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 15, 2022** at the **Los Osos Community Services District Boardroom,** located at 2122 9th Street Suite 106, Los Osos, CA 93402 Members of the public may participate in this meeting in person or via teleconference and/or electronically.

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 danheimel@ConfluenceES.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

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, 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 danheimel@ConfluenceES.com.

BASIN MANAGEMENT COMMITTEE BOARD OF DIRECTORS AGENDA

1. **CALL TO ORDER**

2. **ROLL CALL**

3. **PLEDGE OF ALLEGIANCE**

4. **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.

5. **SPECIAL PRESENTATION**

   None

6. 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. 2022 Budget Update and Invoice Register

7. 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.

8. EXECUTIVE DIRECTOR'S REPORT

9. ACTION ITEMS

a. Presentation of Final Draft 2021 BMC Annual Monitoring Report

Recommendation: Receive the Final Draft 2021 Annual Monitoring Report and authorize submission to the Court or provide alternate direction to staff.

10. ADJOURNMENT

TO: Los Osos Basin Management Committee

FROM: Daniel Heimel, Executive Director

DATE: June 15, 2022

SUBJECT: Item 6a – Approval of Budget Update/Invoice Register

Recommendations

Staff recommends that the BMC review and consider approval of Budget/Invoice Register or provide alternate direction to Staff.

Discussion

BMC Staff has prepared a summary of costs incurred as compared to the adopted budget and a running invoice register for Calendar Year 2022 (see Attachments).

Attachment 1: Cost Summary (January 2022 to Current Date) for Calendar Year 2022 Budget

Item	Description	Budget Amount	Approved Contingency Allocation	Updated Allocated Budget Amount	Costs Incurred	Percent Incurred	Remaining Budget
1	BMC Executive Director Facilitation and Legal Counsel Contingency	$90,000		$90,000	$22,300.00	24.8%	$67,700
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	$0.00	0.0%	$6,000
4	Technical Support/Adaptive Management Services	$15,000		$15,000	$4,960.00	33.1%	$10,040
5	Groundwater Monitoring	$42,000		$42,000	$19,735.80	47.0%	$22,264
6	2021 Annual Report	$56,000		$56,000	$57,270.00	102.3%	-$1,270
7	Grant Pursuit Contingency	$5,000		$5,000	$0.00	0.0%	$5,000
8	WRFP Study Year 1 (Peer Review)	$15,000		$15,000	$0.00	0.0%	$15,000
9	Lower Aquifer Monitoring Well Improvement	$25,000		$25,000	$0.00	0.0%	$25,000
10	Los Osos Creek Stream Gage Rating Curve	$25,000		$25,000	$7,403.40	29.6%	$17,597
	Subtotal	$280,500		$280,500	$111,669		$168,831
	10% Contingency (rounded to nearest $100)	$28,100					
	Total	**$308,600**			**$111,669**	**36.2%**	**$196,931**
	LOCSD (38%)	$117,268					
	GSWC (38%)	$117,268					
	County of SLO/SLOCFC&WCD (20%)	$61,720					
	S&T Mutual (4%)	$12,344					

Attachment 2: Invoice Register for Los Osos BMC for Calendar Year 2022

Vendor	Invoice No.	Amount	Month of Service	Description	Budget Item	Date Executive Director Approved	Date BMC Chairperson Approved	Date BMC Approved
CHG	20211203	$6,490.00	Dec-21	Annual Report Preparations	6	Jan-22		
CHG	20211204	$2,534.40	Dec-21	Groundwater Monitoring	5	Jan-22		
CHG	20211205	$5,076.40	Dec-21	Rating Curve Development	11	Jan-22		
ConfluenceES	1011	$5,100.00	Jan-22	BMC Executive Director Services	1		Feb-22	
CHG	20220103	$20,495.00	Jan-22	Annual Report Preparations	6	Mar-22		
CHG	20220104	$1,319.40	Jan-22	Groundwater Monitoring	5	Mar-22		
CHG	20220105	$2,327.00	Jan-22	Rating Curve Development	11	Mar-22		
CHG	20220204	$15,400.00	Feb-22	Annual Report Preparations	6	Mar-22		
CHG	20220205	$320.00	Feb-22	Technical Support - Data Request Response	4			Apr-22
ConfluenceES	1018	$5,700.00	Feb-22	BMC Executive Director Services	1		Mar-22	
CHG	20220303	$10,740.00	Mar-22	Annual Report Preparations	6	Apr-22		
CHG	20220304	$1,740.00	Mar-22	Groundwater Monitoring	5	Apr-22		
CHG	20220305	$1,440.00	Mar-22	Technical Support - Monitoring Well Invest.	4			May-22
ConfluenceES	1026	$4,050.00	Mar-22	BMC Executive Director Services	1		Apr-22	
CHG	20220405	$2,545.00	Apr-22	Annual Report Preparations	6	May-22		
CHG	20220406	$11,370.00	Apr-22	Groundwater Monitoring	5	May-22		
ConfluenceES	1031	$7,450.00	Apr-22	BMC Executive Director Services	1		May-22	
CHG	20220501	$3,200.00	May-22	Technical Support - Program C Evaluation	4	Jun-22		
CHG	20220503	$2,772.00	May-22	Groundwater Monitoring	5	Jun-22		
CHG	20220502	$1,600.00	May-22	Annual Report Preparations	6			
	2022 Total	**$111,669.20**						To be approved

TO: **Los Osos Basin Management Committee**

FROM: **Dan Heimel, Executive Director**

DATE: **June 15, 2022**

SUBJECT: **Item 8 – Executive Director's Report**

Recommendations

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

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

SGM Implementation Grant: Applications for Round 2 of the Sustainable Groundwater Management (SGM) Implementation Grant are anticipated to be due in September 2022. This grant program is administered by the California Department of Water Resources (DWR) to provide funding for projects that encourage sustainable management of groundwater resources that support Sustainable Groundwater Management Act (SGMA) and/or invest in groundwater recharge projects for surface water, stormwater, recycled water, and other conjunctive use projects. Round 1 funding was provided to Critically Overdrafted (COD) Basins and final awards were recently announced. Round 2 solicitation is anticipated in September 2022. Eligible applicants for this funding include Groundwater Sustainability Agencies or agencies within adjudicated basins, which would include Los Osos Purveyors. However, the Round 2 solicitation is limited to applicants that are located in Medium, High and COD basins. The Los Osos Basin is currently prioritized as Very Low priority as a result of conditions being met under sub-component C of the Draft SGMA 2019 Basin Prioritizations (i.e. non-adjudicated pumping is less than 9,500 acre-feet per year) and thus does not appear to be eligible for Round 2 SGM Implementation Grant Funding. <u>BMC Party Staff are reaching out to DWR to determine if there is the potential for Los Osos to become eligible given the relative unique timing of its adjudication.</u>

Prop 1 GWGP: The Prop 1 GWGP Round 3 solicitation was released on July 6th, 2021 with Concept Proposals due September 7th, 2021. However, as indicated in the January 2018 BMC meeting, the State Board confirmed that seawater 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. Aquifer clean-up projects (e.g. Community Nitrate Facility, Upper Aquifer Capture and Treatment) could be considered for pursuing grant funding through this program. Unfortunately, this is the 3rd and last round for this Program and they are only looking to fund implementation projects (i.e. projects that have design, CEQA and other planning components completed and are ready for construction), not planning projects.

IRWM: The Program A upper aquifer well at 8th Street was submitted by Los Osos CSD to the local IRWM process in 2019 as part of the Round 1, Prop 1 Implementation Grant cycle 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, Round 2 Implementation grant cycle has been initiated and the Call for Projects opened on April 7th, 2022 and closed April 28th, 2022. The BMC did not submit any projects as it was determined that there were not projects that were sufficiently far enough along to be competitive for this grant opportunity.

Prop 1 SWGP: The concept of urban storm water recovery at 8th and El Moro was ranked in the County Stormwater Resource Plan. The Project is labeled as "Capture and Reuse of Storm Water" and listed as a Los Osos Community Services District project. The Stormwater Resource Plan can be found here: https://www.slocounty.ca.gov/Departments/Public-Works/Committees-Programs/Stormwater-Resource-Plan.aspx. The Project is additionally described in the following locations:

- It is **described** here in our SWRP Appendix 4B under "Capture and Reuse of Storm Water" at 9th and El Morro: https://www.slocounty.ca.gov/Departments/Public-Works/Forms-Documents/Committees-Programs/Stormwater-Resource-Plan/Documents/SWRP-Appendix-4-B-Identified-Project-and-Program-D.pdf

- It is **ranked** here on our SWRP website on the **SWRP Project List** link under "Capture and Reuse of Storm Water": https://www.slocounty.ca.gov/Departments/Public-Works/Forms-Documents/Committees-Programs/Stormwater-Resource-Plan/Documents/SWRP-Program-Master-Project-Info-2020-04-16.pdf

- It is also on the **IRWM Project list** under "Capture and Reuse of Storm Water": https://www.slocounty.ca.gov/Departments/Public-Works/Forms-Documents/Committees-Programs/Integrated-Regional-Water-Management-(IRWM)/Current-IRWM-Full-Project-List_20220322.pdf

Grant funding may be available through the Prop 1 Storm Water Grant Program (SWGP). However, the application period for Round 2 of SWGP funding has closed. 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) 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

Recent communication with the SWRCB Representatives confirmed that this funding program is still fully funded and WRFP grants are available. On 2/11/2022 the Los Osos Community Services District (Los Osos CSD) submitted an application for a WRFP grant to develop a transient model and analyze recycled water and supplemental water projects to improve the sustainability of the Los Osos Basin (WRFP Study) and is still waiting for notification. At its May 5th, 2022 Meeting the Los Osos CSD approved the RFP for the WRFP Study and is waiting on approval of the grant before releasing it.

Status of BMC Initiatives

Sustainable Yield: At its October 27th, 2021 Meeting, the BMC unanimously approved a Sustainable Yield estimate of 2,380 AFY for Calendar Year 2022 and these actions will be documented in the 2021 Annual Report.

Lower Aquifer Transducer Installation: In March, Cleath-Harris Geologists (CHG) initiated requests for permission to access and install transducers in several County monitoring wells, a private well, and a purveyor well. The purveyor well (LA 9) was equipped with a transducer. Due to the uncertainty in accessing County wells, two additional purveyor monitoring wells (LA 40 and LA41) were equipped with transducers. Permission was subsequently received to access County wells, and four County monitoring wells have been equipped with transducers (LA11, LA14, LA16, and LA19). This completes the planned transducer expansion program, with 7 added units.

Basin Metric Evaluation: Analysis of potential modifications to the Basin Metric's is currently on hold. Proposed modifications to the metrics were provided to BMC Party Staff for review. However, BMC Party Staff requested that potential improvements to the existing BMC Monitoring Program (i.e. modifications to an existing wells or a new monitoring well) be evaluated prior to modifying the Basin Metrics. Recommendations regarding potential improvements to the Basin Monitoring Network will be brought to the BMC at a future meeting, followed by potential modifications to the Basin Metrics.

Transient Groundwater Model: At its October 27th, 2021 Meeting, the BMC authorized the preparation of a Water Recycling Funding Program Grant Application and to request access to the $150,000 of funding that the County budgeted for a transient groundwater model for Los Osos. The Los Osos CSD will be the lead agency for the grant on behalf of the BMC. The grant application was submitted to the

SWRCB by Los Osos CSD on 2/11/2022 for $150k in grant funds and the County approved providing $150k to the Los Osos CSD for a Transient Model for the Los Osos Basin. After receiving approval from the SWRCB, the Los Osos CSD will solicit proposals from consulting firms through an RFP process to procure the necessary services to develop the model and complete the WRFP Study.

Wellhead Survey: At its October 27th, 2021 Meeting, the BMC authorized Twin Cities Surveying to survey additional wells in Los Osos Basin and for BMC Staff to request that the County survey the wells in their monitoring program. Both Twin Cities Surveying and the County completed their wellhead surveys in November and December. BMC monitoring network wellhead elevations are now up to date.

Lower Aquifer Monitoring Evaluation: At its October 27th, 2021 Meeting, the BMC authorized CHG to evaluate the feasibility and cost of modifying existing wells or construction a new monitoring well(s) to improve monitoring of Zone E water quality. BMC Party Staff evaluated the potential to fund a new monitoring well in 2022, but there is not sufficient budget. BMC Party Staff will target including a new monitoring well in the Calendar Year 2023 Budget. Regarding modifications to existing wells, CHG received quotes to perform the desired modifications and will be presenting a Technical Memorandum summarizing and prioritizing the suggest modifications to BMC Party Staff shortly. After review by staff, recommendations will be brought to the BMC for approval prior to initiating any modifications. If approved by the BMC, the intent is to complete the modifications this Calendar Year to utilize available funding.

Program C Adaptive Management: At its April 20th, 2022 Meeting, the BMC approved CHG to evaluate the re-inclusion of the 3rd Well into Program C. Additional detail regarding the history of the 3rd Program C Well is available in the April 20th, 2022 BMC Agenda Packet. CHG is currently evaluating the anticipated increase in the Sustainable Yield that the 2nd and 3rd Program C Wells would provide utilizing the criteria for calculating the Sustainable Yield approved by the BMC at their October 27th, 2022 Meeting. Results from this evaluation will be presented to BMC Party Staff and then to the BMC at a future meeting.

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 reviewed previously completed analysis on BMC funding and organization structures, documenting the different alternatives and identifying data/information gaps that may require outside technical support. At its October 27th, 2021 Meeting, the BMC approved a proposal from SCI Consulting Group to provide an updated funding options analysis and assessment evaluation. SCI has prepared a draft report, that includes their evaluation of funding alternatives and findings from the funding model, that is being reviewed by BMC Party Staff. It is anticipated that SCI will be presenting their findings for funding for water resource management and Basin Plan implementation in the Los Osos Basin to BMC at its August 2022 Meeting.

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 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.

BMC Legal Counsel – At the December 15, 2021 BMC Meeting, the BMC included in the authorization of the Calendar Year 2022 Budget $20,000 for Legal Counsel Contingency to be included in Executive Director's Budget. The BMC additionally authorized the Executive Director to utilize up to $5,000 before requiring BMC approval and for the Executive Director to provide updates on legal counsel spending in the Executive Director's Report. A Request for Qualifications (RFQ) was approved by the BMC at its April 20th, 2022 Meeting and subsequently released to solicit legal counsel representation for the BMC. BMC Staff received seven Statements of Qualifications (SOQs) and BMC Party Staff are currently reviewing them. A recommendation for selection of BMC Legal Counsel will be brought to the BMC at a future Meeting.

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

Guide to Planning Information for Development in Los Osos:
This website is intended to provide planning information outlining what type of development is currently allowed within https://www.slocounty.ca.gov/Departments/Planning-Building/Grid-Items/Community-Engagement/Communities-Villages/Los-Osos.aspx.

Topics covered include but are not limited to:

- Which types of permit applications are currently being accepted for processing
- Status of the building moratorium and waitlist for undeveloped parcels in the sewer service area (still in place)
- Status of the Communitywide Habitat Conservation Plan

Los Osos Retrofit-to-Build Program (Title 19 Water Offset Requirement) Update:
Maddaus Water Management Inc. is preparing a study to update water usage estimates for urban and rural residences sourcing water from the Los Osos Groundwater Basin, propose new water conservation measures for the retrofit-to-build program, and estimate remaining water savings potential for the community. They are currently reviewing provided data. Scheduling updates will be posted at: https://www.slocounty.ca.gov/Departments/Planning-Building/Grid-Items/Community-Engagement/Active-Planning-Projects/Los-Osos-Water-Offset-Study.aspx#:~:text=Los%20Osos%20Water%20Offset%20Study%20The%20County%20has,is%20anticipated%20to%20be%20completed%20in%20March%202022.

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. In the meantime, the County is meeting with BMC staff to discuss potential policy changes considering ongoing basin monitoring and Basin Plan program implementation efforts. On December 15, 2020, the County Board of Supervisors adopted the Los Osos Community Plan ("LOCP") update and Final Environmental Impact Report (“FEIR”). The LOCP policies are still subject to change based on California Coastal Commission review. The LOCP and FEIR considered by the Board on December 15 are available at: https://www.slocounty.ca.gov/LosOsosPlan-1.aspx.

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 May 17, 2022, the County Board of Supervisors continued to a date certain the hearing to consider accepting the California Coastal Commission's suggested modifications to the Coastal ADU Ordinance, including not allowing ADUs within the Los Osos Groundwater Basin boundary and/or within the Los Osos Groundwater Basin Plan Area. The hearing date is set for August 9, 2022. Coastal's suggested modifications approved at their February 11, 2022 meeting are available at: https://www.coastal.ca.gov/meetings/agenda/#/2022/2 (Agenda Item # 16a).

Los Osos Vacation Rental Ordinance:

On June 7, 2022, the County Board of Supervisors held a hearing and adopted a resolution to accept the California Coastal Commission's suggested modifications to the Los Osos Vacation Rental Ordinance. The Los Osos Vacation Rental Ordinance, as modified with the Coastal Commission's suggested modifications, will go into effect following Coastal Commission certification as part of the County Local Coastal Program.

The Los Osos Vacation Rental Ordinance includes a standard to encourage reducing water usage: "A minimum of one water conservation sign shall be posted in each restroom and kitchen of the dwelling. Water conservation signs shall encourage occupants to reduce water usage by stating (a) the importance of conserving water in Los Osos and (b) ways in which occupants can reduce the amount of water used during the stay. Water conservation signs hall be created and posted utilizing County approved language." Coastal's suggested modifications approved at their February 11, 2022 meeting are available at: https://www.coastal.ca.gov/meetings/agenda/#/2022/2 (Agenda Item # 16b).

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.

LOWRF Wastewater and Recycled Water Flows

Year	Month	Influent	Broderson	Bayridge	Sea Pines	Giaco-mazzi	Construction Water	Ag Users	Discharge/ Recycled Water Delivery Total (AF)
2022	Jan	55	53	1.5	1.5	0.0	0.0	0.1	56
2022	Feb	49	39	1.5	6.9	0.0	0.0	0.2	48
2022	Mar	54	37	1.8	4.8	0.0	0.0	0.2	44
2022	Apr	43	38	1.4	4.6	0.0	0.0	0.2	46
2022	May	N/A	29	1.6	9.1	0.0	0.0	0.3	42
2022	Jun								
2022	Jul								
2022	Aug								
2022	Sept								
2022	Oct								
2022	Nov								
2022	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.

Recycled Water Connections: The County approved $350,000 in funding from the American Rescue Plan Act of 2021 for connecting new users to the LOWRF Recycled Water System. Additional funding was approved for improvements at the LOWRF and the Broderson Leach field.

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.

The Sustainable Groundwater Management Act (SGMA)

SGMA Overview: 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. Updated Status of Basin Plan Programs

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[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."

Update on Status of Basin Plan Infrastructure Projects

Program Name	Project Name	Parties Involved	BMC Budgeted Amount	Funding Status	Anticipated Planning/Pre-Construction Cost	Anticipated Capital Cost	Status/Notes
Program A – Shift groundwater production from Lower Aquifer to Upper Aquifer	Water Systems Interconnection	LOCSD/ GSWC	NA	NA	NA	NA	**Completed**
	Upper Aquifer Well (8th Street)	LOCSD	NA	Fully Funded	NA	$250,000	The piping and other improvements for the wellhead are complete. The electronic/control equipment installation is 99% complete. LOCSD staff is working with the Division of Drinking Water to complete the steps needed to put the well into service. It is anticipated the well will be operational by the beginning of July 2022.
	South Bay Well Nitrate Removal	LOCSD	NA	NA	NA	NA	**Completed**
	Palisades Well Modifications	LOCSD	NA	NA	NA	NA	**Completed**
	Blending Project (Skyline Well)	GSWC	NA	NA	NA	NA	**Completed**
	Water Meters	S&T	NA	NA	NA	NA	**Completed**
Program B - Shift groundwater production from Lower Aquifer to Upper Aquifer	LOCSD Wells (Upper Aquifer)	LOCSD		Not Funded	TBD	BMP: $2.7 mil	Project not initiated
	GSWC Wells (Upper Aquifer)	GSWC		Not Funded	TBD	BMP: $3.2 mil	Project not initiated
	Community Nitrate Removal Facility	LOCSD/GSWC/S&T	TBD	Partial, GSWC portion funded	TBD	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.
Program C - Shift production within the Lower Aquifer from the Western Area to the Central Area of the Basin	Expansion Well No. 1 (Los Olivos)	GSWC	NA	NA	NA	NA	**Completed**
	Expansion Well No. 2 (Lower Aquifer)	LOCSD		LOCSD	TBD	BMP: $2.1 mil	The contract for the drilling phase of the project has been awarded with a timeline to complete the work by the beginning of November 2022. A RFP for the pipeline design phase has been released with submittals due on June 29, 2022. Completion of all phases of the project is estimated to be June 2024.
	Expansion Well 3 (Lower Aquifer) and LOVR Water Main Upgrade	GSWC/LOCSD		Cooperative Funding	TBD	BMP: $1.6 mil	This project has been deferred under Adaptive Management.
	LOVR Water Main Upgrade	GSWC		May be deferred	TBD	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	TBD	BMP: $30,000	Currently on hold, pending the completion of S&T's water meter cellular updates.

Program Name	Project Name	Parties Involved	BMC Budgeted Amount	Funding Status	Anticipated Planning/Pre-Construction Cost	Anticipated Capital Cost	Status/Notes
Program D - Shift production within the Lower Aquifer from the Western Area to the Eastern Area of the Basin							Currently being considered for deferment through Adaptative Management. BMC to review on an annual or semi-annual basis.
Program M – Groundwater Monitoring Plan	New Zone D/E lower aquifer monitoring well in Cuesta by the Sea	All Parties	NA	NA	NA	NA	**Completed**
Program U - Urban Water Reinvestment Program	Creek Discharge Program	All Parties				TBD	These activities are currently on hold.
	8th and El Moro Urban Storm Water Recovery Project	All Parties				TBD	These activities are currently on hold.

TO: Los Osos Basin Management Committee

FROM: Dan Heimel, Executive Director

DATE: June 15, 2022

SUBJECT: Item 9a– Presentation of Final Draft 2021 Annual Monitoring Report

Recommendations

Receive the Final Draft 2021 Annual Monitoring Report and authorize submission to the Court or provide alternate direction to staff.

Discussion

Section 5.8.3 of the Stipulated Judgment requires the preparation of an Annual Monitoring Report (AMR) for the Los Osos Basin by June 30 of each year. The AMR describes activities related to the Los Osos Basin Plan, groundwater monitoring program, and the results and interpretations of these findings. The BMC retained Cleath-Harris Geologists (CHG) to prepare the sixth AMR for Calendar Year 2021. The Final Draft 2021 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 2022 budget address monitoring and preparation of the Annual Monitoring Report.

FINAL DRAFT

LOS OSOS BASIN PLAN
GROUNDWATER MONITORING PROGRAM
2021 ANNUAL MONITORING REPORT

Prepared for the

BASIN MANAGEMENT COMMITTEE

June 2022

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 – 2021 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 2021. 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 halting or reversing 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 2021 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 decreased by three percent compared to 2020, while total Basin production has decreased by less than one percent compared to 2020.

Table ES-1. Groundwater Production

Description	2020 Production in Acre-Feet	2021 Production in Acre-Feet
Los Osos Community Services District	527	503
Golden State Water Company	502	491
S&T Mutual Water Company	34	32
Purveyor Subtotal (metered)	**1,063**	**1,026**
Domestic wells[1]	220	220
Community facilities[1]	80	130
Agricultural wells[1]	650	620
Total Estimated Production[1]	**2,010**	**2,000**

[1] Rounded to the nearest 10 acre-feet. Production from non-metered wells (Domestic, Community, Agricultural) estimated per methods described in Appendix H 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. 42). The Basin received below average rainfall in 2021. The drought condition for San Luis Obispo County ranged from moderate drought to extreme drought conditions during 2021 (NDMC/USDA/NOAA, 2022).

Seawater intrusion front (p. 57). The seawater intrusion front in Zone D retreated toward the coast between Fall 2020 and Fall 2021 (an improvement). This interpretation is based on localized conditions contoured to represent regional trends. The seawater intrusion front in Zone E advanced toward LA11 between Fall 2020 and Fall 2021 (a deterioration).

Basin Yield Metric (p. 66). The Basin Yield Metric decreased between 2020 and 2021 (an improvement) and has met the LOBP goal since 2016, although an updated Sustainable Yield methodology to be implemented in 2022 is expected to result in the Basin Yield Metric not meeting the LOBP goal (discussed in Section 7.5.1).

Water Level Metric (p. 69). The Water Level Metric increased between Spring 2020 and Spring 2021 (an improvement) and has not reached the target value.

Chloride Metric (p. 71). The Chloride Metric decreased between Fall 2020 and Fall 2021 (an improvement) and has not reached the target value.

Nitrate Metric (p. 72). The Nitrate Metric decreased between Winter 2020 and Winter 2021 (an improvement) and has not reached the target value.

Upper Aquifer Water Level Profile (p. 75). Water levels in the Upper Aquifer along the bay remain safely above the Protective Elevation, except for near well UA5, where an increase in chloride concentrations warrants further investigation.

Recommendations for improving the quality and availability of data are contained in Section 9 of the Annual Report. Recommendations from the 2020 Annual Report that are in progress include re-evaluating the Water Level, Chloride, and Nitrate Metrics, evaluating the feasibility of modifying existing wells to become dedicated Lower Aquifer Zone E monitoring locations, and preparing a list of recommended sites for new monitoring well construction. Additional recommendations include updating the Maximum Sustainable Yield (sustainable yield with all LOBP projects implemented) of the Basin and replacing the steady-state Basin model with a transient model.

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[1]	**LOBP Goal**	**Calculated Value from 2021 Data**	**Change in Condition from 2020**
Basin Yield Metric[2]	80 or less	72	Decrease from 73 (improvement)
Water Level Metric	8 feet above mean sea level or higher	2.1 feet above mean sea level	Increase from 1.8 ft. (improvement)
Chloride Metric	100 mg/L or lower	202 mg/L	Decrease from 205 mg/L (improvement)
Nitrate Metric	10 mg/L or lower	17 mg/L (NO_3-N)	Decrease from 20 mg/L (improvement)

[1]Revisions to the Water Level, Chloride, and Nitrate Metrics were initiated in 2021 and are currently on hold as the BMC Staff evaluates opportunities to improve the Basin Monitoring Network.

[2]On October 27, 2021, the BMC considered and adopted a revised methodology for estimating sustainable yield, along with a sustainable yield for Year 2022 that will likely increase the Basin Yield Metric to a value above the LOBP goal. See Appendix M for additional details.

Approval of the Annual Monitoring Report by the BMC does not constitute unanimous approval of actions listed under Section 5.11.4 (Approval Requirements) of the Stipulated Judgment or setting the Sustainable Yield for a given year. These actions require a separate action and unanimous approval by the BMC.

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.

- Lower Aquifer Monitoring Evaluation
- Updated Metric Evaluation
- Contingency Plan Development
- Lower Aquifer Nitrate Trends
- Evaluation of Water Conservation Measures
- Transient Groundwater Model
- Discussion and Recommendation of Criteria for Future Growth

LOBP Infrastructure Programs

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

Table ES-3. Basin Infrastructure Projects

Project Name	Parties Involved	Funding Status	Capital Cost	Status
Program A				
Water Systems Interconnection	LOCSD/ GSWC			Completed
Upper Aquifer Well (8th Street)	LOCSD	Fully Funded	$320,000	The piping and other improvements for the wellhead are complete. The electronic/control equipment is scheduled to be delivered the week of May 9th. Completion of the project is anticipated by the end of May 2022.
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	LOCSD	BMP: $2.0 mil	LOCSD is in the process of obtaining bids for the well drilling phase. The submittal deadline is May 9th. It is anticipated that the drilling of the well will begin by June/July 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 further evaluation of the project.

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. The Transient Model and Water Recycling Funding Study are intended to better inform the BMC on the most effective opportunities for increasing the sustainable yield of the Basin.
8th and El Moro Urban Storm Water Recovery Project	All Parties		TBD	These activities are currently on hold. The Transient Model and Water Recycling Funding Study are intended to better inform the BMC on the most effective opportunities for increasing the sustainable yield of the Basin.

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 seventh Annual Report for the Basin.

The 2021 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 halting or reversing 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). Confluences Engineering Services 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.

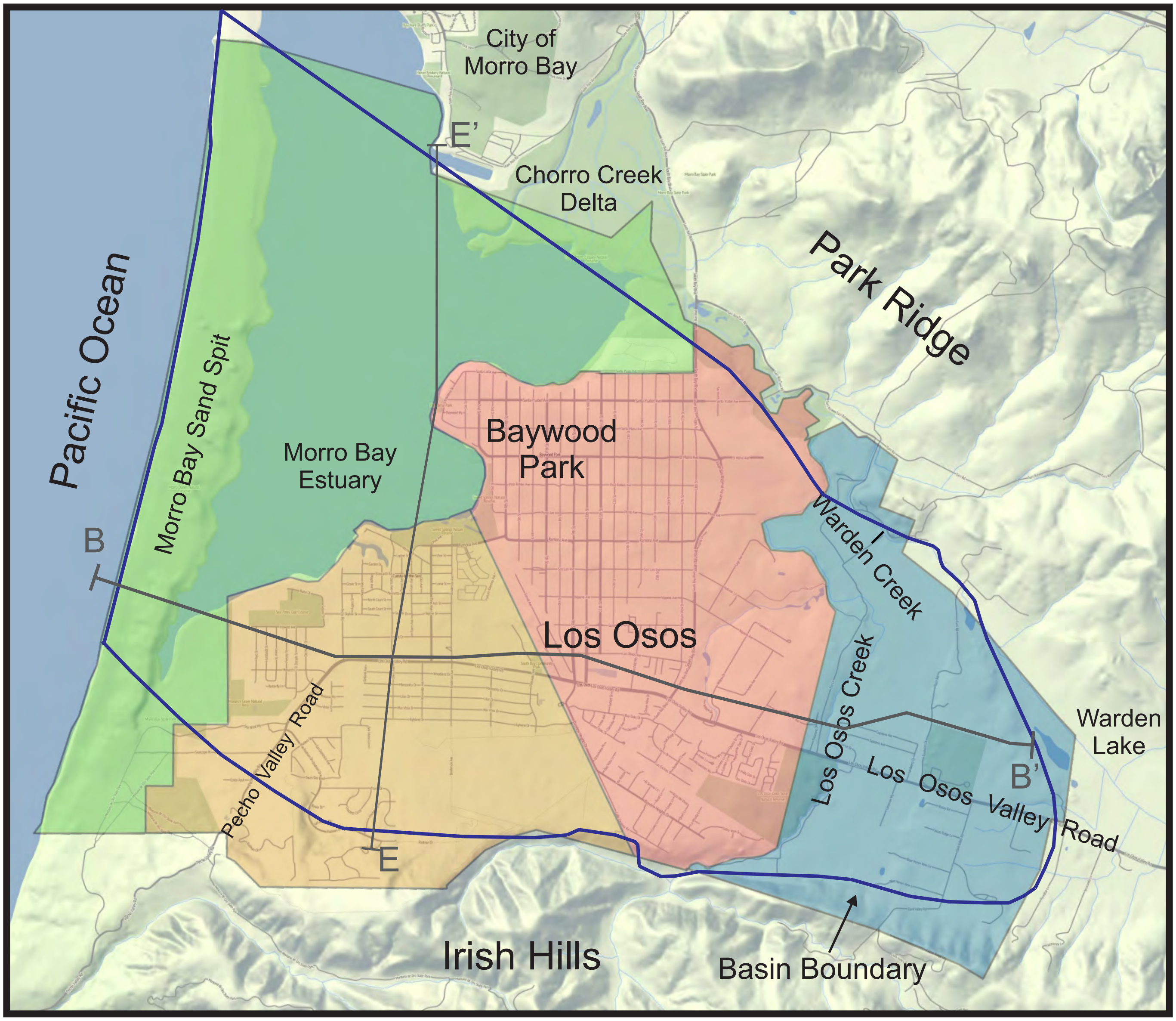
2.1 Groundwater Monitoring History

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 2021 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
2021 Annual Report

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- 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.

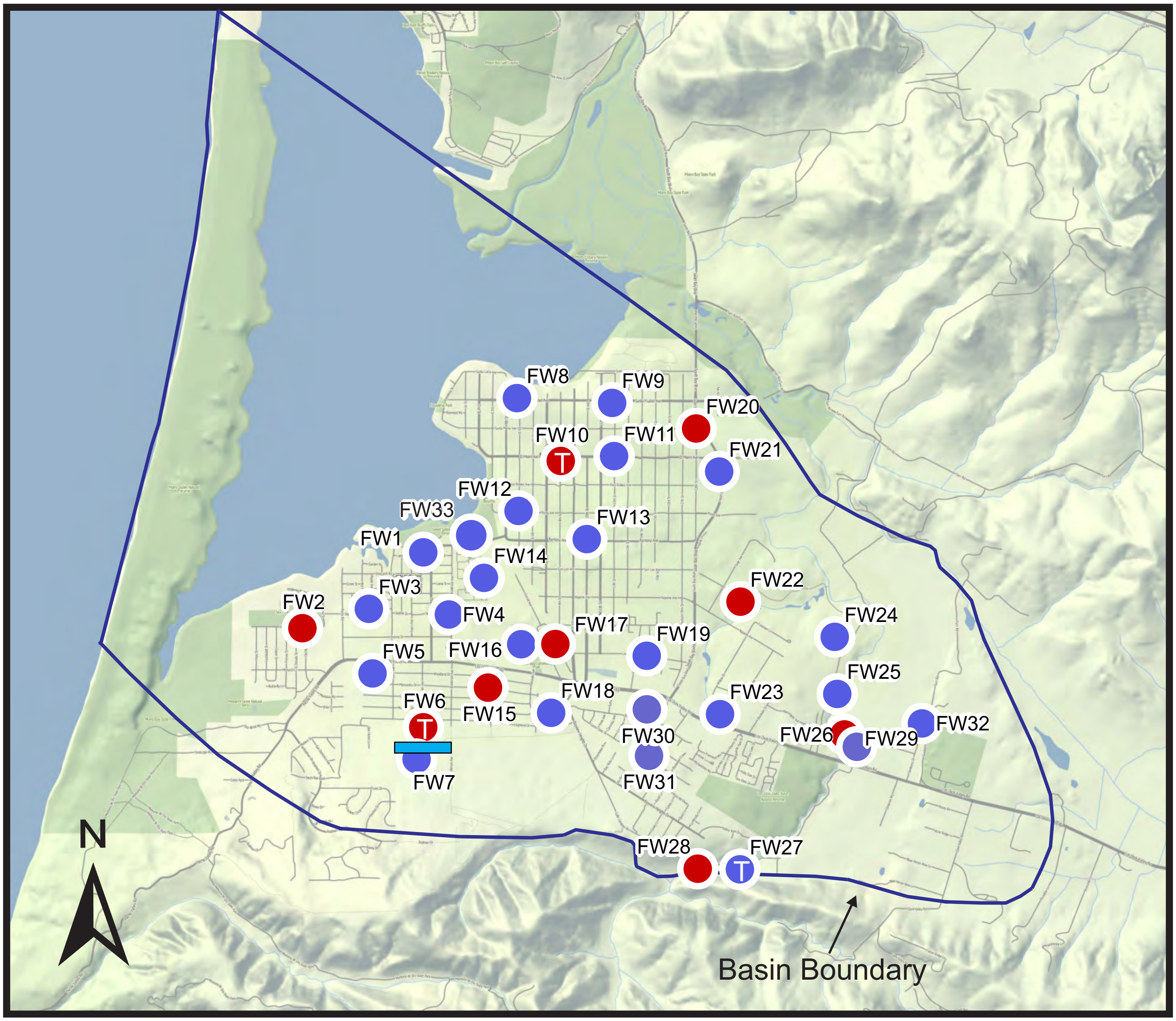
There are currently 93 wells in the LOBP Groundwater Monitoring Program, including 43 BMC member agency monitoring wells, 17 municipal wells (active and inactive) and 33 private wells (Appendix B). Private well participation in the monitoring program during 2021 was 73 percent (24 out of 33 wells). "Private" 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. Fourteen 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 second phase of wellhead elevation surveying was performed during 2021 (see Section 3.2.1 and Appendix C). 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
- Broderson Leach Field

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
2021 Annual Report

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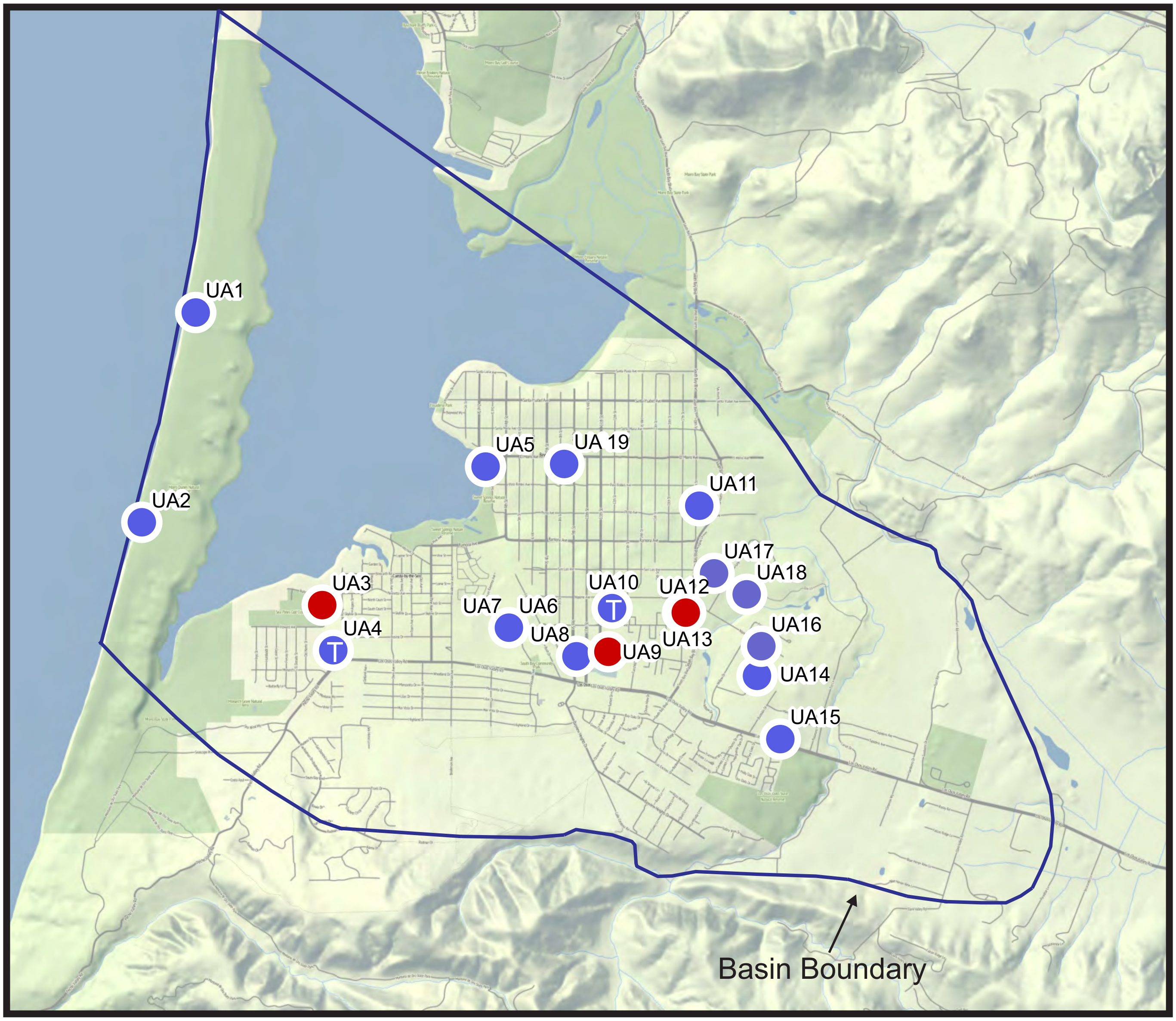

