				7/24/2014	290	271	647	7.5	380	28	ND	34	56	32	2	27
				4/21/2015	290	265	634	7.7	400	33	ND	39	55	31	2	27
				10/19/2015	230	256	621	7.3	370	29	ND	33	53	30	2	26
				4/20/2016	190	265	700	7.5	390	31	ND	38	55	31	2	26
				10/18/2016	290	256	615	6.8	370	31	ND	35.9	53	30	2	26
				4/12/2017	290	274	616	7.5	450	31	ND	38	57	32	2	27
				10/10/2017	220	271	619	7.8	350	30	ND	35.5	56	32	2	27
				4/17/2018	290	260	625	7.3	390	33	ND	39.9	53	31	2	27
				10/10/2018	290	254	608	7.5	360	31	ND	39.8	54	29	2	26
				4/10/2019	290	245	620	7.6	380	32	ND	37.4	52	28	2	25
				10/9/2019	290	253	647	7.9	390	33	ND	40.5	52	30	2	26
				4/14/2020	290	269	629	7.5	400	33	ND	40.2	55	32	2	26
				10/22/2020	300	247	669	7.5	370	**32**	ND	38.2	51	29	3	26
30S/11E-18K9	LOCSD 10th St.	LA32	C,D	May 2002	250	--	550	6.9	320	37	0.2	26	31	32	--	39
				11/20/2009	180	160	539	7.2	307	36	1	27	27	24	1.3	32
				7/23/2014	220	190	546	7.7	300	32	1	20	30	28	1	35
				4/21/2015	190	108	504	7.6	270	38	1.6	20	17	16	1	27
				10/6/2015	50	62	248	7.2	190	31	5.9	3	10	9	ND	21
				4/20/2016	130	121	382	7.5	220	32	3.3	12	19	18	1	27
				10/11/2016	200	168	511	6.6	270	36	1.2	21.5	26	25	1	34
				4/10/2017	190	155	461	7.3	270	35	1.9	19.1	24	23	1	31
				10/9/2017	200	168	493	7.6	270	36	1.4	23.1	26	25	1	33
				4/10/2018	50	75.2	256	7.7	150	35	6.5	28.6	12	11	ND	23
				10/2/2018	210	168	492	7.3	270	36	1.3	22	26	25	ND	33
				4/9/2019	200	172	474	7.6	270	34	1.6	21.5	26	26	1	33
				10/2/2019	200	185	531	7.4	310	36	1.4	24.7	28	28	1	35
				4/16/2020	60	72.7	272	8.1	190	35	6	5.4	11	11	ND	20
				10/6/2020	60	68.6	246	8	180	**30**	4	4.9	11	10	ND	21
30S/11E-18K	GSWC Los Olivos #5	LA39	D	4/15/2019	290	230	619	8.1	350	38	ND	27.4	33	36	2	41
				10/14/2019	300	225	628	7.2	370	37	ND	28.6	34	34	1	41
				4/21/2020	300	236	674	6.9	370	37	0.2	28.4	37	35	2	42
				10/7/2020	300	227	657	7.4	360	**37**	ND	28.2	35	34	2	43

Water Quality Results - Lower Aquifer Monitoring

Station ID	Well Name	Basin Plan Well ID	Aquifer Zone	Date	HCO3	Total Hardness	Cond	pH	TDS	Cl	NO3-N	SO4	Ca	Mg	K	Na
					mg/l	mg/l	umhos/cm		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
30S/11E-18K	GSWC Los Olivos #5	LA39	D	4/15/2019	290	230	619	8.1	350	38	ND	27.4	33	36	2	41
				10/14/2019	300	225	628	7.2	370	37	ND	28.6	34	34	1	41
				4/21/2020	300	236	674	6.9	370	37	0.2	28.4	37	35	2	42
				10/7/2020	300	227	657	7.4	360	**37**	ND	28.2	35	34	2	43
30S/11E-18L2**	LOCSD Palisades	LA15	D,E	11/18/2004	220	330	880	7.3	420	120	ND	31	54	48	2.2	40
				11/19/2009	200	590	1460	7.2	890	360	0.4	39	94	86	2	44
			D	7/23/2014	250	293	783	7.8	390	90	0.4	26	48	42	2	40
				4/29/2015	80	78	348	7.4	230	43	5	10	13	11	ND	30
				10/28/2015	230	288	782	7.4	420	104	0.6	29	46	42	ND	36
				4/27/2016	230	264	796	7.3	450	93	0.9	28	43	38	2	43
				10/11/2016	200	221	694	7	380	91	1.7	25.5	36	32	1	35
				10/5/2017	180	306	768	7.6	400	102	0.7	27	50	44	2	40
				4/10/2018	250	311	767	7.3	420	100	0.8	32.4	52	44	2	40
				10/23/2018	250	288	772	7.7	440	83	0.6	30.7	48	41	1	38
				4/9/2019	250	301	774	7.4	460	102	0.8	29.2	48	44	1	38
				11/14/2019	210	303	806	7.8	430	107	0.7	32.9	49	44	2	39
				4/16/2020	260	299	832	7.7	460	109	0.8	32.5	49	43	2	37
				10/5/2020	250	319	841	7.8	450	**109**	0.7	29.7	52	46	2	41

ND = Not Detected

Chloride Metric Wells in Green (13J1 weighted x2); **current chloride concentrations in red**

*Chloride concentrations at 13J1 can vary seasonally by 100+ mg/l and are affected by well production and borehole leakage, so fluctuations are expected.

**Water from 18L2 affected by wellbore leakage/upper aquifer influence when inactive

Legend and Detection Limits

Constituent	Description	Practical Quantitation Limit*
HCO3	Bicarbonate Alkalinity in mg/L CaCO3	10.0
Total Hardness	Total Hardness in mg/L CaCO3	--
Cond	Electrical Conductance in µmhos/cm	1.0
pH	pH in pH units	--
TDS	Total Dissolved Solids in mg/L	20.0
Cl	Chloride concentration in mg/L	1.0
NO3-N	Nitrate as Nitrogen concentration in mg/L	0.1
SO4	Sulfate concentration in mg/L	2.0
Ca	Calcium concentration in mg/L	1.0
Mg	Magnesium concentration in mg/L	1.0
K	Potassium concentration in mg/L	1.0
Na	Sodium concentration in mg/L	1.0

*where dilution not required

APPENDIX K

Groundwater Storage Calculation Example

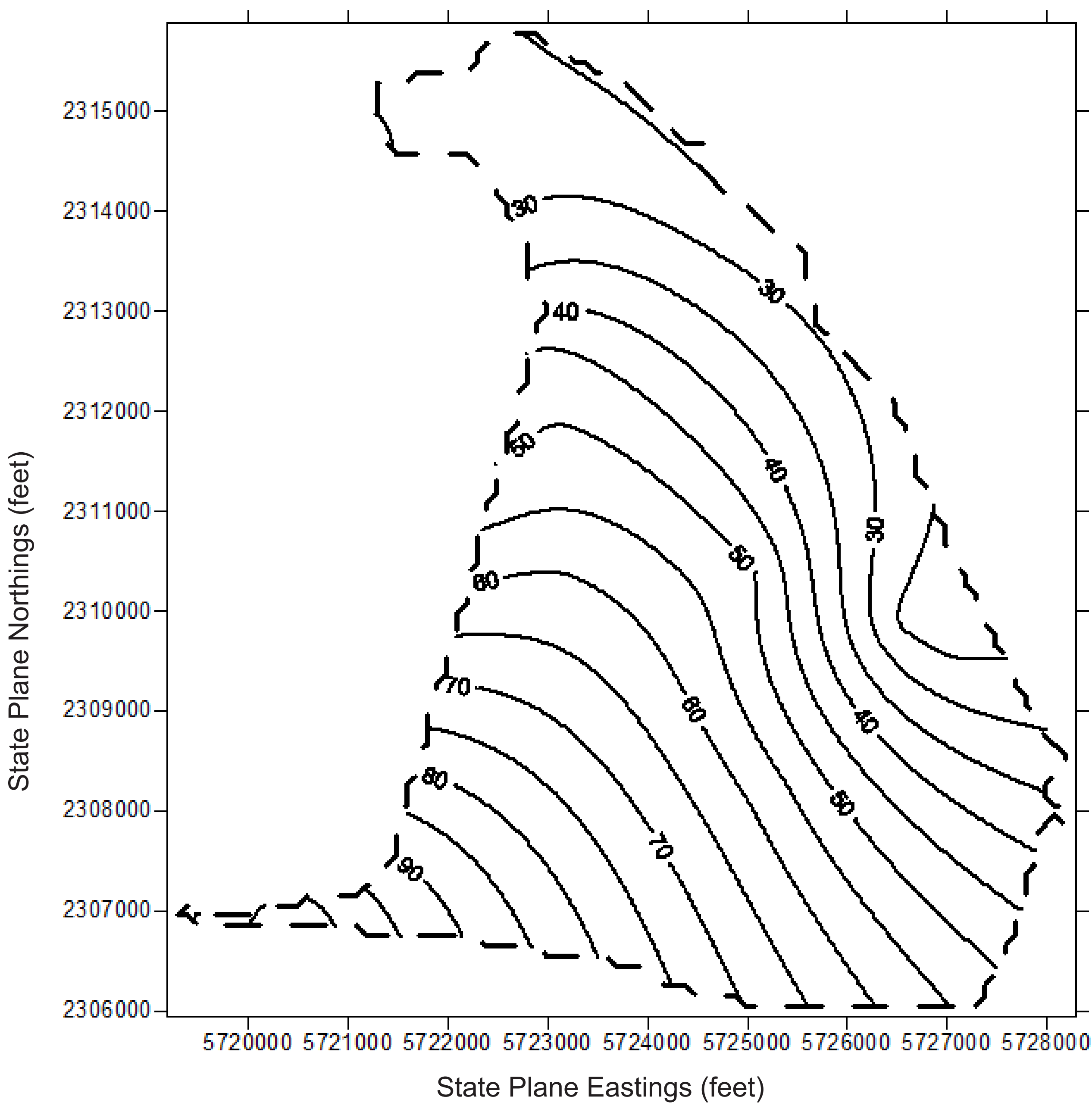
WELLS USED FOR GROUNDWATER ELEVATION CONTOURS
2020 GROUNDWATER STORAGE CALCULATIONS