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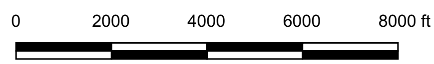

Scale: 1 inch ≈ 4,000 feet

Explanation

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

Figure 3
Groundwater Monitoring Program
Upper Aquifer Wells
Los Osos Groundwater Basin
2021 Annual Report

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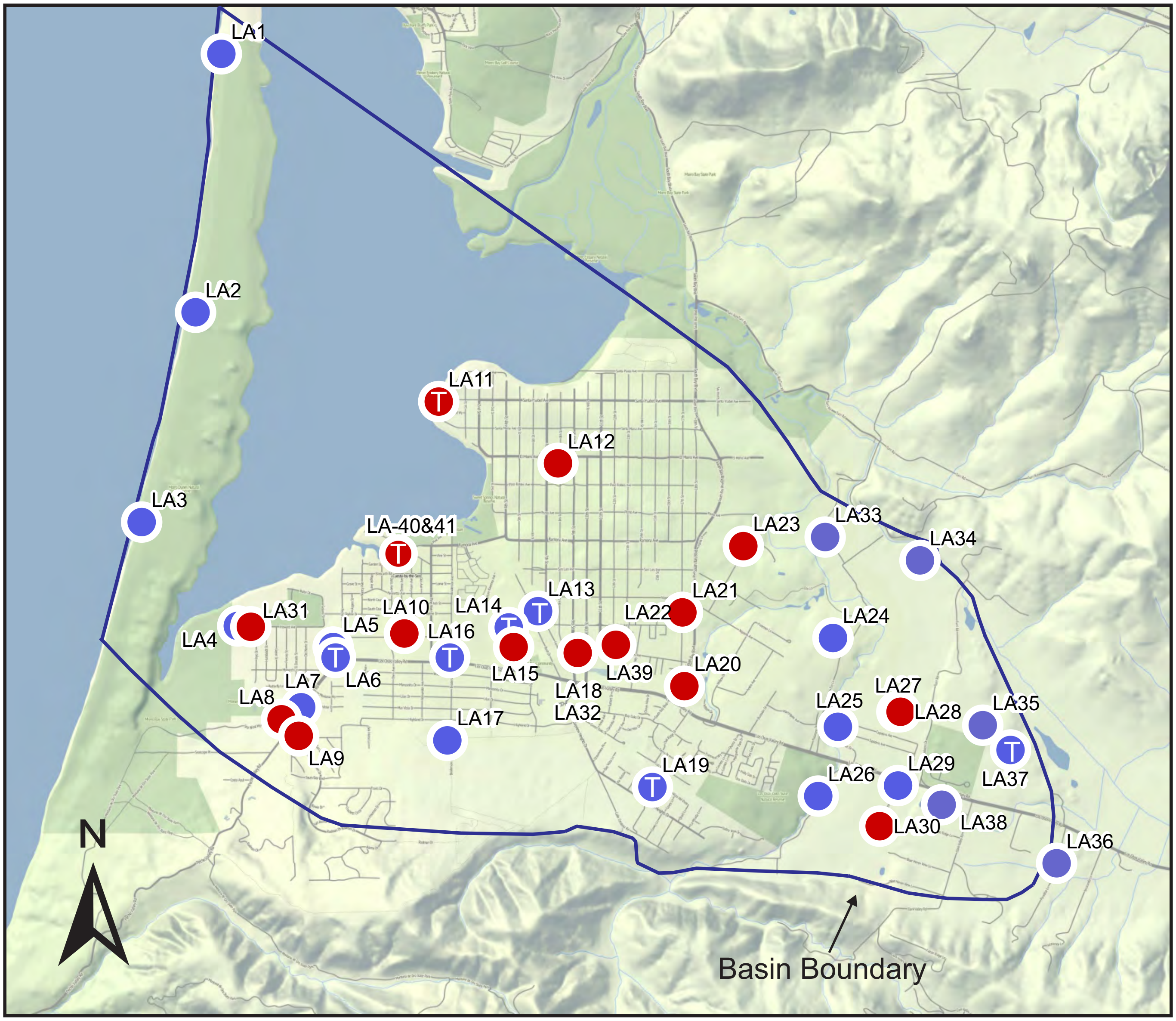

Base Image: Stamen-Terrain

0 2000 4000 6000 8000 ft

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: 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
2021 Annual Report

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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

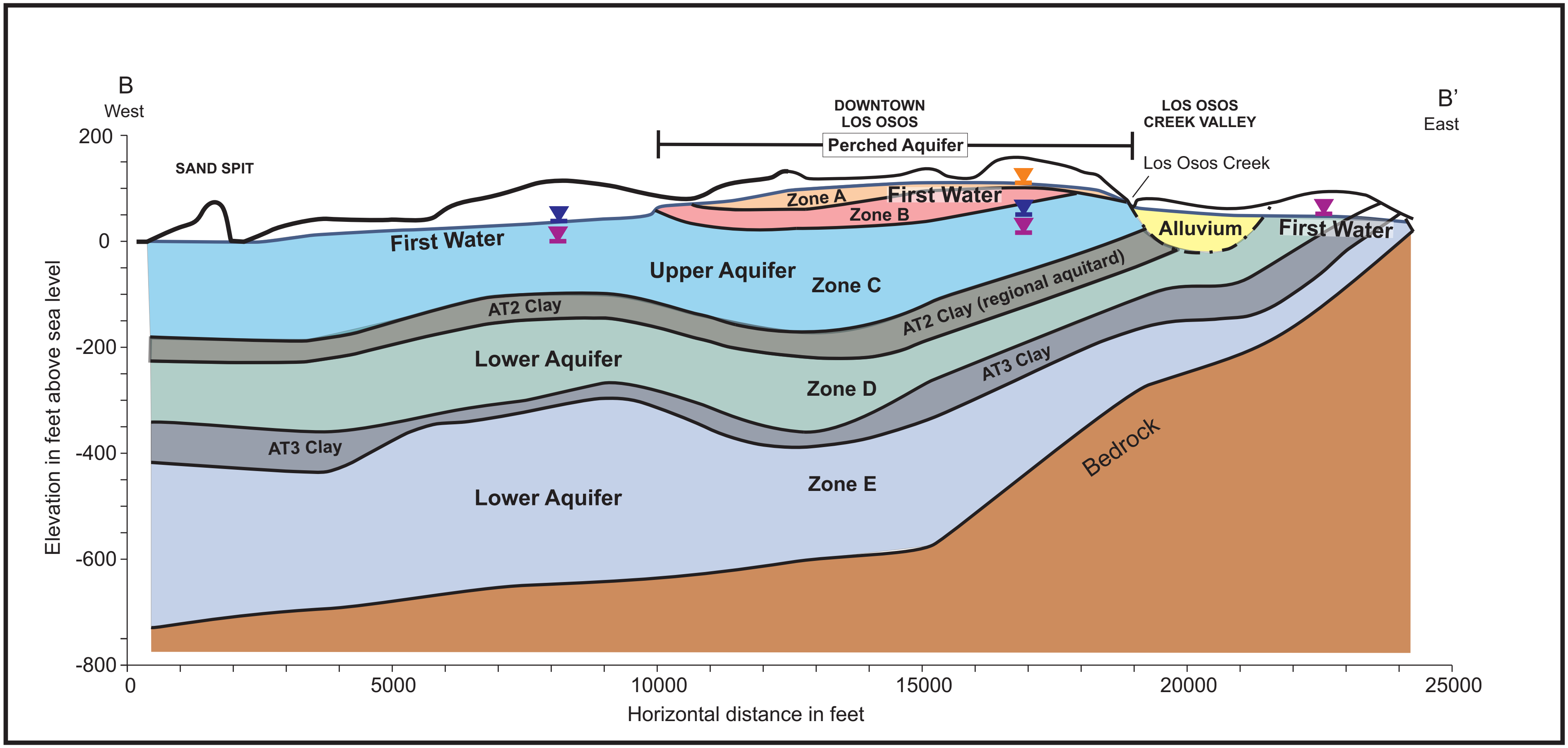
The First Water group refers to wells screened within the first 50 feet of saturated sediments across the Basin, regardless of the aquifer (Figure 5). First Water is the interface where percolating waters, including precipitation and return flows from irrigation and wastewater, mix with Basin waters. 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 could be implemented under LOBP 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
2021 Annual Report

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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 D). 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.

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	0.004
Triclosan	Antimicrobial		0.008
Caffeine	Stimulant		0.004
NDMA (N-Nitrosodimethylamine)	Disinfection Byproduct		0.002
Gemfibrozil	Pharmaceutical Residue	Performance	0.004
DEET (Diethyl-meta-toluamide)	Personal Care Product		0.004
Iopromide	Pharmaceutical Residue		0.004
Sucralose	Food additive		0.020
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 2021, including:

- An elevation survey was completed at 30 wells across the basin (Phase 2 wellhead survey).
- An update to the sustainable yield methodology and estimate for the calendar year 2022 was completed in 2021, in order to meet the requirements of the Stipulated Judgement.
- The development of a rating curve for the Los Osos Creek stream gauge at Los Osos Valley Road (Station 751) was authorized in 2021. The process involves manually measuring stream flow at the existing gauge over a wide range of flow, and converting the historical data that is available in 15-minute intervals to daily flow data in cubic feet per second. The

flow data will assist development of a transient groundwater flow model and is useful for Basin water balance applications.

- A recycled water beneficial use study was authorized in 2021 to analyze and rank various options for recycled water use in terms of the potential benefits to Basin Sustainable Yield. This study has been put on hold and is anticipated to be included in the Water Recycling Funding Program Planning Grant Initiative.

- A metric review was authorized and initiated 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 completed in late 2021. A total of seven additional transducers were deployed to assist in monitoring the Lower Aquifer response to development of the groundwater mound associated with recycled water discharges at the Broderson Site.

- LOCSD, a BMC member, completed Phase 2 environmental review of Program C expansion well Site E on Bay Oaks Drive, and anticipates well construction to take place in 2022.

- A study was authorized to evaluate the feasibility of modifying up to four existing program wells to become dedicated Zone E water quality monitoring locations, and to recommend additional Lower Aquifer monitoring well sites. The study is in progress in 2022.

- Planning and funding efforts for a transient Basin model was initiated in 2021. The transient model would replace the existing steady-state model, once completed.

3. CONDUCT OF WORK

This Annual Report covers monitoring activities performed during the 2021 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 2021.

3.1 Services Provided

All 2021 groundwater monitoring data compiled for this report, unless described otherwise, comes from the following monitoring programs:

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

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

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

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

3.2 Field Methods

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

3.2.1 Elevation Datum

The original survey for wells in the County's Semi-Annual Water Level Monitoring Program was likely based on the National Geodetic Vertical Datum of 1929 (NGVD 29), which has been replaced in land surveying practice by the North American Vertical Datum of 1988 (NAVD 88). Monitoring network wells were re-surveyed in 2003, 2005, 2020 and 2021 using NAVD 88. All wells in the LOBP monitoring network that are used in water level contouring have now been surveyed to NAVD 88 (elevations shown in Tables 3 through 8).

The 2021 Phase 2 wellhead elevation survey included 30 wells. 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 1.8 feet higher than the prior estimated elevations in the wells for which no prior survey was available, and averaged 1.9 feet higher in four wells where County NGVD 29 survey data were available. The Phase 2 survey completes the transition to the NAVD 88 datum for the LOBP monitoring network. Results of the 2021 elevation survey are shown in Appendix C.

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. As of December 7, 2021, fourteen monitoring network wells are currently equipped with a pressure transducer, allowing for automatic water level data collection between regular (manual) monitoring events. These devices are placed below the water surface in a well and record changes in pressure that occur in response to changes in the height of the water column above the transducer. Detailed water level monitoring procedures are included in Appendix E.

3.2.3 Groundwater Sampling Procedures

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

3.3 Monitoring Staff Affiliations

Monitoring services that contributed data to the 2021 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 2021 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 2021 monitoring program reports (Rincon Consultants, 2021; 2022).

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 2021, 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 2021, rather than using the June and December 2021 LOWRF monitoring event values.

Table 3. Spring 2021 Water Levels – First Water					
Well ID	State Well Number	R. P. Elevation (feet NAVD 88)	Date	Water Level (feet)	
				Depth	Elevation
FW1	30S/10E-13A7	PRIVATE (not measured)			
FW2	30S/10E-13L8	32.63	4/1/2021	22.00	10.6
FW3	30S/10E-13G	50.95	4/1/2021	39.62	11.3
FW4	30S/10E-13H	49.33	4/8/2021	21.59	27.7
FW5	30S/10E-13Q2	101.27	4/8/2021	81.23	20.0
FW6	30S/10E-24A	193.04	4/9/2021	142.55	50.5
FW7	30S/10E-24Ab	Not measured (damaged)			
FW8	30S/11E-7L4	45.76	4/12/2021	37.83	7.9
FW9	30S/11E-7K3	90.71	4/6/2021	54.31	36.4
FW10	30S/11E-7Q1	25.29	4/9/2021	8.80	16.5
FW11	30S/11E-7R2	61.93	4/6/2021	23.99	37.9
FW12	30S/11E-18C2	34.55	4/13/2021	20.07	14.5
FW13	30S/11E-18B2	79.89	4/13/2021	22.43	57.5
FW14	30S/11E-18E1	PRIVATE (not measured – destroyed)			
FW15	30S/11E-18N2	125.53	4/6/2021	76.36	49.2
FW16	30S/11E-18L11	88.02	4/8/2021	45.73	42.3
FW17	30S/11E-18L12	103.85	4/8/2021	22.10	81.8
FW18	30S/11E-18P	143.92	4/8/2021	26.45	117.5
FW19	30S/11E-18J7	125.74	4/1/2021	25.05	100.7
FW20	30S/11E-8Mb	94.75	4/13/2021	45.90	48.9
FW21	30S/11E-8N4	95.99	4/13/2021	39.98	56.0
FW22	30S/11E-17F4	PRIVATE (measured)			
FW23	30S/11E-17N4	PRIVATE (measured)			
FW24	30S/11E-17J2	PRIVATE (measured)			
FW25	30S/11E-17R1	PRIVATE (not measured)			
FW26	30S/11E-20A2	PRIVATE (measured)			
FW27	30S/11E-20L1	PRIVATE (measured)			
FW28	30S/11E-20M2	PRIVATE (measured)			
FW29	30S/11E-20A1	PRIVATE (not measured)			
FW30	30S/11E-18R1	PRIVATE (measured)			
FW31	30S/11E-19A	214.67	4/9/2021	25.54	189.1
FW32	30S/11E-21D14	PRIVATE (measured)			
FW33	30S/11E-18D1S	PRIVATE (measured)			

Table 4. Spring 2021 Water Levels – Upper Aquifer					
Well ID	**State Well Number**	**R. P. Elevation (feet NAVD 88)**	**Date**	**Water Level (feet)**	
				Depth	**Elevation**
UA1	30S/10E-11A1	16.01	not measured		
UA2	30S/10E-14B1	23.9	not measured		
UA3	30S/10E-13F1	17.57	4/13/2021	9	8.6
UA4	30S/10E-13L1	40.31	4/9/2021	29.24	11.1
UA5	30S/11E-7N1	10.66	4/30/2021	6.3	4.4
UA6	30S/11E-18L8	79.18	3/23/2021	55.00	24.2
UA7	30S/11E-18L7	79.16	3/23/2021	63.90	15.3
UA8	30S/11E-18K7	137.17	4/5/2021	117.40	19.8
UA9	30S/11E-18K3	123.42	4/15/2021	105	18.4
UA10	30S/11E-18H1	110.02	4/9/2021	92.80	17.2
UA11	30S/11E-17D	PRIVATE (not measured)			
UA12	30S/11E-17E9	107.39	4/8/2021	86.72	20.7
UA13	30S/11E-17E10	107.81	4/15/2021	106.1	1.7
UA14	30S/11E-17P4	PRIVATE (not measured)			
UA15	30S/11E-20B7	PRIVATE (not measured)			
UA16	30S/11E-17L4	PRIVATE (measured)			
UA17	30S/11E-17E1	PRIVATE (measured)			
UA18	30S/11E-17F2	PRIVATE (not measured)			
UA19	30S/11E-7Q__	26.80	4/5/2021	17.71	9.1

Table 5. Spring 2021 Water Levels – Lower Aquifer					
Well ID	State Well Number	R. P. Elevation (feet NAVD 88)	Date	Water Level (feet)	
				Depth	Elevation
LA1	30S/10E-2A1	23.13	not measured		
LA2	30S/10E-11A2	16.07	not measured		
LA3	30S/10E-14B2	23.89	not measured		
LA4	30S/10E-13M1	42.70	4/1/2021	43.74	-1.0
LA5	30S/10E-13L7	37.87	4/8/2021	33	4.9
LA6	30S/10E-13L4	74.58	4/13/2021	64	10.6
LA7	30S/10E-13P2	PRIVATE (not measured)			
LA8	30S/10E-13N	141.36	4/1/2021	134.3	7.1
LA9	30S/10E-24C1	180.34	4/13/2021	175	5.3
LA10	30S/10E-13J1	98.33	4/13/2021	96	2.3
LA11	30S/10E-12J1	8.43	4/5/2021	4.63	3.8
LA12	30S/11E-7Q3	27.75	4/15/2021	39.40	-11.7
LA13	30S/11E-18F2	103.57	4/9/2021	100.80	2.8
LA14	30S/11E-18L6	79.52	3/23/2021	74.70	4.8
LA15	30S/11E-18L2	88.08	4/15/2021	100.6	-12.5
LA16	30S/11E-18M1	108.74	3/23/2021	99.50	9.2
LA17	30S/11E-24A2	212.82	3/26/2021	171.30	41.5
LA18	30S/11E-18K8	137.13	4/12/2021	133.75	3.4
LA19	30S/11E-19H2	257.35	3/26/2021	253.40	4.0
LA20	30S/11E-17N10	141.22	4/13/2021	145	-3.8
LA21	30S/11E-17E7	107.22	3/24/2021	107	0.2
LA22	30S/11E-17E8	107.27	3/24/2021	118.70	-11.4
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	4/15/2021	4.04	22.1
LA35	30S/11E-21Bb	86.80	4/9/2021	76	10.8
LA36	30S/11E-21Ja	PRIVATE (not measured)			
LA37	30S/11E-21B1	81.61	4/9/2021	60.46	21.2
LA38	30S/11E-21E	PRIVATE (measured)			
LA39	30S/11E-18K_	123.17	4/13/2021	137	-13.8
LA40	30S/11E-13Ba	11.47	4/14/2021	8.70	2.8
LA41	30S/11E-13Bb	11.46	4/13/2021	7.54	3.9

Table 6. Fall 2021 Water Levels – First Water					
Well ID	State Well Number	R. P. Elevation (feet NAVD 88)	Date	Water Level (feet)	
				Depth	Elevation
FW1	30S/10E-13A7	PRIVATE (not measured)			
FW2	30S/10E-13L8	32.63	10/5/2021	22.90	9.7
FW3	30S/10E-13G	50.95	10/5/2021	40.35	10.6
FW4	30S/10E-13H	49.33	10/5/2021	24.35	25.0
FW5	30S/10E-13Q2	101.27	10/26/2021	81.40	19.9
FW6	30S/10E-24A	193.04	10/26/2021	141.91	51.1
FW7	30S/10E-24Ab	Not measured (damaged)			
FW8	30S/11E-7L4	45.76	10/5/2021	38.69	7.1
FW9	30S/11E-7K3	90.71	10/5/2021	55.40	35.3
FW10	30S/11E-7Q1	25.29	10/27/2021	9.83	15.5
FW11	30S/11E-7R2	61.93	10/5/2021	26.85	35.1
FW12	30S/11E-18C2	34.55	10/5/2021	20.94	13.6
FW13	30S/11E-18B2	79.89	10/5/2021	24.45	55.4
FW14	30S/11E-18E1	PRIVATE (not measured – destroyed)			
FW15	30S/11E-18N2	125.53	10/5/2021	75.79	49.7
FW16	30S/11E-18L11	88.02	10/5/2021	46.28	41.7
FW17	30S/11E-18L12	103.85	10/5/2021	23.79	80.1
FW18	30S/11E-18P	143.92	10/5/2021	26.25	117.7
FW19	30S/11E-18J7	125.74	10/5/2021	27.63	98.1
FW20	30S/11E-8Mb	94.75	DRY		
FW21	30S/11E-8N4	95.99	10/5/2021	40.68	55.3
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	10/8/2021	30.40	184.3
FW32	30S/11E-21D14	PRIVATE (measured)			
FW33	30S/11E-18D1S	PRIVATE (measured)			

Table 7. Fall 2021 Water Levels – Upper Aquifer					
Well ID	State Well Number	R. P. Elevation (feet NAVD 88)	Date	Water Level (feet)	
				Depth	Elevation
UA1	30S/10E-11A1	16.01	10/20/2021	12.14	3.9
UA2	30S/10E-14B1	23.9	10/20/2021	19.85	4.1
UA3	30S/10E-13F1	17.57	10/18/2021	8	9.6
UA4	30S/10E-13L1	40.31	10/1/2021	31.2	9.1
UA5	30S/11E-7N1	10.66	10/14/2021	7.2	3.5
UA6	30S/11E-18L8	79.18	10/7/2021	55.82	23.4
UA7	30S/11E-18L7	79.16	10/7/2021	64.93	14.2
UA8	30S/11E-18K7	137.17	10/19/2021	119.52	17.7
UA9	30S/11E-18K3	123.42	10/26/2021	104	19.4
UA10	30S/11E-18H1	110.02	10/8/2021	94.82	15.2
UA11	30S/11E-17D	PRIVATE (not measured)			
UA12	30S/11E-17E9	107.39	10/19/2021	90.67	16.7
UA13	30S/11E-17E10	107.81	10/14/2021	92.4	15.4
UA14	30S/11E-17P4	PRIVATE (not measured)			
UA15	30S/11E-20B7	PRIVATE (not measured)			
UA16	30S/11E-17L4	PRIVATE (measured)			
UA17	30S/11E-17E1	PRIVATE (measured)			
UA18	30S/11E-17F2	PRIVATE (not measured)			
UA19	30S/11E-7Q_	26.80	10/5/2021	18.52	8.3

Table 8. Fall 2021 Water Levels – Lower Aquifer					
Well ID	State Well Number	R. P. Elevation (feet NAVD 88)	Date	Water Level (feet)	
				Depth	Elevation
LA1	30S/10E-2A1	23.13	10/20/2021	15.51	7.6
LA2	30S/10E-11A2	16.07	10/20/2021	10.72	5.4
LA3	30S/10E-14B2	23.89	10/20/2021	21.46	2.4
LA4	30S/10E-13M1	42.70	10/7/2021	44.17	-1.5
LA5	30S/10E-13L7	37.87	10/26/2021	32.3	5.6
LA6	30S/10E-13L4	74.58	10/11/2021	62.85	11.7
LA7	30S/10E-13P2	PRIVATE (not measured)			
LA8	30S/10E-13N	141.36	10/1/2021	135	6.4
LA9	30S/10E-24C1	180.34	10/21/2021	176	4.3
LA10	30S/10E-13J1	98.33	10/27/2021	97	1.3
LA11	30S/10E-12J1	8.43	10/6/2021	3.90	4.5
LA12	30S/11E-7Q3	27.75	10/14/2021	29.80	-2.1
LA13	30S/11E-18F2	103.57	10/8/2021	101.83	1.7
LA14	30S/11E-18L6	79.52	10/7/2021	76.26	3.3
LA15	30S/11E-18L2	88.08	10/14/2021	90.3	-2.2
LA16	30S/11E-18M1	108.74	10/7/2021	100.17	8.6
LA17	30S/11E-24A2	212.82	10/7/2021	193.85	19.0
LA18	30S/11E-18K8	137.13	10/19/2021	135.01	2.1
LA19	30S/11E-19H2	257.35	10/5/2021	263.45	-6.1
LA20	30S/11E-17N10	141.22	10/27/2021	145	-3.8
LA21	30S/11E-17E7	107.22	10/8/2021	110.45	-3.2
LA22	30S/11E-17E8	107.27	10/19/2021	149.30	-42.0
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	10/18/2021	8.02	18.1
LA35	30S/11E-21Bb	86.80	10/8/2021	81	5.8
LA36	30S/11E-21Ja	PRIVATE (not measured)			
LA37	30S/11E-21B1	81.61	10/8/2021	67.52	14.1
LA38	30S/11E-21E	PRIVATE (measured)			
LA39	30S/11E-18K_	123.17	10/26/2021	139	-15.8
LA40	30S/11E-13Ba	11.47	10/12/2021	9.37	2.1
LA41	30S/11E-13Bb	11.46	10/11/2021	7.61	3.9

4.2 Water Quality Results

Available Fall 2021 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 2021 water quality monitoring at First Water or Upper Aquifer Wells. Available Spring and Fall 2021 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 2021 LOBP Groundwater Monitoring Program are included in Appendix D.

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

Lower Aquifer wells LA2 and LA3 on the Morro Bay sand spit 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.

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 2021 in the County's LOWRF Groundwater Monitoring Program reports (Rincon Consultants, 2020, 2021, 2022). Nitrate concentration trends are tracked using the Nitrate Metric (see Section 7.5.3).

Lower Aquifer water quality results for 2021 show four wells, (LA10, LA11, 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 2021 (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 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 D. 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 2021 Water Quality Results – First Water and Upper Aquifer																		
LOBP Well	State Well Number	Date	SC	pH (field)	TDS	Alkalinity			Cl	NO3-N	SO4	B	Ca	Mg	K	Na	T (field)
						CO3	HCO3	Total as CaCO3									
			µS/cm	pH units	mg/L												°F
FW2*	30S/10E-13L8	12/17/2021	--	*7.19*	470	--	--	--	89	22	27	0.13	--	--	--	97	--
FW5	30S/10E-13Q2	10/26/2021	1030	6.02	750	<10	80	70	152	28.3	43.4	0.2	50	37	2	82	65.30
FW6*	30S/10E-24A	12/16/2021	--	*7.68*	550	--	--	150	180	2.5	51	0.3	--	--	--	120	--
FW10	30S/11E-7Q1	10/27/2021	755	6.83	410	<10	110	90	94	15.9	47.9	0.2	23	18	3	77	66.7
FW15*	30S/11E-18N2	12/16/2021	--	*7.48*	430	--	--	--	120	22	72	0.19	--	--	--	67	--
FW16*	30S/11E-18L11	12/16/2021	--	*7.65*	240	--	--	--	41	8	27	0.084	--	--	--	35	--
FW17*	30S/11E-18L12	12/17/2021	--	*7.51*	320	--	--	--	52	23	40	0.096	--	--	--	42	--
FW22*	30S/11E-17F4	12/17/2021	--	*7.79*	390	--	--	--	140	0.81	28.0	<0.050	--	--	--	61	--
FW26	30S/11E-20A2	10/26/2021	677	6.74	390	<10	230	190	76	<0.1	28.1	<0.1	36	38	1	39	64.2
FW28	30S/11E-20M2	10/27/2021	1000	7.18	550	<10	440	360	60	<0.1	72.8	0.1	71	57	1	40	60.1
UA3	30S/10E-13F4	10/7/2021	533	7.40	320	<10	70	60	68	17.5	22.8	<0.1	19	15	2	46	65
UA9	30S/11E-18K3	10/7/2021	347	7.60	210	<10	60	50	44	9.6	8.5	<0.1	16	13	1	29	65
UA13	30S/11E-17E10	10/6/2021	523	7.54	310	<10	100	80	30	3.9	5.4	<0.1	22	21	1	37	66.6

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 2021 (Rincon Consultants, 2022; report pending o*nly laboratory results available*)

Table 10. Spring 2021 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	CaCO3									
			µS/cm	pH units	-- mg/L --												°F
LA8	30S/10E-13N	4/6/2021	438	7.38	302	<10	63	51.5	78.2	7.8	13.1	0.02	16.7	15	1.43	38.2	64.76
LA9	30S/10E-24C1	4/6/2021	443	7.4	287	<10	62.5	51.2	78.4	6.8	12.2	0.02	15.6	14.5	1.37	39.2	65
LA10	30S/10E-13J1	4/6/2021	1110	7.3	815	<10	81.3	66.6	258	2.1	16.1	0.03	66	58.4	1.55	36.4	66
LA11	30S/10E-12J1	4/5/2021	1630	7.56	1050	<10	345	283	256	<0.1	192	0.2	87.8	95.6	4.67	91.3	68.18
LA12	30S/10E-7Q3	4/5/2021	849	7.65	504	<10	305	250	94.2	<0.1	54.1	0.17	47.7	43.3	1.99	54	66.92
LA15	30S/11E-18L2	4/6/2021	780	7.4	444	<10	234	192	108	1	27.2	0.05	47.4	41.8	1.7	37.8	67.82
LA18	30S/11E-18K8	4/12/2021	621	7.61	389	<10	298	244	31.9	<0.1	41.2	0.06	54.3	32	2.11	26.6	71.24
LA20	30S/11E-17N10	4/6/2021	529	7.5	329	<10	204	168	42.5	3	21.1	0.1	28.6	25.9	1.92	33.4	66
LA22	30S/11E-17E8	4/8/2021	470	7.52	329	<10	159	130	46.2	5.8	12.5	0.01	24.1	22.7	1.17	26.8	67.82
LA30	30S/11E-20H1	4/1/2021	945	7.28	582	<10	402	329	57.2	<0.1	112	0.1	68.7	58.5	1.35	38.6	65.84
LA31	30S/10E-13M2	4/1/2021	1010	8.29	581	<10	218	179	161	2.9	47.3	0.27	31.1	26.5	20	113	64.22
LA32	30S/11E-18K9	4/5/2021	390	7.82	247	<10	143	117	34.3	2.1	15.7	0.05	19.7	19.1	1.17	27.1	66.02
LA39	30S/11E-18K_	4/6/2021	629	7.2	382	<10	301	246	37.9	0.05	25.8	0.06	34.2	34.1	1.6	40	68
LA40	30S/10E-13Ba	4/15/2021	8590	7.35	6760	<10	274	224	2510	<0.2	217	0.08	558	576	6.91	210	68.9
LA41	30S/10E-13Bb	4/14/2021	855	7.6	505	<10	333	273	66	0.05	85.8	0.1	53.4	37.8	2.02	59.9	67.46

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.

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
LA8	30S/10E-13N	10/8/2021	443	7.84	290	<10	60	50	77	7.5	13.3	<0.1	17	16	2	41	65.3
LA9	30S/10E-24C1	10/7/2021	490	7.70	280	<10	60	50	86	6.4	16.0	<0.1	17	17	2	44	67
LA10	30S/10E-13J1	10/7/2021	1180	7.20	790	<10	80	70	289	2.1	16.8	<0.1	65	61	2	37	68
LA11	30S/10E-12J1	10/6/2021	1710	7.30	1020	<10	340	280	258	<0.1	176	0.2	83	88	5	82	68.9
LA12	30S10E-7Q3	10/6/2021	874	7.47	510	<10	300	250	95	<0.1	55	0.2	46	41	2	51	69.8
LA15	30S/11E-18L2	10/6/2021	856	7.27	490	<10	250	210	107	0.5	32.8	<0.1	49	42	2	37	69.44
LA18	30S/11E-18K8	10/19/2021	657	7.40	400	<10	300	240	32	<0.1	38.4	<0.1	59	34	2	28	73.76
LA20	30S/11E-17N10	10/7/2021	633	6.80	340	<10	290	240	40	0.7	27.8	0.1	37	37	2	43	67
LA22	30S/11E-17E8	10/19/2021	480	7.43	310	<10	170	140	41	5.8	14.9	<0.1	28	27	1	29	69.98
LA30	30S/11E-20H1	10/7/2021	943	7.44	560	<10	410	330	56	<0.1	103	0.1	66	59	1	38	64.22
LA31	30S/10E-13M2	11/4/2021	2780	7.90	1700	<10	70	50	629	0.6	124	0.1	77	77	4	305	64.94
LA32	30S/11E-18K9	10/6/2021	255	7.73	150	<10	60	50	30	3.9	5.7	<0.1	11	10	<1	20	68
LA39	30S/11E-18K_	10/7/2021	638	7.40	360	<10	300	240	37	<0.1	29.3	<0.1	37	39	2	45	69
LA40	30S/10E-13Ba	10/13/2021	8930	7.39	7430	<10	270	230	2910	<0.1	201	<0.1	544	530	6	190	66.74
LA41	30S/10E-13Bb	10/11/2021	812	7.24	460	<10	340	280	48	<0.1	79.6	<0.1	58	40	2	64	71.24

Table 11. Fall 2021 Water Quality Results – Lower Aquifer

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.

Table 12. CEC Monitoring Results					
Constituent or Parameter	Units	FW5	FW6	FW26	LOWRF Recycled Water[1]
		October 26, 2021			October 27, 2021
Health-based					
17β-estradiol	ng/L	ND (<4)	ND (<4)	ND (<4)	ND (<10)
Triclosan	ng/L	ND (<8)	ND (<8)	ND (<8)	ND (<25)
Caffeine[2]	ng/L	ND (<4)	ND (<4)	ND (<4)	ND (<100)
NDMA	ng/L	7.9	7.5	ND (<2)	3.2
Performance-based					
Gemfibrozil	ng/L	ND (<4)	ND (<4)	ND (<4)	120
DEET[2]	ng/L	ND (<4)	17	ND (<4)	--
Iopromide	ng/L	ND (<4)	ND (<4)	ND (<4)	ND (<100)
Sucralose	ng/L	2,600	12,000	43	55,000
Surrogate					
Ammonia	mg/L	ND (<0.1)	ND (<0.1)	0.19	--
Nitrate-Nitrogen	mg/L	32	2.7	ND (<0.2)	3.4[3]
Total Organic Carbon	mg/L	0.58	1.1	1.3	--
UV Light Absorption	1/cm	0.021	0.016	0.025	--
Specific Conductance	µmhos/cm	1,000	980	650	--

[1]2021 LOWRF CEC Blue Ribbon Report and 2021 LOWRF Annual Report (SLO Co. 2021a, 2021b).
[2] Blank Contamination. Analyte also detected in the laboratory method blank.
[3] October 2021 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")

CEC Laboratory results are in Appendix C. In 2021, Weck Laboratories reported results for the full suite of CEC constituents, rather than just the specific constituents identified in the LOBP. A summary sheet of the CEC constituents tested, along with analytical method information, is included in Appendix C. Constituents detected above the reporting limits and listed in Table 12 are discussed below.

DEET (Diethyl-meta-toluamide), a personal care product used for insect repellent, was detected in one groundwater sample (FW6). No DEET was detected in the laboratory blanks.

Sucralose, an artificial sweetener, was reported at 2,600 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 12,000 ng/L, and was detected in groundwater from FW26 at 43 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 sucralose, suggests a potential for low level influence from septic tank discharges, although no nitrate has been detected at FW26 since CEC monitoring began in 2017.

Nitrate-nitrogen was reported at 32 mg/L in groundwater from FW5, 2.7 mg/L in FW6, and was not detected in groundwater from FW26. NDMA (N-Nitroso-dimethylamine) was detected at 7.5 ng/L in groundwater from FW5, 7.9 ng/L in groundwater from FW6, and was not detected in groundwater from FW26. Available CEC-constituent quality of recycled water from LOWRF is also provided in Table 12 for comparison.

NDMA is a byproduct of ion-exchange water treatment and chlorine, ozone, or chloramine disinfection. Concentrations of NDMA in Los Osos groundwater were previously reported at FW5 (30S/10E-13Q1) in a 2006 water quality investigation (Cleath & Associates, 2006). NDMA is also present in recycled water from LOWRF (Table 12).

Results of the CEC testing are interpreted to indicate wastewater influence at FW5 and FW6, based on sucralose, nitrate, and NDMA 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 or NDMA present. Recycled water discharges may be influencing water quality at FW5, based on an order of magnitude increase in sucralose concentrations since the 2020 sampling (Table 12).

FW6 is the sentry well for Broderson recycled water discharges entering the Basin. 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 concentrations detected prior to Broderson Site operation and are similar to LOWRF effluent. Sucralose concentrations at FW6 continue to increase over time, and are now in the same order of magnitude (over 10,000 ng/L) as LOWRF effluent. Sucralose is a food additive and there is no State notification level for sucralose concentrations in drinking water.

4.3 Geophysics

Induction and natural gamma logging were performed at Lower Aquifer monitoring well LA4, LA14, and LA40 on November 5, 2021. 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. The fresh water/seawater interface on geophysical logs is selected where resistivity becomes a relatively straight and vertical line close to zero ohm-meters. This interface does not correspond to the 250 mg/L chloride concentration isopleth used to delineate the seawater intrusion front in contour maps, but represents a greater chloride concentration transition that is used for relative comparison between geophysical surveys.

Geophysical monitoring events have been performed in 1985, 2004, 2009, 2014, 2015, 2018 and 2021 at LA4 and LA14. The fresh water/seawater interface at LA4 rose approximately 50 feet between 1985 and 2009, with Lower Aquifer production reaching historical highs. Since 2009, induction logging at well LA4 indicates the fresh water/seawater interface has dropped approximately 18 feet in elevation in response to a general reduction in the west side Lower Aquifer pumping (Appendix F). No evidence of seawater intrusion has been observed in geophysical logging at Lower Aquifer monitoring well LA14. Historical geophysical records are included in Appendix F.

Geophysical monitoring events were completed in 2019 and 2021 at LA40. The fresh water/seawater interface is interpreted to have remained unchanged at approximately 410 feet depth between monitoring events (Appendix F). The next scheduled geophysical logging will be in October of 2024.

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 G. 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 (2013-2021)				
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
2021	503	491	32	1,026

Note: [1]Metered production

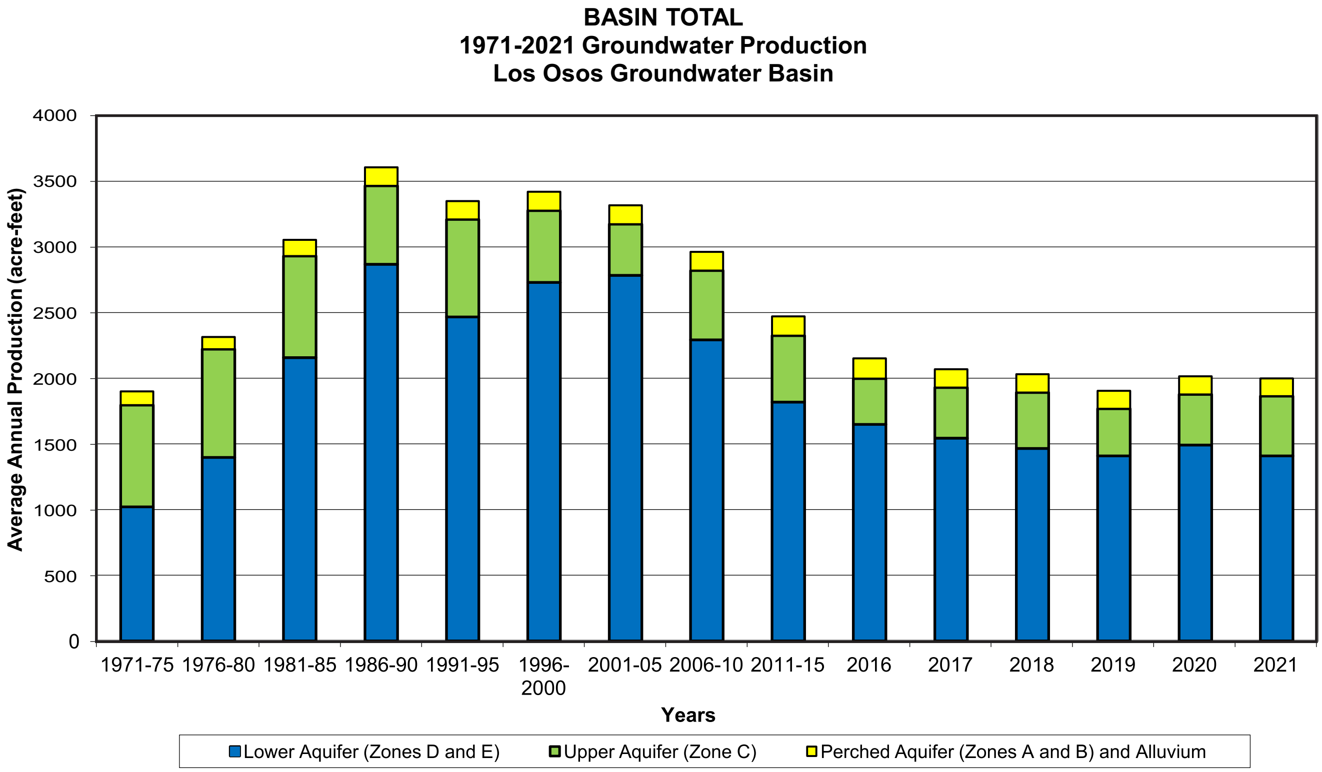
Table 14. Estimated Basin Groundwater Production (2013-2021)					
Year	Purveyors	Domestic	Community	Agriculture	Total
	Acre-Feet[1]				
2013	1,470	200	140	750	2,560
2014	1,246	220	130	800	2,400
2015	1,007	220	140	800	2,170
2016	1,003	220	140	800	2,160
2017	1,050	220	130	670	2,070
2018	1,018	220	120	670	2,030
2019	991	220	60	630	1,900
2020	1,063	220	80	650	2,010
2021	1,026	220	130	620	2,000

Note: [1]All figures except Purveyors rounded to the nearest 10 acre-feet. Production from non-metered wells (Domestic, Community, Agricultural) estimated per methods described in Appendix H and LOBP Section 4 and Section 7.5.

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. Produced water from purveyors 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 2019 and 2020 in response to recycled water deliveries for golf course irrigation. Recycled water deliveries to the golf course declined sharply in 2021, resulting in an increase in community demand to historical levels. Estimated agricultural irrigation is shown as declining overall, mainly due to reductions in estimated irrigated acreage since 2017 (details in Appendix H). Overall declines in Basin production since 2015 are from declines in estimated production values, rather than metered production.

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 was a 25 percent reduction in Basin production over the last 10 years, of which reduced purveyor pumping from wells in the Lower Aquifer Western Area accounted for approximately 57 percent of the total reduction in Basin pumping (Figure 6). Over the last five-year period (2017-2021), overall Lower Aquifer production in the Basin decreased by 135 acre-feet per year, although in the Western Area, Lower Aquifer production increased by 70 acre-feet per year.

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 H). 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).



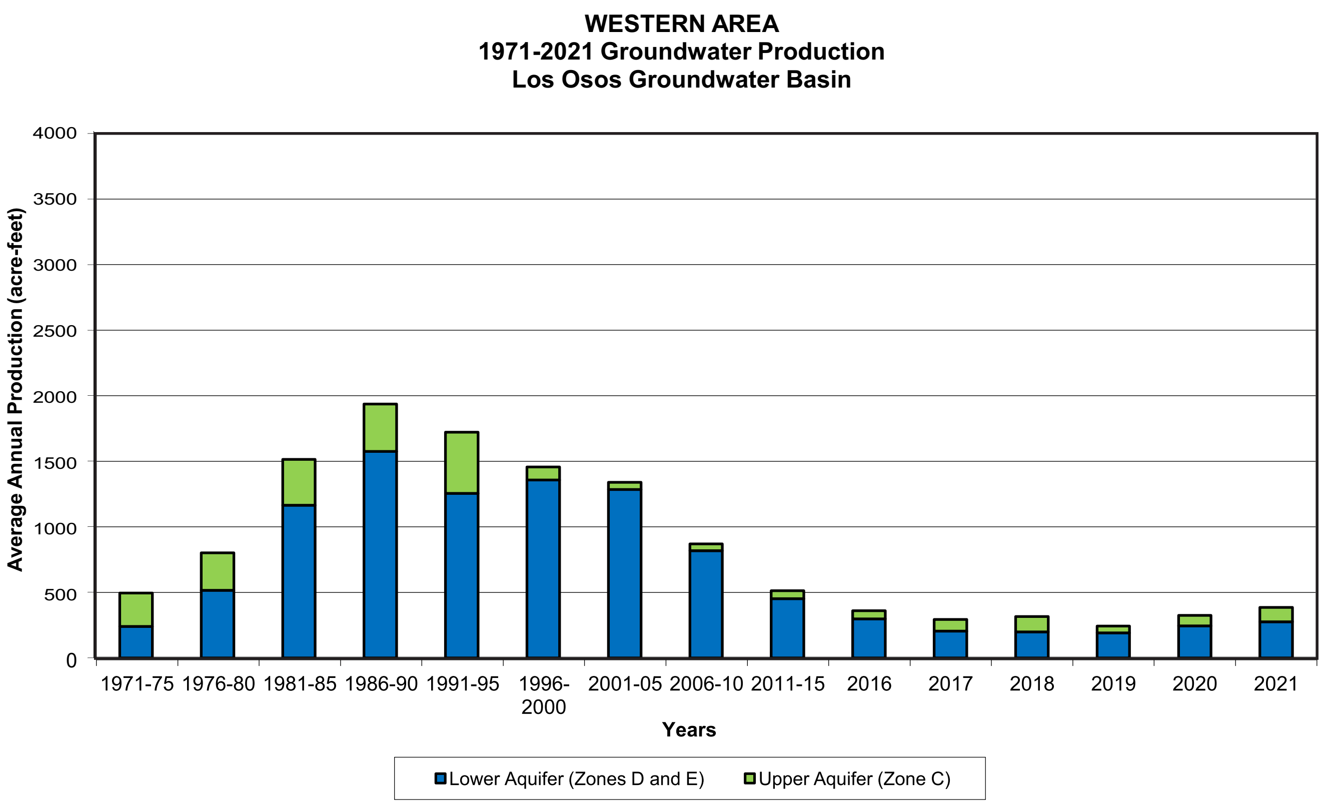
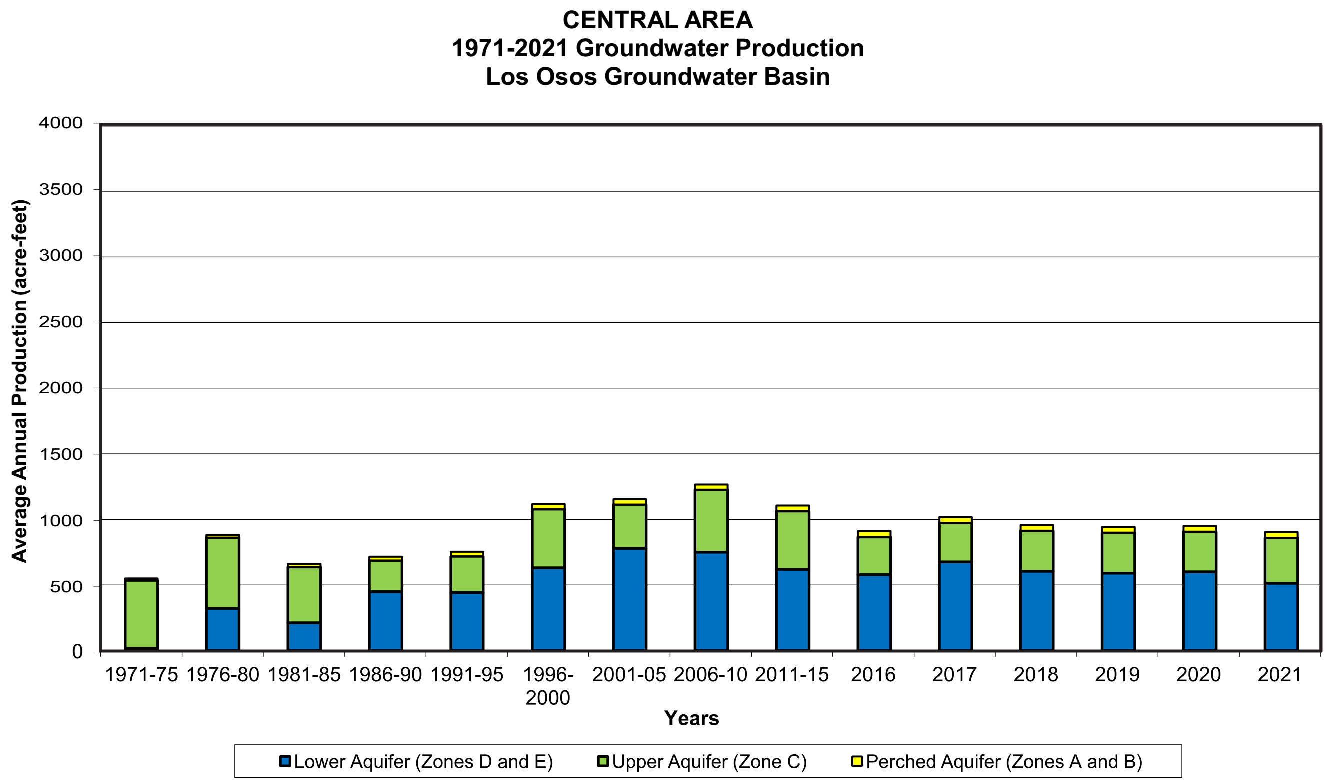


Figure 6
Basin Production 1971-2021
Basin Total and Western Areas
Los Osos Groundwater Basin
2021 Annual Report

Cleath-Harris Geologists



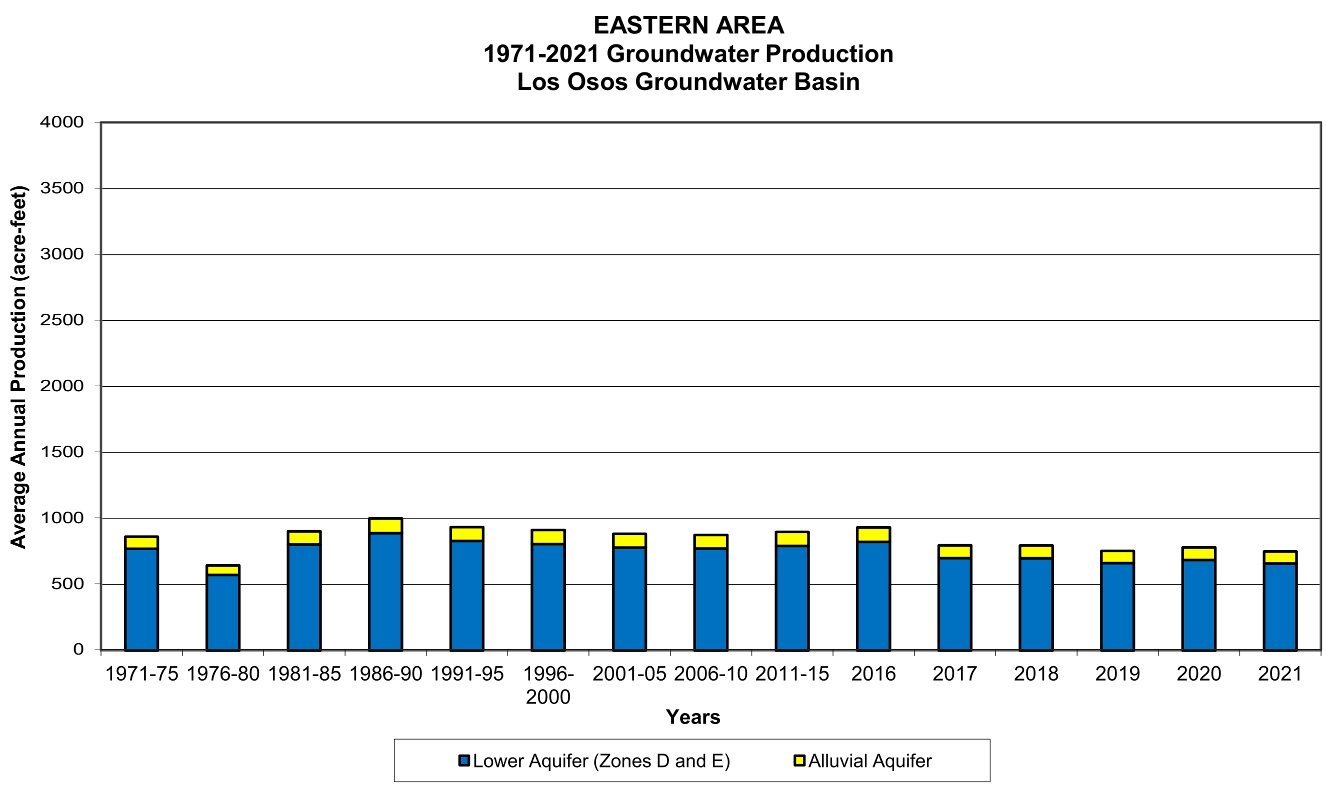


Figure 7
Basin Production 1971-2021
Central and Eastern Areas
Los Osos Groundwater Basin
2021 Annual Report

Cleath-Harris Geologists

6. PRECIPITATION AND STREAMFLOW

Precipitation data are currently available from a County gage located at the former Los Osos landfill (Station #727). Continuous precipitation records for Station #727 are available beginning with the 2006 rainfall year (July 2005 through June 2006), and show that rainfall has averaged 16.09 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 2021 rainfall year was reported at 14.16 (below average). Records for Station #727 through the calendar year 2021 are included in Appendix I. 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.

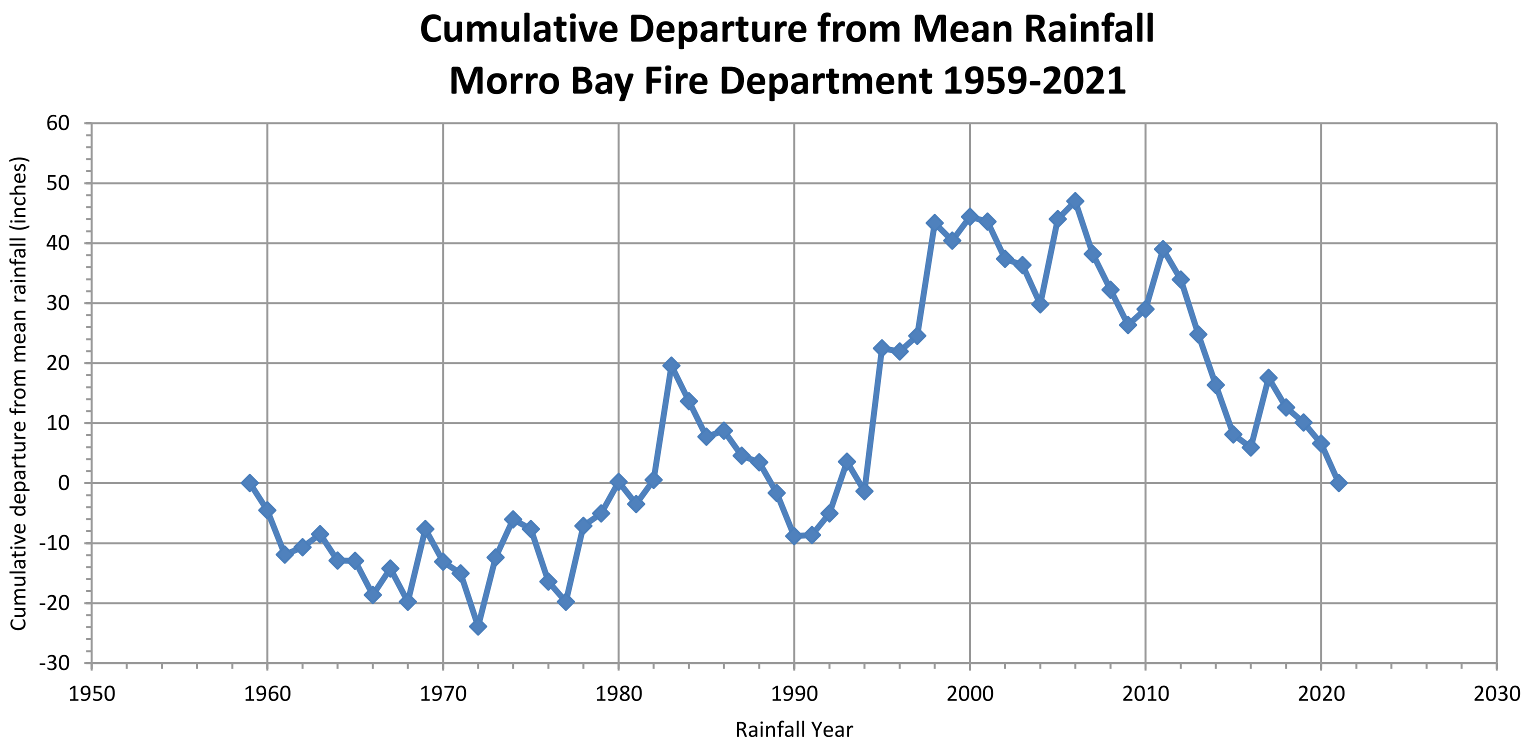
Table 15. Active and Former Precipitation Stations

Station No.	Name	Period of Record (rainfall years)	Average Annual Precipitation (inches)
144.1	Bender	1955-1987	19.17
152	Morro Bay Fire Dept.	1959-2021 (active)	15.99
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)	15.97*

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 2021 (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 2021 with moderate drought conditions in January. Severe drought conditions were reported at the end of the calendar year in December 2021 (NDMC/USDA/NOAA, 2021).



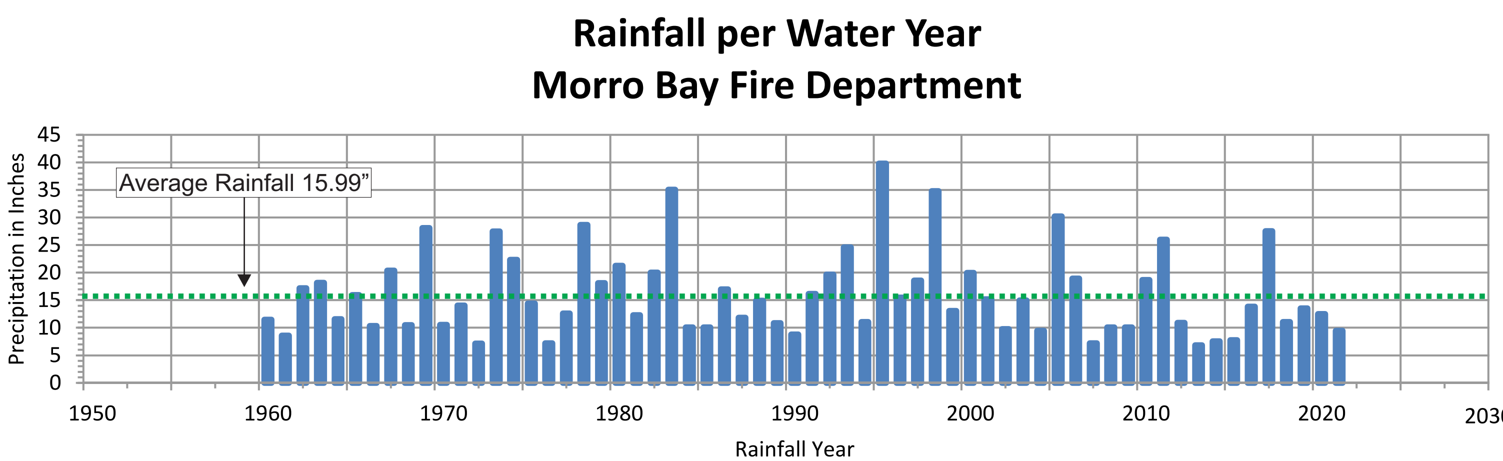


Figure 8
Cumulative Departure from
Mean Rainfall at Morro Bay Fire Department
Los Osos Groundwater Basin
2021 Annual Report

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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 46 inches from the long-term average, equivalent to 3.1 inches per year below average. Station #727 records begin in 2006, therefore, the current average rainfall of 15.97 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 I.

Streamflow was recorded at the gage for 23 individual days during the 2021 water year (October 1, 2020 to September 30, 2021), during a continuous flow period between January 27 and February 18, 2021. 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, 2021 Water Year

Date	Maximum Stream Stage County Sensor #751 (feet)
1/28/2021	9.99
2/01/2021	3.55

Development of a rating curve for Sensor 751 has been authorized by the BMC for completion in 2022, although drought conditions are projected to delay completion until Spring 2023. 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 2021 are included in Appendix I.

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

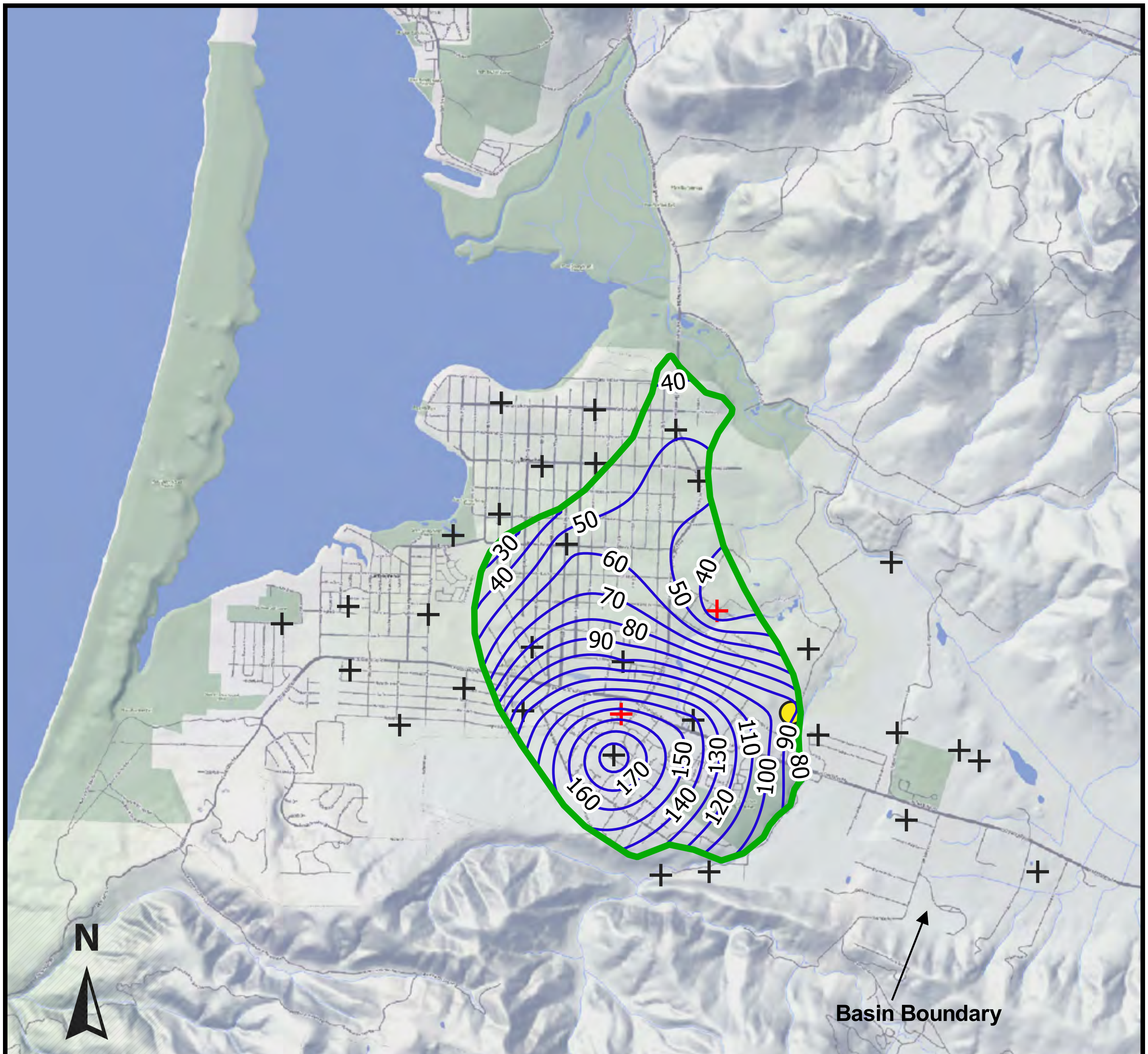
Groundwater level and groundwater quality data for 2021, together with selected historical data, have been used to develop the following information:

- Groundwater elevation contour maps for the Perched Aquifer, Upper Aquifer (with Alluvial Aquifer), and Lower Aquifer for both Spring and Fall 2021 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 2021 position of the seawater intrusion front.
- Estimates of groundwater in storage for Spring and Fall 2021, including amount above mean sea level.
- Estimates of changes to groundwater in storage from Spring 2020 to Spring 2021, 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 2021 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 2021 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). Private well participation in the monitoring program during 2021 was 73 percent (24 out of 33 wells). With completion of the 2021 wellhead elevation survey, all of the LOBP monitoring network wells that are used for water level monitoring now have NAVD 88 elevations as reported by a licensed land surveyor.



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 2021 groundwater elevation data point (contours not applicable outside of Perched Aquifer limits)
- Alternate date groundwater elevation data point

Figure 9
Spring 2021 Water Level Contours
Perched Aquifer
Los Osos Groundwater Basin
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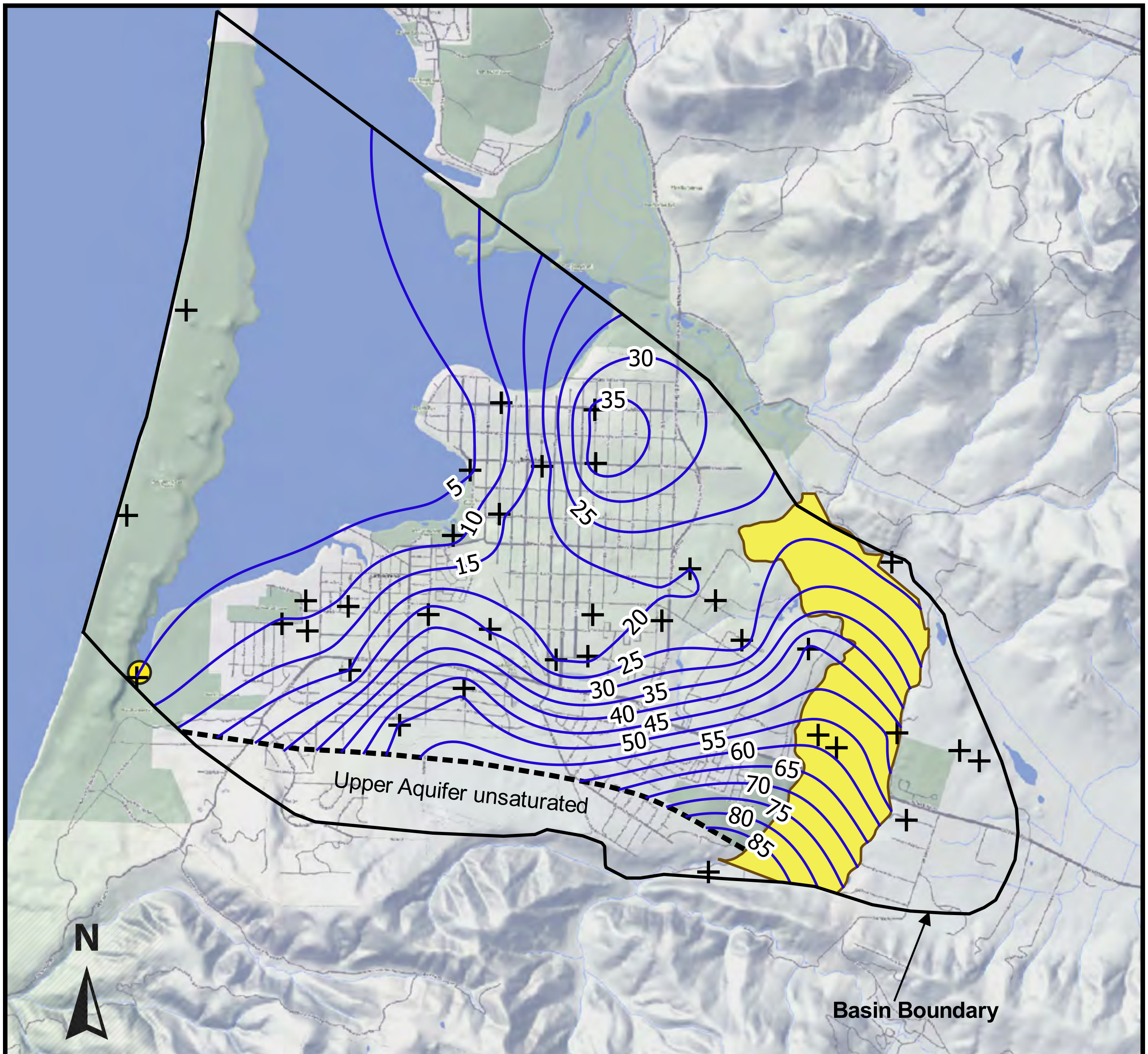

Base Image: Stamen-Terrain

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

Spring 2021 groundwater elevation data point

Spring seep used for groundwater elevation

Figure 10
Spring 2021 Water Level Contours
Upper Aquifer
Los Osos Groundwater Basin
2021 Annual Report

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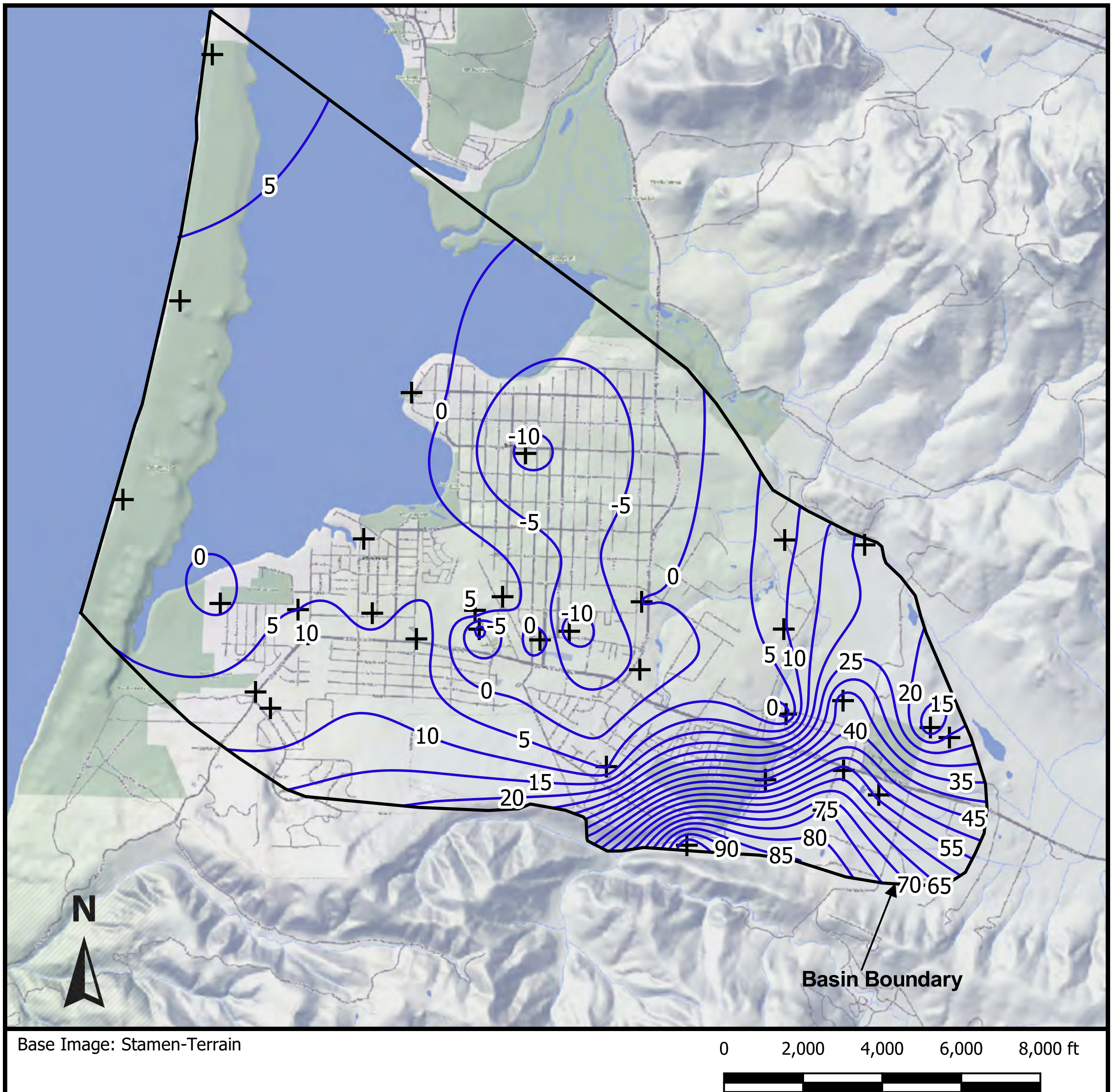

Explanation

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

Spring 2021 groundwater elevation data point

Figure 11
Spring 2021 Water Level Contours
Lower Aquifer
Los Osos Groundwater Basin
2021 Annual Report

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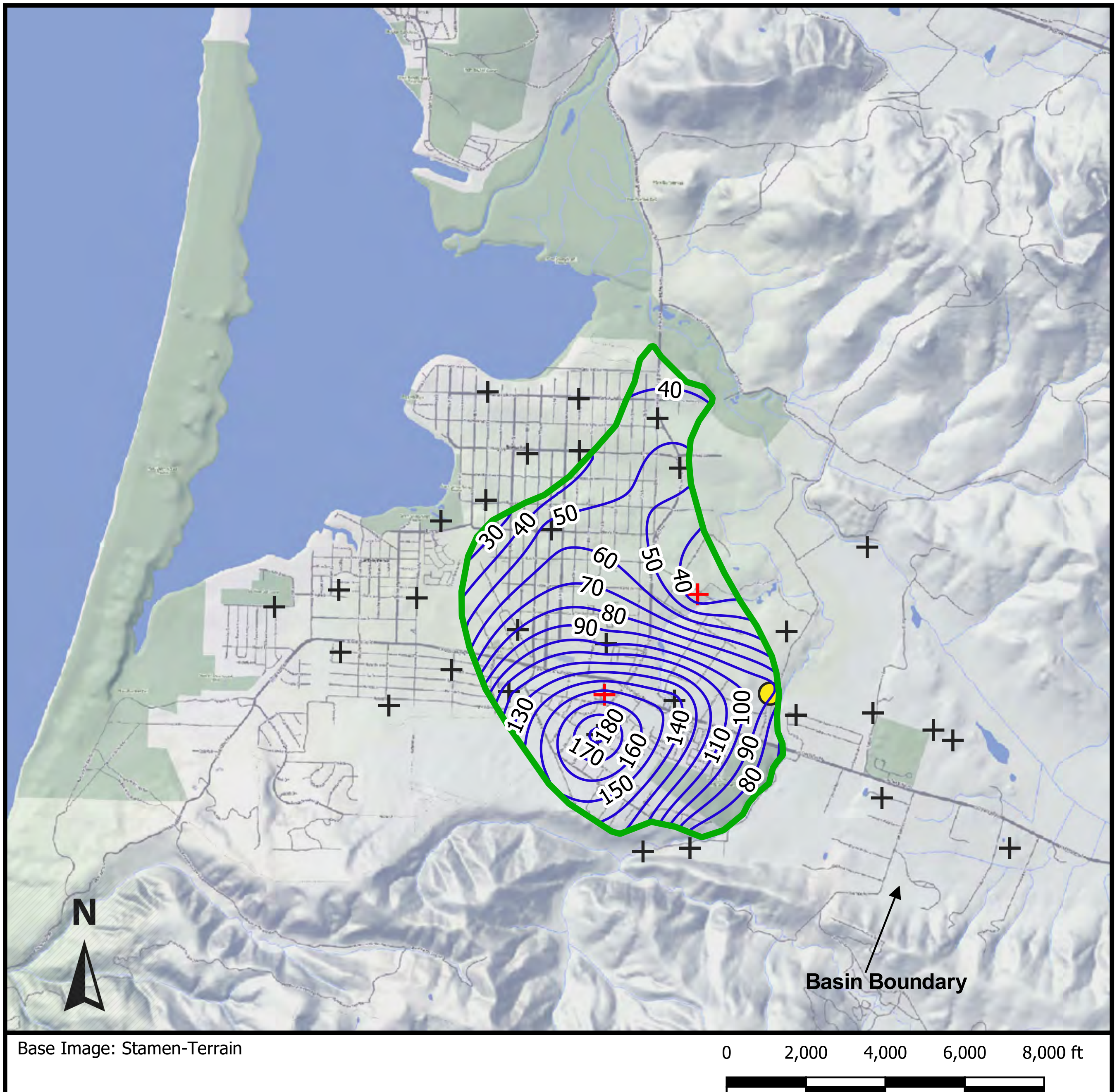