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	UA18	UA18	LA14	LA14
FW18	FW18	FW2	FW2	LA15	LA15
FW19	FW19	FW3	FW3	LA16	LA16
FW20	FW21	FW4	FW4	LA18	LA18
FW21	FW22	FW5	FW5	LA19	LA19
FW22	FW23	FW6	FW6	LA20	LA20
FW23	FW24	FW8	FW8	LA21	LA21
FW24	FW26	FW9	FW9	LA24	LA24
FW26	FW27	FW10	FW10	LA25	LA25
FW27	FW28	FW11	FW11	LA26	LA26
FW28	FW30	FW12	FW12	LA27	LA27
FW30	FW31	FW15	FW15	LA29	LA29
FW31	FW32	FW24	FW24	LA30	LA30
FW32	FW33	FW26	FW26	LA33	LA33
FW33	LA34	FW27	FW27	LA34	LA34
LA34	LA35	FW32	FW32	LA35	LA35
LA35	LA37	FW33	FW33	LA37	LA37
LA37	LA38	LA34	LA34	LA38	LA38
LA38		LA35	LA35	LA39	LA39
		LA37	LA37	LA41	LA41
		LA38	LA38	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:

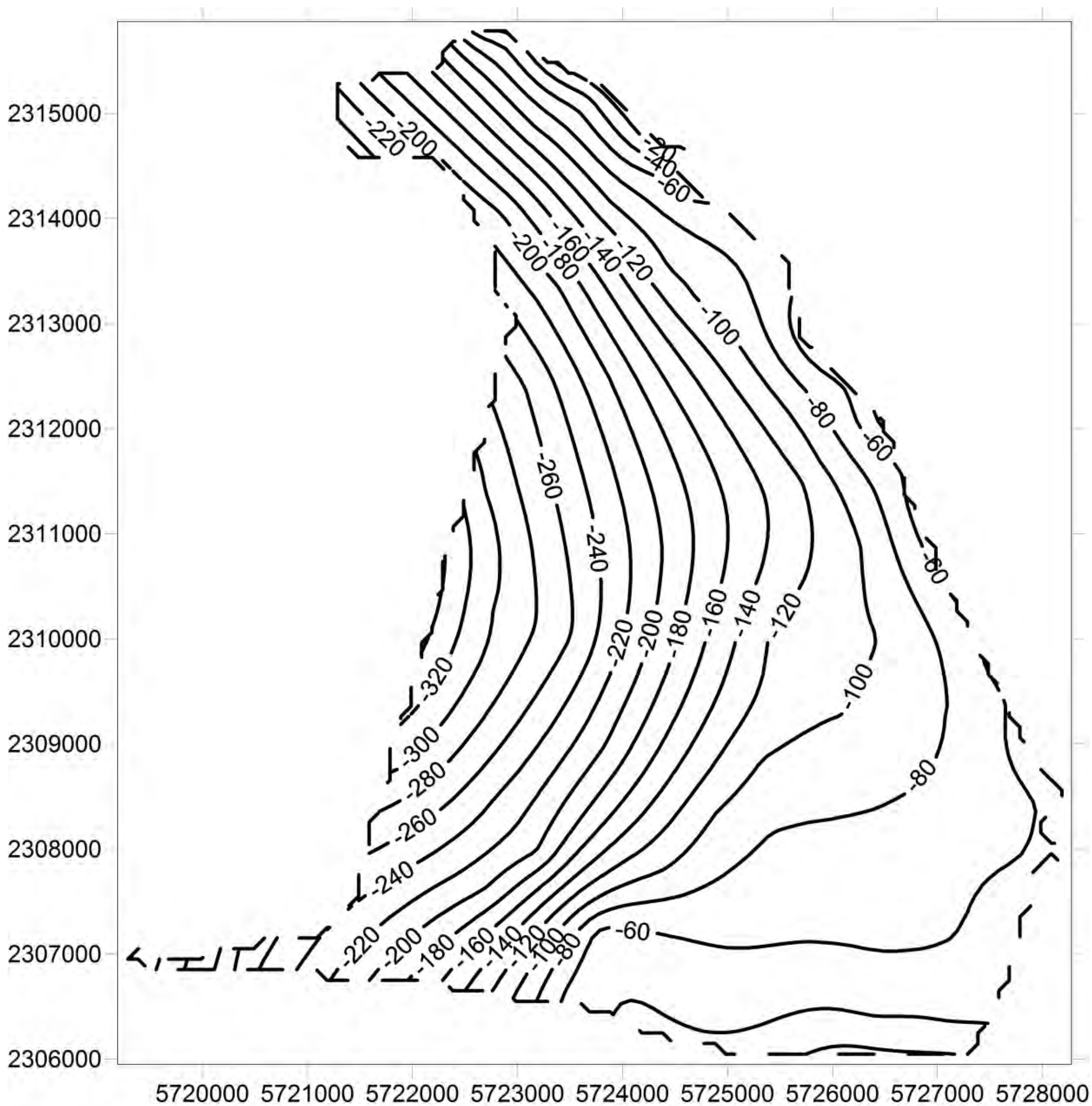
STEP 1: GRID AND TRIM WATER LEVEL CONTOURS



Spring 2020
Eastern Area Water Levels
Alluvial Aquifer and Lower Aquifer

EXAMPLE STORAGE CALCULATION FOR EASTERN AREA:

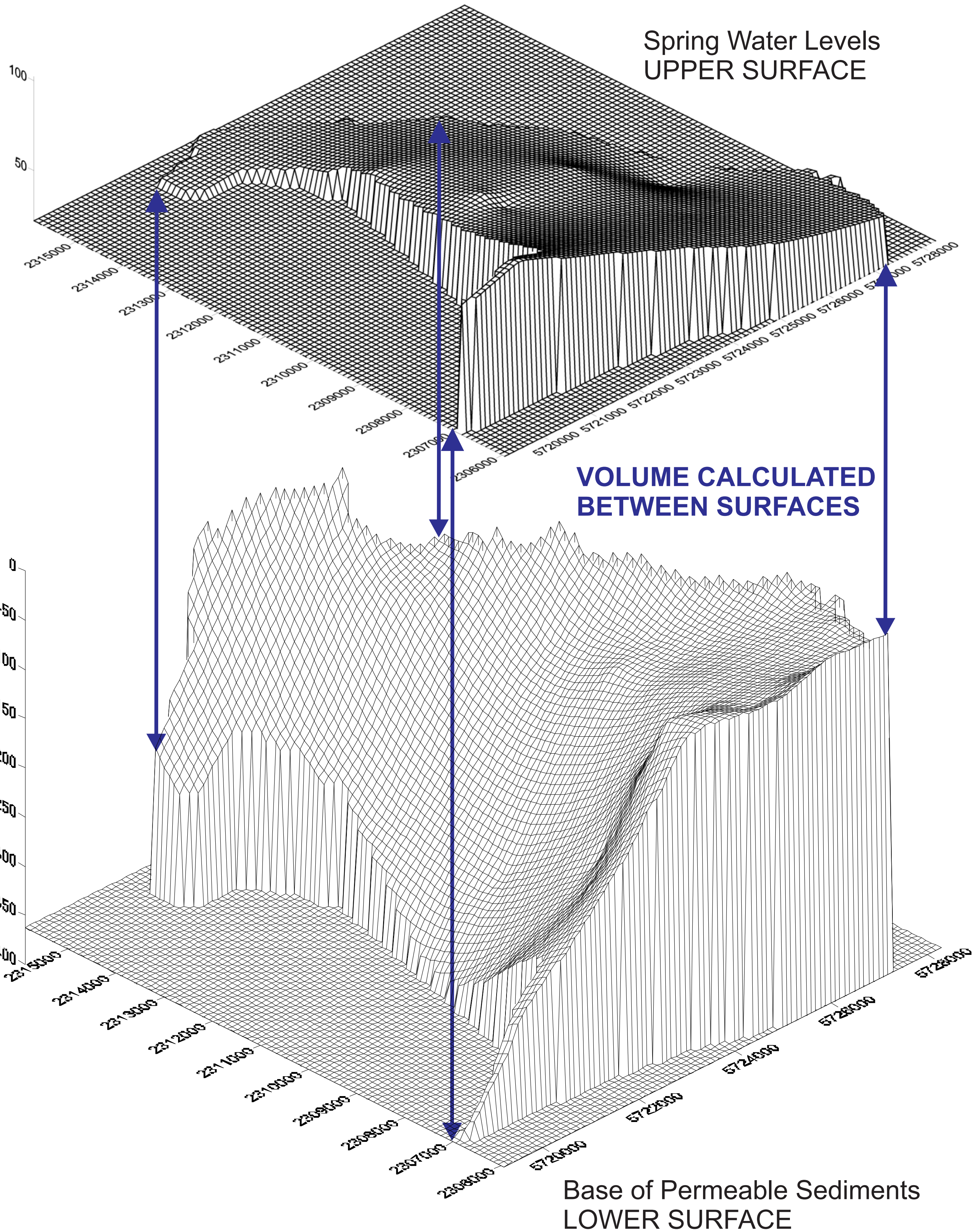
STEP 2: GRID AND TRIM BASE OF PERMEABLE SEDIMENTS



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 Mar 25 10:51:15 2021

Upper Surface

Grid File Name:	C:\Users\andre\Desktop\Projects\Los Osos BMC\2020\BMC 2020 Annual Report\Working Data - REPORT\Contouring and Storage\BLANKED FILES\EASTERN\UpperEasternSpring2020_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:	22.313779877636
Z Maximum:	103.09197745274