Base Image: Stamen-Terrain

Explanation

Approximate limits of Perched Aquifer

Groundwater elevation contour in feet above sea level (NAVD88 datum)

Spring seep used for groundwater elevation

Fall 2021 groundwater elevation data point (contours not applicable outside of Perched Aquifer limits)

Alternate date groundwater elevation data point

Figure 12
Fall 2021 Water Level Contours
Perched Aquifer
Los Osos Groundwater Basin
2021 Annual Report

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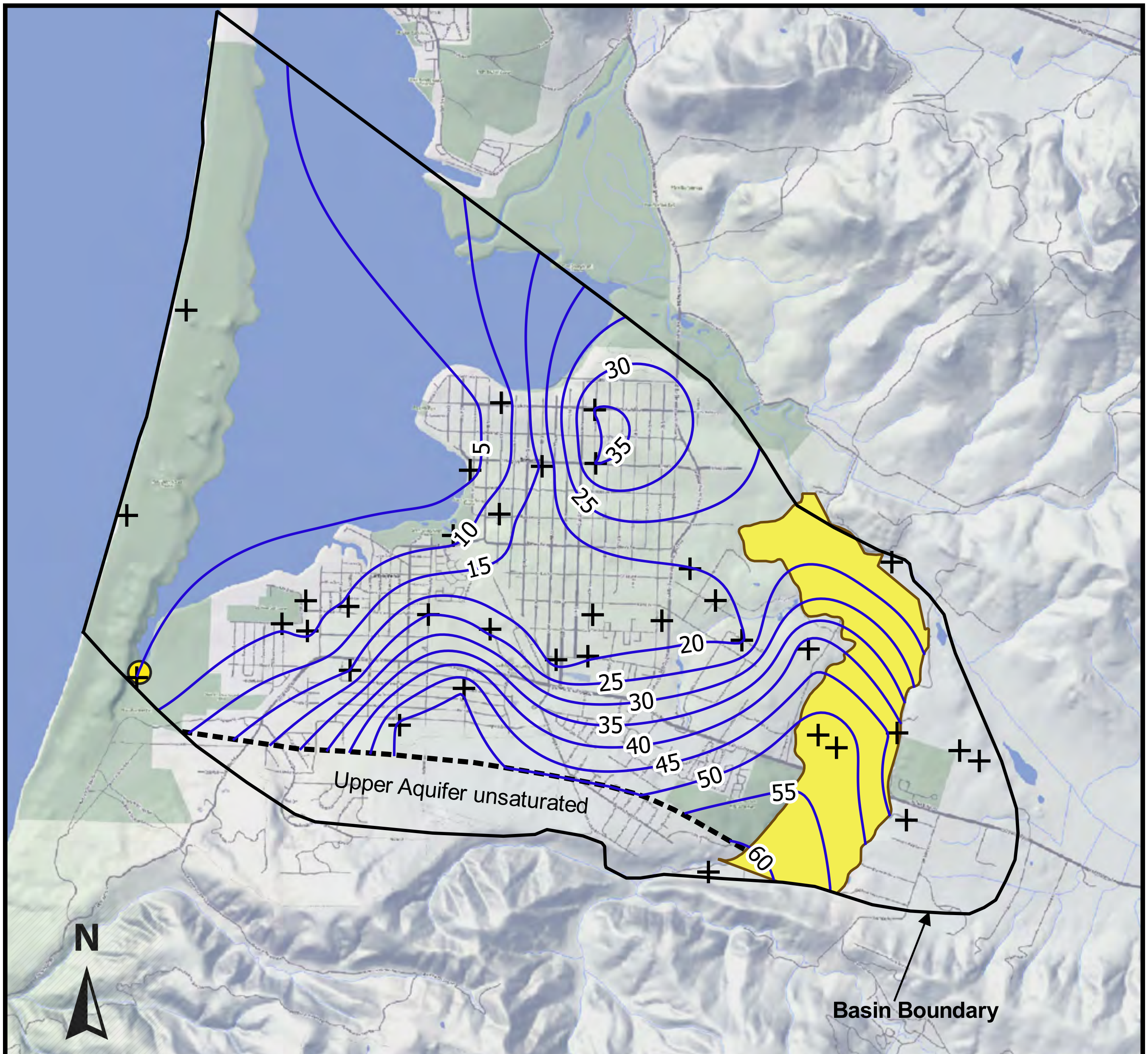

Base Image: Stamen-Terrain

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

Scale: 1 inch ≈ 4,000 feet

Explanation

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

Limits of Alluvial Aquifer

Fall 2021 groundwater elevation data point

Spring seep used for groundwater elevation

Figure 13
Fall 2021 Water Level Contours
Upper Aquifer
Los Osos Groundwater Basin
2020 Annual Report

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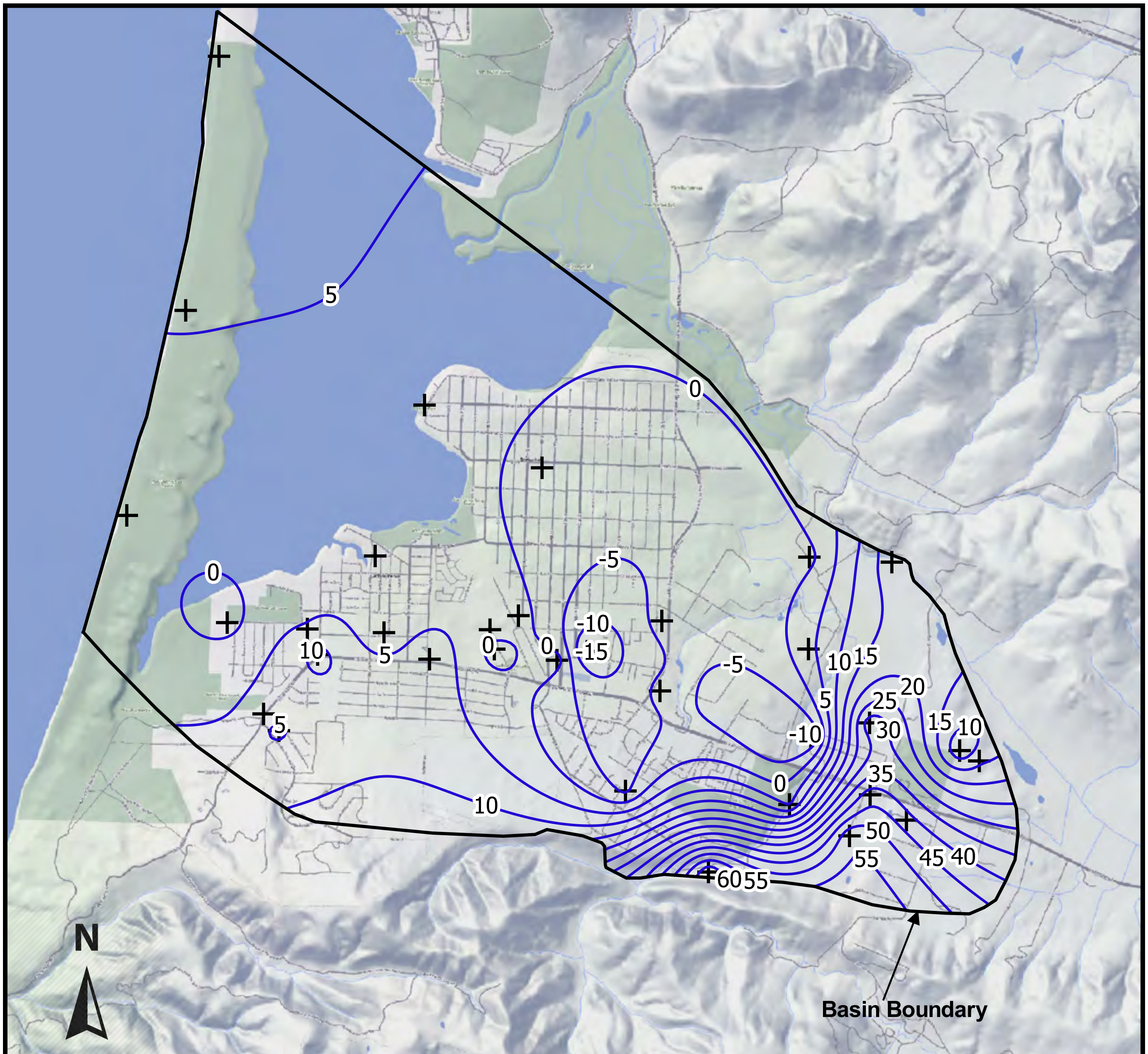

Base Image: Stamen-Terrain

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

Scale: 1 inch ≈ 4,000 feet

Explanation

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

+ Fall 2021 groundwater elevation data point

Figure 14
Fall 2021 Water Level Contours
Lower Aquifer
Los Osos Groundwater Basin
2021 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 3.1 feet from Spring to Fall 2021, which is normal (water levels typically decline in the fall and recover in the spring). The average seasonal water level decline in the Perched Aquifer over the last five years has been 2.5 feet, followed by water level recovery in the spring.

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 2.2 feet of water level decline from Spring to Fall 2021, which is normal. The average seasonal water level decline in the Upper Aquifer over the last five years has been 2.2 feet, followed by water level recovery in the spring.

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 2.8 feet of water level decline from Spring to Fall 2021, which is normal, although there was less decline than usual. The average seasonal water level decline in the Lower Aquifer over the last five years has been 4.9 feet, followed by water level recovery in the spring.

7.2 Water Level Hydrographs

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

In previous reports, trends for the First Water wells have been analyzed in ten-year spans. There was a lapse in monitoring between 2006 and 2012 for three of the five representative First Water wells, however, so beginning in 2017 a five-year trend was analyzed, increasing by one year with each subsequent report until the First Water trend analysis returns to a ten-year span. A nine-year trend is reported for 2021.

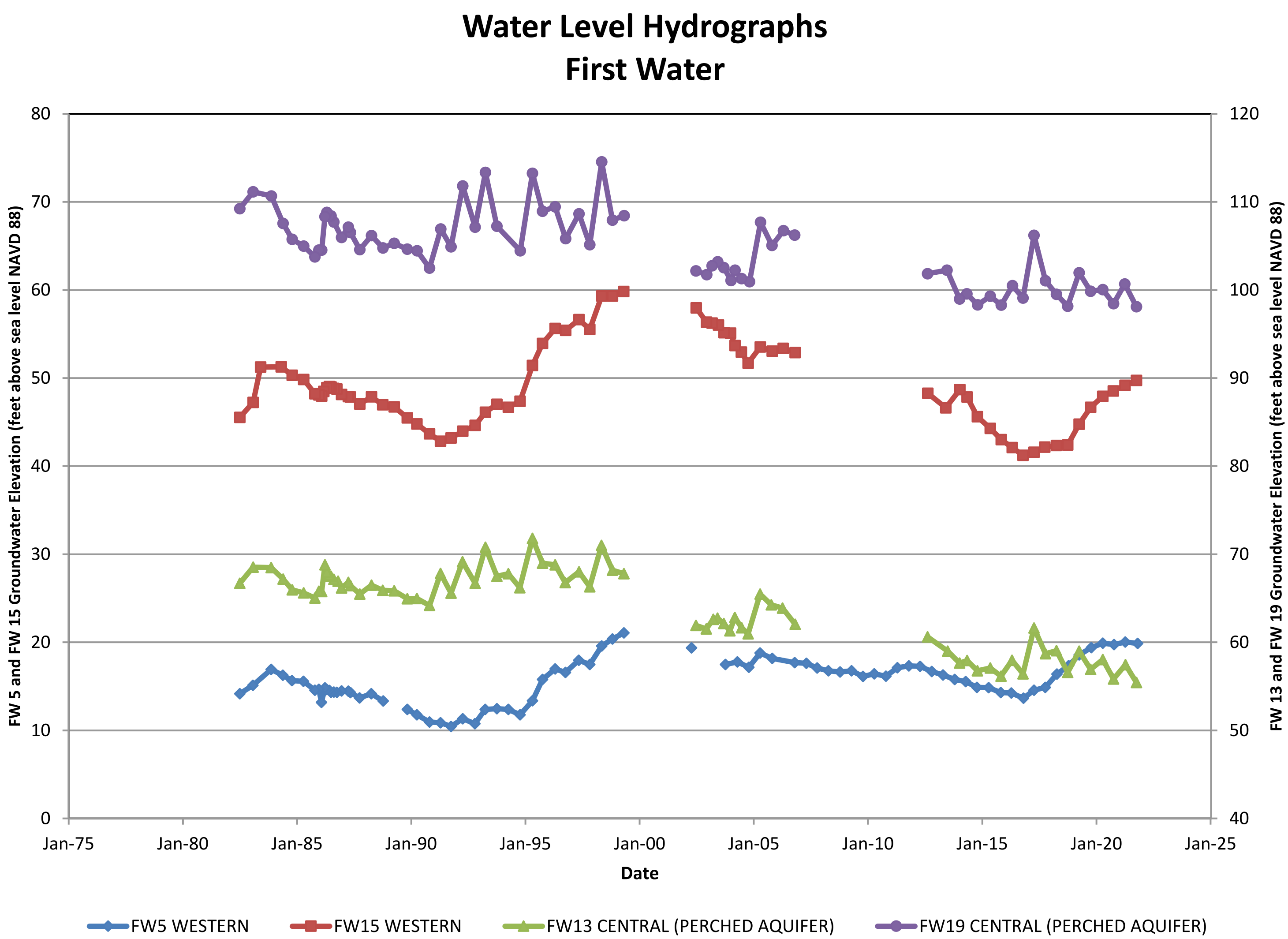

Figure 15
Water Level Hydrographs
Perched Aquifer / First Water
Los Osos Groundwater Basin
2021 Annual Report

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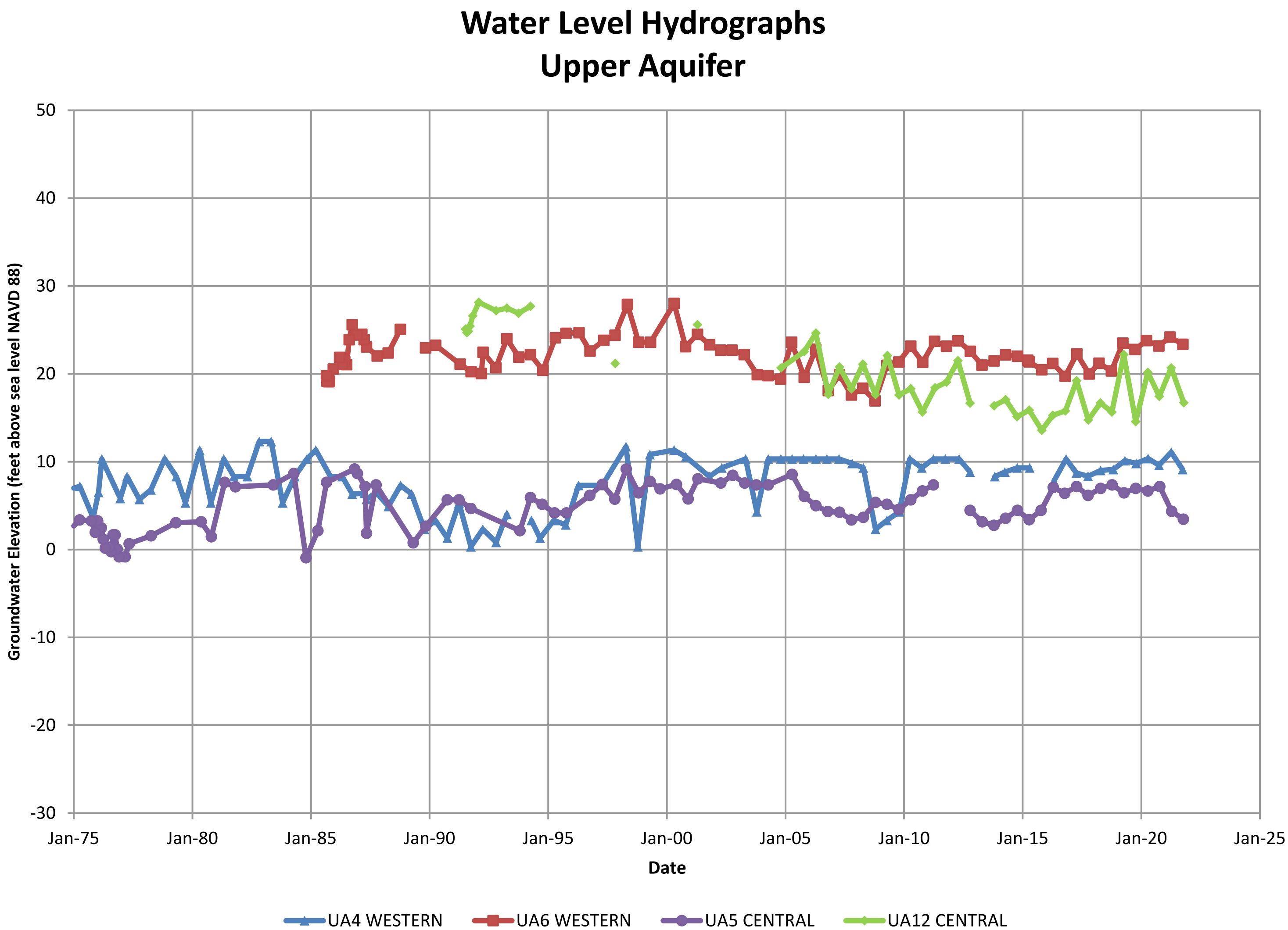

Figure 16
Water Level Hydrographs
Upper Aquifer
Los Osos Groundwater Basin
2021 Annual Report

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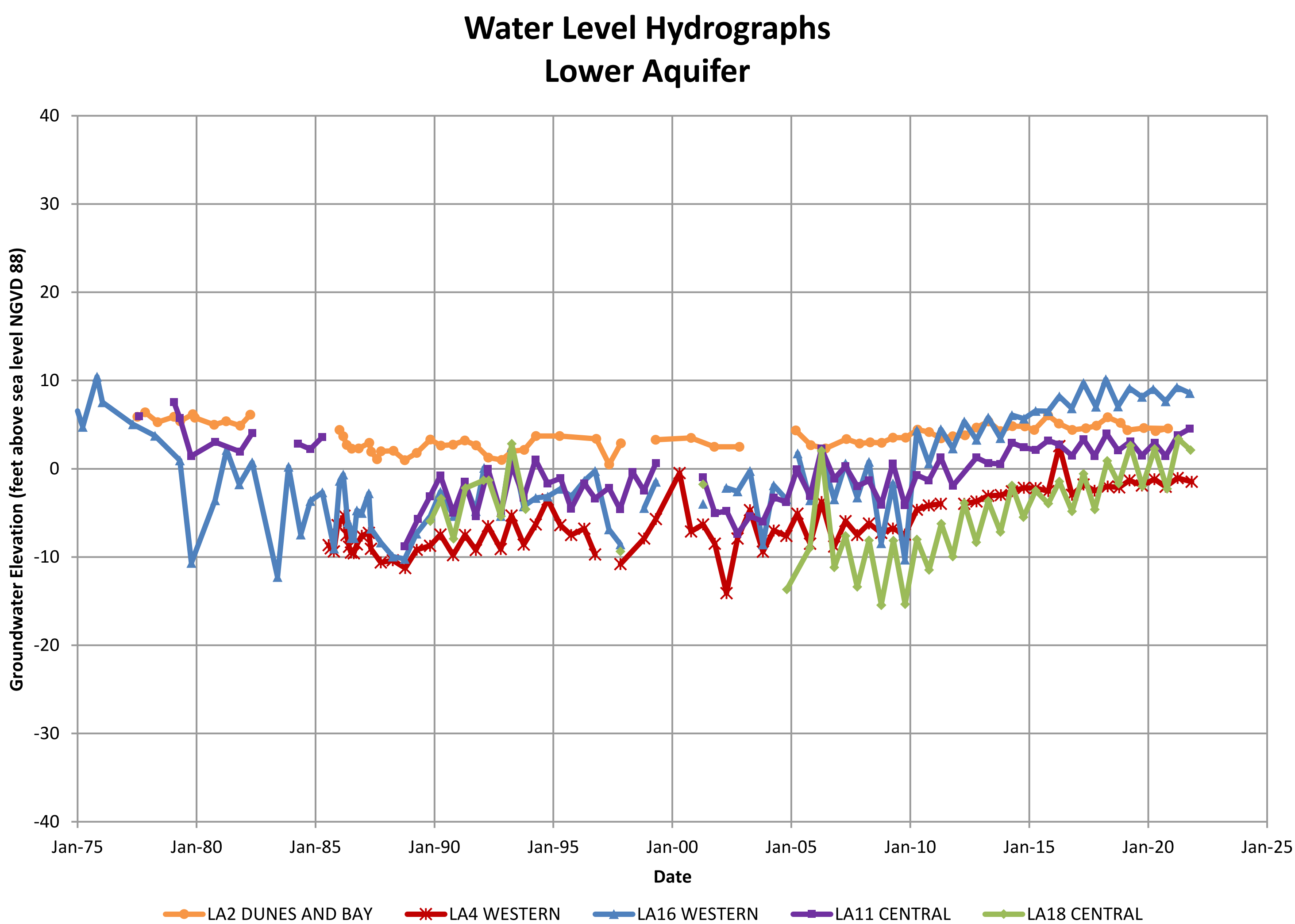

Figure 17
Water Level Hydrographs
Lower Aquifer
Los Osos Groundwater Basin
2021 Annual Report

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The Spring to Spring water level trend for the last nine years (2012-2021), based on First Water hydrographs in Western and Central Area wells was 0.02 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 (2011-2021), based on representative Central and Western wells was an increase of 0.09 feet per year in the Upper Aquifer, and 0.41 feet of rise per year in Lower Aquifer water levels (Figures 16 and 17, respectively).

Hydrographs for fourteen wells equipped with pressure transducers are shown in Appendix J. Transducer locations are shown in Figure 2, 3, and 4. 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 nine Lower Aquifer wells equipped with transducers.

Seven of the transducer hydrographs were initiated in 2016-17. Data from these wells have been interpreted to show the following 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 21 feet (Appendix J). 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 J).

- 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 J). 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 J).

The remaining seven transducers were installed in late 2021, and only had a month of data recorded through the end of the year. The y-axis (vertical scale) of the hydrographs at the wells with newly installed transducers are set to 10 feet (instead of 50 feet), due to the short monitoring interval. The hydrographs from these wells are interpreted to show the following trends:

- Tidal influence is clearly observed in the hydrographs for LA11, LA40 and LA41, which are dedicated Lower Aquifer monitoring wells close to the bay. The tidal influence is interpreted to be a result of pressure loading and unloading to aquifers underlying the bay as the tides ebb and flow. Overall short-term trends, besides the dominant tidal effects, are slightly declining water levels in LA11 and slightly rising water levels in LA40 and LA41.

- LA6, LA14, LA16, and LA19 all show slightly rising water levels in December 2021.

7.3 Seawater Intrusion

The estimated position of the Fall 2021 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 in Zone D moved several hundred feet seaward between Fall 2020 and Fall 2021 (an improvement), 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.

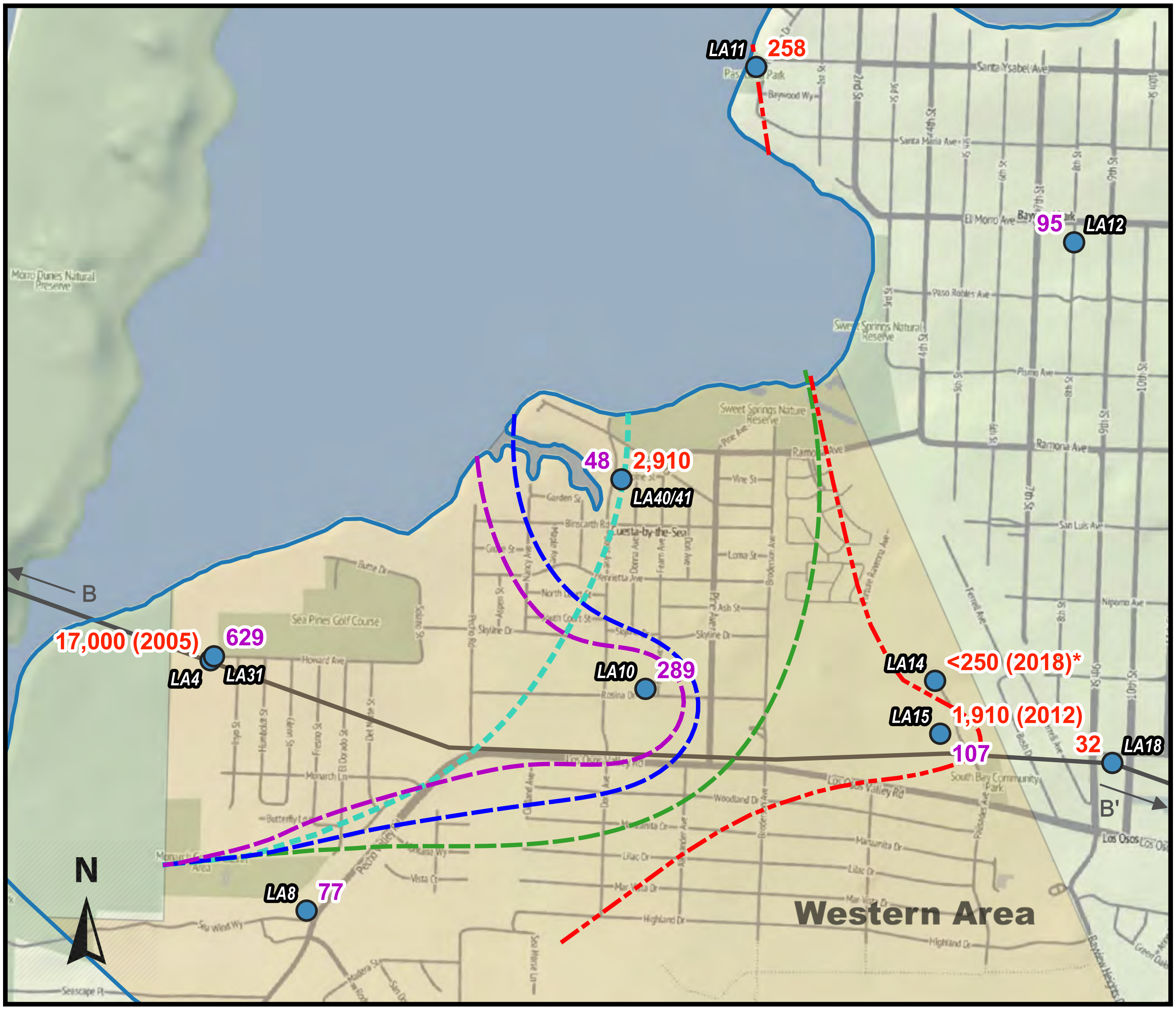
Contouring for the intrusion front (250 mg/L chloride isopleth) shown in Figure 18 uses the ordinary kriging interpolation method, which provides a best (least-squares) estimate of values at unmeasured points based on the mapped values. Chloride concentrations at Dunes and Bay Area wells LA2 and LA3 were not analyzed in 2021 due to no access, but in general they are two orders of magnitude greater than the Western Area wells and are 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 (see Section 4.3) 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 the latest geophysics at LA14 (Section 4.3) and on water quality monitoring at Zone E monitoring well LA32 (10th Street). Inland movement of the Zone E front toward LA11, however, has been detected, as LA 11 had a chloride concentration of 258 mg/L in October of 2021 (Figure 20). There has also been a substantial increase in chloride concentrations at LA40 over the past two years which indicates active intrusion in Zone E along the bay. Seawater intrusion into Zone E is a significant threat to basin sustainability and has been for decades

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 48 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 individual Lower Aquifer wells and are included in Appendix K for reference.

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). Evaluating the feasibility and costs of these modifications, with implementation of at least one recommended modification, was authorized to be completed in 2022. Additional Lower Aquifer monitoring wells are also recommended to improve seawater intrusion definition in both Zone D and Zone E. Selecting a feasible site for a new monitoring well is also planned for 2022

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 2021 except where year noted)

* 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 2020 - Zone D

Fall 2021 - Zone D

Zone E (Generalized with data from various years)

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

Los Osos Groundwater Basin
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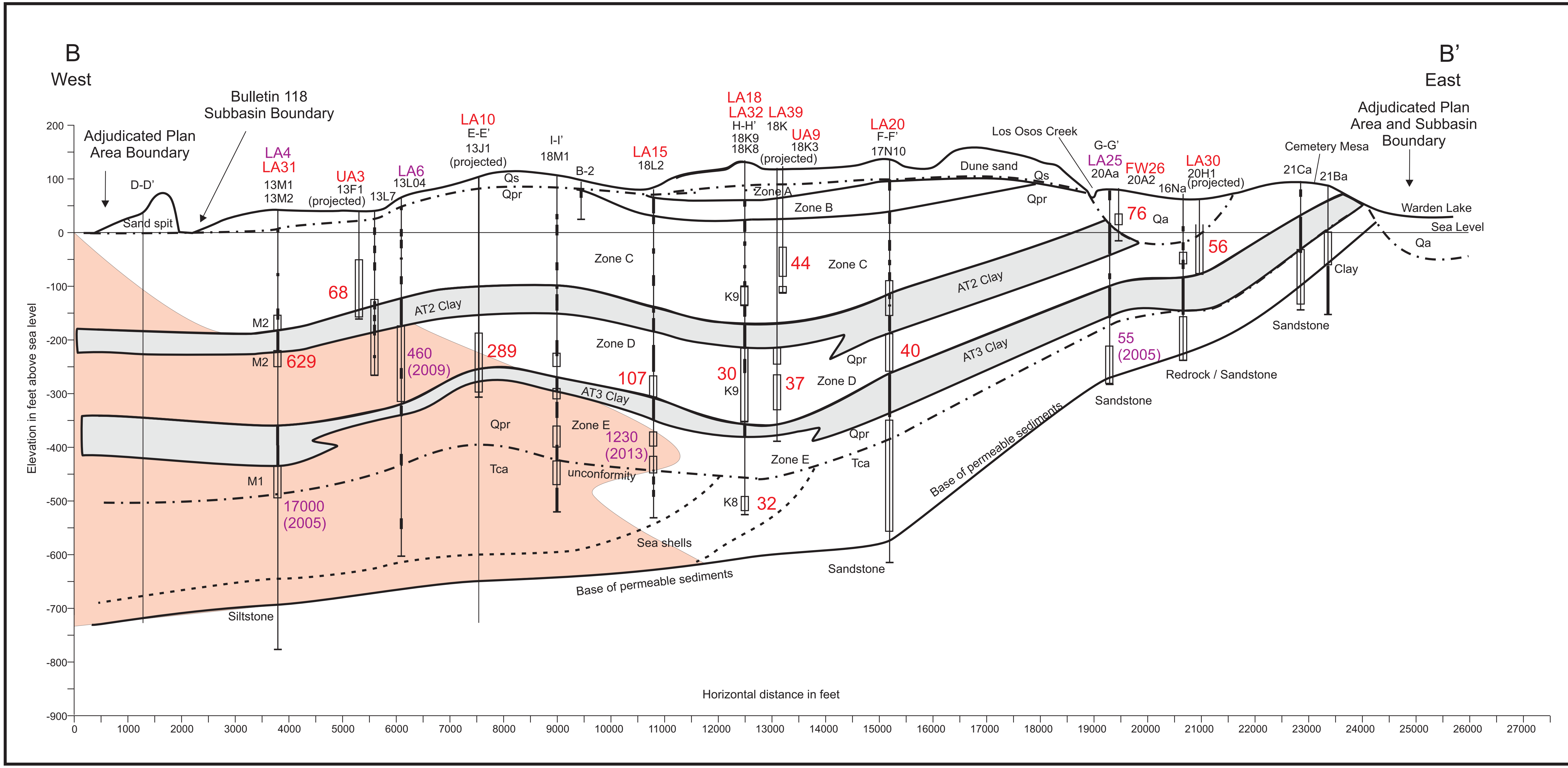

Aquifer Zones:
Zone A - Perched Aquifer
Zone B - Transitional Aquifer
Zone C - Upper Aquifer
Zone D - Lower Aquifer (shallow)
Zone E - Lower Aquifer (deep)

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 2021)

Estimated extent of seawater intrusion (Fall 2021)

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

Figure 19

Seawater Intrusion Front
Cross-Section B-B'
Los Osos Groundwater Basin
2021 Annual Report

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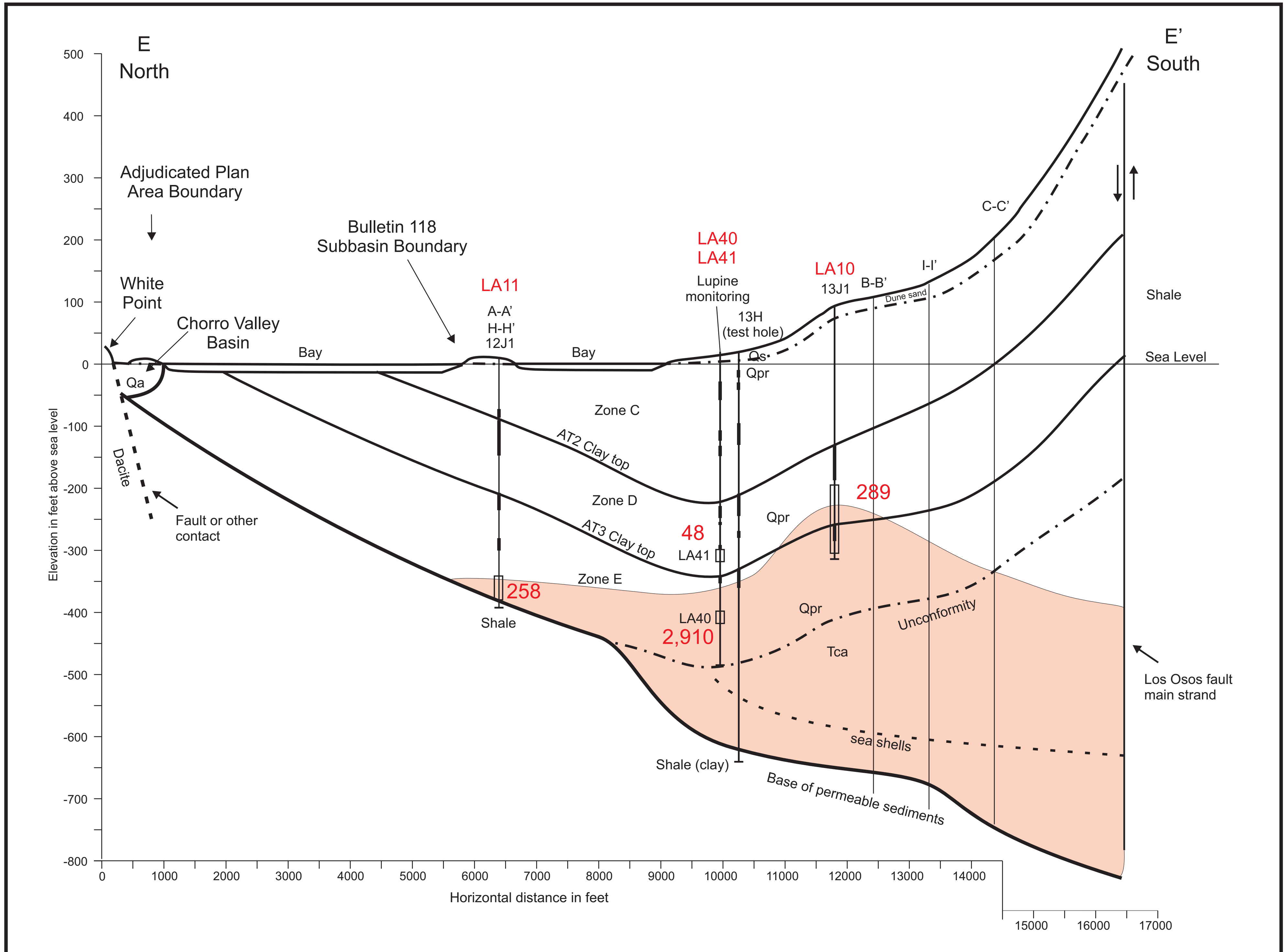

Aquifer Zones:
Zone A - Perched Aquifer
Zone B - Transitional Aquifer
Zone C - Upper Aquifer
Zone D - Lower Aquifer (shallow)
Zone E - Lower Aquifer (deep)

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

289 - Chloride concentration in mg/L (Fall 2021)

Estimated extent of seawater intrusion (Fall 2021)

Figure 20

Seawater Intrusion Front
Cross-Section E-E'
Los Osos Groundwater Basin
2021 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 L. Storage estimates were performed for Spring and Fall 2021 and included separate estimates for the following areas and aquifers shown in Figure 21:

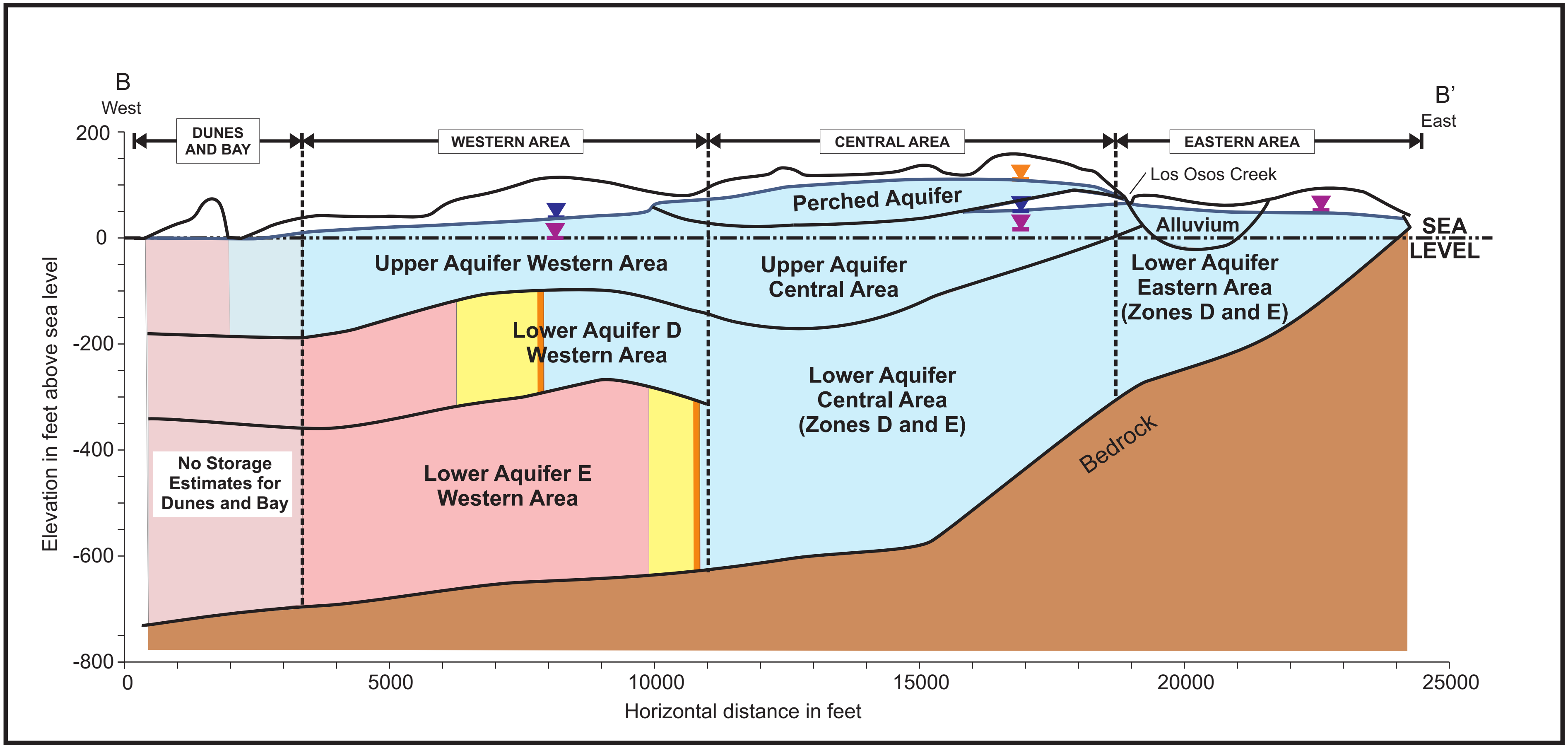
- Perched Aquifer
- Western Area Upper Aquifer
- Western Area Lower Aquifer
- Central Area Upper Aquifer
- Central Area Lower Aquifer
- Eastern Area Alluvial and Lower Aquifer

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 2021
- Groundwater in Storage >250 mg/l Chloride 2021
- Change in Groundwater in Storage >250 mg/l Chloride Winter 2005-2021
- Fall 2021 seawater intrusion front
- Perched Aquifer Water level
- Upper Aquifer Water level
- Lower Aquifer Water level

Figure 21
Basin Storage Compartments
Los Osos Groundwater Basin
2021 Annual Report

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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 L includes a list of wells used for 2021 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 2021.

Table 18. Groundwater in Storage Spring and Fall 2021 (<250 mg/L Chloride)

Basin Area	Aquifer	Zone	Spring 2021		Fall 2021	
			Total	Above Sea Level	Total	Above Sea Level
			ACRE-FEET			
Western and Central	Perched	A, B	5,800	5,800	5,500	5,500
	Upper	C	28,800	7,000	27,900	6,000
Western	Lower[1]	D[2]	15,700	<10	15,300	<10
Central	Lower[1]	D, E	55,100	<10	55,100	<10
Eastern	Alluvial and Lower	Alluvial, D, E	19,100	4,600	18,200	3,700
TOTAL			124,500	17,400	122,000	15,200

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 124,500 acre-feet in Spring 2021, with an estimated 17,400 acre-feet above sea level (Table 18). There was a calculated net seasonal storage decline of 2,500 acre-feet between Spring 2021 and Fall 2021, with 400 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 (results for Fall monitoring events shown). 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 2020 groundwater in storage with Spring 2021.

Table 19. Change in Storage Spring 2020 to Spring 2021 (<250 mg/L Chloride)

Basin Area	Aquifer	Zone	Spring 2020		Change from Spring 2020 to Spring 2021	
			Total	Above Sea Level	Total	Above Sea Level
			ACRE-FEET			
Western and Central	Perched	A, B	5,800	5,800	0	0
	Upper	C	28,800	6,900	0	100
Western	Lower[1]	D[2]	15,400	<10	300	0
Central	Lower[1]	D, E	55,100	<10	0	0
Eastern	Alluvial and Lower	Alluvial, D, E	19,500	5,000	-400	-400
TOTAL			124,600	17,700	-100	-300

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

As reported in Table 19, there was an estimated gain of 300 acre-feet of freshwater storage in the Lower Aquifer between Spring 2020 and Spring 2021. There was a loss of 400 acre-feet in storage above sea level in the Eastern Area of the Basin over the same period, for a net loss of 100 acre-feet of Basin storage between Spring 2020 and Spring 2021, 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.

One of the components used to calculate the Basin Yield Metric is the Sustainable Yield. On October 27, 2021, the BMC considered and adopted a revised methodology for estimating sustainable yield, along with a sustainable yield for Year 2022. The Sustainable Yield for 2021 and prior years was estimated (using the Basin model) as the maximum amount of water that may be extracted from the Basin with no further inland advance of the front (i.e. a stationary front under steady-state conditions) and with none of the active wells producing water with chloride concentration in excess of 250 mg/L (ISJ Group, 2015). The updated methodology adopted by the BMC adds the condition that no further inland advance is allowed from threshold lines drawn parallel to the coast that represent the current (2021) position of the seawater intrusion front in the Lower Aquifer. In accordance with the Stipulated Judgement Section 4.2, the BMC used the updated methodology to adopt a Sustainable Yield value for 2022.

Based on developed purveyor infrastructure capacity for year-end 2021, along with the updated methodology, a sustainable yield of 2,380 acre-feet was approved by the BMC for year 2022. Details of the updated Sustainable Yield methodology are presented in Appendix M.

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 for Year 2021 was estimated using the Basin model as the maximum amount of water that may be extracted from the Basin with a stationary seawater intrusion front and 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 2021 is a ratio expressed as follows:

$$\frac{\text{2021 Groundwater Production}}{\text{2021 Sustainable Yield}} * 100$$

Groundwater production in 2021 was 2,000 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. For reporting year 2021, therefore, the sustainable yield remains at the previously estimated value of 2,760 acre-feet[1], and the resulting Basin Yield Metric for 2021 is 72. The LOBP objective for the Basin Yield Metric is 80 or less and has been met in each of the last five years, although using the new methodology in effect beginning 2022, the Basin Yield Metric for 2021 would be 84 (assuming no change in Basin production), exceeding the threshold value of 80. Approval of the Annual Monitoring Report by the BMC does not constitute unanimous approval of actions listed under Section 5.11.4 (Approval Requirements) of the Stipulated Judgment or setting the Sustainable Yield for a given year. These actions require a separate action and unanimous approval by the BMC.

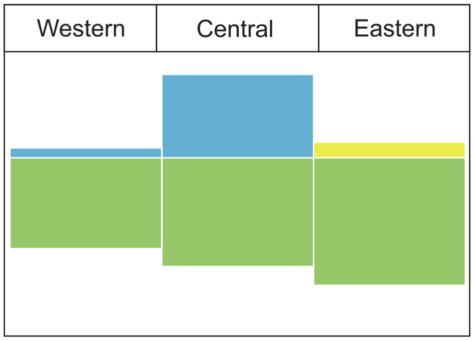
The estimated Sustainable Yield is not just a volume of water that can be pumped from anywhere in the basin, however. Sustainability is achieved through a balanced distribution of groundwater pumping across the Basin, both vertically and laterally, that maintains a stationary seawater front, with no active well producing water with chloride concentrations above 250 mg/L. Long-term climatic conditions are incorporated into the estimated sustainable yield.

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 72 in 2021. Two development scenarios from the LOBP are also provided for comparison in Figure 22.

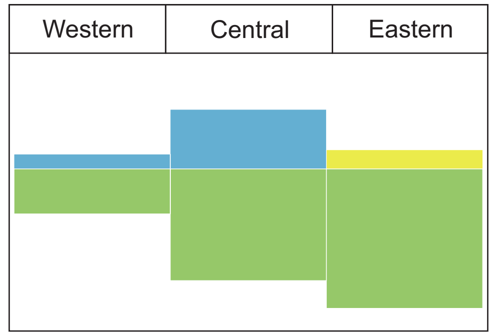
The estimated sustainable yield of the Basin has been reported to the closest 10 acre-feet, similar to the other components of inflow and outflow to the Basin water balance estimated using the Basin model (LOBP Figures 74 and 75, 2015). This level of rounding is based on the precision, not the accuracy, 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 showed the two models were within 2 percent of each other. The SEAWAT model also matched the historical average velocity of seawater 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).

[1] 2015 LOBP established the sustainable yield methodology and estimated 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. On June 16, 2021, the BMC approved submitting the 2020 Final Draft Annual Report to the Court with a Sustainable Yield of 2,760 AFY, but clarified that approval of the report should not be construed as "evaluating, setting, or establishing" the sustainable yield under the terms of the Stipulated Judgement. In October 2021, a sustainable yield of 2,380 AF for 2022 was approved by the BMC.

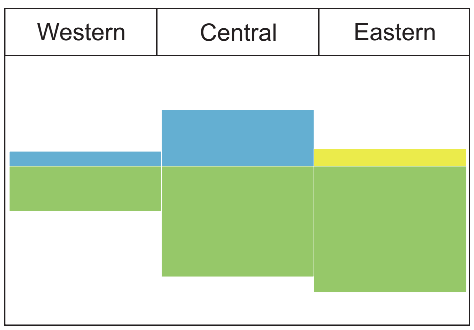
2010-2014
Average Production 2,600 AFY
Sustainable Yield 2,450 AFY
Basin Yield Metric = 106



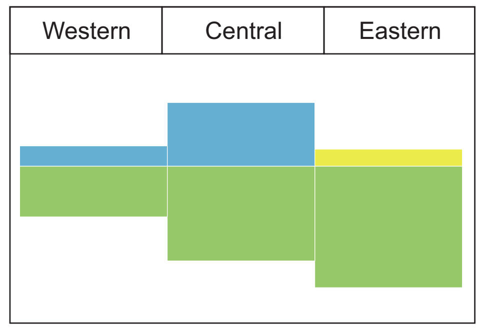
2015-2019
Average Production 2,070 AFY
Sustainable Yield 2,760 AFY
Basin Yield Metric = 75



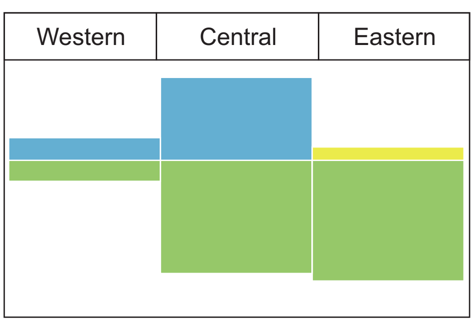
Year 2020
Average Production 2,010 AF
Sustainable Yield 2,760 AF
Basin Yield Metric = 73



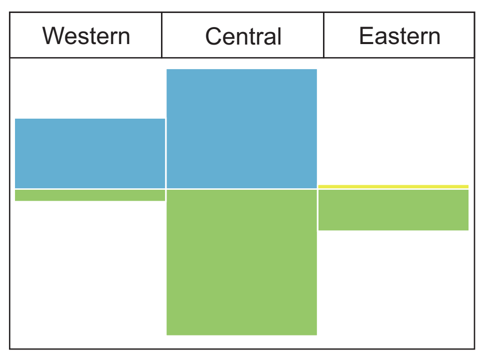
Year 2021
Average Production 2,000 AF
Sustainable Yield* 2,760 AF
Basin Yield Metric* = 72



E+AC+U (No Further Development Scenario)
refer to Basin Plan for full description
Average Production 2,230 AFY
Sustainable Yield* 3,000 AFY
Basin Yield Metric* = 74



E+UG+ABC (Buildout Scenario)
refer to Basin Plan for full description
Average Production 2,380 AFY
Sustainable Yield* 3,350 AFY
Basin Yield Metric* = 71



Explanation:

Size of rectangle is proportional to groundwater production

Alluvial Aquifer

Upper and Perched Aquifer

Lower Aquifer

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

*Sustainable Yield methodology revision will increase Basin Yield Metric for 2022 reporting year and for development scenarios.

Figure 22
Basin Yield Metric Comparison
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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. Upgrading the steady-state model to a fully transient model is recommended prior to a peer review, and is currently planned (Section 10.2).

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 2021 is a ratio expressed as follows:

$$\frac{\text{2021 Sustainable Yield}}{\text{Maximum Sustainable Yield}} * 100$$

The 2021 sustainable yield is estimated at 2,760 acre-feet. The maximum sustainable yield with all LOBP projects implemented is estimated at 3,500 acre-feet. Therefore, the Basin Development Metric in 2021 is 79, which is the same value as 2020. The purpose of the metric is to inform the BMC on the percentage of the Basin's maximum sustainable yield that has been developed. There is no LOBP objective for the Basin Development Metric.

As presented in the LOBP, the estimated sustainable yield of the Basin will increase beginning with urban water reinvestment Program U and Basin infrastructure Programs A and C, which are currently in progress. The BMC may consider updating the Maximum Sustainable Yield, 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 and changes to sustainable yield methodology implemented for 2022.

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. Because of access restrictions to the sand spit wells in 2021, Spring water levels from 2020 were used to complete the metric. Figure 23 graphs historical trends in the metric. Table 20 presents the 2021 Water Level Metric.

Table 20. 2021 Water Level Metric

Metric Well	Spring 2021 Groundwater Elevation (feet above sea level – NGVD 29 Datum*)
LA2	1.47
LA3	-0.51
LA11	1.00
LA14	2.02
LA16	6.44
Water Level Metric (average)	2.1

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.

The NGVD 29 datum is still used for the Water Level Metric because it matches the Basin model datum and conveniently equates zero elevation with mean sea level. Groundwater elevations have been adjusted to the NGVD 29 datum using a 2.8 feet downward shift, based on North American Vertical Datum Conversion (VERTCON) data reviewed for the Basin, as published by the National Geodetic Society.

The Spring 2021 Water Level Metric is 2.1 feet NGVD 29 (approximately 4.9 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 2018, likely in response to a decrease in Lower Aquifer production. Following a flat interval between 2018 and 2020, the metric continued rising in 2021 (Figure 23). The LOBP objective for the Water Level Metric is 8 feet or higher (ISJ Group, 2015).

Completion of the Phase 2 wellhead survey in 2021 resulted in a slight decline in the average Water Level Metric well elevations of 0.014 feet. This correction has been applied to the historical Water Level Metric values graphed in Figure 23. For example, the 2020 Water Level Metric was reported at 1.8 feet, but has been adjusted to 1.7 feet on Figure 23 so that the magnitude of the rise in the metric between 2020 and 2021 is visually correct.

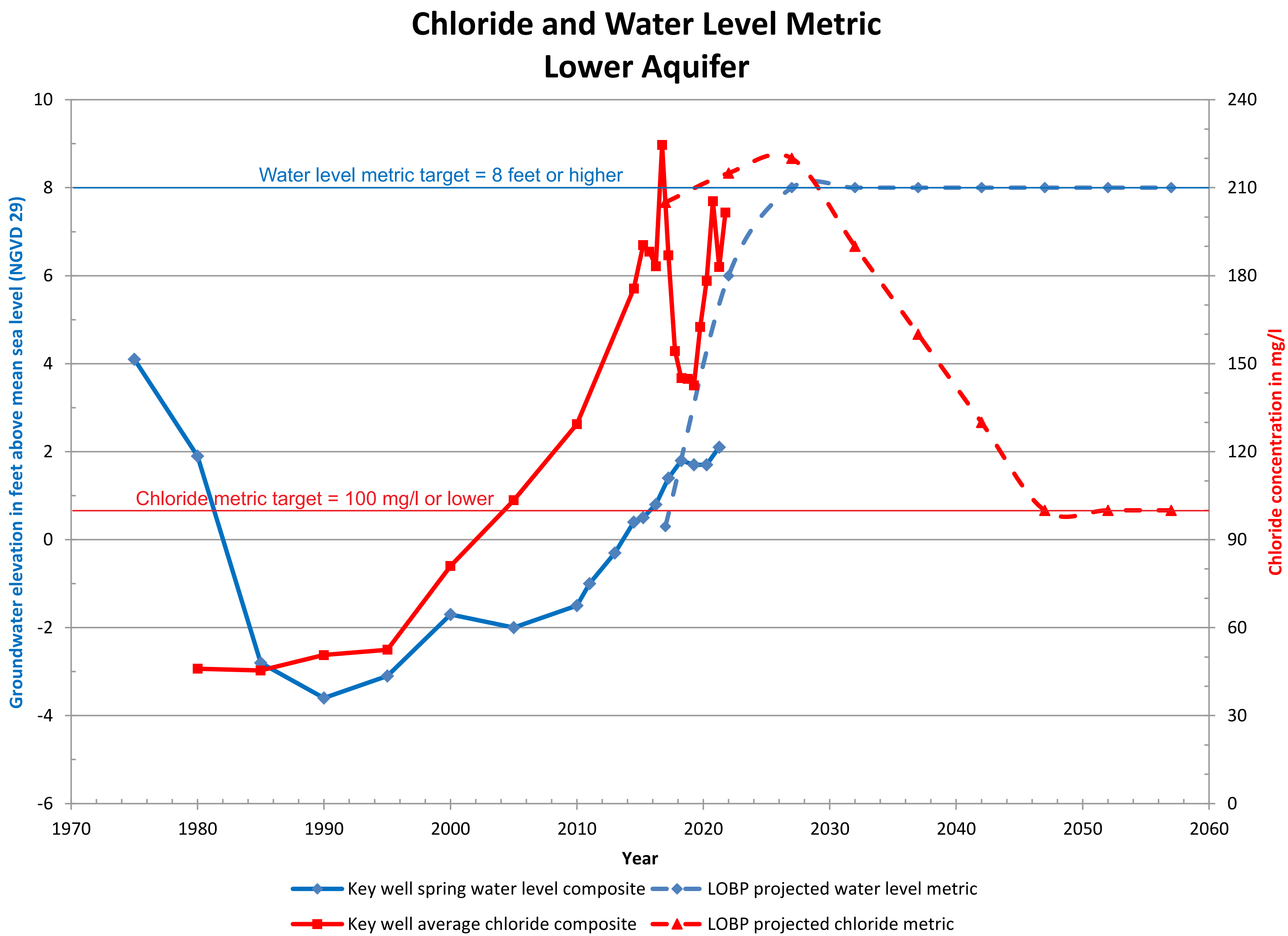

Figure 23
Chloride and Water Level Metric
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Included in Figure 23 are projected trendlines for the Water level and Chloride Metric from the LOBP. The actual metrics are not expected to follow straight lines, but the trendlines are useful to depict the general nature of the anticipated trends. Several years of continued rise in the Water Level metric is expected before reaching the LOBP objective.

A re-evaluation of the Water Level Metric (and other metrics discussed below) was initiated in 2021, in coordination with completion of the Phase 2 welhead survey, as recommended in the 2020 Annual Report. This effort is currently on hold as the BMC Staff evaluates opportunities to improve the Basin Monitoring Network (Section 10.2). Expansion of the Lower Aquifer transducer network was implemented at the end of 2021, which will help to identify groundwater mounding effects within the Lower Aquifer from treated wastewater disposal at the Broderson Site and provide support for interpreting Water Level Metric trends in the future.

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). 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 due to wellbore leakage from the Upper Aquifer (2018 Annual Report, Appendix J). Table 21 presents the Spring and Fall 2021 Chloride Metric. Figure 23 graphs historical values in the metric.

Table 21. 2021 Chloride Metric		
Metric Well (Aquifer Zone)	**Spring 2021 Chloride Concentrations**	**Fall 2021 Chloride Concentrations**
LA8 (Zone D)	48 mg/L	77 mg/L
LA10 (Zone D/E)	258 mg/L (double counted for average)*	289 mg/L (double counted for average)*
LA11 (Zone E)	256 mg/L	258 mg/L
LA12 (Zone D)	94 mg/L	95 mg/L
Chloride Metric (weighted average)	183 mg/L	202 mg/L

Data Source: LOBP Groundwater Monitoring Program (Appendix C)

The 2021 Chloride Metric indicates a slight retreat of the seawater intrusion front (fall to fall), 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 2021 and Fall 2021 shows an increase in the metric, although the Chloride Metric has decreased relative to the target value between Fall 2020 (205 mg/L) and Fall 2021 (202 mg/L), indicating an overall improvement during 2021 (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 with the Water Level Metric, a re-evaluation of the Chloride Metric was initiated in 2021 and is currently on hold, pending BMC Staff evaluation of opportunities to improve the Basin Monitoring Network (Section 10.2).

As previously mentioned, Figure 23 includes projected trendlines for the Water level and Chloride Metric from the LOBP. Several years of continued rise in the Chloride Metric (deterioration in Basin conditions) is expected before the metric trend reverses, followed by many years of gradual decline in the metric before reaching the LOBP objective.

Nitrate Metric

The Nitrate Metric is defined as the average concentration of nitrate in five First Water key wells located in areas of the Basin that have been impacted by elevated nitrate concentrations. The Nitrate Metric data is obtained from the LOWRF Groundwater Monitoring Program's winter sampling event and focuses on shallow, adversely impacted wells to track changes in nitrate concentrations in groundwater over time. FW10 was not included in LOWRF's sampling efforts in 2021, so CHG staff purged and sampled the well in October 2021 to fill the gap in the metric. Table 22 presents the Nitrate Metric for 2021. 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. 2021 Nitrate Metric	
Metric Well	**Winter 2021 Nitrate-Nitrogen (NO_3-N) Concentrations**
FW2	22 mg/L
FW6	2.5 mg/L
FW10*	15.9 mg/L
FW15	22 mg/L
FW17	23 mg/L
Nitrate Metric (average)	17 mg/L

Data Source: LOWRF Groundwater Monitoring Program (Rincon Consultants, 2022)
*Sample taken in October by CHG

The Nitrate Metric for Winter 2021 was calculated at 17 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 3 mg/L decrease in the Nitrate Metric from Winter 2020 (20 mg/L), to Winter 2021 (17 mg/L), which is 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 2.5 mg/L in 2021. FW6 is hydraulically downgradient of the Broderson site, and NO_3-N declines are largely attributable to recycled water discharges at Broderson.

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 2021 the Nitrate Metric reached the lowest point recorded since 2013. The five-year running average (currently 2017-2021), which represents long term trends, continues to decrease (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). Development of a Nitrate Metric specific to the Lower Aquifer was initiated in 2021 as part of the metric re-evaluations and is currently on hold, pending BMC Staff evaluation of opportunities to improve the Basin Monitoring Network (Section 10.2).

Included in Figure 24 is the projected trendline for the Nitrate Metric from the LOBP. The actual metric is not expected to follow straight lines, but a trendline is useful to depict the general nature of the anticipated trend. The anticipated trend following wastewater project implementation was several years of stable (but elevated) nitrate-nitrogen concentrations, followed by a gradual and long-term decline in the Nitrate Metric, reaching the LOBP objective mid-century.

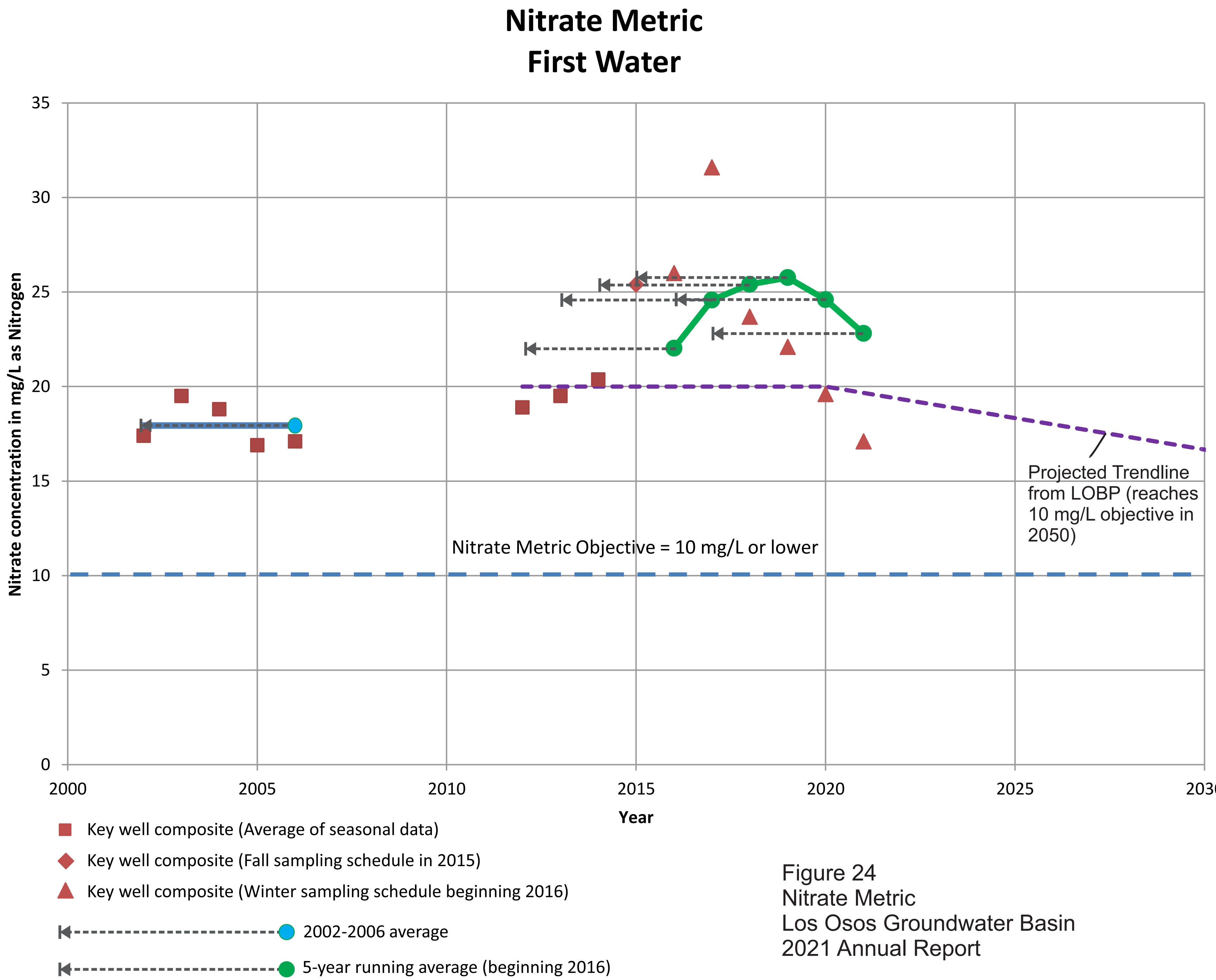

Figure 24
Nitrate Metric
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7.5.4 Upper Aquifer Water Level Profile

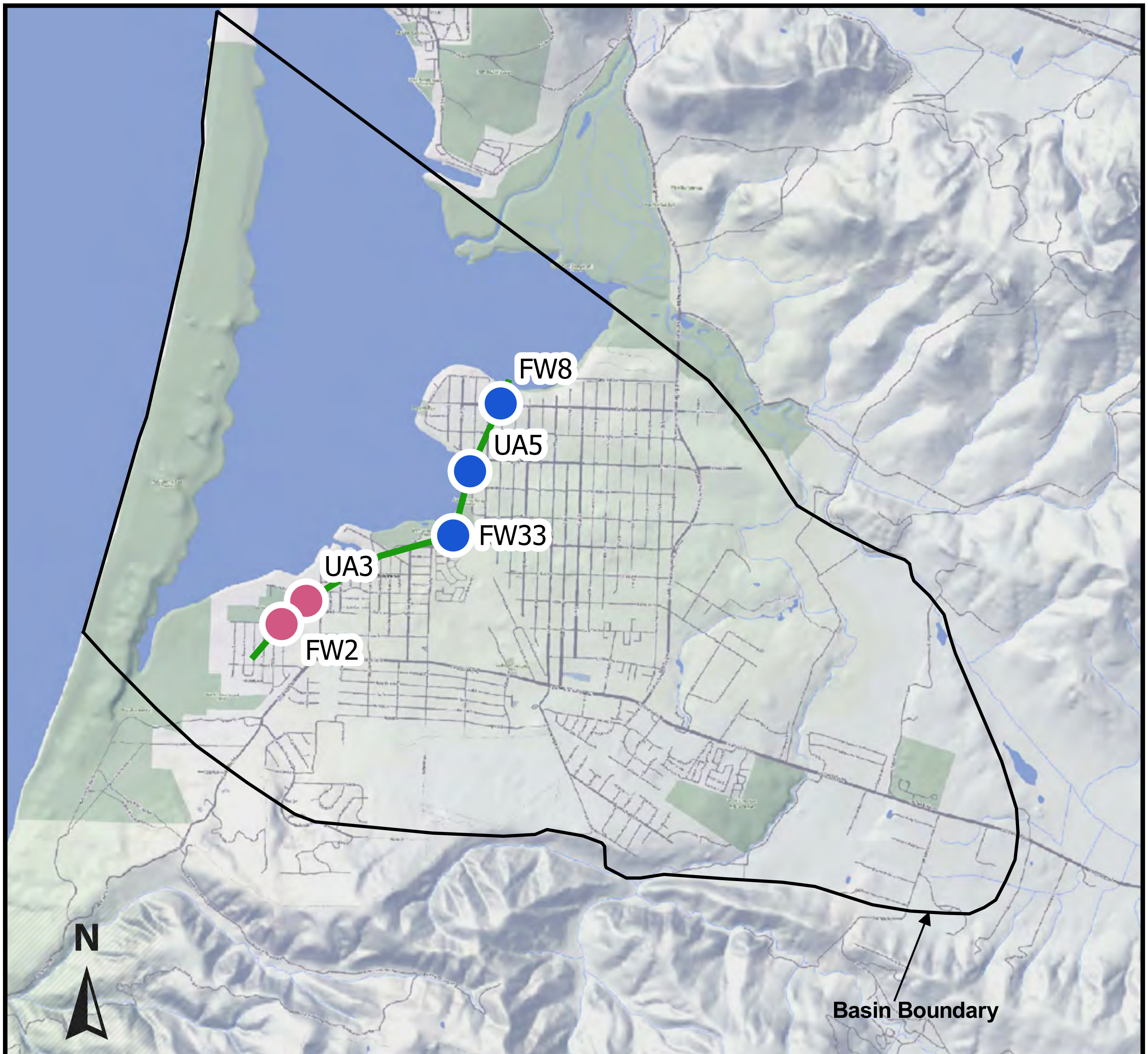
Metrics allow the BMC, regulatory agencies, and the public to evaluate the status of nitrate concentrations and seawater intrusion in the Basin through objective, numerical criteria that can be tracked over time (LOBP, 2015). The Upper Aquifer has a Nitrate Metric, but does not have Water Level Metric 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 2021 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 2021 were above the Protective Elevation except for near UA5, which is an Upper Aquifer supply well along the bay in Baywood Park (Figure 25). Spring 2021 water levels shown above ground surface in low-lying areas near the bay represent artesian pressures in the aquifer, and incorporate pressure measured in 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. 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). Chloride concentrations from UA5 available from purveyor records indicate a rise in chlorides, however, between Fall 2020 (32 mg/L) and Fall 2021 (64 mg/L). Although these concentrations are relatively low (250 mg/L is the recommended limit and 500 mg/L is the upper limit for drinking water), the increase warrants further investigation.



Base Image: Stamen-Terrain

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

Scale: 1 inch ≈ 4,000 feet

Explanation

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

Figure 25
Water Level Profile Alignment
Los Osos Groundwater Basin
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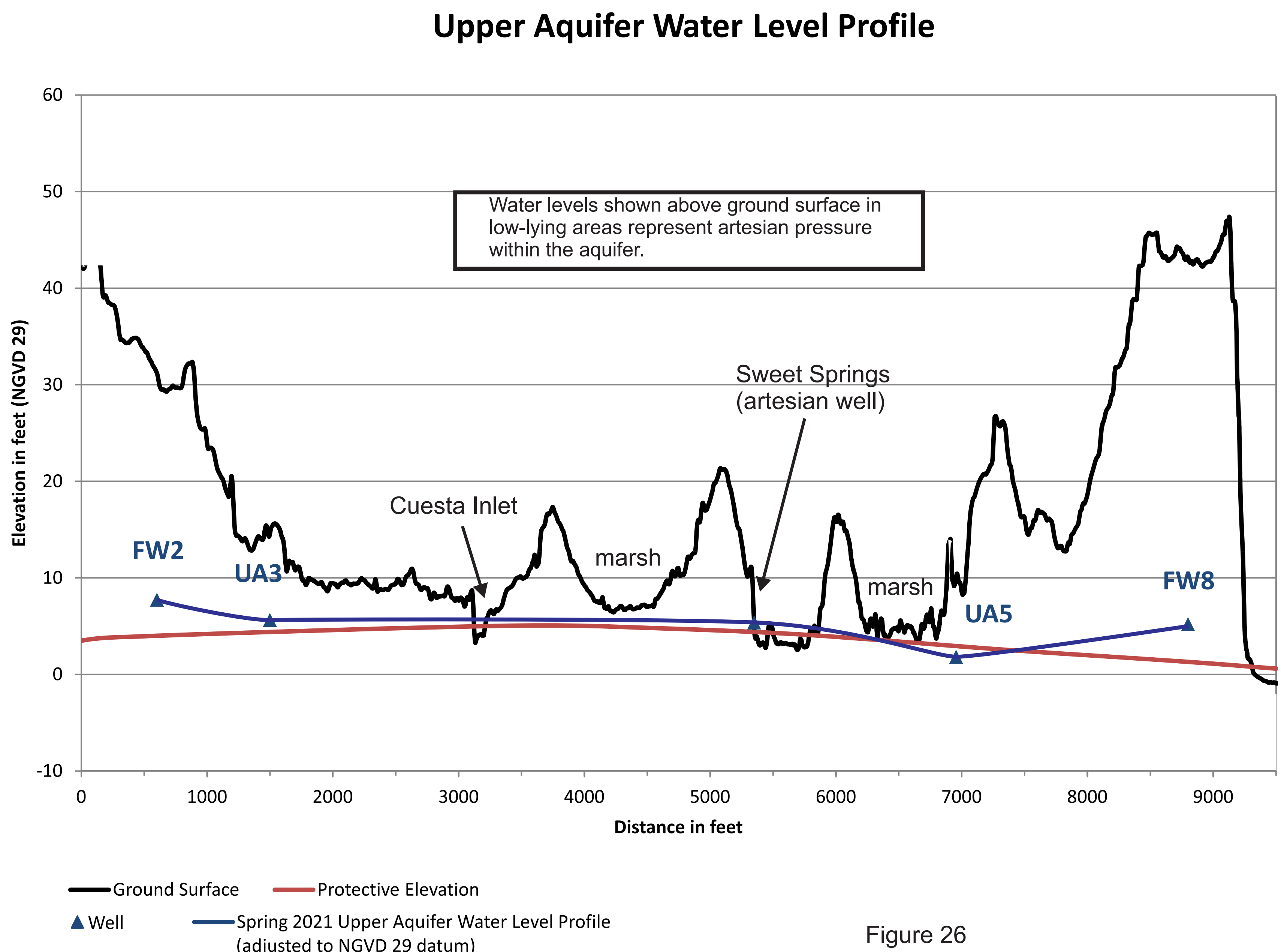

Note: Sweet Springs artesian well marker at estimated wellhead pressure.

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

The status of the Basin in 2021 is summarized as follows:

- The Basin received below normal rainfall in 2021. San Luis Obispo County started 2021 with moderate drought conditions in January and ended in December 2021 with severe drought conditions, trending to extreme on the eastern border (NDMC/USDA/NOAA, 2022).

- Groundwater production for the Basin totaled an estimated 2,000 acre-feet in the 2021 calendar year, compared to 2,010 acre-feet in 2020. Purveyor groundwater production decreased by an estimated 37 acre-feet, while production for community facilities increased by an estimated 50 acre-feet in 2021, compared to 2020. Production for agricultural irrigation decreased by an estimated 30 acre-feet in 2021, compared to 2020.

- Long-term water level trends over the last 9 years in representative First Water wells averaged 0.02 feet of decline per year. Long-term water level trends over the last 10 years in representative Upper Aquifer wells averaged 0.09 feet of rise per year, and in Lower Aquifer wells averaged 0.41 feet of rise per year.

- The seawater intrusion front in Zone D retreated toward the coast between Fall 2020 and Fall 2021, although there was an estimated net loss of 100 acre-feet of Basin freshwater storage between Spring 2020 and Spring 2021. The seawater intrusion front in Zone E, however, is interpreted as moving inland toward LA11.

- The Basin Yield Metric decreased from 73 in 2020 to 72 in 2021. The metric has met the LOBP goal of 80 or less for five consecutive years. Beginning in 2022, however, the updated Sustainable Yield methodology will result in a lower Sustainably Yield, which is anticipated to increase to the Basin Yield Metric above the LOBP goal.

- The Basin Development Metric in 2021 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 since 2016, meaning that no new infrastructure projects affecting Basin sustainable yield have been completed.

- The Water Level Metric increased between 2020 and 2021 from 1.8 to 2.1 feet, indicating a slight improvement, but still remains several feet below the target value of 8 feet.

- The Chloride Metric decreased relative to the 100 mg/L target value between Fall 2020 (205 mg/L) and Fall 2021 (202 mg/L), indicating slight improvement in 2021.

- The Nitrate Metric decreased relative to the 10 mg/L target value, from 20 mg/L NO_3-N in 2020 to 17 mg/L NO_3-N in 2021, indicating improvement in 2021.

- Upper Aquifer water levels were above the Protective Elevation along the bay, except for near UA5, where an increase in chloride concentrations warrants further investigation.

9. RECOMMENDATIONS

The following LOBP Groundwater Monitoring Program recommendations from the 2020 Annual Report were completed in 2021, are in progress and planned for completion in 2022:

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

- 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). – ***Completed***

- Re-evaluate Water Level Metric target after completion of wellhead surveys (Section 7.5.3). This task has been expanded to include Water Level, Chloride, and Nitrate Metric updates – ***In progress***

- Develop a rating curve for stream flow Sensor 751 on Los Osos Creek (Section 6) – ***In Progress***

- 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 Progress***

- 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). – ***In Progress***

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

- 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 and revisions to the sustainable yield methodology (Section 7.5.2).