Lower Surface

Grid File Name:	C:\Users\andre\Desktop\Projects\Los Osos BMC\2020\BMC 2020 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

EXAMPLE STORAGE CALCULATION FOR EASTERN AREA:

STEP 5: CALCULATE GROUNDWATER IN STORAGE

Volumes

Z Scale Factor: 1

Total Volumes by:

Trapezoidal Rule:	8386671881.32
Simpson's Rule:	8382294091.8341
Simpson's 3/8 Rule:	8378605370.1388

Cut & Fill Volumes

Positive Volume [Cut]:	8386671881.32
Negative Volume [Fill]:	0
Net Volume [Cut-Fill]:	8386671881.32

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]:	41785010.174032
Negative Surface Area [Fill]:	0

STORAGE CALCULATION

Positive Volume: 8,386,671,881.32 ft^3 * 0.101 specific yield ÷ 43,560 acre-feet per ft^3 = 19,445 acre-feet

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TO: Daniel Heimel; Executive Director, BMC
Copies: BMC Staff, S&T Board

FROM: Charlie Cote; Operations at S&T MWC
DATE: 18May2021

SUBJECT: BMC annual report: comments and suggested edits

Description and Status of Revision	Revision by	Rev	Date
First draft	Cote	A	18May2021

Dan,
The following table contains my comments and requested edits from my study of the draft 2020 Annual Report. I have tried to edit my comments to remove bad "tone of voice" problems. Thank you (and thanks to Spencer Harris) for all the effort that goes into making this report.

The Los Osos Basin is a large and complicated system. The BMC management plan often treats the basin as a bulk system, but there are special important issues affecting smaller specific areas within the basin. I continue to be a little frustrated that the S&T water supply has existential problems which do not get the attention of the BMC basin management measurements and projects. You will see that a lot of my comments and suggested edits involve these issues.

Thank you for your comments. CHG's response is in blue following your comments or suggested edit.

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Section / Page	Pdf page	Comment or suggestion for edit
1	6	In table ES-1 I would like to see an additional footnote after "Total Estimated Production". This footnote would say something like, "These production figures represent estimated production from non-metered wells. The estimation methods are part of the Adjudicated Judgement and are described in Section 4 and 7.5 of the Los Osos Basin Plan document. Yes, will add footnote/clarification
2 of 16	234	Appendix H is missing the rainfall amounts for the 2019 rain season. I have placed that data here which I gleaned from station #727. The data is not included on the pdf handouts, but it can be gleaned from the search feature. Is it true that you don't need this data because of the 16" / year assumption used in the Basin model? **As noted on cover page of Appendix H, the data for station #727 was obtained from the website (same as you did), since the formal records are not yet published. The 2020 daily precipitation data has been added to the appendix and we will check again for the formal County summary prior to final. Individual**

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		annual precipitation data not used in model - model assumes 17.5 inches/year steady-state.

Rain year data from Station # 727

	2019-2020	2020-2021
June	0.04	0.00
July	0.04	0.04
August	0.00	0.00
Sept.	0.00	0.00
Oct	2.13	0.47
Nov	4.37	2.01
Dec	0.20	9.93
Jan	0.04	0.20
Feb	5.00	1.26
Mar	1.89	0.00
Apr	0.12	0.04
Jun	0.04	NA
Totals	13.87	TBD

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Section / Page	Pdf page	Comment or suggestion for edit
41	46	Please mention that the BMC computer model of the basin is a static model which uses a 16"/year rainfall year regardless of the actual rainfall that occurred. The Basin model uses 17.5 inches for sustainable yield scenarios. Long-term yield does not disregard actual rainfall that occurred, but is based on long-term average annual rainfall. **As shown in the cumulative departure from mean rainfall graph (Figure 8), the climate has been mostly dry since 2006 (a cumulative drop of 40 inches from average, or 2.9 inched per year). Station #727 (Los Osos Landfill) records begin in 2006, so the long-term average at that station (currently at 16.1 inches) could be closer to 18.5 inches, based on the record at Morro Bay. We assume 17.5 inches in the model, which is reasonable and was developed as part of the USEPA climate resiliency evaluation, but we can revisit that.**

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		I suggest that the BMC formally vote to change this practice and use the actual rainfall year figures from Station 727.
Fig 8	47	The chart of rainfall at the bottom of Fig 8 demonstrates why it is more accurate to use the Median (expected) value for rainfall instead of the average. In that plot, where the average rainfall was 16.1″/year there were 22 times during the 60 year period when rainfall exceeded 16″ and 32 times when rainfall was less than 16″. **You get more recharge with greater rainfall, so average is okay to use.**

Section / Page	Pdf page	Comment or suggestion for edit
84	89	Section 10.3.5: Is the increasing nitrate pollution of lower aquifer wells, by septic effluent, a proper consideration of the wellhead protection program? At least 7 community water wells are subjected to increasing nitrate from septic pollution which will eventually end their usefulness as community water sources (LA5, LA8, LA9, LA22, 17E11, LA15, and LA10).

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		Yes, to the extent that abandoned or improperly destroyed wells within the protection zones for a well source can decrease the Physical Barrier Effectiveness for that source (refer to the Drinking Water Source Assessment and Protection program).
5 and 85	10 and 90	Why has the S&T intertie with GSW project been removed from the Program A project list. S&T desperately needs to complete a system intertie as soon as it can generate the funds to complete the project. Please add this project back to the matrix and the focus of the BMC. **BMC to consider**
76	81	In the second bullet point, please change, "…totaled 2,010…" to "…totaled an estimated 2,010…" It continues to appear that the BMC is using words which imply an exact nature of its estimation of basin production. **Edit made.**
76	81	Please consider renaming the "Nitrate Metric" to the "Upper Aquifer Nitrate Metric" of "First Water Nitrate Metric" to avoid confusion with issues related to the destruction of 7 community wells in the lower aquifer by septic pollution (LA5, LA8, LA9, LA22, 17E11, LA15, and LA10).

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		First Water Nitrate Metric would be correct, but we don't add qualifiers to the other metrics so no change is made at this time for consistency.
77	82	Please recommend a BMC project for tracking and remediating septic pollution of lower aquifer community water sources. **BMC to consider**
69	74	Re-evaluations (redesign) of basin metrics and methods which constitute parts of the adjudicated agreement, must only be done with the unanimous approval of the BMC board.

Section / Page	Pdf page	Comment or suggestion for edit

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71	76	The statements in the last paragraph of this page demonstrate that CHG and the BMC in general are ignoring the destruction of important lower aquifer water sources by septic nitrate pollution. Please remove the statement, "Independent of LOBP actions, construction and operation of the community sewer system and LOWRF have largely stopped nitrate loading in the Basin from septic disposal within the wastewater service area." And replace it with an acknowledgement that reflects that we care about the (at least) 7 community water sources that are continuing to be destroyed by septic pollution (LA5, LA8, LA9, LA22, 17E11, LA15, and LA10). **The statement that nitrate loading to the basin has been largely stopped is correct, but text has been added to acknowledge the continued movement of nitrate within the basin.**

CHG responses to LOSG comments on 2020 Draft annual report.

Thank you for the substantial effort put forth by LOSG in reviewing the Draft 2020 Annual Report. Several edits and clarifications have been made in the Annual Report based on the comments received, while other requested revisions are addressed below or will need to be considered for future Annual Reports. Responses to recommended revisions are provided below in italics.

LOSG Recommended Revisions for the 2020 Draft Annual Monitoring Report

1. **Page 2—**Under "Basin Status," revise the Water Level Metric value from 1.8' "Pending" to indicate a review and evaluation of the sustainable yield is pending (also see #38 below).

   The 2020 water level metric is correct (1.8 feet). San Luis Obispo County raised the wellhead at LA3 by 4.42 feet, and the updated RP elevation will be reflected in Table 5 of the 2021 report. All the calculations and contours use the correct elevation.

2. **Page 2—**Under "Basin Status," revise the "Basin Yield Metric" statement to "Pending" to indicate a review and evaluation of the sustainable yield is pending (also see #38 below).

   Current value based on establish methodology – pending update mentioned but any changes in methodology would be reflected in 2021 Annual Report.

3. **Page 2—**Under "Basin Status" (the paragraph after the list of topics in bold) revise the recommendation to update the "Maximum Sustainable Yield" removing the clause in the last sentence "…now that the location of the second Program C expansion well has been selected." The well is not installed and the potential production of the well has not been confirmed by data

   Disagree, the Maximum Sustainable Yield is estimated with all potential LOBP projects implemented and is used for the Basin Development Metric.

4. **Page 3—**On Table ES-2, remove the Basin Yield Metric value of "73" and add the word "Pending" (see #2 and #38). Also, revise the Water Level Metric value to 0.9' (see #40 below).

   BYM of 73 based on established methodology, and any changes in methodology would be reflected in 2021 Annual Report. Water level metric is correct.

5. **Pages 3 & 4—**Update "Contingency Plan Development." Since one Program C project is complete and one is in progress, add contingency planning including

"detailed milestone schedules" to the list of recommendations on Page 77 of the Draft Report. Add programs to mitigate for impacts on private wells and sensitive habitat, e.g., near Willow Creek and Los Osos Creeks.

BMC to consider for future reporting

6. **Page 7**—Remove all statements indicating that programs have been deferred and add Infrastructure Program D back onto the "LOBP Infrastructure Programs" chart.

   BMC to consider for future reporting

7. **Page 11—**Add a paragraph to the Water Level Monitoring section explaining that a survey was done affecting water level data.

   Paragraph added.

8. **Page 15—**In the "Lower Aquifer" section, the reference to Zones D and E as "generalized aquifer zones" followed by a discussion of Zone D currently being the "main supply source" is confusing. Explain why these two "zones" are referred to as one aquifer rather than two, and how the designation supports effective Basin management.

   Expanding discussion to be considered for future reporting.

9. **Page 15—**Add a line explaining that seawater intrusion has not been stopped with the present level of program implementation according to existing data.

   Explanation added

10. **Page 16—**Show seawater intrusion on Figure 1.

    (Page reference refers to Figure 5). Disagree, intrusion front not needed here. The intrusion front is show for this basin section in Figure 19 and Figure 21

11. **Page 22—**Under "Elevation Datum" correct or clarify why the number of surveyed wells are listed as 20 but Appendix E includes 21 wells without showing data for LA3, which would make the number 22. The "RP Elevation and Datum" columns in Table 8 of the 2019 Annual Report and 2020 Draft Report indicate that the reference point was changed from 2019.

    LA40/41 was surveyed as one well, but then adjusted to each piezometer individually per the footnote (clarification added). LA3 was not surveyed, and the 2019 RP was correct (wellhead was raised in 2019) but update not carried forward - will correct in Table 5 (see response #1).

12. **Page 22—**Under “Elevation Datum,” include a recommendation for surveys of all County reference points by a licensed surveyor rather than only a recommendation for a review of documentation by the surveyor. Also, recommend that reference points for all private wells being used to monitor water levels are surveyed and have updated reference points.

    The original County survey was conducted by a licensed surveyor. Wells using the original survey data are private and may be sensitive to disturbance, so a review of available documentation by a surveyor is recommended to confirm a field survey is necessary for an update.

13. **Page 22**—Under “Elevation Datum,” explain why some of the elevation reference points vary so much from earlier estimated elevations (e.g., LA6 and LA28).

    Already explained – most of the elevations were at wells where no prior survey was performed.

14. **Pages 24-29**—In Tables 5 & 8, provide two more columns for water level data**—**one showing all water level data converted from NAVD 88 to NVGD 29 (or a value that coverts data to values for which “0” equal mean sea level) and one column showing all data as NAVD 88. This would allow stakeholders to more easily compare water levels at monitoring sites and recognize problem areas. Also identify datums for the private wells used.

    Will consider for future reporting.

15. **Page 30**—Under “Water Quality Results” explain why LA3 had “access issues” since it is a County well and publicly owned.

    Access is through State Parks, and there were delays in the permit.

16. **Pages 33**—On Tables 10 & 11, indicate in a footnote which well data were likely influenced by well bore leakage and, as a result, did not provide accurate chloride and TDS levels for the aquifer—i.e., LA8, LA9, LA10 (fall), LA22, & LA32. Explain in the discussion of the tables that actual chloride levels in the aquifers could be substantially higher.

    Only applicable to LA10 for Fall 2020 (footnote added). Wellbore leakage at LA8, LA9, and LA22 not shown to be significant compared to natural leakage through the regional aquitard (2019 TM), and chloride levels are representative. LA32 is partially screened in the Upper Aquifer, so wellbore leakage wouldn’t apply.

17. **Page 37**—Under “Geophysics” refer to an appendix that provides copies of the 2018 logs for LA4 and LA14 and add the appendix to the Draft Report. Note that the 2018 log for LA14 was not provided in the 2018 Annual Monitoring Report. Both logs should be provided each year.

Geophysics is scheduled for Fall 2021 and will be included in 2021 annual report. Both logs will be provided.

18. **Page 38—**On Table 14 add +/- signs behind each of the unmetered or partially metered groundwater production numbers to indicate uncertainty.

    That would be too busy. "Estimated" added to title. Uncertainty is discussed on the same page.

19. **Page 38—**Point out in the discussion of water use on Page 38 that purveyor water use is higher than it was when the LOBP was implemented in 2015 (1063 AFY vs. 1007 AFY) and that all of the 160 AFY of Basin-wide water use reduction has resulted from estimating reductions in Community and Agriculture water use categories. Further explain, that at this point, the LOBP and purveyor conservation programs, and the Title 19 program required by the County for new development, has resulted in no reduction in water use during the five years of BMC operation.

    Added paragraph to discuss general trends.

20. **Page 41—**The discussion of rainfall should point out that 15 years of "below average" rainfall has already, and will continue for some time to have, deleterious effects on Basin recharge and Basin sustainable yield relative to what is predicted by the model which assumes 17.5" of annual rainfall. The 15 years of lower rainfall warrant factoring the lower rainfall into planning. Recommend an update of the model and interim use of a 10 % reduction in the Basin Yield Metric Target of 80 (BYM 80) being factored into planning.

    Will consider for future reporting. Changes to Model assumptions for long-term rainfall can be discussed during sustainable yield methodology review.

21. **Page 44 and Figures 9 through 14—**On Figures 9-14, show contour lines as values for which "0" is equal to mean sea level, and identify wells with numbers rather than crosses (e.g., 11 for LA11), so that stakeholders can more easily evaluate seawater intrusion vulnerability and overall Basin conditions. Also, change the "Explanation," which states: "Ground water elevation contour in feet above sea level (NAVD 88 datum)." NAVD 88 values are apparently 2.8' below sea level (see footnote below Table 20 "The Water Level Metric" and last paragraph on Page 67). Looking at the current maps, stakeholders may now think the "0" and the "5" designations represent mean sea level and 5 feet above mean sea level, but they actually represent about -2.8' (2.8 feet below sea level) and about 2.2' above sea level respectively.

    Will consider for future reporting.

22. **Page 51 and Figures 11 and 14—**On Page 51 in the second paragraph or in a subsequent paragraph, point out that the present lower aquifer contour maps are generalizations with low resolution because they are based on very little data in some areas, e.g., about three data points in the northern Basin. As a result, they can be inaccurate within localized areas and even general areas depending on the number of data points in an area, and can fail to capture problem areas, e.g., very low water levels along the syncline (see area between the third and fourth contour lines from the bottom of Figure 14). Also, explain that the current maps do not provide contours for Zones D and E separately due to a lack of dedicated wells, but instead provide generalized water levels based on a mix of wells in Zone D, Zone E, and both aquifers. Recommend more water level wells to increase the resolution of water level contours in the Basin west of Los Osos Creek and to provide more detailed contour maps to better track water levels in the future.

    For a basin of this size, there is actually reasonably good coverage. Will consider expanding discussion of contouring and data density in future reporting.

23. **Pages 46 and 47, Figures 11 and 14—**Provide a clear elevation designation for water levels between the third and fourth contour lines (up from the bottom of the figure in the Western Area) and label the third line up on Figure 14. Also, show correct elevations for wells on the sandspit and along the bay front. Assuming the area between the third and fourth contour lines extending to the sandspit demark water levels of "5" NAVD 88, Figures 11 and 14 are not accurate for several wells. For instance, spring and fall water levels for LA4, the southern-most well next to the estuary (near Sea Pines) are about 0 (-2.7 NGVD 29 converted to NAVD 88 = 0.1') and -0.7 (-3.5 NGVD 29 converted to NAVD 88); and spring and fall water levels for LA3 on the sandspit are -2.1' and -2.4'.

    Contour label added. Elevations for LA4 in the data set from which the contours were obtained are correct: 0.1' (Spring) and -0.7' (Fall). The elevations for LA3 are also correct: 2.3' Spring and 2' Fall (just needed to update RP in Table 5 – see comment #1).

24. **Page 51—**In the second paragraph, point out that water levels are relatively high on the southern edge of the Basin and appear to be influencing a few well levels along the southern slope of the syncline in the traditional seawater intrusion pathway. Also, point out that some of the rise in water levels in the area since 2019 is due to reference point changes resulting from recent surveys.

    Will consider expanding interpretation for future reporting.