- A peer review of the Basin model is required by the Stipulated Judgement every 10 years. Upgrading to a fully transient Basin model would be recommended prior to the next peer review (Section 7.5.2). Planning and funding efforts for a transient Basin model was initiated in 2021. The transient Basin model would replace the existing steady-state model, once completed.

- Chloride concentrations in groundwater from UA5 increased between Fall 2020 (32 mg/L) and Fall 2021 (64 mg/L). Although these concentrations are relatively low (250 mg/L is the recommended limit and 500 mg/L is the upper limit for drinking water), the increase coincides with a water level decline to below the Protective Elevation, and further review and monitoring of UA5 water quality is recommended (Section 7.5.4).

10. STATUS OF BASIN METRICS, BMC INITIATIVES AND 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 following sections provide a status update on the Basin metrics, BMC Initiatives and LOBP Program implementation. The Adaptive Management Plan offers a tool with which the BMC can modify the LOBP programs, based on the performance of Basin metrics and other monitoring results, 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 2021 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 2021 Data**	**Change in Condition from 2020**
Basin Yield Metric: Comparison of current well production to sustainable yield*	80 or less	72	Decrease (improvement)
Water Level Metric: Average groundwater elevation in 5 key wells in the Lower Aquifer	8 feet above mean sea level or higher	2.1 feet above mean sea level	Increase (improvement)
Chloride Metric: Weighted average chloride concentration in 4 key wells in the Lower Aquifer	100 mg/L or lower	202 mg/L	Decrease (improvement)
Nitrate Metric: Average nitrate concentration in 5 key wells in the Upper Aquifer	10 mg/L or lower	17 mg/L (NO_3-N)	Decreased (improvement)

* On October 27, 2021, the BMC considered and adopted a revised methodology for estimating sustainable yield, along with a sustainable yield for Year 2022 that will likely increase the Basin Yield Metric to a value above the LOBP goal. See Appendix M for additional details.

10.2 Update on BMC Initiatives

Based on the Basin status (Section 8) and recommendations (Section 9), the BMC intends to continuously develop and pursue additional measures to improve Groundwater Monitoring and Management. The following is an update on additional measures related to BMC Groundwater Monitoring and Management:

Lower Aquifer Monitoring Evaluation: At its October 27th, 2021 Meeting, the BMC authorized CHG to evaluate the feasibility and cost of modifying existing wells or construction a new monitoring well(s) to improve monitoring of Zone E water quality. CHG will be providing BMC Party Staff with recommendations for modifying wells to improve the BMC Monitoring Program and these recommendations will be brought to the BMC for consideration. BMC Party Staff evaluated the potential to fund a new monitoring well in 2022, but there was not sufficient available budget. BMC Party Staff will target including a new monitoring well in the Calendar Year 2023 Budget**.**

Updated Metric Evaluation. In Calendar Year 2021, BMC Staff began evaluating the existing Basin Monitoring Metrics to determine if there were 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). This effort is currently on hold as the BMC Staff evaluates opportunities to improve the Basin Monitoring Network (i.e. modification of existing wells to improve data collection). 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 are collaborating with the County on a Title 19 Water Offset Study to update water usage estimates for urban and rural residences sourcing water from the Los Osos Groundwater Basin, propose new water conservation measures for the retrofit-to-build program, and estimate remaining water savings potential for the community. This study is anticipated to be completed in 2022.

Transient Groundwater Model: At its October 27th, 2021 Meeting, the BMC authorized the preparation of a Water Recycling Funding Program Grant Application and to request access to the $150,000 of funding that the County budgeted to develop a transient model and analyze recycled water and supplemental water projects to improve the sustainability of the Basin (WRFP Study). The LOCSD will be the lead agency for the grant on behalf of the BMC. The grant application was submitted to the State Water Resources Control Board (SWRCB) by LOCSD on 2/11/2022 for $150k in grant funds and the County approved providing $150k to the LOCSD for a Transient Model for the Basin. After receiving approval from the SWRCB, the LOCSD will solicit proposals from consulting firms through a Request for Proposal (RFP) process to procure the necessary services to develop the model and complete the WRFP Study.

Discussion and Recommendation of Criteria for Future Growth. At its May 2017 meeting, to 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, 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 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[2]. The adopted LOCP is still subject to change based on Coastal Commission review, which is currently underway. If the LOCP is certified by the Coastal Commission with no changes, the Growth Management Ordinance amendments to establish a growth rate for Los Osos become effective upon Coastal Commission certification. If the Coastal Commission recommends changes, then the growth rate may need to be further considered at another County Board of Supervisors hearing.

The purveyors are currently working with the County, at the request of the Coastal Commission, to evaluate water supply availability in the Basin and the triggers or water offset requirements for allowing additional development within the Basin.

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

[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

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.

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 sixth 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.

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[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.

[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.

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 purveyors and the County are performing an updated evaluation of the conservation potential for the community. The evaluation will 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.

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	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 2021[5].

Table 25. Planned Recycled Water Uses in the Urban Water Reinvestment Program

Potential Use	LOBP Planned Annual Volume (AFY)	Actual Annual Volume in 2021 (AFY)
Broderson Leach Fields	448	474.6
Bayridge Estates Leach Fields	33	20.6
Urban Reuse	63	0
Sea Pines Golf Course	40	16.5
Los Osos Valley Memorial Park	50	0
Agricultural Reuse	146	1.7
Construction Water	0	0.5
Total	780	514

The LOWRF construction was completed in March 2016. Through May 12, 2021, the sewer service area had connected 99.4 percent of parcels that are required to connect. Flows to the wastewater plant in 2021 averaged approximately 485,000 gallons per day and totaled 544 AF for the year[6]. Average wastewater flows are lower than anticipated due to conservation measures implemented by the community. Projecting the average flow per connection for 100 percent of the parcels required to connect results in a total estimated effluent inflow volume of 550 AFY, which is 230 AFY less than the anticipated 780 AFY of recycled water available for the urban water reinvestment program.

Recycled water in 2021 was conveyed to the Broderson and Bayridge Estates leach fields, Agricultural users, Sea Pines Golf Course and used for construction water. In 2021 recycled water began being provided to irrigate the medians near the intersection of Los Osos Valley Road and South Bay Blvd. It is additionally envisioned that recycled water for irrigation will be provided to the schools, parks, and various additional agricultural areas, however those connections were not made in 2021. The purveyors have executed agreements with the County of San Luis Obispo to supply recycled water to the schools and the County intents to utilize funding provided by the

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

[6]Wastewater plant influent volumes in 2021 were greater than the final recycled water volumes. This difference attributed to change in volume of water in storage in the effluent ponds, evaporation in effluent ponds, water diverted with sludge and screenings hauling offsite and stormwater contributions that are not counted as influent.

America Rescue Plan Act (ARPA) to improve recycled water distribution system operations and connect the schools to the recycled water system.

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. As of 2021, it is estimated that the Broderson mound has reached 50% of its anticipated maximum height. Additional information on the current status of the Broderson Mound can be found in Appendix M.

The BMC is pursuing in Calendar Year 2022 grant funding for the development of a Transient Groundwater Model and completion of a recycled water and supplemental water supply alternatives study. This study is intended 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, Los Osos Creek, etc.). It will additionally evaluate opportunities to increase amount of water sent to the LOWRF to improve the understanding and document the opportunities and constraints regarding the use of the recycled water resource.

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 increase the Basin's sustainable yield, which in turn will help lower or 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.

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

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	The piping and other improvements for the wellhead are complete. The electronic/control equipment is scheduled to be delivered the week of May 9th. Completion of the project is anticipated by the end of May 2022.
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	LOCSD	BMP: $2.0 mil	LOCSD is in the process of obtaining bids for the well drilling phase. The submittal deadline is May 9th. It is anticipated that the drilling of the well will begin by June/July 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 further evaluation of the project.

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. The Transient Model and Water Recycling Funding Study are intended to better inform the BMC on the most effective opportunities for increasing the sustainable yield of the Basin.
8th and El Moro Urban Storm Water Recovery Project	All Parties		TBD	These activities are currently on hold. The Transient Model and Water Recycling Funding Study are intended to better inform the BMC on the most effective opportunities for increasing the sustainable yield of the Basin.

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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, 2021, 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.

Monitoring Programs:

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

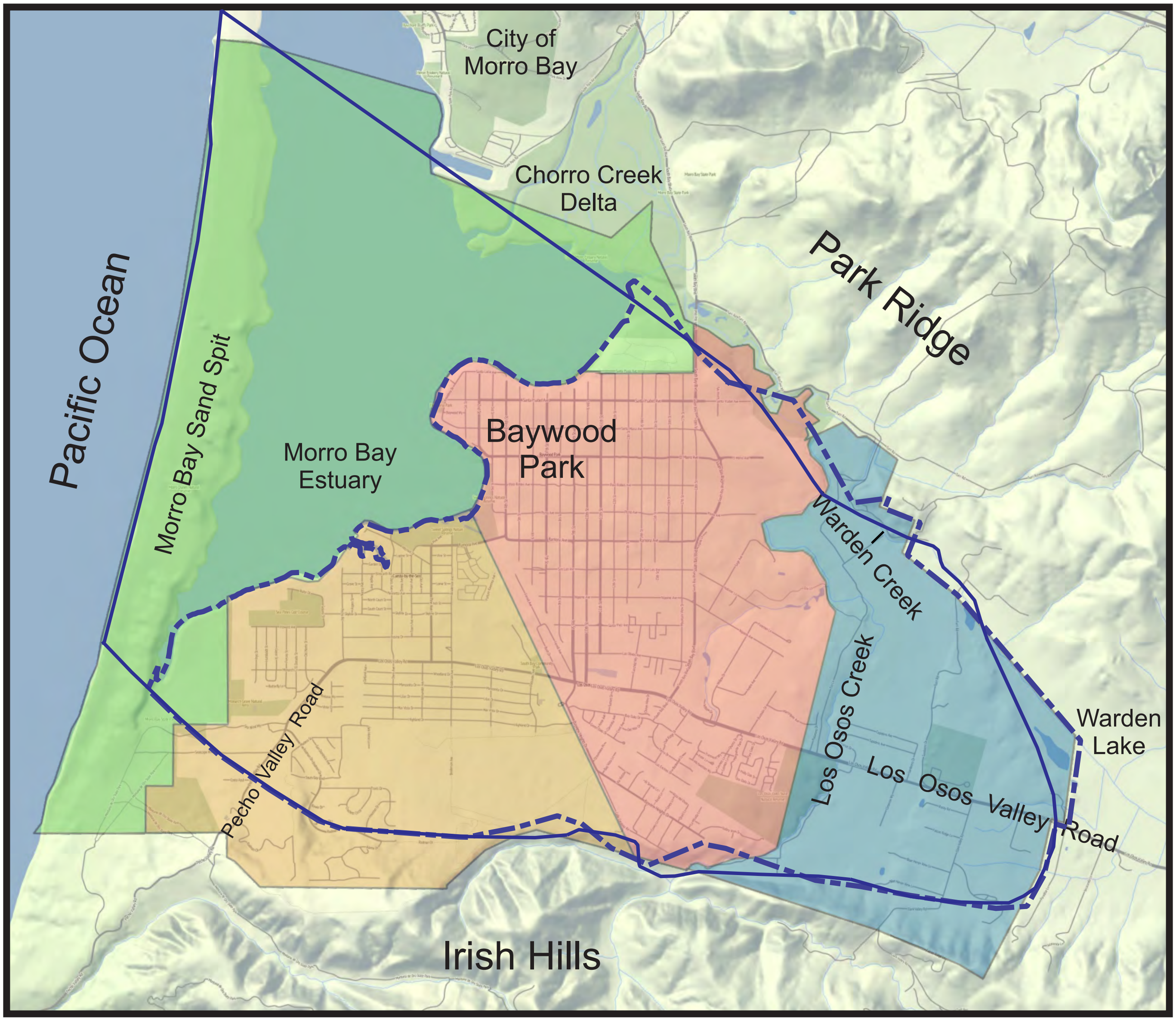
- *Purveyor Water Supply Well Monitoring per SWRCB-Division of Drinking Water requirements. Period of record for individual wells varies; program remains active.*

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

- *2012-2021 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 2021 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 H).



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
2021 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: Latitude	Coordinates: Longitude	Coordinates: RP Elevation* (feet amsl)	Well Type	Well Owner	Well Data: Screened Interval (feet bgs)	Well Data: Well Depth (feet bgs)	Well Data: Casing Diameter (inches)	Aquifer: Creek Valley Alluvium	Aquifer: Zone A/B	Aquifer: Zone C	Aquifer: Zone D	Aquifer: 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 2021
FIRST WATER

Program Well ID	Well Owner	Basin Plan Monitoring Code	County Water Level Program	LOWRF Groundwater Monitoring Program[1]	**2021 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, 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	
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 water levels, water quality in Fall only

Los Osos Basin Plan
Monitoring Well Network 2021
UPPER AQUIFER

Program Well ID	Well Owner	Basin Plan Monitoring Code	County Water Level Program	LOWRF Groundwater Monitoring Program[1]	**2021 Basin Plan Monitoring Program[2]**
UA1	SLO CO.	L	L		
UA2	SLO CO.	L	L		
UA3	GSWC	L, G			**L, G**
UA4	S&T	TL			**TL**
UA5	LOCSD	L		L	**L**
UA6	SLO CO.	L	L		
UA7	SLO CO.	L	L		
UA8	LOCSD	L			**L**
UA9	GSWC	L, G			**L, G**
UA10	LOCSD	TL			**TL**
UA11	PRIVATE	L		L	**L**
UA12	LOCSD	L		L	**L**
UA13	LOCSD	L, G			**L, G**
UA14	PRIVATE	L			**L**
UA15	PRIVATE	L			**L**
UA16	PRIVATE	(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 water levels, water quality in Fall only

Los Osos Basin Plan
Monitoring Well Network 2021
LOWER AQUIFER

Program Well ID	Well Owner	Basin Plan Monitoring Code	County Water Level Program	2021 Basin Plan Monitoring Program[1]
LA1	SLO CO.	L	L	
LA2	SLO CO.	L	L	
LA3	SLO CO.	L	L	
LA4	PRIVATE	L, GL		**L, GL**
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	**GL**
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		no access
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,G**
LA31	PRIVATE	(added in 2015)	L	**G**
LA32	LOCSD	(added in 2015)	L	**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)		no access
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, GL**
LA41	LOCSD	(added in 2019)		**L,G**

L = WATER LEVEL **LOCSD = Los Osos Community Services District**
G = GENERAL MINERAL **SLO CO. = San Luis Obispo County**
GL = GEOPHYSICAL LOG (triennial) **GSWC = Golden State Water Company**
TL = TRANSDUCER WATER LEVEL **S&T = S&T Mutual Water Company**

1 - Water level and water quality both Spring and Fall

APPENDIX C

New Surveys

New Reference Point Elevation Survey				
2021 Survey (Phase 2)				
Well Name	**Basin Plan Well ID**	**Original Elevation Estimate**	**2021 Survey Elevation (NAVD 88)**	**Difference**
30S/11E-18D1S	FW33	Private		-0.57
30S/11E-17J02	FW24	Private		-2.05
30S/11E-20L01	FW27	Private		2.51
30S/11E-20M02	FW28	Private		2.69
30S/10E-13L1	UA4	38.68	40.31	1.63
30S/11E-7N1	UA5	9.13	10.66	1.53
30S/11E-18K3	UA9	121.18	123.42	2.24
30S/11E-18H1	UA10	107.1	110.02	2.92
30S/11E-17E9	UA12	105.85	107.39*	1.54
30S/11E-17L04	UA16	Private		2.16
30S/11E-17E01	UA 17	Private		2.14
30S/11E-17F02	UA18	Private		2.21
30S/11E-7Q__	UA19	Private		0.8
30S/10E-13M1	LA4	41.2	42.7	1.5
30S/10E-24C1	LA9	178.32	180.34	2.02
30S/10E-13J1	LA10	95.31	98.33	3.02
30S/11E-7Q3	LA12	24.3	27.75	3.45
30S/11E-18F2	LA13	100	103.57	3.57
30S/11E-18L06	LA14	79.4	79.52	0.12
30S/11E-18M01	LA16	106.8	108.74	1.94
30S/11E-24A02	LA17	210.4	212.82	2.42
30S/11E-19H02	LA19	256.2	257.35	1.15
30S/11E-17E7	LA 21*	105.85	107.22	1.37
30S/11E-17E8	LA 22*	105.85	107.27	1.42
30S/11E-17J01	LA24	Private		-2.12
30S/11E-20G02	LA26	Private		2.75
30S/11E-21E03	LA29	Private		2.29
30S/11E-20H1	LA30	Private		2.99
30S/11E-17A01	LA33	Private		2.83
30S/11E-18K_	LA39	118	123.17	5.17

*LA 21 & 22, UA 12 surveyor measured 107.70 feet NAVD at Top of Monument (TOM)
Manual adjustments from TOM to Top of Casing (TOC) measured by CHG:

LA21: 107.7- 0.479	107.22
LA22: 107.7- 0.427	107.27
UA12: 107.7- 0.3125	107.39

APPENDIX D

Field Logs and Laboratory Analytical Reports for 2021 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 2021 Field Logs and Analytical Results

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/6/2021
Operator: B. Pfeifle
Well number and location: 30S/11E-13N (LA8)
Site and wellhead conditions: Sunny. Site secure. Well turned on at 11:30 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):	175
Pumping water level (feet):	--
Pump setting (feet):	--
Minimum purge time (min):	flush line
Time begin purge:	11:30 AM

Time	Gallons (from spigot)	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:06	6300	436	7.31	18.4	Clear, colorless, odorless
12:07	6475	439	7.61	18.2	Clear, colorless, odorless
12:08	6650	435	7.62	18.2	Clear, colorless, odorless
					Sampled @ 12:08 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/5/2021
Operator: B. Pfeifle
Well number and location: 30S/10E-12J1 (LA11)
Site and wellhead conditions: Sunny, still. Site secure.

Static water depth (feet): 4.63
Well depth (feet): 389
Water column (feet): 384
Casing diameter (inches): 2
Minimum purge volume (gal) 186
Purge rate (gpm): 1.9
Pumping water level (feet): 10.5
Pump setting (feet): 25
Minimum purge time (min): 98
Time begin purge: 11:38 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
11:43	5	1,112	7.79	18.8	Clear, colorless, odorless
11:45	10	1,108	7.65	18.6	Clear, colorless, odorless
11:48	15	1,104	7.63	18.7	Clear, colorless, odorless
11:51	20	1,099	7.60	18.9	Clear, colorless, odorless
11:53	25	1,100	7.57	19.2	Clear, colorless, odorless
11:58	35	1,097	7.51	19.6	Clear, colorless, odorless
12:04	45	1,106	7.56	20	Clear, colorless, odorless
12:14	65	1,416	7.42	20.4	Cloudy, colorless, odorless
12:24	85	1,377	7.53	20.5	Cloudy, colorless, odorless
12:34	105	1,360	7.53	20.5	Cloudy, colorless, odorless
12:44	125	1,353	7.53	20.5	Cloudy, colorless, odorless
12:54	145	1,347	7.53	19.9	Cloudy, colorless, odorless
13:04	165	1,334	7.60	20.2	Clear, colorless, odorless
13:14	185	1335	7.57	20.2	Clear, colorless, odorless
13:24	195	1337	7.56	20.1	Clear, colorless, odorless
					Sampled @ 1:24 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/5/2021
Operator: B. Pfeifle
Well number and location: 30S/11E-7Q3 (LA12)
Site and wellhead conditions: Cloudy calm. Site Secure. Pump Turned on at 9:50 AM.

Static water depth (feet): 39.4
Well depth (feet): 270
Water column (feet): 231
Casing diameter (inches): 10
Minimum purge volume (gal) flush line
Purge rate (gpm): 320
Pumping water level (feet): --
Pump setting (feet): --
Minimum purge time (min): flush line
Time begin purge: 9:50 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
10:10	6400	805.6	7.65	19.4	Clear, colorless, odorless
					Sampled @ 10:10 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/6/2021
Operator: B. Pfeifle
Well number and location: 30S/11E-18L2 (LA15)
Site and wellhead conditions: Sunny. Site secure. Well has been running since 7:30 AM.

Static water depth (feet):	100.6
Well depth (feet):	394
Water column (feet):	293
Casing diameter (inches):	12
Minimum purge volume (gal)	flush line
Purge rate (gpm):	--
Pumping water level (feet):	--
Pump setting (feet):	--
Minimum purge time (min):	flush line
Time begin purge:	12:49 PM

Time	Gallons (from spigot)	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:44	flush line	739.0	7.58	19.7	Clear, colorless, odorless
12:45	flush line	704.0	7.47	19.7	Clear, colorless, odorless
12:47	flush line	735.0	7.43	19.9	Clear, colorless, odorless
12:50	flush line	762.0	7.40	19.9	Clear, colorless, odorless
					Sampled @12:50 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/12/2021
Operator: B. Pfeifle
Well number and location: 30S/11E-18K8 (LA18)
Site and wellhead conditions: Sunny, breezy. Site secure.

Static water depth (feet): 133.75
Well depth (feet): 650
Water column (feet): 516
Casing diameter (inches): 2
Minimum purge volume (gal) 253
Purge rate (gpm): 2.4
Pumping water level (feet): 144.35
Pump setting (feet): 155
Minimum purge time (min): 106
Time begin purge: 10:45 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
10:48	1	508.2	7.35	18.7	Clear, colorless, odorless
10:50	5	513.5	7.66	20.4	Clear, colorless, odorless
10:55	15	520.8	7.22	20.4	Clear, colorless, odorless
11:10	51	564.9	7.43	20.9	Clear, colorless, odorless
11:25	87	562.7	7.57	21.9	Clear, colorless, odorless
11:40	123	563.0	7.55	22.5	Clear, colorless, odorless
11:55	159	565.8	7.58	23.1	Clear, colorless, odorless
12:10	195	565.4	7.54	23	Clear, colorless, odorless
12:15	207				Clear, colorless, odorless
1:15	210	568.6	7.51	23.5	Clear, colorless, odorless
1:30	246	566.6	7.59	21.7	Clear, colorless, odorless
1:40	270	565.5	7.61	21.8	Clear, colorless, odorless
					Sampled @ 1:40 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/8/2021
Operator: B. Pfeifle
Well number and location: 30S/11E-17E8 (LA22)
Site and wellhead conditions: Sunny, clear. Site secure.

Static water depth (feet):	102.65
Well depth (feet):	380
Water column (feet):	277.4
Casing diameter (inches):	2
Minimum purge volume (gal)	136
Purge rate (gpm):	2.5
Pumping water level (feet):	105.94
Pump setting (feet):	122
Minimum purge time (min):	55
Time begin purge:	10:24

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
10:26	1	495.3	8.82	18.7	Clear, colorless, odorless
10:30	5	483.0	8.44	19.4	Clear, colorless, odorless
10:32	10	483.1	8.33	19.5	Clear, colorless, odorless
10:35	20	480.8	8.22	19.7	Clear, colorless, odorless
10:43	40	446.3	7.90	19.9	Clear, colorless, odorless
10:51	60	439.5	7.76	20	Clear, colorless, odorless
10:59	80	438.1	7.57	19.9	Clear, colorless, odorless
11:07	100	438.4	7.54	19.9	Clear, colorless, odorless
11:15	120	438.0	7.54	19.9	Clear, colorless, odorless
11:23	140	439.3	7.52	19.9	Clear, colorless, odorless
					Sampled @ 11:26 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/1/2021
Operator: B. Pfeifle
Well number and location: 30S/11E-20H1 (LA30)
Site and wellhead condition: Sunny. Site Secure.

Static water depth (feet): 12.53
Well depth (feet): 140
Water column (feet): 127.47
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: 11:00 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
11:00	5	868	6.95	36.7	Clear, colorless, odorless
11:03	10	838.3	7.29	23	Clear, colorless, odorless
11:05	15	826	7.34	19.3	Clear, colorless, odorless
11:07	20	821.8	7.34	19.2	Clear, colorless, odorless
11:08	25	822.3	7.30	18.7	Clear, colorless, odorless
11:09	30	820.7	7.31	18.8	Clear, colorless, odorless
11:10	35	819.2	7.28	18.8	Clear, colorless, odorless
					Sampled @ 11:10 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/1/2021
Operator: B. Pfeifle
Well number and location: 30S/10E-13M2 (LA31)
Site and wellhead conditions: Sunny. 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: 3:03 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
15:04	5	2,020	7.46	14.9	Clear, colorless, odorless
15:05	10	2,040	7.50	14.8	Clear, colorless, odorless
15:06	15	2,050	7.46	14.8	Clear, colorless, odorless
15:08	25	939	7.70	17.8	Clear, colorless, odorless
15:10	35	938.5	8.02	17.9	Clear, colorless, odorless
15:12	45	938.9	8.08	18	Clear, colorless, odorless
15:14	60	935.3	8.22	17.9	Clear, colorless, odorless
15:16	75	938.1	8.29	17.9	Clear, colorless, odorless
					Sampled @ 3:16 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/5/2021
Operator: B. Pfeifle
Well number and location: 30S/11E-18K9 (LA32)
Site and wellhead conditions: Sunny. Site Secure. Well turned on at 10:10 AM.

Static water depth (feet): 157.1
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: 10:10 AM

Time	Gallons (from spigot)	EC (µS/cm)	pH	Temp. (°C)	Comments*
10:25	flush Line	373.4	7.82	18.9	Clear, colorless, odorless
					Sampled @ 10:25 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/14/2021-4/15/2021
Operator: B. Pfeifle
Well number and location: 30S/11E-13Ba (LA40)
Site and wellhead conditions: Sunny, breezy. Site secure.

Static water depth (feet):	16.39
Well depth (feet):	410.00
Water column (feet):	393.61
Casing diameter (inches):	2.26
Minimum purge volume (gal)	250
Purge rate (gpm):	0.60
Pumping water level (feet):	106.88
Pump setting (feet):	160
Minimum purge time (min):	417
Time begin purge:	12:15

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:15	1	4,870	7.69	18.7	Clear, Colorless, Slight Sulfur Odor
12:32	20	4,790	7.36	19.0	Clear, Colorless, Slight Sulfur Odor
1:05	40	4,720	7.37	19.7	Clear, Colorless, Odorless
1:45	60	4,600	7.38	19.9	Clear, Colorless, Odorless
2:23	80	5,760	7.39	19.9	Clear, Colorless, Odorless
3:02	100	5,950	7.35	20.0	Clear, Colorless, Odorless
3:40	120	5,950	7.34	20.2	Clear, Colorless, Odorless
4:00	140	6,050	7.29	20.2	Clear, Colorless, Odorless
Purge stopped at 4:00 PM 4/14/2021 and continued at 7:50 AM 4/15/2021					
8:12	165	5970	7.33	18.7	Clear, Colorless, Odorless
8:44	185	5970	7.32	19.4	Clear, Colorless, Odorless
9:19	205	5840	7.29	20.0	Clear, Colorless, Odorless
9:56	225	5910	7.43	19.9	Clear, Colorless, Odorless
10:32	245	5920	7.31	20.1	Clear, Colorless, Odorless
11:08	265	5910	7.35	20.2	Clear, Colorless, Odorless
11:44	285	5920	7.33	20.5	Clear, Colorless, Odorless
12:05	297	5900	7.35	20.5	Clear, Colorless, Odorless
					Sampled 4/15/2021 @ 12:05

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 4/13/2021 - 4/14/2021
Operator: J. Carlson
Well number and location: 30S/11E-13Bb (LA41)
Site and wellhead conditions: Overcast, cool. Site secure.

Static water depth (feet): 7.54
Well depth (feet): 350.00
Water column (feet): 342.46
Casing diameter (inches): 2.26
Minimum purge volume (gal) 215
Purge rate (gpm): ~0.9
Pumping water level (feet): 90.56
Pump setting (feet): 155
Minimum purge time (min): 239
Time begin purge: 4/13/21 9:22

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
9:22	1	690.4	8.19	15.4	Clear, colorless, odorless
9:39	20	695.2	7.83	18.8	Clear, colorless, odorless
11:14	40	709.4	7.64	18.5	Clear, colorless, odorless
11:49	60	729.4	7.55	18.5	Clear, colorless, odorless
12:28	80	740.0	7.57	19.5	Slightly opaque, colorless, odorless
1:08	100	739.5	8.15	19.1	Opaque, light grey, odorless
1:47	120	743.0	8.30	19.5	Slightly opaque, colorless, odorless
2:27	140	738.9	7.57	20.0	Slightly opaque, colorless, odorless
3:21	160	736.6	7.59	19.4	Clear, colorless, odorless
Purge stopped at 3:21 PM 4/13/2021 and continued at 8:05 AM 4/14/2021					
8:05	180	738.3	8.28	17.4	Clear, colorless, odorless
8:34	200	732.9	7.95	18.1	Clear, colorless, odorless
9:11	220	739.0	8.04	18.7	Clear, colorless, odorless
9:51	240	739.9	8.23	19.2	Clear, colorless, odorless
10:30	260	745.0	7.64	19.7	Slightly opaque, colorless, odorless
11:06	280	751.6	7.62	19.7	Slightly turbid, colorless, odorless
					Sampled 04/14/2021 @ 11:18

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

April 19, 2021

Lab ID : CC 2180916-001
Customer ID : 8-514

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

Sampled On : April 6, 2021-12:08
Sampled By : Bryce Pfeifle
Received On : April 6, 2021-15:20
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	103	2.5	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Calcium	16.7	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Magnesium	15.0	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Potassium	1.43	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Sodium	38.2	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Total Cations	3.8	---	meq/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Boron	0.0246	0.05	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Copper	22.0	10	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Iron	16.2	30	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Manganese	ND	10	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Zinc	12.7	20	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
SAR	1.63	0.1	--		200.7	04/09/21:203850	200.7	04/10/21:205265
Total Alkalinity (as CaCO3)	51.5	10	mg/L		2320B	04/13/21:203994	2320B	04/14/21:205468
Hydroxide as OH	ND	10	mg/L		2320B	04/13/21:203994	2320B	04/14/21:205468
Carbonate as CO3	ND	10	mg/L		2320B	04/13/21:203994	2320B	04/14/21:205468
Bicarbonate as HCO3	63.0	10	mg/L		2320B	04/13/21:203994	2320B	04/14/21:205468
Sulfate	13.1	0.5	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Chloride	78.2	1	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203
Nitrate as NO3	34.6	0.4	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203
Nitrite as N	ND	0.1	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203
Nitrate + Nitrite as N	7.80	0.1	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203
Fluoride	0.0690	0.1	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203
Total Anions	4.07	---	meq/L		2320B	04/13/21:203994	2320B	04/14/21:205468
pH	7.38	--	units		4500-H B	04/12/21:203857	4500HB	04/12/21:205293
Specific Conductance	438	1	umhos/cm		2510B	04/15/21:204068	2510B	04/15/21:205501
Total Dissolved Solids	302	20	mg/L		2540CE	04/08/21:203749	2540C	04/09/21:205173
MBAS Screen	Negative	0.1	mg/L		5540C	04/07/21:203902	5540C	04/07/21:205282
Aggressiveness Index	10.7	1	--		4500-H B	04/12/21:203857	4500HB	04/12/21:205293
Langelier Index (20°C)	-1.1	1	--		4500-H B	04/12/21:203857	4500HB	04/12/21:205293
Nitrate Nitrogen	7.80	0.1	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203

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

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April 19, 2021

Lab ID : CC 2180916-001
Customer ID : 8-514

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

Sampled On : April 6, 2021-12:08
Sampled By : Bryce Pfeifle
Received On : April 6, 2021-15:20
Matrix : Ground Water

LA 8

Description : 13N (LA8)
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								
Conductivity	435		umhos/cm			04/06/21 12:08	2510B	04/06/21 12:08

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

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May 4, 2021

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

LA 9

Description : Cabrillo
Project : Los Osos BMC Monitoring

Lab ID : CC 2181067-002
Customer ID : 8-514

Sampled On : April 6, 2021-10:00
Sampled By : Seth
Received On : April 6, 2021-15:20
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	98.6	2.5	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Calcium	15.6	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Magnesium	14.5	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Potassium	1.37	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Sodium	39.2	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Total Cations	3.7	---	meq/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Boron	0.0219	0.05	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Copper	1.53	10	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Iron	12.2	30	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Manganese	ND	10	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Zinc	24.4	20	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
SAR	1.72	0.1	--		200.7	04/09/21:203850	200.7	04/10/21:205265
Total Alkalinity (as CaCO3)	51.2	10	mg/L		2320B	04/12/21:203927	2320B	04/12/21:205387
Hydroxide as OH	ND	10	mg/L		2320B	04/12/21:203927	2320B	04/12/21:205387
Carbonate as CO3	ND	10	mg/L		2320B	04/12/21:203927	2320B	04/12/21:205387
Bicarbonate as HCO3	62.5	10	mg/L		2320B	04/12/21:203927	2320B	04/12/21:205387
Sulfate	12.2	0.5	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Chloride	78.4	1	mg/L		300.0	04/07/21:203745	300.0	04/07/21:205199
Nitrate as NO3	30.2	0.4	mg/L		300.0	04/07/21:203745	300.0	04/07/21:205199
Nitrite as N	ND	0.1	mg/L		300.0	04/07/21:203745	300.0	04/07/21:205199
Nitrate + Nitrite as N	6.80	0.1	mg/L		300.0	04/07/21:203745	300.0	04/07/21:205199
Fluoride	0.0990	0.1	mg/L		300.0	04/07/21:203745	300.0	04/07/21:205199
Total Anions	3.98	---	meq/L		2320B	04/12/21:203927	2320B	04/12/21:205387
pH	7.89	--	units		4500-H B	04/20/21:204264	4500HB	04/20/21:205749
Specific Conductance	443	1	umhos/cm		2510B	04/14/21:204009	2510B	04/14/21:205416
Total Dissolved Solids	287	20	mg/L		2540CE	04/08/21:203749	2540C	04/09/21:205173
MBAS Extraction	ND	0.1	mg/L		5540C	04/07/21:203869	5540C	04/07/21:205224
Aggressiveness Index	11.2	1	--		4500-H B	04/20/21:204264	4500HB	04/20/21:205749
Langelier Index (20°C)	-0.6	1	--		4500-H B	04/20/21:204264	4500HB	04/20/21:205749
Nitrate Nitrogen	6.80	0.1	mg/L		300.0	04/07/21:203745	300.0	04/07/21:205199

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

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May 4, 2021

Lab ID : CC 2181067-002
Customer ID : 8-514

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

Sampled On : April 6, 2021-10:00
Sampled By : Seth
Received On : April 6, 2021-15:20
Matrix : Ground Water

LA 9

Description : Cabrillo
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)	7.4		units			04/06/21 10:00	4500HB	04/06/21 10:00
Temperature	65		°F			04/06/21 10:00	2550B	04/06/21 10:00
Conductivity	0.47		umhos/cm			04/06/21 10:00	2510B	04/06/21 10:00

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

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CA ELAP Certification No. 2810

May 4, 2021

Lab ID : CC 2181067-003
Customer ID : 8-514

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

LA 10

Description : Rosina
Project : Los Osos BMC Monitoring

Sampled On : April 6, 2021-11:05
Sampled By : Seth
Received On : April 6, 2021-15:20
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	405	2.5	mg/L		200.7	04/14/21:204031	200.7	04/14/21:205502
Calcium	66.0	1	mg/L		200.7	04/14/21:204031	200.7	04/14/21:205502
Magnesium	58.4	1	mg/L		200.7	04/14/21:204031	200.7	04/14/21:205502
Potassium	1.55	1	mg/L		200.7	04/14/21:204031	200.7	04/14/21:205502
Sodium	36.4	1	mg/L		200.7	04/14/21:204031	200.7	04/14/21:205502
Total Cations	9.7	0.1	meq/L		200.7	04/14/21:204031	200.7	04/14/21:205502
Boron	0.0327	0.05	mg/L		200.7	04/14/21:204031	200.7	04/14/21:205502
Copper	ND	10	ug/L		200.7	04/14/21:204031	200.7	04/14/21:205502
Iron	191	30	ug/L		200.7	04/14/21:204031	200.7	04/14/21:205502
Manganese	3.16	10	ug/L		200.7	04/14/21:204031	200.7	04/14/21:205502
Zinc	8.01	20	ug/L		200.7	04/14/21:204031	200.7	04/14/21:205502
SAR	0.8	0.1	--		200.7	04/14/21:204031	200.7	04/14/21:205502
Total Alkalinity (as CaCO3)	66.6	10	mg/L		2320B	04/13/21:203994	2320B	04/13/21:205468
Hydroxide as OH	ND	10	mg/L		2320B	04/13/21:203994	2320B	04/13/21:205468
Carbonate as CO3	ND	10	mg/L		2320B	04/13/21:203994	2320B	04/13/21:205468
Bicarbonate as HCO3	81.3	10	mg/L		2320B	04/13/21:203994	2320B	04/13/21:205468
Sulfate	16.1	0.5	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203
Chloride	258	5*	mg/L		300.0	04/29/21:204714	300.0	04/29/21:206372
Nitrate as NO3	9.20	0.4	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203
Nitrite as N	ND	0.1	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203
Nitrate + Nitrite as N	2.10	0.1	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203
Fluoride	0.0560	0.1	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203
Total Anions	9.10	---	meq/L		2320B	04/13/21:203994	2320B	04/13/21:205468
pH	7.62	--	units		4500-H B	04/12/21:203857	4500HB	04/12/21:205293
Specific Conductance	1110	1	umhos/cm		2510B	04/15/21:204068	2510B	04/15/21:205501
Total Dissolved Solids	815	20	mg/L		2540CE	04/08/21:203749	2540C	04/09/21:205173
MBAS Extraction	ND	0.1	mg/L		5540C	04/07/21:203869	5540C	04/07/21:205224
Aggressiveness Index	11.7	1	--		4500-H B	04/12/21:203857	4500HB	04/12/21:205293
Langelier Index (20°C)	-0.2	1	--		4500-H B	04/12/21:203857	4500HB	04/12/21:205293
Nitrate Nitrogen	2.10	0.1	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203

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

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May 4, 2021

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

LA 10

Lab ID : CC 2181067-003
Customer ID : 8-514

Sampled On : April 6, 2021-11:05
Sampled By : Seth
Received On : April 6, 2021-15:20
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)	7.3		units			04/06/21 11:05	4500HB	04/06/21 11:05
Temperature	66		°F			04/06/21 11:05	2550B	04/06/21 11:05
Conductivity	1.19		umhos/cm			04/06/21 11:05	2510B	04/06/21 11:05

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

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April 15, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 12J1 (LA11)
Project : Los Osos BMC Monitoring