25. **Page 51—**In the second paragraph or a subsequent paragraph, point out that the large pumping depression shown in Figure 14 for Fall of 2020 extends to Los Osos Creek and is larger and deeper than at any time since BMC operation began in 2015. Explain possible reasons for the very low levels in the depression and near the

creek, including that more private wells owners may be using the lower aquifers than had been previously.

Explanation provided.

26. **Page 51**--Include additional analysis and discussion of water contours and water levels, e.g., in the Central Area. These two data sources are key to assessing the affects of Infrastructure Program C on the Basin, on private wells in the area, on sensitive habitat near Los Osos Creek, on the success of the LOBP, and on the overall health and sustainability of the Basin.

    Will consider for future reporting.

27. **Page 51 and Figure 17—**Under "Water Level Hydrographs" explain why the average annual rise decreased from 0.60' per year as reported in the 2019 Annual Report to .43' per year in 2020 over a ten-year period (see Page 50 in the 2019 Annual Report). If it is due to a drop in water levels for these wells in 2020, that should be reported and explained since it could signal a deteriorating condition.

    There is less of an average rise overt the 10-year period because levels are flatter between 2019 and 2020 compared to between 2009 and 2010. We're reporting the long-term trend, not comparing changes in long-term trends. The short-term trend is reflected by the water level metric, which was flat between 2019 and 2020.

28. **Page 56—**In the first line of the first paragraph discussing Zone D intrusion and its inland movement of "several hundred feet," remove the statement: "…although this is a result of localized chloride fluctuations at LA10 rather than broad intrusion front movement." This qualifying phrase minimizes the seriousness of the intrusion problem in Zone D. Seawater intrusion has impacted the well for years and continues to threaten to shut it down. The recovery of this well has been a key benchmark of LOBP effectiveness (i.e., reaching the Chloride Metric target of 100). Seawater intrusion at the well continues to show that the Basin is in an unstable condition. Further, there are not enough dedicated Zone D chloride monitoring wells to map seawater intrusion in Zone D (accurately estimate the contour line) or enough chloride monitoring wells in the area to determine how wide the front is, how far it extends—or whether it is threatening other production wells, e.g., LA15 and 16. Recommend more dedicated chloride and water level monitoring wells in Zone D to track seawater intrusion. The new wells should be nested with dedicated Zone E wells.

    Disagree that the statement "minimizes" the severity of conditions in Zone D. Movement of the front in Zone D is heavily controlled by LA10, so movement as shown is localized. Recommendations for placement of new monitoring wells is included in report Section 7.3.

29. **Page 56—**In the third paragraph correct the last part of the sentence "Zone D intrusion has reached LA10 (Rosina Drive near Fearn Avenue), where seasonal chloride concentrations fluctuate above and below the 250 mg/L threshold." According to Tables 5 and 8, the chloride level at LA10 has been above the 250 mg/l threshold for all of 2020 (with chloride levels adjusted for well bore leakage).

    The intent was to describe historical fluctuations, but has been removed for clarity in describing current condition.

30. **Page 56—**In the third paragraph, use the customary labeling for "Well 18L6," which is LA14, and provide the 2018 geophysics log referred to on Page 56 in an appendix. (Also see #14 above.)

    Changed to LA14. Geophysics scheduled for Fall 2021 and will be included in 2021 Annual Report.

31. **Page 56—**In the fourth paragraph, modify the phrases in the second sentence that refer to Zone D seawater intrusion, which state that it "… does not extend laterally to the north and south and is not present along the Basin synclinal axis at the new Lupine Well." Not enough chloride metric wells are present in the area to determine with certainty where seawater intrusion is in Zone D including whether it is moving along the syncline at some point. The statement suggests that it is not moving inland along the syncline. Also, the statement is not technically accurate: the seawater intrusion does extend laterally.

    Text added for clarification. The interpretation is based on the available information.

    Page 56—At the bottom of the fourth paragraph or in another paragraph, explain that the "laterally pervasive" interpretation of Zone E intrusion represents a worsening of seawater intrusion conditions because the Basin Plan and earlier Annual Reports assume that Zone E intrusion is along a relatively narrow preferential pathway (see Page 54 of the 2018 Annual Monitoring Report). Although the annual reports do not include Zone E in the Western Area in storage estimates (they assume the Western Area is fully intruded), the fact that seawater intrusion is actively replacing and reducing freshwater capacity in the aquifer means conditions are deteriorating. The section could point out that significant and relatively rapid increases in chloride levels at LA11 and LA40 signal a worsening condition although tracking the extent and direction of the intrusion is not possible due to a lack of monitoring wells.

    Text added for clarification.

32. **Page 56—**In the last paragraph, which recommends modifications to four wells to "allow better delineations of the seawater intrusion," also recommend that new

chloride and water level monitoring wells are installed to track the seawater intrusion and low water levels, e.g., to the south of LA15.

Recommendation added

33. **Page 56**—In a subsequent paragraph, a brief discussion of the Zone E intrusion problem and potential remedies should be included. For instance, the potential mitigating effects of Broderson leach fields on Zone E intrusion should be discussed, the possibility Zone E intrusion is entering the Rosina Well (LA5) due to more serious intrusion (seawater rising to the top of the aquifer), the potential for seawater intrusion to enter the large pumping depression, and the possible need for injection.

    Some text added, will consider expanding in future reporting.

34. **Page 56 and Figure 18—**In several sentences or a paragraph, explain why seawater intrusion in Zone D is estimated to extend about as far inland past LA10 (which has a chloride level of 310 mg/l) as it extends in Zone E past LA15 (which had a chloride level of 1230 mg/l in 2013). Note that the 2019 Adaptive Management TM reports a chloride reading of 1910 mg/l at LA15 in 2012 before the Zone E level of LA15 was sealed off in 2013 (Page 7). Also, rising chloride levels in Wells LA11 and LA40 indicate worsening seawater intrusion conditions in Zone E.

    The constraints on the extent of Zone E intrusion are given in text. Will consider expanding discussion in future reporting.

35. **Page 61, Figure 21**—Revise the cross-sectional representation of Zone E seawater intrusion. It appears to show a slight improvement in Zone E conditions relative to previous years. If it is intended, explain exactly how data supports the modification (also see #31 above and #37 below).

    Not intended, figure adjusted.

36. **Page 63—**At the bottom of the page, the Spring 2019 to Spring 2020 "Lower Aquifer" storage estimates are not adequately explained. The draft estimates a "gain of 1,100 acre-feet of freshwater storage" due to the addition of the new observation well LA41. However, this would seem to be offset by the rise in chloride levels at LA10 between Spring of 2019 and Spring of 2020, which indicates a significant advance of seawater intrusion and substantial reduction in freshwater storage. Also, like the 2019 Annual Report, the storage estimate apparently doesn't consider that a test well for the second expansion well of Infrastructure Program C showed less storage capacity in the lower aquifers in the Central Area due to an unmapped bedrock outcropping (see Page 2 of the "Site A Summary TM in the BMC 4-15-20 Agenda Package, pdf page 23). Moreover, some of the estimated increase in storage

in the 2020 Draft Annual Report appears to be due to changes in elevation reference points, which should be explained so that the increase in storage is not mistaken for program effects or improved conditions, e.g., more rainfall. Since drought conditions existed in 2020 and water use went up, any increase in water levels and estimated storage in the lower aquifers shown by contours should be explained.

LA41 was first sampled in Fall 2019, so as noted in the report the Spring 2019 to Spring 2020 gain in storage was from LA41 appearing in Spring 2020. The increase in chloride at LA10 was not sufficient to offset the gain. At the expansion well test hole location, changes in the base of permeable sediments would not affect change in storage, only overall storage. Will consider re-gridding base of permable sediments for future reporting. A sensitivity analysis would be needed to isolate the effects of the survey on storage, but added text to indicate an effect.

37. **Page 64—**Under "Basin Yield Metric" revise the second paragraph to indicate that the "sustainable yield" and Basin Yield Metric are being evaluated by the BMC and are pending review. The BMC has not formally agreed to raise the Basin Sustainable Yield to 2760 AFY, in 2016 or since, so the 2400 AFY agreed to in the Stipulated Judgment should still be in effect. The agreement between the BMC members (Stipulated Judgment) states that the BMC "…shall set the Sustainable Yield at 2,400 AFY" for the first five years of operation "…unless conditions warrant an adjustment" (Page 15—see excepted paragraph from Page 15 of the Stipulated Judgment on Page 7 of these comments). The agreement also states that the BMC "With unanimous consent, shall annually evaluate, confirm, and set the Sustainable Yield x," and "Any change to the Sustainable Yield x shall be based upon the best available then existing data and evidence" (Page 15). The Chloride Metric has shown no clear improvement in seawater intrusion conditions and instead continues to show a deterioration (e.g., Zone E), and the Water Level Metric is well below its target of 8' and has leveled off. The Basin Water Level Metric value is reported in the 2020 Draft Report as 1.8," but could be significantly lower (0.9') (see #40 below). Therefore, even with pumping levels at or below about 2000 AFY for four years (since 2017), seawater intrusion got worse in 2019 and 2020. Therefore, at a minimum, the sustainable yield should be reset to the agreed on 2400 AFY and a Basin Yield Metric target of 80 (BMY 80) should remain in effect (about 1920 AFY), to account for the uncertainties that continue to exist and to achieve the goal of moving seawater intrusion fronts offshore. To confirm that Basin Plan goals, including the BYM 80 goal, is reached, clearly-defined water level and chloride objectives must be confirmed with sufficient reliable and accurate monitoring data. The LOSG continues to request that the BMC redefines "sustainable yield" to achieve the goal of the BYM 80 because the goal is consistent with accepted definitions of sustainable yield, which define sustainable yield as a yield that avoids undesirable effects, e.g., the loss of production Wells LA10 and LA16 (see LOSG letter to the BMC, 3-16-21, Request #17).

Current sustainable yield and associated BYM value based on establish methodology – pending update mentioned but any changes in methodology would be reflected in 2021 Annual Report.

38. **Page 65—**In the first paragraph or in a subsequent paragraph, add further information on the model. Explain that the model was reviewed in 2010 by Stetson Engineers and the review found the model to be adequate to "initiate" a strategy of moving wells inland. However, the review also recommended updates of the model as more data is collected. Since the BMC initiated the strategy in 2016, a test well for Expansion Well #2 has showed that the capacity of the lower aquifers in the Central Area is less than assumed. Further, the large pumping depression in the Central Area now extends to Los Osos Creek and rainfall is less than assumed in the model (see Figure 14 in the Draft Annual Report). All of these factors can adversely affect the productivity of relocated wells. The Draft Annual Report should indicate that an update of the model is needed, further mentioning that the agreement between the BMC members requires a peer review of the model every 10 years. (Also see two quotes excerpted from the 2010 peer review of the model by Stetson Engineers on Page 7 of these comments.)

    Text added. Model update and peer review are recommended.

39. **Page 67** and Appendix E-- Correct the Water Level Metric value by first correcting the value for LA3. Based on Table 5, the water level of LA3 is -2.1' (NAVD 88). With 2.8' subtracted to convert to NGVD 29, the value would be - 4.9' and the metric value would be 0.94', about 0.9' below the 1.8' stated in the draft. Add the change in elevation reference points for LA3 to the list of changed reference points in Appendix E (see Table 5 in the 2019 and 2020 Annual Reports).

    The metric of 1.8 is correct. RP for LA3 just needs to be updated in Table 5 (comment #1)

40. **Pages 69, 70 and Table 21—**On Table 21 make it clear in one or more footnotes that regular spring/fall data for Well LA10 was substituted with data from another sampling event due to well bore leakage during the regular event. Also, provide the list of the water quality monitoring results from which the substituted value was selected, as was done for LA10 data in 2018 (see Appendix J of the 2018 Annual Monitoring Report). Similar information should be provided whenever data use varies from established practice to make the change clear to stakeholders. Also, explain why the pumping protocol put in place to eliminate the effects of well-bore leakage at LA10 did not produce a sample without upper aquifer influence as it did, apparently, in 2019.

    Footnote and additional text added. The expanded list of purveyor water quality results was presented in 2018 for the analysis of wellbore leakage. A discussion of the protocol would be inconclusive.

41. **Page 76—**Under "Basin Status" fourth bullet, point out that Zone D intrusion moved inland "several hundred feet" and Zone E intrusion is estimated to be moving inland,

but the exact direction and extent cannot be verified due to a limited number of monitoring sites. Also, make the changes to the freshwater storage information in this item per recommendation in #37.

The "several hundred feet" is a projected movement based on limited contour data points and heavily influenced by chloride fluctuations at LA10 as explained in Section 7.3 – explaining this would add undesirable complexity to basin status. Zone E movement added.

42. **Page 76—**Under "Basin Status" fifth and sixth bullets, indicate that the Basin Yield and Basin Development Metrics are pending until review of the sustainable yield is conducted

    Current values based on establish methodology – any changes in methodology would be reflected in 2021 Annual Report.

43. **Page 76**-- Under "Basin Status" seventh bullet, correct the Water Level Metric value and modify comment per # 40 above.

    No correction needed (see comment #1)

44. **Page 77—**Under "Recommendations," add the following and remove the last recommendation on Page 77:
    a. Reset the "sustainable yield" to 2400 AFY and target a BYM of 80 (1920 AFY) until chloride and water level monitoring data meets clear and measurable objectives that confirm a higher sustainable yield value will not result in undesirable effects.
    b. Add additional Zone D and E chloride and water level monitoring wells to track seawater intrusion conditions. In the interim, provide chloride data for all existing lower aquifer water level monitoring wells and water level data for all existing lower aquifer chloride monitoring wells.
    c. Survey all remaining water level wells not surveyed, including all provided wells, and provide water level data in NAVD 88. Also provide water level data converted to values for which "O" equals mean sea level to make the data more accessible to stakeholders. Provide contour maps and hydrographs using data values for which "0" equals means sea level, so that stakeholders can better evaluate seawater intrusion vulnerability and Basin status.
    d. Update the model with current data and have a peer review done with sensitivity and uncertainty analyses for all parameters with uncertainty.
    e. Maximize conservation and recycled water use, the most cost effective infrastructure programs proposed in the Basin Plan, and the most environmentally sustainable options not in the Basin Plan, e.g., stormwater reuse and LID to establish a sustainable Basin for the current population a.s.a.p.

f. Develop a Basin-wide funding program and ordinance that spreads costs and responsibility for Basin sustainability equitably.
g. Develop a contingency plan to respond to adverse impacts from Infrastructure Programs, including measures protective of private wells and ESHA in the Central Area of the Basin.

(a) May be considered during sustainable yield review.
(b) Recommendation added. Historical water quality data tables are already included as Appendix J. Historical water level data already shown as selected hydrographs. Will consider expanded water level tables for future reporting.
(c) See response to #12 and #14
(d) Recommendation added.
(e-f) For further BMC consideration

45. **Page 85—**Under "Basin Infrastructure Programs," remove the last line in the first paragraph or point out that the "increase in the Basin's sustainable yield" is predicted by the model but recent monitoring data does not support modeling predictions.

    Disagree. Current conditions do not meet model conditions for pumping distribution or development of Broderson mound, and without Broderson mound and under current pumping distribution (last evaluated in 2017), model predicts continued intrusion.

46. **Page 85—**Remove the line at the end of the second paragraph, which indicates that Program D has been removed from Table 30, and restore Program D to the table as an active program.

    Will be considered for future reporting.

47. **Pages 87-88—**On Table 30, remove all the "deferred" and "on hold" status designations for programs, except the Creek Discharge Program, and restore Program D as an active program on the table.

    Will be considered for future reporting.

Hydrogeology
consulting

To: Los Osos Sustainability Group
From: Stephanie Shakofsky
Date: May 30, 2021
Re: Review of Basin Yield Metric & Chloride Metric (CONFIDENTIAL)

Summary: The Los Osos Groundwater Basin continues to degrade with seawater intrusion advancing. Given the continuing degradation, the BMC should consider, at a minimum, resetting the Maximum Sustainable Yield back to the originally agreed upon 2,400 AFY and resetting the Agricultural Water Usage back to 800 AFY. Using these original calculations, the BMC is not meeting its Basin Yield Metric goal of 80%.

Chloride levels are rising in key wells and overall salinity is increasing as evidenced not only by the Chloride readings but also by the increases in conductance and total dissolved solids. It is clear that established metrics are not being met and, under current conditions, may possibly never be met. Therefore, it would be prudent policy to minimize any new additional water usage in the basin until the BMC has adequately shown that agreed upon metrics and goals are being met.

I. Basin Yield Metric

RECOMMENDATION: The BMC should strongly consider resetting the maximum sustainable yield back to 2,400 AFY as agreed upon in the Stipulated Judgement (*2015*). The basis for this recommendation is the continuing degradation of the basin, which includes but is not limited to, active wells exceeding or nearing 250 mg/l of chloride.

RECOMMENDATION: The BMC should strongly consider resetting the agricultural water usage back to 800 AFY as originally set in the Basin Plan (*2015*) which was based on historical surveys of agricultural use and aerial photography. The basis for this recommendation is that the 2017 calculated agricultural water use that applied an evapotranspiration and rainfall model (effectively lowering the agricultural water usage from 800 AFY to 670 AFY) is an idealized and unrealistic water usage calculation given typical agricultural practices in San Luis Obispo County and used an unrealistic irrigation efficiency factor of 92%.

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Discussion

As defined in the Basin Plan, the basin yield metric is calculated each year by:

$$\textit{Annual GW Production} \div \textit{Maximum Sustainable Yield}$$

Where Annual GW production is the total water removed by purveyors, and estimates of community users (parks), agriculture, and domestic wells. And, where Maximum Sustainable Yield was calculated using the basin Model (Modflow + SEAWAT) and then agreed upon in Stipulated Judgement (*2015*) to be set at 2,400 AFY for five years.

Specifically, Section 6.3.2 of the Basin Plan states "The Sustainable Yield$_x$ is determined for a given set of infrastructure in place by using the Model to determine the maximum amount of groundwater extractions that may occur with a stable seawater intrusion front, and no active well producing water with chloride concentrations above 250 mg/l.

This initial Maximum Sustainable Yield of 2,400 AFY was to be set for 5 years, as agreed upon in the Stipulated Judgement (*2015*). However, because certain infrastructure was completed or was anticipated to be completed, the Maximum Sustainable Yield was increased by 360 AFY in 2016 to 2,760 AFY which is where it remains to date for calculating the 2020 metric.