LA 11

Lab ID : CC 2181023-003
Customer ID : 8-514

Sampled On : April 5, 2021-13:24
Sampled By : Bryce Pfeifle
Received On : April 5, 2021-15:30
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	612	2.5	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Calcium	87.8	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Magnesium	95.6	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Potassium	4.67	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Sodium	91.3	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Total Cations	16.3	---	meq/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Boron	0.228	0.05	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Copper	2.12	10	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Iron	373	30	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Manganese	46.7	10	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Zinc	3.32	20	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
SAR	1.60	0.1	--		200.7	04/07/21:203727	200.7	04/07/21:205084
Total Alkalinity (as CaCO3)	283	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Hydroxide as OH	ND	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Carbonate as CO3	ND	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Bicarbonate as HCO3	345	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Sulfate	192	0.5	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Chloride	256	5*	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Nitrate as NO3	ND	0.4	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Nitrite as N	ND	0.1	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Fluoride	0.116	0.1	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Total Anions	16.9	---	meq/L		2320B	04/11/21:203884	2320B	04/12/21:205313
pH (Field)	7.56	--	units		4500-H B	04/05/21:203991		04/05/21:205386
Specific Conductance	1630	1	umhos/cm		2510B	04/12/21:203892	2510B	04/12/21:205266
Total Dissolved Solids	1050	20	mg/L		2540CE	04/07/21:203708	2540C	04/08/21:205096
MBAS Screen	Negative	0.1	mg/L		5540C	04/07/21:203902	5540C	04/07/21:205282
Aggressiveness Index	12.4	1	--		4500-H B	04/05/21:203991		04/05/21:205386
Langelier Index (20°C)	0.4	1	--		4500-H B	04/05/21:203991		04/05/21:205386
Nitrate Nitrogen	ND	0.1	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050

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

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April 15, 2021

Lab ID : CC 2181023-003
Customer ID : 8-514

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

LA 11

Sampled On : April 5, 2021-13:24
Sampled By : Bryce Pfeifle
Received On : April 5, 2021-15:30
Matrix : Ground Water

Description : 12J1 (LA11)
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								
Conductivity	1337		umhos/cm			04/05/21 13:24	2510B	04/05/21 13:24

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

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April 15, 2021

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

LA 12

Lab ID : CC 2181023-001
Customer ID : 8-514

Sampled On : April 5, 2021-10:10
Sampled By : Bryce Pfeifle
Received On : April 5, 2021-15:30
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	297	2.5	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Calcium	47.7	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Magnesium	43.3	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Potassium	1.99	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Sodium	54.0	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Total Cations	8.34	---	meq/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Boron	0.170	0.05	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Copper	3.55	10	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Iron	37.3	30	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Manganese	51.9	10	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Zinc	8.14	20	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
SAR	1.36	0.1	--		200.7	04/07/21:203727	200.7	04/07/21:205084
Total Alkalinity (as CaCO3)	250	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Hydroxide as OH	ND	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Carbonate as CO3	ND	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Bicarbonate as HCO3	305	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Sulfate	54.1	0.5	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Chloride	94.2	1	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Nitrate as NO3	ND	0.4	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Nitrite as N	ND	0.1	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Fluoride	0.0500	0.1	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Total Anions	8.78	---	meq/L		2320B	04/11/21:203884	2320B	04/12/21:205313
pH (Field)	7.65	--	units		4500-H B	04/05/21:203991		04/05/21:205386
Specific Conductance	849	1	umhos/cm		2510B	04/12/21:203892	2510B	04/12/21:205266
Total Dissolved Solids	504	20	mg/L		2540CE	04/07/21:203708	2540C	04/08/21:205096
MBAS Screen	Negative	0.1	mg/L		5540C	04/07/21:203902	5540C	04/07/21:205282
Aggressiveness Index	12.1	1	--		4500-H B	04/05/21:203991		04/05/21:205386
Langelier Index (20°C)	0.3	1	--		4500-H B	04/05/21:203991		04/05/21:205386
Nitrate Nitrogen	ND	0.1	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050

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

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April 15, 2021

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

LA 12

Lab ID : CC 2181023-001
Customer ID : 8-514

Sampled On : April 5, 2021-10:10
Sampled By : Bryce Pfeifle
Received On : April 5, 2021-15:30
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								
Conductivity	805.6		umhos/cm			04/05/21 10:10	2510B	04/05/21 10:10

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

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April 19, 2021

Lab ID : CC 2180916-002
Customer ID : 8-514

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

Sampled On : April 6, 2021-12:50
Sampled By : Bryce Pfeifle
Received On : April 6, 2021-15:20
Matrix : Ground Water

LA 15

Description : 18L2 (LA15)
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	290	2.5	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Calcium	47.4	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Magnesium	41.8	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Potassium	1.70	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Sodium	37.8	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Total Cations	7.5	---	meq/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Boron	0.0489	0.05	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Copper	2.91	10	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Iron	30.0	30	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Manganese	0.338	10	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Zinc	5.69	20	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
SAR	0.965	0.1	--		200.7	04/09/21:203850	200.7	04/10/21:205265
Total Alkalinity (as CaCO3)	192	10	mg/L		2320B	04/13/21:203994	2320B	04/13/21:205468
Hydroxide as OH	ND	10	mg/L		2320B	04/13/21:203994	2320B	04/13/21:205468
Carbonate as CO3	ND	10	mg/L		2320B	04/13/21:203994	2320B	04/13/21:205468
Bicarbonate as HCO3	234	10	mg/L		2320B	04/13/21:203994	2320B	04/13/21:205468
Sulfate	27.2	0.5	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Chloride	108	2*	mg/L		300.0	04/07/21:203744	300.0	04/08/21:205203
Nitrate as NO3	4.31	0.4	mg/L		300.0	04/07/21:203744	300.0	04/08/21:205203
Nitrite as N	ND	0.1	mg/L		300.0	04/07/21:203744	300.0	04/08/21:205203
Nitrate + Nitrite as N	1.00	0.1	mg/L		300.0	04/07/21:203744	300.0	04/08/21:205203
Fluoride	0.0780	0.1	mg/L		300.0	04/07/21:203744	300.0	04/08/21:205203
Total Anions	7.52	---	meq/L		2320B	04/13/21:203994	2320B	04/13/21:205468
pH	7.69	--	units		4500-H B	04/12/21:203857	4500HB	04/12/21:205293
Specific Conductance	780	1	umhos/cm		2510B	04/14/21:204009	2510B	04/14/21:205416
Total Dissolved Solids	444	20	mg/L		2540CE	04/08/21:203749	2540C	04/09/21:205173
MBAS Screen	Negative	0.1	mg/L		5540C	04/07/21:203902	5540C	04/07/21:205282
Aggressiveness Index	12.0	1	--		4500-H B	04/12/21:203857	4500HB	04/12/21:205293
Langelier Index (20°C)	0.2	1	--		4500-H B	04/12/21:203857	4500HB	04/12/21:205293
Nitrate Nitrogen	1.00	0.1	mg/L		300.0	04/07/21:203744	300.0	04/08/21:205203

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

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April 19, 2021

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

LA 15

Lab ID : CC 2180916-002
Customer ID : 8-514

Sampled On : April 6, 2021-12:50
Sampled By : Bryce Pfeifle
Received On : April 6, 2021-15:20
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								
Conductivity	762		umhos/cm			04/06/21 12:50	2510B	04/06/21 12:50

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

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May 3, 2021

Lab ID : CC 2181140-001
Customer ID : 8-514

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

Sampled On : April 12, 2021-13:40
Sampled By : Bryce Pfeifle
Received On : April 12, 2021-15:35
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	267	2.5	mg/L		200.7	04/13/21:203997	200.7	04/14/21:205417
Calcium	54.3	1	mg/L		200.7	04/13/21:203997	200.7	04/14/21:205417
Magnesium	32.0	1	mg/L		200.7	04/13/21:203997	200.7	04/14/21:205417
Potassium	2.11	1	mg/L		200.7	04/13/21:203997	200.7	04/14/21:205417
Sodium	26.6	1	mg/L		200.7	04/13/21:203997	200.7	04/14/21:205417
Total Cations	6.55	---	meq/L		200.7	04/13/21:203997	200.7	04/14/21:205417
Boron	0.0658	0.05	mg/L		200.7	04/13/21:203997	200.7	04/14/21:205417
Copper	1.46	10	ug/L		200.7	04/13/21:203997	200.7	04/14/21:205417
Iron	35.7	30	ug/L		200.7	04/13/21:203997	200.7	04/14/21:205417
Manganese	83.1	10	ug/L		200.7	04/13/21:203997	200.7	04/14/21:205417
Zinc	1.04	20	ug/L		200.7	04/13/21:203997	200.7	04/14/21:205417
SAR	0.708	0.1	--		200.7	04/13/21:203997	200.7	04/14/21:205417
Total Alkalinity (as CaCO3)	244	10	mg/L		2320B	04/20/21:204252	2320B	04/21/21:205833
Hydroxide as OH	ND	10	mg/L		2320B	04/20/21:204252	2320B	04/21/21:205833
Carbonate as CO3	ND	10	mg/L		2320B	04/20/21:204252	2320B	04/21/21:205833
Bicarbonate as HCO3	298	10	mg/L		2320B	04/20/21:204252	2320B	04/21/21:205833
Sulfate	41.2	0.5	mg/L		300.0	04/13/21:203982	300.0	04/13/21:205499
Chloride	31.9	1	mg/L		300.0	04/13/21:203982	300.0	04/13/21:205499
Nitrate as NO3	ND	0.4	mg/L		300.0	04/13/21:203982	300.0	04/13/21:205499
Nitrite as N	ND	0.1	mg/L		300.0	04/13/21:203982	300.0	04/13/21:205499
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	04/13/21:203982	300.0	04/13/21:205499
Fluoride	0.248	0.1	mg/L		300.0	04/13/21:203982	300.0	04/13/21:205499
Total Anions	6.65	---	meq/L		2320B	04/20/21:204252	2320B	04/21/21:205833
pH (Field)	7.61	--	units		4500-H B	04/12/21:204291		04/12/21:205789
Specific Conductance	621	1	umhos/cm		2510B	04/22/21:204332	2510B	04/22/21:205864
Total Dissolved Solids	389	20	mg/L		2540CE	04/14/21:204017	2540C	04/15/21:205510
MBAS Screen	Negative	0.1	mg/L		5540C	04/14/21:204521	5540C	04/14/21:206077
Aggressiveness Index	12.1	1	--		4500-H B	04/12/21:204291		04/12/21:205789
Langelier Index (20°C)	0.3	1	--		4500-H B	04/12/21:204291		04/12/21:205789
Nitrate Nitrogen	ND	0.1	mg/L		300.0	04/13/21:203982	300.0	04/13/21:205499

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

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May 3, 2021

Lab ID : CC 2181140-001
Customer ID : 8-514

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

LA 18

Description : 18K8 (LA18)
Project : Los Osos BMC Monitoring

Sampled On : April 12, 2021-13:40
Sampled By : Bryce Pfeifle
Received On : April 12, 2021-15:35
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								
Conductivity	565.5		mS/cm			04/12/21 13:40	2510B	04/12/21 13:40

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

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May 4, 2021

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

LA 20

Description : South Bay
Project : Los Osos BMC Monitoring

Lab ID : CC 2181067-001
Customer ID : 8-514

Sampled On : April 6, 2021-08:00
Sampled By : Seth
Received On : April 6, 2021-15:20
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	178	2.5	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Calcium	28.6	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Magnesium	25.9	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Potassium	1.92	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Sodium	33.4	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Total Cations	5.1	---	meq/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Boron	0.108	0.05	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Copper	ND	10	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Iron	4.70	30	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Manganese	6.39	10	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Zinc	1.22	20	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
SAR	1.09	0.1	--		200.7	04/09/21:203850	200.7	04/10/21:205265
Total Alkalinity (as CaCO3)	168	10	mg/L		2320B	04/13/21:203994	2320B	04/13/21:205468
Hydroxide as OH	ND	10	mg/L		2320B	04/13/21:203994	2320B	04/13/21:205468
Carbonate as CO3	ND	10	mg/L		2320B	04/13/21:203994	2320B	04/13/21:205468
Bicarbonate as HCO3	204	10	mg/L		2320B	04/13/21:203994	2320B	04/13/21:205468
Sulfate	21.1	0.5	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Chloride	42.5	1	mg/L		300.0	04/07/21:203745	300.0	04/07/21:205199
Nitrate as NO3	13.5	0.4	mg/L		300.0	04/07/21:203745	300.0	04/07/21:205199
Nitrite as N	ND	0.1	mg/L		300.0	04/07/21:203745	300.0	04/07/21:205199
Nitrate + Nitrite as N	3.00	0.1	mg/L		300.0	04/07/21:203745	300.0	04/07/21:205199
Fluoride	0.147	0.1	mg/L		300.0	04/07/21:203745	300.0	04/07/21:205199
Total Anions	5.21	---	meq/L		2320B	04/13/21:203994	2320B	04/13/21:205468
pH	7.88	--	units		4500-H B	04/12/21:203857	4500HB	04/12/21:205293
Specific Conductance	529	1	umhos/cm		2510B	04/15/21:204068	2510B	04/15/21:205501
Total Dissolved Solids	329	20	mg/L		2540CE	04/08/21:203749	2540C	04/09/21:205173
MBAS Extraction	ND	0.1	mg/L		5540C	04/07/21:203869	5540C	04/07/21:205224
Aggressiveness Index	12.0	1	--		4500-H B	04/12/21:203857	4500HB	04/12/21:205293
Langelier Index (20°C)	0.1	1	--		4500-H B	04/12/21:203857	4500HB	04/12/21:205293
Nitrate Nitrogen	3.00	0.1	mg/L		300.0	04/07/21:203745	300.0	04/07/21:205199

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

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May 4, 2021

Lab ID : CC 2181067-001
Customer ID : 8-514

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

LA 20

Sampled On : April 6, 2021-08:00
Sampled By : Seth
Received On : April 6, 2021-15:20
Matrix : Ground Water

Description : South Bay
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								
pH (Field)	7.5		units			04/06/21 08:00	4500HB	04/06/21 08:00
Temperature	66		°F			04/06/21 08:00	2550B	04/06/21 08:00
Conductivity	0.56		umhos/cm			04/06/21 08:00	2510B	04/06/21 08:00

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

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May 4, 2021

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

LA 22

Lab ID : CC 2181121-001
Customer ID : 8-514

Sampled On : April 8, 2021-11:26
Sampled By : Bryce Pfeifle
Received On : April 8, 2021-15:37
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	154	2.5	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Calcium	24.1	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Magnesium	22.7	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Potassium	1.17	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Sodium	26.8	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Total Cations	4.3	---	meq/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Boron	0.0154	0.05	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Copper	ND	10	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Iron	0.441	30	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Manganese	1.45	10	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Zinc	ND	20	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
SAR	0.941	0.1	--		200.7	04/09/21:203850	200.7	04/10/21:205265
Total Alkalinity (as CaCO3)	130	10	mg/L		2320B	04/13/21:203994	2320B	04/14/21:205468
Hydroxide as OH	ND	10	mg/L		2320B	04/13/21:203994	2320B	04/14/21:205468
Carbonate as CO3	ND	10	mg/L		2320B	04/13/21:203994	2320B	04/14/21:205468
Bicarbonate as HCO3	159	10	mg/L		2320B	04/13/21:203994	2320B	04/14/21:205468
Sulfate	12.5	0.5	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Chloride	46.2	1	mg/L		300.0	04/09/21:203838	300.0	04/09/21:205395
Nitrate as NO3	25.6	0.4	mg/L		300.0	04/09/21:203838	300.0	04/09/21:205395
Nitrite as N	ND	0.1	mg/L		300.0	04/09/21:203838	300.0	04/09/21:205395
Nitrate + Nitrite as N	5.80	0.1	mg/L		300.0	04/09/21:203838	300.0	04/09/21:205395
Fluoride	0.0690	0.1	mg/L		300.0	04/09/21:203838	300.0	04/09/21:205395
Total Anions	4.59	---	meq/L		2320B	04/13/21:203994	2320B	04/14/21:205468
Specific Conductance	470	1	umhos/cm		2510B	04/15/21:204068	2510B	04/15/21:205501
Total Dissolved Solids	329	20	mg/L		2540CE	04/09/21:203818	2540C	04/12/21:205287
MBAS Screen	Negative	0.1	mg/L		5540C	04/09/21:203918	5540C	04/09/21:205290
Nitrate Nitrogen	5.80	0.1	mg/L		300.0	04/09/21:203838	300.0	04/09/21:205395

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

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May 4, 2021

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

LA 22

Description : 17E8 (LA22)
Project : Los Osos BMC Monitoring

Lab ID : CC 2181121-001
Customer ID : 8-514

Sampled On : April 8, 2021-11:26
Sampled By : Bryce Pfeifle
Received On : April 8, 2021-15:37
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)	7.52		units			04/08/21 11:26	4500HB	04/08/21 11:26
Conductivity	439.3		umhos/cm			04/08/21 11:26	2510B	04/08/21 11:26

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

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April 15, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 20H1 (LA30) LA 30
Project : Los Osos BMC Monitoring

Lab ID : CC 2181016-001
Customer ID : 8-514

Sampled On : April 1, 2021-11:10
Sampled By : Bryce Pfeifle
Received On : April 1, 2021-15:44
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	412	2.5	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Calcium	68.7	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Magnesium	58.5	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Potassium	1.35	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Sodium	38.6	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Total Cations	9.96	---	meq/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Boron	0.103	0.05	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Copper	0.889	10	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Iron	899	30	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Manganese	201	10	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Zinc	ND	20	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
SAR	0.827	0.1	--		200.7	04/07/21:203727	200.7	04/07/21:205084
Total Alkalinity (as CaCO3)	329	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Hydroxide as OH	ND	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Carbonate as CO3	ND	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Bicarbonate as HCO3	402	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Sulfate	112	0.5	mg/L		300.0	04/02/21:203564	300.0	04/02/21:204967
Chloride	57.2	1	mg/L		300.0	04/02/21:203564	300.0	04/02/21:204967
Nitrate as NO3	ND	0.4	mg/L		300.0	04/02/21:203564	300.0	04/02/21:204967
Nitrite as N	ND	0.1	mg/L		300.0	04/02/21:203564	300.0	04/02/21:204967
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	04/02/21:203564	300.0	04/02/21:204967
Fluoride	0.240	0.1	mg/L		300.0	04/02/21:203564	300.0	04/02/21:204967
Total Anions	10.5	---	meq/L		2320B	04/11/21:203884	2320B	04/12/21:205313
pH (Field)	7.28	--	units		4500-H B	04/01/21:203659		04/01/21:204954
Specific Conductance	945	1	umhos/cm		2510B	04/12/21:203892	2510B	04/12/21:205266
Total Dissolved Solids	582	20	mg/L		2540CE	04/05/21:203622	2540C	04/06/21:204956
MBAS Screen	Negative	0.1	mg/L		5540C	04/02/21:203633	5540C	04/02/21:204932
Aggressiveness Index	12.0	1	--		4500-H B	04/01/21:203659		04/01/21:204954
Langelier Index (20°C)	0.2	1	--		4500-H B	04/01/21:203659		04/01/21:204954
Nitrate Nitrogen	ND	0.1	mg/L		300.0	04/02/21:203564	300.0	04/02/21:204967

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

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April 15, 2021

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

LA 30

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

Lab ID : CC 2181016-001
Customer ID : 8-514

Sampled On : April 1, 2021-11:10
Sampled By : Bryce Pfeifle
Received On : April 1, 2021-15:44
Matrix : Ground Water

Sample Result - Support

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Field Test								
Conductivity	819.2		umhos/cm			04/01/21 11:10	2510B	04/01/21 11:10

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

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April 15, 2021

Lab ID : CC 2181016-002
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
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LA 31

Description : 13M2 (LA31)
Project : Los Osos BMC Monitoring

Sampled On : April 1, 2021-15:16
Sampled By : Bryce Pfeifle
Received On : April 1, 2021-15:44
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	187	2.5	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Calcium	31.1	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Magnesium	26.5	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Potassium	20.0	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Sodium	113	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Total Cations	9.16	---	meq/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Boron	0.277	0.05	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Copper	15.6	10	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Iron	11.0	30	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Manganese	2.19	10	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Zinc	30.9	20	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
SAR	3.60	0.1	--		200.7	04/07/21:203727	200.7	04/07/21:205084
Total Alkalinity (as CaCO3)	179	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Hydroxide as OH	ND	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Carbonate as CO3	ND	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Bicarbonate as HCO3	218	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Sulfate	47.3	0.5	mg/L		300.0	04/02/21:203564	300.0	04/02/21:204967
Chloride	161	2*	mg/L		300.0	04/02/21:203564	300.0	04/02/21:204967
Nitrate as NO3	13.0	0.4	mg/L		300.0	04/02/21:203564	300.0	04/02/21:204967
Nitrite as N	ND	0.1	mg/L		300.0	04/02/21:203564	300.0	04/02/21:204967
Nitrate + Nitrite as N	2.90	0.1	mg/L		300.0	04/02/21:203564	300.0	04/02/21:204967
Fluoride	0.0920	0.1	mg/L		300.0	04/02/21:203564	300.0	04/02/21:204967
Total Anions	9.31	---	meq/L		2320B	04/11/21:203884	2320B	04/12/21:205313
pH (Field)	8.29	--	units		4500-H B	04/01/21:203659		04/01/21:204954
Specific Conductance	1010	1	umhos/cm		2510B	04/12/21:203892	2510B	04/12/21:205266
Total Dissolved Solids	581	20	mg/L		2540CE	04/05/21:203622	2540C	04/06/21:204956
MBAS Screen	Negative	0.1	mg/L		5540C	04/02/21:203633	5540C	04/02/21:204932
Aggressiveness Index	12.4	1	--		4500-H B	04/01/21:203659		04/01/21:204954
Langelier Index (20°C)	0.6	1	--		4500-H B	04/01/21:203659		04/01/21:204954
Nitrate Nitrogen	2.90	0.1	mg/L		300.0	04/02/21:203564	300.0	04/02/21:204967

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

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April 15, 2021

Lab ID : CC 2181016-002
Customer ID : 8-514

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

Sampled On : April 1, 2021-15:16
Sampled By : Bryce Pfeifle
Received On : April 1, 2021-15:44
Matrix : Ground Water

Description : 13M2 (LA31) LA 31
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								
Conductivity	938.1		umhos/cm			04/01/21 15:16	2510B	04/01/21 15:16

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

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April 15, 2021

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

Lab ID : CC 2181023-002
Customer ID : 8-514

Sampled On : April 5, 2021-10:25
Sampled By : Bryce Pfeifle
Received On : April 5, 2021-15:30
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	128	2.5	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Calcium	19.7	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Magnesium	19.1	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Potassium	1.17	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Sodium	27.1	1	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Total Cations	3.76	---	meq/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Boron	0.0505	0.05	mg/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Copper	4.33	10	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Iron	24.3	30	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Manganese	1.06	10	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
Zinc	73.9	20	ug/L		200.7	04/07/21:203727	200.7	04/07/21:205084
SAR	1.04	0.1	--		200.7	04/07/21:203727	200.7	04/07/21:205084
Total Alkalinity (as CaCO3)	117	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Hydroxide as OH	ND	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Carbonate as CO3	ND	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Bicarbonate as HCO3	143	10	mg/L		2320B	04/11/21:203884	2320B	04/12/21:205313
Sulfate	15.7	0.5	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Chloride	34.3	1	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Nitrate as NO3	9.38	0.4	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Nitrite as N	ND	0.1	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Nitrate + Nitrite as N	2.10	0.1	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Fluoride	0.110	0.1	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050
Total Anions	3.80	---	meq/L		2320B	04/11/21:203884	2320B	04/12/21:205313
pH (Field)	7.82	--	units		4500-H B	04/05/21:203991		04/05/21:205386
Specific Conductance	390	1	umhos/cm		2510B	04/12/21:203892	2510B	04/12/21:205266
Total Dissolved Solids	247	20	mg/L		2540CE	04/07/21:203708	2540C	04/08/21:205096
MBAS Screen	Negative	0.1	mg/L		5540C	04/07/21:203902	5540C	04/07/21:205282
Aggressiveness Index	11.6	1	--		4500-H B	04/05/21:203991		04/05/21:205386
Langelier Index (20°C)	-0.2	1	--		4500-H B	04/05/21:203991		04/05/21:205386
Nitrate Nitrogen	2.10	0.1	mg/L		300.0	04/06/21:203682	300.0	04/06/21:205050

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

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April 15, 2021

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

LA 32

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

Lab ID : CC 2181023-002
Customer ID : 8-514

Sampled On : April 5, 2021-10:25
Sampled By : Bryce Pfeifle
Received On : April 5, 2021-15:30
Matrix : Ground Water

Sample Result - Support

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Field Test								
Conductivity	373.4		umhos/cm			04/05/21 10:25	2510B	04/05/21 10:25

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

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May 4, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : Los Olivos 5
Project : Los Osos BMC Monitoring

LA 39

Lab ID : CC 2181067-004
Customer ID : 8-514

Sampled On : April 6, 2021-11:40
Sampled By : Seth
Received On : April 6, 2021-15:20
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	226	2.5	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Calcium	34.2	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Magnesium	34.1	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Potassium	1.60	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Sodium	40.0	1	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Total Cations	6.3	---	meq/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Boron	0.0636	0.05	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Copper	ND	10	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Iron	7.62	30	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Manganese	0.761	10	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Zinc	ND	20	ug/L		200.7	04/09/21:203850	200.7	04/10/21:205265
SAR	1.16	0.1	--		200.7	04/09/21:203850	200.7	04/10/21:205265
Total Alkalinity (as CaCO3)	246	10	mg/L		2320B	04/13/21:203994	2320B	04/14/21:205468
Hydroxide as OH	ND	10	mg/L		2320B	04/13/21:203994	2320B	04/14/21:205468
Carbonate as CO3	ND	10	mg/L		2320B	04/13/21:203994	2320B	04/14/21:205468
Bicarbonate as HCO3	301	10	mg/L		2320B	04/13/21:203994	2320B	04/14/21:205468
Sulfate	25.8	0.5	mg/L		200.7	04/09/21:203850	200.7	04/10/21:205265
Chloride	37.9	1	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203
Nitrate as NO3	0.230	0.4	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203
Nitrite as N	ND	0.1	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203
Fluoride	0.121	0.1	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203
Total Anions	6.55	---	meq/L		2320B	04/13/21:203994	2320B	04/14/21:205468
pH	7.96	--	units		4500-H B	04/12/21:203857	4500HB	04/12/21:205293
Specific Conductance	629	1	umhos/cm		2510B	04/15/21:204068	2510B	04/15/21:205501
Total Dissolved Solids	382	20	mg/L		2540CE	04/08/21:203749	2540C	04/09/21:205173
MBAS Extraction	ND	0.1	mg/L		5540C	04/07/21:203869	5540C	04/07/21:205224
Aggressiveness Index	12.3	1	--		4500-H B	04/12/21:203857	4500HB	04/12/21:205293
Langelier Index (20°C)	0.4	1	--		4500-H B	04/12/21:203857	4500HB	04/12/21:205293
Nitrate Nitrogen	0.0500	0.1	mg/L		300.0	04/07/21:203744	300.0	04/07/21:205203

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

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May 4, 2021

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

Description : Los Olivos 5
Project : Los Osos BMC Monitoring

LA 39

Lab ID : CC 2181067-004
Customer ID : 8-514

Sampled On : April 6, 2021-11:40
Sampled By : Seth
Received On : April 6, 2021-15:20
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)	7.2		units			04/06/21 11:40	4500HB	04/06/21 11:40
Temperature	68		°F			04/06/21 11:40	2550B	04/06/21 11:40
Conductivity	0.70		umhos/cm			04/06/21 11:40	2510B	04/06/21 11:40

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

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May 10, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 13Ba (LA40)
Project : Los Osos BMC Monitoring

LA 40

Lab ID : CC 2181178-001
Customer ID : 8-514

Sampled On : April 15, 2021-12:05
Sampled By : Bryce Pfeifle
Received On : April 15, 2021-13:55
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	3760	2.5	mg/L		200.7	04/16/21:204151	200.7	04/19/21:205711
Calcium	558	1	mg/L		200.7	04/16/21:204151	200.7	04/19/21:205711
Magnesium	576	5*	mg/L		200.7	04/16/21:204151	200.7	04/20/21:205740
Potassium	6.91	1	mg/L		200.7	04/16/21:204151	200.7	04/19/21:205711
Sodium	210	1	mg/L		200.7	04/16/21:204151	200.7	04/19/21:205711
Total Cations	84.6	0.1	meq/L		200.7	04/16/21:204151	200.7	04/19/21:205711
Boron	0.0806	0.05	mg/L		200.7	04/16/21:204151	200.7	04/19/21:205711
Copper	10.6	10	ug/L		200.7	04/16/21:204151	200.7	04/19/21:205711
Iron	5.21	50	ug/L		200.7	04/16/21:204151	200.7	04/19/21:205711
Manganese	404	10	ug/L		200.7	04/16/21:204151	200.7	04/19/21:205711
Zinc	3.86	20	ug/L		200.7	04/16/21:204151	200.7	04/19/21:205711
SAR	1.5	0.1	--		200.7	04/16/21:204151	200.7	04/19/21:205711
Total Alkalinity (as CaCO3)	224	10	mg/L		2320B	04/24/21:204466	2320B	04/25/21:206001
Hydroxide as OH	ND	10	mg/L		2320B	04/24/21:204466	2320B	04/25/21:206001
Carbonate as CO3	ND	10	mg/L		2320B	04/24/21:204466	2320B	04/25/21:206001
Bicarbonate as HCO3	274	10	mg/L		2320B	04/24/21:204466	2320B	04/25/21:206001
Sulfate	217	1	mg/L		300.0	04/29/21:204714	300.0	04/29/21:206372
Chloride	2510	50*	mg/L		300.0	05/04/21:204893	300.0	05/05/21:206667
Nitrate as NO3	0.300	1	mg/L		4500NO3F	04/16/21:204153	4500NO3F	04/16/21:205606
Nitrite as N	ND	0.1	mg/L		4500NO3F	04/16/21:204154	4500NO3F	04/16/21:205604
Nitrate + Nitrite as N	ND	0.1	mg/L		4500NO3F	04/16/21:204153	4500NO3F	04/16/21:205606
Fluoride	0.0550	0.1	mg/L		300.0	04/29/21:204714	300.0	04/29/21:206372
Total Anions	79.8	---	meq/L		2320B	04/24/21:204466	2320B	04/25/21:206001
pH (Field)	7.35	--	units		4500-H B	04/15/21:204291		04/15/21:205789
Specific Conductance	8590	1	umhos/cm		2510B	04/30/21:204720	2510B	04/30/21:206349
Total Dissolved Solids	6760	100*	mg/L		2540CE	04/19/21:204194	2540C	04/20/21:205728
MBAS Screen	Negative	0.1	mg/L		5540C	04/16/21:204523	5540C	04/16/21:206081
Aggressiveness Index	12.8	1	--		4500-H B	04/15/21:204291		04/15/21:205789
Langelier Index (20°C)	0.8	1	--		4500-H B	04/15/21:204291		04/15/21:205789
Nitrate Nitrogen	ND	0.2	mg/L		4500NO3F	04/16/21:204153	4500NO3F	04/16/21:205606

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

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May 4, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 13Bb (LA41) LA 41
Project : Los Osos BMC Monitoring

Lab ID : CC 2181170-001
Customer ID : 8-514

Sampled On : April 14, 2021-11:18
Sampled By : Bryce Pfeifle
Received On : April 14, 2021-14:37
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	289	2.5	mg/L		200.7	04/16/21:204105	200.7	04/16/21:205579
Calcium	53.4	1	mg/L		200.7	04/16/21:204105	200.7	04/16/21:205579
Magnesium	37.8	1	mg/L		200.7	04/16/21:204105	200.7	04/16/21:205579
Potassium	2.02	1	mg/L		200.7	04/16/21:204105	200.7	04/16/21:205579
Sodium	59.9	1	mg/L		200.7	04/16/21:204105	200.7	04/16/21:205579
Total Cations	8.4	---	meq/L		200.7	04/16/21:204105	200.7	04/16/21:205579
Boron	0.102	0.05	mg/L		200.7	04/16/21:204105	200.7	04/16/21:205579
Copper	3.95	10	ug/L		200.7	04/16/21:204105	200.7	04/16/21:205579
Iron	297	30	ug/L		200.7	04/16/21:204105	200.7	04/16/21:205579
Manganese	66.4	10	ug/L		200.7	04/16/21:204105	200.7	04/16/21:205579
Zinc	14.4	20	ug/L		200.7	04/16/21:204105	200.7	04/16/21:205579
SAR	1.53	0.1	--		200.7	04/16/21:204105	200.7	04/16/21:205579
Total Alkalinity (as CaCO3)	273	10	mg/L		2320B	04/24/21:204466	2320B	04/25/21:206001
Hydroxide as OH	ND	10	mg/L		2320B	04/24/21:204466	2320B	04/25/21:206001
Carbonate as CO3	ND	10	mg/L		2320B	04/24/21:204466	2320B	04/25/21:206001
Bicarbonate as HCO3	333	10	mg/L		2320B	04/24/21:204466	2320B	04/25/21:206001
Sulfate	85.8	0.5	mg/L		300.0	04/15/21:204081	300.0	04/16/21:205858
Chloride	66.0	1	mg/L		300.0	04/15/21:204081	300.0	04/16/21:205858
Nitrate as NO3	0.218	0.4	mg/L		300.0	04/15/21:204081	300.0	04/16/21:205858
Nitrite as N	ND	0.1	mg/L		300.0	04/15/21:204081	300.0	04/16/21:205858
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	04/15/21:204081	300.0	04/16/21:205858
Fluoride	0.112	0.1	mg/L		300.0	04/15/21:204081	300.0	04/16/21:205858
Total Anions	9.11	---	meq/L		2320B	04/24/21:204466	2320B	04/25/21:206001
pH	7.87	--	units		4500-H B	04/23/21:204418	4500HB	04/23/21:205942
Specific Conductance	855	1	umhos/cm		2510B	04/26/21:204492	2510B	04/26/21:206024
Total Dissolved Solids	505	20	mg/L		2540CE	04/19/21:204194	2540C	04/20/21:205728
MBAS Screen	Negative	0.1	mg/L		5540C	04/15/21:204522	5540C	04/15/21:206080
Aggressiveness Index	12.4	1	--		4500-H B	04/23/21:204418	4500HB	04/23/21:205942
Langelier Index (20°C)	0.6	1	--		4500-H B	04/23/21:204418	4500HB	04/23/21:205942
Nitrate Nitrogen	0.0500	0.1	mg/L		300.0	04/15/21:204081	300.0	04/16/21:205858

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

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May 4, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 13Bb (LA41)
Project : Los Osos BMC Monitoring

LA 41

Lab ID : CC 2181170-001
Customer ID : 8-514

Sampled On : April 14, 2021-11:18
Sampled By : Bryce Pfeifle
Received On : April 14, 2021-14:37
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)	7.60		units			04/14/21 11:18	4500HB	04/14/21 11:18
Conductivity	767.9		umhos/cm			04/14/21 11:18	2510B	04/14/21 11:18

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

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Fall 2021 Field Logs and Analytical Results

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/27/2021
Operator: J. Carlson
Well number and location: 30S/11E-7Q1 (FW10)
Site and wellhead conditions: Sunny, breezy. Site secure.

Static water depth (feet): 9.83
Well depth (feet): 68.65
Water column (feet): 58.82
Casing diameter (inches): 6
Minimum purge volume (gal) 260
Purge rate (gpm): 1.6
Pumping water level (feet): 28.1
Pump setting (feet): 40
Minimum purge time (min): 35
Time begin purge: 12:01 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:02	1	606.6	8.11	19.4	Clear, colorless, odorless
12:05	5	595.6	8.32	18.4	Clear, colorless, earthy odor
12:09	10	594.8	8.48	18.8	Clear, colorless, earthy odor
12:12	15	592.2	8.56	18.7	Clear, colorless, odorless
12:29	40	613.2	8.38	19	Clear, colorless, odorless
12:43	60	628.4	8.23	19.2	Clear, colorless, odorless
13:01	90	652.7	7.47	19.4	Clear, colorless, odorless
13:18	120	673.9	7.53	19.3	Clear, colorless, odorless
13:29	140	677.6	7.51	19.4	Clear, colorless, odorless
13:52	180	693.8	7.46	19.3	Clear, colorless, odorless
14:01	200	689.8	6.95	19.2	Clear, colorless, odorless
14:08	210	692.1	6.75	19.3	Clear, colorless, odorless
14:23	240	691.5	6.84	19.3	Clear, colorless, odorless
14:28	250	683.9	6.80	19.3	Clear, colorless, odorless
14:33	260	698	6.83	19.3	Clear, colorless, odorless
14:35			6.83		Sampled

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/27/2021
Operator: Andrea Berge
Well number and location: 30S/11E-20M2 (FW28)
Site and wellhead conditions: Sunny, clear, breezy. Site secure.

Static water depth (feet): 31.62
Well depth (feet): 102
Water column (feet): 70.38
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: 11:09 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
11:09	1	973	7.83	16.8	Particles, clear, odorless
11:11	10	965	7.51	15.9	Clear, colorless, odorless
	30	972	7.35	15.9	Clear, colorless, odorless
	50	966	7.22	15.5	Clear, colorless, odorless
11:20	100	966	7.18	15.6	Clear, colorless, odorless
					Sampled @ 11:25 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/6/2021
Operator: James Carlson, Tanner Mihelic
Well number and location: 30S/11E-17E10 (UA13)
Site and wellhead conditions: Sunny, breezy. Site secure. Well has been running since 8:30 AI

Static water depth (feet):	92.4
Well depth (feet):	142
Water column (feet):	49.6
Casing diameter (inches):	8
Minimum purge volume (gal)	flush line
Purge rate (gpm):	--
Pumping water level (feet):	--
Pump setting (feet):	--
Minimum purge time (min):	flush line
Time begin purge:	12:33 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:33	flush line	517.6	7.75	19.2	Clear, colorless, odorless
12:36	flush line	518.1	7.63	19.2	Clear, colorless, odorless
12:38	flush line	514.5	7.54	19.2	Clear, colorless, odorless
					Sampled @ 12:40 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/7/2021
Operator: James Carlson, Tanner Mihelic
Well number and location: 30S/11E-13N (LA8)
Site and wellhead conditions: Sunny and breezy. Site secure. Well turned on at 12:00PM

Static water depth (feet): 135.0
Well depth (feet): 350
Water column (feet): 215.0
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: 12:00 PM

Time	Gallons (from spigot)	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:07	1400	447	7.94	18.6	Clear, colorless, odorless
12:09	1800	443.6	7.96	18.6	Clear, colorless, odorless
12:11	2200	443.7	7.90	18.5	Clear, colorless, odorless
12:13	2600	443.6	7.84	18.5	Clear, colorless, odorless
					Sampled @ 12:14 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/6/2021
Operator: James Carlson, Tanner Mihelic
Well number and location: 30S/10E-12J1 (LA11)
Site and wellhead conditions: Overcast, still. Site secure.