The recommendation to return to the 2,400 AFY Maximum Sustainable Yield is based on the fact that chloride readings for at least one well (LA10) has exceeded the 250 mg/l of Chloride goal set by the Model. It also appears that well LA11 will likely exceed the 250 mg/l of Chloride goal in the very near future. Moreover, water quality data is clearly showing a continuing degradation and increasing salinity of the basin which does not meet the criteria of maintaining a stable seawater intrusion front. This is discussed in more detail in the Chloride metric discussion.

An additional concern is that the DRAFT 2020 Annual Monitoring Report recommends an update and an increase to the Maximum Sustainable Yield now that the location of the second Program C expansion well is finalized. However, current water quality data do not support a increase in the Maximum Sustainable Yield as this memo discusses.

The Maximum Sustainable Yield in the basin is constrained primarily by the need to prevent Lower Aquifer seawater intrusion. The goal is to keep the Basin Yield Metric at or below 80% which is intended to represent a conservation of water usage and maintain a stable intrusion front, as well as compensate for a variety of uncertainty factors in the model. While this goal is articulated well in the Basin Plan (*source: Section 6.3.3 Seawater Intrusion Targets*) it is important to keep expectations for simulated model forecasts in line with actual chloride concentrations and other water quality and real time data.

Coastal aquifers are complex environments characterized by transient water levels, variable salinity and water density distributions, and heterogeneous hydraulic properties. Climate variations, groundwater pumping, and fluctuating sea levels create dynamic hydrologic conditions, which are interrelated with the distribution of dissolved salts through water density-salinity relationships. Moreover, these processes are often important at different spatial and time scales. In short, these real life and dynamic systems are extremely difficult to model.

Saltwater intrusion is severely affecting the water quality in the Los Osos basin, which presently is the sole source of potable water in the basin. Intrusion requires years to decades to reverse and remediate. Therefore, any prudent water management plan must include margins of safety that consider the uncertainty in estimated basin yields from modeling, and must include adaptive management strategies with contingency actions that can be implemented quickly should the proposed plan not work.

The BMC created metrics that allow the parties, regulatory agencies, and the public to evaluate the status of seawater intrusion in the Basin through objective, numerical criteria that can be tracked over time. However, single metrics are not designed for early detection, and decision-making must rely on current and best available data.

Therefore, because the water quality data clearly shows that the BMC is not meeting the goals set forth in the Basin Plan (*specifically Section 6.3.2*) and the Stipulated Judgement, it is recommended that the BMC consider resetting the Maximum Sustainable Yield back to the initially agreed upon 2,400 AFY.

It is also recommended that, at a minimum, the BMC consider resetting the Agricultural Groundwater Production estimate back to 800 AFY. The Basin currently encompasses approximately 1,090 acres of land that is zoned for agricultural uses. In 2015, estimated acreage of irrigated agricultural land was 375 acres. Over the past five years that number has been lowered to 283 acres based on the County's aerial photography updates. Although inaccuracies may exist in the estimation of irrigated lands from aerial photography, the most significant calculation errors and inaccurate assumptions exist in the parameters used to estimate agricultural water use based on soil moisture content, crop rooting depth, local rainfall and evaporation, and the efficiency of any given farmer's irrigation system (*source: Draft 2020 Annual Monitoring Report, Appendix G*).

In brief, the most significant potential errors in the method used by the BMC for calculating water usage for irrigated crops are as follows:

1. The BMC used an unreasonably high irrigation efficiency number of 92%. Although, an extremely efficient and properly maintained drip irrigation system might approach a 92% efficiency, typically drip irrigation systems have efficiencies ranging between 60% and 90% while sprinkler irrigation systems tend to have low efficiencies ranging between 50% to 70%.
In estimating water usage for unmetered irrigation systems the U.S. Department of Energy suggests the following efficiency coefficients (*source: US Dept of Energy, Guide for Estimating Unmetered Landscaping*, *2010*):

- Low Efficiency: 50%: sprinkler type systems that are aging with poor maintenance and lack of proper scheduling
- Medium Efficiency: 65%: sprinkler type systems that have regular maintenance and proper scheduling
- High Efficiency: 85%: micro irrigation systems that have regular maintenance and proper scheduling.

2. The BMC calculation assumes that every farmer uses an evapotranspiration (ET) model in their irrigation decision process. This is an extremely idealized view of typical farming practices. While some farmers may use an ET model to assist in their irrigation schedule, most farmers irrigate on a fixed schedule which most likely uses significantly more water than typical ET model estimations.

3. The BMC calculation does not consider other onsite farm water usage including, but not limited to: plant wash down, production processing facilities, frost protection sprinkler systems, and pesticide and herbicide delivery systems. These farming processes can use significant amounts of water.

While it is understood that agricultural wells are privately owned, and often not metered, so that exact water usage is not available and educated guestimates must be calculated, it is also imperative that calculated estimates take a prudent and conservative approach to estimating water use.

For example, using a conservative efficiency coefficient of 50% (instead of the 92% currently being used by BMC) to compensate for the uncertainties and unknowns of the parameters used in the agricultural ET model, then agricultural water production for 2020 would equate to approximately 1,198 AFY compared to 650 AFY calculated by the BMC (*source: Table G-5, Draft 2020 Annual Monitoring Report*).

It is also interesting to note, that by applying the more conservative irrigation efficiency coefficient of 50%, the approximated agricultural water use is closer to the historical estimates published by others for the Los Osos Basin:

Estimates of Agricultural Water Use in Los Osos Basin	
Dept of Water Resources (1973)*	**1,100 AFY**
Brown & Caldwell (1983)*	**1,070 AFY**
this paper (2021) @ 50% irrigation efficiency	**1,198 AFY**
CHG (2020 Annual Report) @ 92% irrigation efficiency	**650 AFY**

**source: Basin Plan (2015), Sec. 4.5 Production by Agricuiltural Water Users, p. 42-46*.

The Basin Plan (*p.110-114*) describes the range of uncertainties for the model calculations noting that the two most significant factors contributing to uncertainty are: (1) the physical characteristics of and hydrogeologic relationships with the Basin, and (2) the assumptions regarding the estimated levels of pumping by private domestic and agricultural water users.

The Basin Plan (*p.113*) goes on to state that, "depending on the severity of any inaccuracies regarding the underlying assumptions or unexpected conditions, the impact on future Basin management could range from minimal to significant."

It would appear that non-purveyor pumping rates may be significantly underestimated, and the impacts on the Basin management are likely significant.

Therefore, the BMC should consider, at a minimum, resetting the agricultural use back to 800 AFY, until such time that actual water usage can be obtained from the agricultural community.

Recalculating the Basin Yield Metric by using the originally agreed upon Maximum Sustainable Yield of 2,400 AFY and the original calculated agricultural water use of 800 AFY, **then the BMC has never met the 80% goal for the Basin Yield Metric as the table below illustrates:**

Year	Reported Water Use/SY	Reported Basin Yield Metric (Goal = 80%)	Recalculated Water Use/SY	Recalcuated Basin Yield Metric (Goal = 80%)
2015	$\frac{2,170\ AFY}{2,450\ AFY}$	89%	$\frac{2,170\ AFY}{2,400\ AFY}$	90%
2016	$\frac{2,160\ AFY}{2,760\ AFY}$	78%	$\frac{2,160\ AFY}{2,400\ AFY}$	90%
2017	$\frac{2,070\ AFY}{2,760\ AFY}$	75%	$\frac{2,200\ AFY}{2,400\ AFY}$	92%
2018	$\frac{2,030\ AFY}{2,760\ AFY}$	74%	$\frac{2,160\ AFY}{2,400\ AFY}$	90%
2019	$\frac{1,900\ AFY}{2,760\ AFY}$	69%	$\frac{2,070\ AFY}{2,400\ AFY}$	86%
2020	$\frac{2,010\ AFY}{2,760\ AFY}$	73%	$\frac{2,160\ AFY}{2,400\ AFY}$	90%

II. Chloride Metric

Recommendation: Chloride readings should be combined with existing Conductance and Total Dissolved Solids (TDS) readings to create a clearer understanding of the overall salinity and degradation of the basin.

Discussion

The BMC has defined the Chloride Metric as the weighted average concentration of chlorides in four key wells (LA8, LA10, LA11, and LA12), where 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 various management actions (*source: Basin Plan, p.108*).

Chloride is the major anion of seawater, and it moves through aquifers at nearly the same rate as the intruding water. Thus, it is recognized that increasing chloride concentrations are typically the first indication of the approach of a seawater contamination front. In an area where no other source of saline contamination exists, high chloride concentrations can be considered definitive proof of seawater contamination and an appropriate measurement.

Yet, other water quality measurements can provide indications of increasing salinity and should also be used in describing conditions in the Basin. Specifically, electrical conductivity (measured as Conductance in umhos/cm) is a strong indicator of salinity, and total dissolved solids (TDS, mg/l) is also a common salinity parameter, particularly for groundwater quality measurements (*source: Chloride, Salinity and Dissolved Solids*, *USGS Science Center, 2020*).

The BMC acknowledges that the Chloride Metric is a simplification of basin conditions that will vary significantly from year to year due to localized chloride fluctuations (*source: Draft Annual Monitoring Report, 2020, p.69*).

However, the BMC has not considered the continuing increase in Conductance and TDS over time in the four key wells. <u>The current and historic water quality data show a steady increase in salinity in all four key wells</u>, as show in the table:

	Conductance (umhos/cm)[1]		**Total Dissolved Solids (TDS)** (mg/l)[2]	
Well #	**2004**	**2020**	**2004**	**2020**
LA8	390 →	464	200 →	300
LA10[3]	1,200 →	1,310	410 →	970
LA11	1,300 →	1,650	840 →	1,040
LA12	790 →	891	410 →	510

[1]Typical Conductance Readings (umhos/cm):
Deonized Water: 0.5
Drinking Water: 200-1,000
Brackish Water: 1,000-35,000
Seawater: >35,000
(*Source: USGS, Saline Water & Salinity, 2020*)

[2]Typical Total Dissolved Solids (mg/l)
Freshwater: <1,000
Brackish Water: 1,000-10,000
Seawater: >10,000
(*Source: CA State Water Resources Control Board, Fact Sheet 3.1.3.0, 2004*)

[3]No data for fall 2020

Again, a cautious level of concern should be adopted by the BMC with a reasoned approach to decision-making that is based on the quantitative water quality data available to date in order to avoid a threat that is serious and plausible.

Conclusions:

1. The Los Osos Groundwater Basin continues to degrade with seawater intrusion advancing.

2. Given the continuing degradation, the BMC should consider, at a minimum, resetting the Maximum Sustainable Yield back to the originally agreed upon 2,400 AFY and resetting the Agricultural Water Usage back to 800 AFY. Using these original calculations, the BMC is not meeting its Basin Yield Metric goal of 80%.

3. The BMC is not meeting its Chloride Metric. Chloride levels are rising in key wells and overall salinity is increasing as evidenced by the increases in conductance and total dissolved solids.

4. It is clear that established metrics are not being met and, under current conditions, may possibly never be met. Therefore, it would be prudent policy to minimize any new additional water usage in the basin until the BMC has adequately shown that agreed upon metrics and goals are being met.

CHG Response to Hydrogeology Consulting, TM Review of Basin Yield Metric & Chloride Metric dated May 30, 2021.

Thank you for your review of the Basin Yield Metric and Chloride Metric. Responses to the recommendations are provided below. Some of the responses are brief, as the comments were received later than others, but the TM will be helpful going forward.

Basin Yield Metric

RECOMMENDATION: The BMC should strongly consider resetting the maximum sustainable yield back to 2,400 AFY as agreed upon in the Stipulated Judgement (2015). The basis for this recommendation is the continuing degradation of the basin, which includes but is not limited to, active wells exceeding or nearing 250 mg/l of chloride.

For clarification, the Maximum Sustainable Yield is the sustainable yield of the Basin after implementing all of the LOBP infrastructure projects, both existing and potential. That's why if Program C changes, or the recycled water supply for Urban Reinvestment Program U changes, that would change the Maximum Sustainable Yield.

The sustainable yield for a given year, and associated Basin Yield Metric, has been estimated following methodology established in the LOBP (and actually developed several years prior). The methodology and sustainable yield will be reviewed by the BMC this year, and any changes will be reflected in future Annual Reports.

RECOMMENDATION: The BMC should strongly consider resetting the agricultural water usage back to 800 AFY as originally set in the Basin Plan (2015) which was based on historical surveys of agricultural use and aerial photography. The basis for this recommendation is that the 2017 calculated agricultural water use that applied an evapotranspiration and rainfall model (effectively lowering the agricultural water usage from 800 AFY to 670 AFY) is an idealized and unrealistic water usage calculation given typical agricultural practices in San Luis Obispo County and used an unrealistic irrigation efficiency factor of 92%.

The "efficiency factor" is really a calibration factor to provide consistency between historical estimates for agricultural irrigation (2006-2008) and the soil moisture budget methodology that was started in 2017. This was explained in 2017 Annual Report, but the data tables used for calibration were subsequently removed.

As shown below in Table F-5 of the 2017 Annual Report, the soil moisture balance was run for 2006-2008 and then adjusted using the "efficiency factor" to match the prior estimate of 750 AFY. The intent was to develop a methodology that provided variation in irrigation estimates from year to year based on both rainfall and acreages. Prior estimates did not change with annual rainfall and only changed if crops acreages were added or subtracted following an aerial image review.

Table F-5 (2017 Annual Report)
Applied Irrigation for Agriculture

Description	Units	Average 2006-2008	2017
Irrigation demand vegetables	inches	22.53	24.92[1]
Irrigation demand pasture	inches	37.24	41.27[2]
Irrigation Efficiency Factor[3]	factor	0.92	0.92
Applied irrigation vegetables	feet	2.04	2.26
Applied irrigation pasture	feet	3.37	3.74
Vegetables acreage[4]	acres	339	282.2
Vegetables applied water	acre-feet	692	637.8
Pasture acreage[4]	acres	18.3	8.7
Pasture applied water	acre-feet	61.7	32.5
TOTAL applied ag irrigation	acre-feet	754	670
TOTAL from CHG (2009b)	acre-feet	750	--

[1]From Table F-3;
[2]From Table F-4;
[3]Efficiency factor used to calibrate 2006-2008 total
[4]2006-2008 acreage from CHG, 2009b (excludes memorial park);
"--" = no value for this cell
2017 acreage from County GIS 2016 (1 vineyard and 1.8 nursery acres counted as 2.2 acres in vegetables, based on equivalent water demand conversion using 2012 County Master Water Plan Table A1 [Carollo, 2012]).

It is true that 92% is not a realistic efficiency for truck crops grown in the Los Osos Creek valley or elsewhere in the County, and the term "efficiency factor" is should really have been called "calibration factor". The 2020 Annual Report (Appendix G) has been revised accordingly. A review of the actual applied irrigation factors used shows the numbers used are not low at all, but are actually higher than would be estimated from standard sources. Comparison with the San Luis Obispo County Master Water Plan (2012) values for the Los Osos water planning area are shown in the following table.

Applied Irrigation Water Estimates (acre-feet per acre per year)

Crop	SLO County Master Water Plan (Los Osos WPA)			2020 Soil Moisture Budget
	Low	Medium	High	
Vegetables	1.2	1.4	1.7	2.19
Pasture	2.3	2.9	3.4	3.83

The reduction in irrigation water demand between 2016 (800 AFY) and 2017 (670 AFY) was NOT due to the "efficiency factor" being unrealistic, but rather due to a reduction in irrigated acreage. The actual reduction did not happen suddenly between 2016 and 2017, but may have occurred between 2006-2008 and 2017. Some, or possibly all of the reduction may have been from changing the source for irrigated acreage estimates from aerial images to the County agricultural database, but the County database is field checked with growers and is the appropriate data source.

Finally, it is important to also understand that agricultural irrigation for all sustainable yield scenarios is fixed at 800 AFY in accordance with the pool allocation in the Stipulated Judgement. Therefore, 800 AFY will always be set aside in planning for agriculture, regardless of whether they are using that much or not.

Chloride Metric

Recommendation: Chloride readings should be combined with existing Conductance and Total Dissolved Solids (TDS) readings to create a clearer understanding of the overall salinity and degradation of the basin.

Thank you for the analysis. It will be reviewed during the upcoming evaluation of alternatives to the existing Chloride Metric.

TO: Los Osos Basin Management Committee

FROM: Dan Heimel, Executive Director

DATE: June 16, 2021

SUBJECT: Item 8b – Update on potential geophysics opportunities for the Los Osos Basin

Recommendations

Receive an update on potential geophysics opportunities for the Los Osos Basin and provide direction to staff.

Discussion

Geophysics surveys are non-invasive investigations of subsurface conditions that allow for the collection of data on aquifer properties and groundwater water quality in areas where monitoring or other wells may not exist. Both land based and airborne geophysics systems are available for data collection. These systems work by creating an electromagnetic field that penetrates down into the ground and then measuring/analyzing the response of the field to the materials within the ground. The varying responses received to the introduction of the electromagnetic field provides information on the electromagnetic or resistivity properties of the underground materials and can provide information on aquifer properties and/or the salinity of the groundwater in the underlying aquifer. Geophysics can be a very useful tool in improving the understanding of subsurface geologic conditions and identifying the location of a freshwater/seawater interface or seawater intrusion front within different aquifer formations.

A couple of potential opportunities to utilize geophysics to improve the understanding of hydrogeologic conditions in and around the Los Osos Basin have recently become available and are described below,

Land-based - In November 2018, the BMC received a presentation on a potential opportunity to partner with Cal Poly to perform a land based Electrical Resistivity Imaging (ERI) survey of key areas of the Los Osos Basin to assess the location and movement of the seawater intrusion front. While promising, the survey did not move forward at that time due to potential property access and environmental impact constraints. Recently, discussion with Cal Poly have been re-initiated and the potential to perform an ERI survey is being re-evaluated.

Aerial – The California Department of Water Resources (DWR) recently announced that it will be conducting airborne electromagnetic (AEM) surveys for high and medium priority groundwater basins throughout the state. This survey is being completed to assist local water managers as they implement the Sustainable Groundwater Management Act (SGMA) Groundwater Sustainability Plans (GSP). While the Los Osos Basin is not designated as a high or medium priority basin under SGMA due to its adjudicated status, there may be potential to partner with DWR or other basins to perform an AEM survey of the basin. Additional data on

DWR's AEM survey program can be found at the following website:
https://water.ca.gov/Programs/Groundwater-Management/Data-and-Tools/AEM

BMC Staff will provide an overview of the two potential geophysics opportunities for the Los Osos Basin.