Static water depth (feet):	3.90
Well depth (feet):	389
Water column (feet):	385.1
Casing diameter (inches):	2
Minimum purge volume (gal)	189
Purge rate (gpm):	1.2
Pumping water level (feet):	3.99
Pump setting (feet):	25
Minimum purge time (min):	167
Time begin purge:	9:24 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
9:24	1	1,157	8.22	16.2	Clear, colorless, odorless
9:28	5	1,171	7.76	18	Clear, colorless, odorless
9:32	10	1,174	7.66	18.1	Clear, colorless, odorless
9:41	20	1,174	7.67	18.7	Clear, colorless, odorless
10:01	45	1,242	7.58	19.7	Clear, colorless, odorless
10:09	55	1,401	7.55	20.1	Slightly cloudy, colorless, odorless
10:25	75	1,482	7.59	20.4	Clear, colorless, odorless
10:43	100	1,480	7.60	20.6	Clear, colorless, odorless
10:59	120	1,466	7.55	20.8	Clear, colorless, odorless
11:12	145	1,462	7.75	20.6	Clear, colorless, odorless
11:45	170	1,453	7.68	20.7	Clear, colorless, odorless
11:56	185	1,440	7.29	20.5	Clear, colorless, odorless
12:00	190	1,437	7.39	20.4	Clear, colorless, odorless
12:03	195	1433	7.36	20.5	Clear, colorless, odorless
12:07	200	1437	7.30	20.5	Clear, colorless, odorless
					Sampled @ 12:10 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/6/2021
Operator: James Carlson, Tanner Mihelic
Well number and location: 30S/11E-7Q3 (LA12)
Site and wellhead conditions: Sunny and breezy. Well has been running since 1:10 PM

Static water depth (feet): 29.8
Well depth (feet): 270
Water column (feet): 240
Casing diameter (inches): 10
Minimum purge volume (gal) flush line
Purge rate (gpm): 302
Pumping water level (feet): --
Pump setting (feet): --
Minimum purge time (min): flush line
Time begin purge: 1:30 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
13:30	6040	806.8	7.50	21.0	Clear, colorless, faint odor
13:32	6644	806.3	7.47	21.0	Clear, colorless, odorless
13:34	7248	806.6	7.47	21.0	Clear, colorless, odorless
					Sampled @ 1:34 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/6/2021
Operator: James Carlson, Tanner Mihelic
Well number and location: 30S/11E-18L2 (LA15)
Site and wellhead conditions: Sunny and breezy. Well has been pumping since 8:30 AM.

Static water depth (feet): 90.3
Well depth (feet): 394
Water column (feet): 304
Casing diameter (inches): 12
Minimum purge volume (gal) flush line
Purge rate (gpm): --
Pumping water level (feet): --
Pump setting (feet): --
Minimum purge time (min): flush line
Time begin purge: 12:49 PM

Time	Gallons (from spigot)	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:49	flush line	788.4	7.40	20.8	Clear, colorless, odorless
12:51	flush line	788.8	7.36	20.8	Clear, colorless, odorless
12:53	flush line	789.7	7.32	20.8	Clear, colorless, odorless
12:55	flush line	790.8	7.27	20.8	Clear, colorless, odorless
12:57	flush line	789.7	7.27	20.8	Clear, colorless, odorless
					Sampled @12:60

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/19/2021
Operator: James Carlson, Tanner Mihelic
Well number and location: 30S/11E-18K8 (LA18)
Site and wellhead conditions: Sunny, clear. Site secure

Static water depth (feet):	135.01
Well depth (feet):	650
Water column (feet):	515
Casing diameter (inches):	2
Minimum purge volume (gal)	255
Purge rate (gpm):	1.2
Pumping water level (feet):	119.09
Pump setting (feet):	160
Minimum purge time (min):	208
Time begin purge:	8:57 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
8:57	1	484.0	8.37	20.5	Clear, colorless, odorless
9:04	5	460.6	8.27	21	Clear, colorless, odorless
9:09	10	465.0	8.10	20.9	Clear, colorless, odorless
9:17	20	458.7	8.01	20.9	Clear, colorless, odorless
9:26	30	506.9	7.69	21	Clear, colorless, odorless
9:40	50	596.5	7.81	21.5	Clear, colorless, odorless
10:03	80	603.3	7.79	22.6	Clear, colorless, odorless
10:33	120	605.8	8.05	22.8	Clear, colorless, odorless
11:15	170	599.8	8.04	23.3	Clear, colorless, odorless
11:58	220	595.9	8.30	22.8	Clear, colorless, odorless
12:14	240	604.7	7.50	23	Clear, colorless, odorless
12:21	250	604.9	7.44	22.6	Clear, colorless, odorless
12:25	255	604.5	7.40	23.2	Clear, colorless, odorless
					Sampled @ 12:27 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/19/2021
Operator: James Carlson, Tanner Mihelic
Well number and location: 30S/11E-17E8 (LA22)
Site and wellhead conditions: Sunny, clear. Site secure.

Static water depth (feet):	149.3
Well depth (feet):	380
Water column (feet):	230.7
Casing diameter (inches):	2
Minimum purge volume (gal)	115
Purge rate (gpm):	~1.6
Pumping water level (feet):	150.0
Pump setting (feet):	160
Minimum purge time (min):	73
Time begin purge:	12:52 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
13:12	1	527.5	8.09	20.3	Slightly cloudy, odorless
13:15	5	527.6	7.80	20.3	Slightly cloudy, odorless
13:22	10	519	7.94	20.2	Clear, colorless, odorless
13:25	15	502	7.79	20.6	Clear, colorless, odorless
13:31	25	483.7	7.72	20.8	Clear, colorless, odorless
13:38	35	480.1	7.57	21	Clear, colorless, odorless
13:48	50	481.7	7.73	21.2	Clear, colorless, odorless
13:51	55	472.8	7.47	21	Clear, colorless, odorless
14:03	75	477.5	7.61	21	Clear, colorless, odorless
14:14	95	479	7.52	21	Clear, colorless, odorless
14:17	100	477.4	7.62	20.7	Clear, colorless, odorless
14:20	105	474.5	7.45	21.1	Clear, colorless, odorless
14:22	110	476.2	7.44	20.7	Clear, colorless, odorless
14:25	115	476.6	7.43	21.1	
					Sampled @ 2:25 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/7/2021
Operator: James Carlson, Tanner Mihelic
Well number and location: 30S/11E-20H1 (LA30)
Site and wellhead conditions: Sunny, breezy. Site secure.

Static water depth (feet): 34.64
Well depth (feet): 140
Water column (feet): 105.36
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: 11:17 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
11:17	1	845.5	7.89	17.8	Clear, colorless, odorless
11:18	10	847.5	7.71	17.5	Clear, colorless, odorless
11:20	15	844.8	7.60	17.5	Clear, colorless, odorless
11:21	20	845.4	7.54	17.8	Clear, colorless, odorless
11:23	30	845.7	7.54	18	Clear, colorless, odorless
11:25	40	846.7	7.54	18	Clear, colorless, odorless
11:26	45	850.1	7.44	17.9	Clear, colorless, odorless
11:27	55	847.9	7.44	17.9	Clear, colorless, odorless
					Sampled @ 11:28 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/3/2019
Operator: Andrea Berge
Well number and location: 30S/10E-13M2 (LA31)
Site and wellhead conditions: Sunny breezy. Gate locked, site secure.

Static water depth (feet): 36.04
Well depth (feet): --
Water column (feet): --
Casing diameter (inches): 8
Minimum purge volume (gal) flush line
Purge rate (gpm): --
Pumping water level (feet): --
Pump setting (feet): --
Minimum purge time (min): flush line
Time begin purge: 12:18 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
12:19	1	2,880	7.85	18.6	Clear, colorless, odorless
12:25	10	2,940	7.75	18	Clear, colorless, odorless
12:26	15	2,960	7.63	17.8	Clear, colorless, odorless
12:27	20	2,930	7.61	18.1	Clear, colorless, odorless
					Sampled @ 12:28 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/6/2021
Operator: James Carlson, Tanner Mihelic
Well number and location: 30S/11E-18K9 (LA32)
Site and wellhead conditions: Sunny, breezy. Site secure.

Static water depth (feet): 148.3
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: 1:15 PM

Time	Gallons (from spigot)	EC (µS/cm)	pH	Temp. (°C)	Comments*
13:15		472.7	7.80	20.6	Clear, colorless, odorless
13:17		422.2	7.70	20.4	Clear, colorless, odorless
13:19		459.4	7.79	20.2	Clear, colorless, odorless
13:21		254.6	7.75	20.0	Clear, colorless, odorless
13:23		260.5	7.73	20.0	Clear, colorless, odorless
					Sampled @ 1:25 PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/12/2021-10/13/2021
Operator: James Carlson
Well number and location: Lupine Zone E (LA40)
Site and wellhead conditions: Sunny with breeze; Site secure
Static water depth (feet): 9.37
Well depth (feet): 410
Water column (feet): 400.63
Casing diameter (inches): 2.26
Minimum purge volume (gal) 250
Purge rate (gpm): 1
Pumping water level (feet): 89.90
Pump setting (feet): 150
Minimum purge time (min): 250
Time begin purge: 10:20 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
10:20	1	5,490	7.49	18.7	Clear, colorless, odorless
10:26	10	5,530	7.31	18.8	Clear, colorless, odorless
10:43	30	5,610	7.34	19.9	Clear, colorless, odorless
11:06	50	5,140	7.33	20.8	Clear, colorless, odorless
11:29	70	5,260	7.56	21.8	Clear, colorless, odorless
11:54	90	6,050	7.44	22.2	Clear, colorless, odorless
12:18	110	6,400	7.30	22.2	Clear, colorless, odorless
12:42	130	6,100	7.56	22.5	Clear, colorless, odorless
13:05	150	6,450	7.41	22.1	Clear, colorless, odorless
13:23	170	6,430	7.43	22.3	Clear, colorless, odorless
14:11	190	6,380	7.50	21.7	Clear, colorless, odorless
14:37	210	6,330	7.3	21.8	Clear, colorless, odorless
15:08	230	6,250	7.48	22	Clear, colorless, odorless
15:15	235	6,230	7.2	21.8	Clear, colorless, odorless
15:23	240	6,230	7.4	21.8	Clear, colorless, odorless
Purge stopped at 15:23 10/12/2022 and continued at 9:32 10/13/2022					
9:42	250	6,240	7.30	19	Clear, colorless, odorless
9:53	260	6,310	7.39	19.3	Clear, colorless, odorless
					Sampled @ 9:56 AM on 10/13/2021

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/11/2021
Operator: James Carlson
Well number and location: Lupine Zone D (LA41)
Site and wellhead conditions: Sunny, clear. Site secure.
Static water depth (feet): 7.61
Well depth (feet): 350.00
Water column (feet): 342.39
Casing diameter (inches): 2.26
Minimum purge volume (gal) 215
Purge rate (gpm): ~0.9
Pumping water level (feet): 133.30
Pump setting (feet): 150
Minimum purge time (min): 239
Time begin purge: 11:08

Time	Gallons	EC (μS/cm)	pH	Temp. (°C)	Comments*
11:08	1	769	7.75	20.5	Clear, colorless, odorless
11:12	5	779	7.43	19.6	Clear, colorless, odorless
11:16	10	778	7.22	19.1	Clear, colorless, odorless
11:26	20	783	7.45	19.8	Clear, colorless, odorless
11:36	30	781.5	7.29	20.7	Clear, colorless, odorless
11:47	40	783.5	7.43	20.6	Clear, colorless, odorless
11:59	50	783.9	7.32	21.2	Clear, colorless, odorless
12:10	60	784	7.60	21.4	Clear, colorless, odorless
12:21	70	785.1	7.43	21.7	Clear, colorless, odorless
12:31	80	783.5	7.49	21.8	Slightly cloudy, clear, odorless
12:42	90	780	7.32	21.9	Slightly cloudy, clear, odorless
12:53	100	779.1	7.56	22	Slightly cloudy, clear, odorless
1:04	110	775.6	7.38	21.8	Clear, colorless, odorless
1:15	120	775.2	7.46	22	Clear, colorless, odorless
1:25	130	770.8	7.40	22	Clear, colorless, odorless
1:36	140	768.7	7.35	22	Clear, colorless, odorless
1:47	150	768.6	7.42	22.2	Clear, colorless, odorless
1:58	160	770.4	7.28	21.8	Clear, colorless, odorless
2:09	170	769.7	7.24	21.8	Clear, colorless, odorless
					Sampled @ 2:15

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

November 12, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 1302(FW5)
Project : Los Osos BMC Monitoring

FW 5

Lab ID : CC 2183885-001
Customer ID : 8-514

Sampled On : October 26, 2021-10:12
Sampled By : Andrea Berge
Received On : October 26, 2021-15:03
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	277	2.5	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Calcium	50	1	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Magnesium	37	1	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Potassium	2	1	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Sodium	82	1	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Total Cations	9.2	---	meq/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Boron	0.2	0.1	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Copper	ND	10	ug/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Iron	200	30	ug/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Manganese	ND	10	ug/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Zinc	ND	20	ug/L		200.7	10/27/21:212506	200.7	10/27/21:216840
SAR	2.1	0.1	--		200.7	10/27/21:212506	200.7	10/27/21:216840
Total Alkalinity (as CaCO3)	70	10	mg/L		2320B	11/06/21:212943	2320B	11/07/21:217373
Hydroxide as OH	ND	10	mg/L		2320B	11/06/21:212943	2320B	11/07/21:217373
Carbonate as CO3	ND	10	mg/L		2320B	11/06/21:212943	2320B	11/07/21:217373
Bicarbonate as HCO3	80	10	mg/L		2320B	11/06/21:212943	2320B	11/07/21:217373
Sulfate	43.4	0.5	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Chloride	152	3*	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Nitrate as NO3	125	1.2*	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Nitrite as N	ND	0.2	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Nitrate + Nitrite as N	31.4	0.2	mg/L		4500NO3F	10/28/21:212557	4500NO3F	10/28/21:216859
Fluoride	ND	0.1	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Total Anions	8.5	---	meq/L		2320B	11/06/21:212943	2320B	11/07/21:217373
pH (Field)	6.02	---	units		4500-H B	10/26/21:212628	4500HB	10/26/21:216949
Specific Conductance	1030	1	umhos/cm		2510B	11/09/21:213033	2510B	11/09/21:217460
Total Dissolved Solids	750	20	mg/L		2540CE	10/28/21:212539	2540C	10/29/21:216880
MBAS Screen	Negative	0.1	mg/L		5540C	10/27/21:212828	5540C	10/27/21:217202
Aggressiveness Index	10	1	--		4500-H B	10/26/21:212628	4500HB	10/26/21:216949
Langelier Index (20°C)	-1.9	1	--		4500-H B	10/26/21:212628	4500HB	10/26/21:216949
Nitrate Nitrogen	28.3	0.3*	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918

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

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November 12, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 24A(FW6)
Project : Los Osos BMC Monitoring

FW 6

Lab ID : CC 2183885-003
Customer ID : 8-514

Sampled On : October 26, 2021-12:15
Sampled By : Andrea Berge
Received On : October 26, 2021-15:03
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	191	2.5	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Calcium	32	1	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Magnesium	27	1	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Potassium	2	1	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Sodium	117	1	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Total Cations	9.0	---	meq/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Boron	0.2	0.1	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Copper	ND	10	ug/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Iron	50	30	ug/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Manganese	ND	10	ug/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Zinc	ND	20	ug/L		200.7	10/27/21:212506	200.7	10/27/21:216840
SAR	3.7	0.1	--		200.7	10/27/21:212506	200.7	10/27/21:216840
Total Alkalinity (as CaCO3)	150	10	mg/L		2320B	11/06/21:212943	2320B	11/07/21:217373
Hydroxide as OH	ND	10	mg/L		2320B	11/06/21:212943	2320B	11/07/21:217373
Carbonate as CO3	ND	10	mg/L		2320B	11/06/21:212943	2320B	11/07/21:217373
Bicarbonate as HCO3	190	10	mg/L		2320B	11/06/21:212943	2320B	11/07/21:217373
Sulfate	51.3	0.5	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Chloride	158	3*	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Nitrate as NO3	11.6	0.4	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Nitrite as N	ND	0.2	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Nitrate + Nitrite as N	2.6	0.1	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Fluoride	ND	0.1	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Total Anions	8.8	---	meq/L		2320B	11/06/21:212943	2320B	11/07/21:217373
pH (Field)	6.34	---	units		4500-H B	10/26/21:212628	4500HB	10/26/21:216949
Specific Conductance	993	1	umhos/cm		2510B	11/01/21:212626	2510B	11/01/21:216948
Total Dissolved Solids	580	20	mg/L		2540CE	10/28/21:212539	2540C	10/29/21:216880
MBAS Screen	Negative	0.1	mg/L		5540C	10/27/21:212828	5540C	10/27/21:217202
Aggressiveness Index	10.4	1	--		4500-H B	10/26/21:212628	4500HB	10/26/21:216949
Langelier Index (20°C)	-1.5	1	--		4500-H B	10/26/21:212628	4500HB	10/26/21:216949
Nitrate Nitrogen	2.6	0.1	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918

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

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November 12, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 20A2(FW26) FW 26
Project : Los Osos BMC Monitoring

Lab ID : CC 2183885-002
Customer ID : 8-514

Sampled On : October 26, 2021-13:53
Sampled By : Andrea Berge
Received On : October 26, 2021-15:03
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	246	2.5	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Calcium	36	1	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Magnesium	38	1	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Potassium	1	1	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Sodium	39	1	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Total Cations	6.6	---	meq/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Boron	ND	0.1	mg/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Copper	30	10	ug/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Iron	7060	30	ug/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Manganese	540	10	ug/L		200.7	10/27/21:212506	200.7	10/27/21:216840
Zinc	420	20	ug/L		200.7	10/27/21:212506	200.7	10/27/21:216840
SAR	1.1	0.1	--		200.7	10/27/21:212506	200.7	10/27/21:216840
Total Alkalinity (as CaCO3)	190	10	mg/L		2320B	11/06/21:212943	2320B	11/07/21:217373
Hydroxide as OH	ND	10	mg/L		2320B	11/06/21:212943	2320B	11/07/21:217373
Carbonate as CO3	ND	10	mg/L		2320B	11/06/21:212943	2320B	11/07/21:217373
Bicarbonate as HCO3	230	10	mg/L		2320B	11/06/21:212943	2320B	11/07/21:217373
Sulfate	28.1	0.5	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Chloride	76	1	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Nitrate as NO3	ND	0.4	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Nitrite as N	ND	0.2	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Fluoride	ND	0.1	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918
Total Anions	6.5	---	meq/L		2320B	11/06/21:212943	2320B	11/07/21:217373
pH (Field)	6.74	---	units		4500-H B	10/26/21:212628	4500HB	10/26/21:216949
Specific Conductance	677	1	umhos/cm		2510B	11/09/21:213033	2510B	11/09/21:217460
Total Dissolved Solids	390	20	mg/L		2540CE	10/28/21:212539	2540C	10/29/21:216880
MBAS Screen	Negative	0.1	mg/L		5540C	10/27/21:212828	5540C	10/27/21:217202
Aggressiveness Index	11.0	1	--		4500-H B	10/26/21:212628	4500HB	10/26/21:216949
Langelier Index (20°C)	-0.9	1	--		4500-H B	10/26/21:212628	4500HB	10/26/21:216949
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/27/21:212513	300.0	10/27/21:216918

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

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CA ELAP Certification No. 2810

November 23, 2021

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

FW 28

Lab ID : CC 2183893-001
Customer ID : 8-514

Sampled On : October 27, 2021-11:25
Sampled By : Andrea Berge
Received On : October 27, 2021-12:14
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	412	2.5	mg/L		200.7	10/28/21:212554	200.7	10/29/21:216879
Calcium	71	1	mg/L		200.7	10/28/21:212554	200.7	10/29/21:216879
Magnesium	57	1	mg/L		200.7	10/28/21:212554	200.7	10/29/21:216879
Potassium	1	1	mg/L		200.7	10/28/21:212554	200.7	10/29/21:216879
Sodium	40	1	mg/L		200.7	10/28/21:212554	200.7	10/29/21:216879
Total Cations	10	---	meq/L		200.7	10/28/21:212554	200.7	10/29/21:216879
Boron	0.1	0.1	mg/L		200.7	10/28/21:212554	200.7	10/29/21:216879
Copper	ND	10	ug/L		200.7	10/28/21:212554	200.7	10/29/21:216879
Iron	190	30	ug/L		200.7	10/28/21:212554	200.7	10/29/21:216879
Manganese	200	10	ug/L		200.7	10/28/21:212554	200.7	10/29/21:216879
Zinc	ND	20	ug/L		200.7	10/28/21:212554	200.7	10/29/21:216879
SAR	0.9	0.1	--		200.7	10/28/21:212554	200.7	10/29/21:216879
Total Alkalinity (as CaCO3)	360	10	mg/L		2320B	11/07/21:212971	2320B	11/08/21:217399
Hydroxide as OH	ND	10	mg/L		2320B	11/07/21:212971	2320B	11/08/21:217399
Carbonate as CO3	ND	10	mg/L		2320B	11/07/21:212971	2320B	11/08/21:217399
Bicarbonate as HCO3	440	10	mg/L		2320B	11/07/21:212971	2320B	11/08/21:217399
Sulfate	72.8	0.5	mg/L		300.0	11/22/21:213639	300.0	11/23/21:218308
Chloride	60	1	mg/L		300.0	10/28/21:212601	300.0	10/28/21:216926
Nitrate as NO3	ND	0.4	mg/L		300.0	10/28/21:212601	300.0	10/28/21:216926
Nitrite as N	ND	0.2	mg/L		300.0	10/28/21:212601	300.0	10/28/21:216926
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/28/21:212601	300.0	10/28/21:216926
Fluoride	0.3	0.1	mg/L		300.0	10/28/21:212601	300.0	10/28/21:216926
Total Anions	10.4	---	meq/L		2320B	11/07/21:212971	2320B	11/08/21:217399
pH (Field)	7.18	---	units		4500-H B	10/27/21:212628	4500HB	10/27/21:216949
Specific Conductance	1000	1	umhos/cm		2510B	11/01/21:212626	2510B	11/01/21:216948
Total Dissolved Solids	550	20	mg/L		2540CE	10/29/21:212564	2540C	11/01/21:216967
MBAS Screen	Negative	0.1	mg/L		5540C	10/28/21:212829	5540C	10/28/21:217203
Aggressiveness Index	12.0	1	--		4500-H B	10/27/21:212628	4500HB	10/27/21:216949
Langelier Index (20°C)	0.1	1	--		4500-H B	10/27/21:212628	4500HB	10/27/21:216949
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/28/21:212601	300.0	10/28/21:216926

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

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October 28, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 13F4 (UA3--Skyline) UA 3
Project : Los Osos BMC Monitoring

Lab ID : CC 2183663-004
Customer ID : 8-514

Sampled On : October 7, 2021-10:40
Sampled By : Seth Stocking
Received On : October 8, 2021-17:00
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	109	2.5	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Calcium	19	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Magnesium	15	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Potassium	2	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Sodium	46	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Total Cations	4.2	---	meq/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Boron	ND	0.1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Copper	ND	10	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Iron	ND	30	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Manganese	ND	10	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Zinc	ND	20	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
SAR	1.9	0.1	--		200.7	10/11/21:211733	200.7	10/11/21:215874
Total Alkalinity (as CaCO3)	60	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Hydroxide as OH	ND	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Carbonate as CO3	ND	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Bicarbonate as HCO3	70	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Sulfate	22.8	0.5	mg/L		300.0	10/08/21:211743	300.0	10/09/21:215849
Chloride	68	1	mg/L		300.0	10/08/21:211743	300.0	10/09/21:215849
Nitrate as NO3	77.6	0.4	mg/L		300.0	10/08/21:211743	300.0	10/09/21:215849
Nitrite as N	ND	0.2	mg/L		300.0	10/08/21:211743	300.0	10/09/21:215849
Nitrate + Nitrite as N	17.5	0.1	mg/L		300.0	10/08/21:211743	300.0	10/09/21:215849
Fluoride	ND	0.1	mg/L		300.0	10/08/21:211743	300.0	10/09/21:215849
Total Anions	4.8	---	meq/L		2320B	10/20/21:212153	2320B	10/20/21:216434
pH (Field)	7.4	---	units		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Specific Conductance	533	1	umhos/cm		2510B	10/20/21:212184	2510B	10/20/21:216352
Total Dissolved Solids	320	20	mg/L		2540CE	10/12/21:211803	2540C	10/13/21:215942
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/21:212169	5540C	10/08/21:216335
Aggressiveness Index	10.9	1	--		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Langelier Index (20°C)	-1.0	1	--		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Nitrate Nitrogen	17.5	0.1	mg/L		300.0	10/08/21:211743	300.0	10/09/21:215849

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

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October 28, 2021

Lab ID : CC 2183663-004
Customer ID : 8-514

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

Sampled On : October 7, 2021-10:40
Sampled By : Seth Stocking
Received On : October 8, 2021-17:00
Matrix : Ground Water

Description : 13F4 (UA3--Skyline) UA 3
Project : Los Osos BMC Monitoring

Sample Result - Support

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Field Test								
pH (Field)	7.4		units			10/07/21 10:40	4500HB	10/07/21 10:40
Temperature	65		°C			10/07/21 10:40	2550B	10/07/21 10:40
Conductivity	0.55		umhos/cm			10/07/21 10:40	2510B	10/07/21 10:40

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

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October 28, 2021

Lab ID : CC 2183663-002
Customer ID : 8-514

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

Sampled On : October 7, 2021-09:30
Sampled By : Seth Stocking
Received On : October 8, 2021-17:00
Matrix : Ground Water

Description : 18K3(UA9-Los Olivos #3) UA 9
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	93.4	2.5	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Calcium	16	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Magnesium	13	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Potassium	1	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Sodium	29	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Total Cations	3.2	---	meq/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Boron	ND	0.1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Copper	ND	10	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Iron	ND	30	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Manganese	ND	10	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Zinc	ND	20	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
SAR	1.3	0.1	--		200.7	10/11/21:211733	200.7	10/11/21:215874
Total Alkalinity (as CaCO3)	50	10	mg/L		2320B	10/20/21:212153	2320B	10/21/21:216434
Hydroxide as OH	ND	10	mg/L		2320B	10/20/21:212153	2320B	10/21/21:216434
Carbonate as CO3	ND	10	mg/L		2320B	10/20/21:212153	2320B	10/21/21:216434
Bicarbonate as HCO3	60	10	mg/L		2320B	10/20/21:212153	2320B	10/21/21:216434
Sulfate	8.5	0.5	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Chloride	44	1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrate as NO3	42.3	0.4	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrite as N	ND	0.2	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrate + Nitrite as N	9.6	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Fluoride	ND	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Total Anions	3.1	---	meq/L		2320B	10/20/21:212153	2320B	10/21/21:216434
pH (Field)	7.6	---	units		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Specific Conductance	347	1	umhos/cm		2510B	10/20/21:212184	2510B	10/20/21:216352
Total Dissolved Solids	210	20	mg/L		2540CE	10/12/21:211803	2540C	10/13/21:215942
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/21:212169	5540C	10/08/21:216335
Aggressiveness Index	10.9	1	--		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Langelier Index (20°C)	-0.9	1	--		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Nitrate Nitrogen	9.6	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852

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

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October 28, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 18K3(UA9-Los Olivos #3) UA 9
Project : Los Osos BMC Monitoring

Lab ID : CC 2183663-002
Customer ID : 8-514

Sampled On : October 7, 2021-09:30
Sampled By : Seth Stocking
Received On : October 8, 2021-17:00
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)	7.6		units			10/07/21 09:30	4500HB	10/07/21 09:30
Temperature	65		°C			10/07/21 09:30	2550B	10/07/21 09:30
Conductivity	0.37		umhos/cm			10/07/21 09:30	2510B	10/07/21 09:30

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

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November 12, 2021

Lab ID : CC 2183607-001
Customer ID : 8-514

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

Sampled On : October 6, 2021-12:40
Sampled By : James C
Received On : October 6, 2021-14:35
Matrix : Ground Water

Description : 17E10 (UA13) UA 13
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	141	2.5	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Calcium	22	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Magnesium	21	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Potassium	1	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Sodium	37	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Total Cations	4.5	---	meq/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Boron	ND	0.1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Copper	30	10	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Iron	ND	30	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Manganese	ND	10	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Zinc	50	20	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215761
SAR	1.4	0.1	--		200.7	10/08/21:211698	200.7	10/08/21:215748
Total Alkalinity (as CaCO3)	80	10	mg/L		2320B	10/18/21:212102	2320B	10/18/21:216254
Hydroxide as OH	ND	10	mg/L		2320B	10/18/21:212102	2320B	10/18/21:216254
Carbonate as CO3	ND	10	mg/L		2320B	10/18/21:212102	2320B	10/18/21:216254
Bicarbonate as HCO3	100	10	mg/L		2320B	10/18/21:212102	2320B	10/18/21:216254
Sulfate	5.4	0.5	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Chloride	30	1	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Nitrate as NO3	17.2	0.4	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Nitrite as N	ND	0.2	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Nitrate + Nitrite as N	3.9	0.1	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Fluoride	ND	0.1	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Total Anions	2.9	---	meq/L		2320B	10/18/21:212102	2320B	10/18/21:216254
pH (Field)	7.54	---	units		4500-H B	10/06/21:211692	4500HB	10/06/21:215770
Specific Conductance	523	1	umhos/cm		2510B	10/19/21:212117	2510B	10/19/21:216255
Total Dissolved Solids	310	20	mg/L		2540CE	10/11/21:211730	2540C	10/12/21:215881
MBAS Screen	Negative	0.1	mg/L		5540C	10/07/21:212168	5540C	10/07/21:216332
Aggressiveness Index	11.2	1	--		4500-H B	10/06/21:211692	4500HB	10/06/21:215770
Langelier Index (20°C)	-0.7	1	--		4500-H B	10/06/21:211692	4500HB	10/06/21:215770
Nitrate Nitrogen	3.9	0.1	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724

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

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October 28, 2021

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 2183662-002
Customer ID : 8-514

Sampled On : October 7, 2021-12:14
Sampled By : James C
Received On : October 8, 2021-17:00
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	108	2.5	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Calcium	17	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Magnesium	16	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Potassium	2	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Sodium	41	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Total Cations	4.0	---	meq/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Boron	ND	0.1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Copper	20	10	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Iron	ND	30	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Manganese	ND	10	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Zinc	ND	20	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
SAR	1.7	0.1	--		200.7	10/11/21:211733	200.7	10/11/21:215874
Total Alkalinity (as CaCO3)	50	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Hydroxide as OH	ND	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Carbonate as CO3	ND	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Bicarbonate as HCO3	60	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Sulfate	13.3	0.5	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Chloride	77	1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrate as NO3	33.2	0.4	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrite as N	ND	0.2	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrate + Nitrite as N	7.5	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Fluoride	ND	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Total Anions	4.0	---	meq/L		2320B	10/20/21:212153	2320B	10/20/21:216434
pH (Field)	7.84	---	units		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Specific Conductance	443	1	umhos/cm		2510B	10/20/21:212184	2510B	10/20/21:216352
Total Dissolved Solids	290	20	mg/L		2540CE	10/12/21:211803	2540C	10/13/21:215942
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/21:212169	5540C	10/08/21:216335
Aggressiveness Index	11.2	1	--		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Langelier Index (20°C)	-0.7	1	--		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Nitrate Nitrogen	7.5	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852

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

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CA ELAP Certification No. 2810

October 28, 2021

Lab ID : CC 2183663-006
Customer ID : 8-514

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

Sampled On : October 7, 2021-11:45
Sampled By : Seth Stocking
Received On : October 8, 2021-17:00
Matrix : Ground Water

Description : 24C1 (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	112	2.5	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Calcium	17	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Magnesium	17	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Potassium	2	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Sodium	44	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Total Cations	4.2	---	meq/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Boron	ND	0.1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Copper	ND	10	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Iron	ND	30	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Manganese	ND	10	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Zinc	ND	20	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
SAR	1.8	0.1	--		200.7	10/11/21:211733	200.7	10/11/21:215874
Total Alkalinity (as CaCO3)	50	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Hydroxide as OH	ND	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Carbonate as CO3	ND	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Bicarbonate as HCO3	60	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Sulfate	16.0	0.5	mg/L		300.0	10/08/21:211743	300.0	10/09/21:215849
Chloride	86	1	mg/L		300.0	10/08/21:211743	300.0	10/09/21:215849
Nitrate as NO3	28.4	0.4	mg/L		300.0	10/08/21:211743	300.0	10/09/21:215849
Nitrite as N	ND	0.2	mg/L		300.0	10/08/21:211743	300.0	10/09/21:215849
Nitrate + Nitrite as N	6.4	0.1	mg/L		300.0	10/08/21:211743	300.0	10/09/21:215849
Fluoride	ND	0.1	mg/L		300.0	10/08/21:211743	300.0	10/09/21:215849
Total Anions	4.2	---	meq/L		2320B	10/20/21:212153	2320B	10/20/21:216434
pH (Field)	7.7	---	units		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Specific Conductance	490	1	umhos/cm		2510B	10/20/21:212184	2510B	10/20/21:216352
Total Dissolved Solids	280	20	mg/L		2540CE	10/12/21:211803	2540C	10/13/21:215942
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/21:212169	5540C	10/08/21:216335
Aggressiveness Index	11.0	1	--		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Langelier Index (20°C)	-0.8	1	--		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Nitrate Nitrogen	6.4	0.1	mg/L		300.0	10/08/21:211743	300.0	10/09/21:215849

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

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October 28, 2021

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 2183663-006
Customer ID : 8-514

Sampled On : October 7, 2021-11:45
Sampled By : Seth Stocking
Received On : October 8, 2021-17:00
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)	7.7		units			10/07/21 11:45	4500HB	10/07/21 11:45
Temperature	67		°C			10/07/21 11:45	2550B	10/07/21 11:45
Conductivity	0.51		umhos/cm			10/07/21 11:45	2510B	10/07/21 11:45

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

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October 28, 2021

Lab ID : CC 2183663-005
Customer ID : 8-514

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 13J4(LA10-Rosina) LA 10
Project : Los Osos BMC Monitoring

Sampled On : October 7, 2021-10:50
Sampled By : Seth Stocking
Received On : October 8, 2021-17:00
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	413	2.5	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Calcium	65	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Magnesium	61	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Potassium	2	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Sodium	37	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Total Cations	9.9	---	meq/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Boron	ND	0.1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Copper	ND	10	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Iron	190	30	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Manganese	ND	10	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Zinc	ND	20	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
SAR	0.8	0.1	--		200.7	10/11/21:211733	200.7	10/11/21:215874
Total Alkalinity (as CaCO3)	70	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Hydroxide as OH	ND	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Carbonate as CO3	ND	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Bicarbonate as HCO3	80	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Sulfate	16.8	0.5	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Chloride	289	6*	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrate as NO3	9.4	0.4	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrite as N	ND	0.2	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrate + Nitrite as N	2.1	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Fluoride	ND	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Total Anions	10	---	meq/L		2320B	10/20/21:212153	2320B	10/20/21:216434
pH (Field)	7.2	---	units		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Specific Conductance	1180	1	umhos/cm		2510B	10/20/21:212184	2510B	10/20/21:216352
Total Dissolved Solids	790	20	mg/L		2540CE	10/12/21:211803	2540C	10/13/21:215942
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/21:212169	5540C	10/08/21:216335
Aggressiveness Index	11.3	1	--		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Langelier Index (20°C)	-0.6	1	--		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Nitrate Nitrogen	2.1	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852

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

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October 28, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 13J4(LA10-Rosina) LA 10
Project : Los Osos BMC Monitoring

Lab ID : CC 2183663-005
Customer ID : 8-514

Sampled On : October 7, 2021-10:50
Sampled By : Seth Stocking
Received On : October 8, 2021-17:00
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)	7.2		units			10/07/21 10:50	4500HB	10/07/21 10:50
Temperature	68		°C			10/07/21 10:50	2550B	10/07/21 10:50
Conductivity	1.19		umhos/cm			10/07/21 10:50	2510B	10/07/21 10:50

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

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ENVIRONMENTAL FGL AGRICULTURAL
Analytical Chemists

October 28, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 12JI(LaII) LA 11
Project : Los Osos BMC Monitoring

Lab ID : CC 2183606-001
Customer ID : 8-514

Sampled On : October 6, 2021-12:10
Sampled By : James C
Received On : October 6, 2021-14:35
Matrix : Ground Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	569	2.5	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Calcium	83	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Magnesium	88	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Potassium	5	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Sodium	82	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Total Cations	15.1	---	meq/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Boron	0.2	0.1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Copper	ND	10	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Iron	30	30	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Manganese	40	10	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Zinc	ND	20	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215761
SAR	1.5	0.1	--		200.7	10/08/21:211698	200.7	10/08/21:215748
Total Alkalinity (as CaCO3)	280	10	mg/L		2320B	10/17/21:211890	2320B	10/18/21:216225
Hydroxide as OH	ND	10	mg/L		2320B	10/17/21:211890	2320B	10/18/21:216225
Carbonate as CO3	ND	10	mg/L		2320B	10/17/21:211890	2320B	10/18/21:216225
Bicarbonate as HCO3	340	10	mg/L		2320B	10/17/21:211890	2320B	10/18/21:216225
Sulfate	176	3*	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Chloride	258	6*	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Nitrate as NO3	ND	0.4	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Nitrite as N	ND	0.2	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Fluoride	0.1	0.1	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Total Anions	16.5	---	meq/L		2320B	10/17/21:211890	2320B	10/18/21:216225
pH (Field)	7.3	---	units		4500-H B	10/06/21:211692	4500HB	10/06/21:215770
Specific Conductance	1710	1	umhos/cm		2510B	10/19/21:212117	2510B	10/19/21:216255
Total Dissolved Solids	1020	20	mg/L		2540CE	10/11/21:211730	2540C	10/12/21:215881
MBAS Screen	Negative	0.1	mg/L		5540C	10/07/21:212168	5540C	10/07/21:216332
Aggressiveness Index	12.1	1	--		4500-H B	10/06/21:211692	4500HB	10/06/21:215770
Langelier Index (20°C)	0.2	1	--		4500-H B	10/06/21:211692	4500HB	10/06/21:215770
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724

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

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November 12, 2021

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 2183607-004
Customer ID : 8-514

Sampled On : October 6, 2021-13:36
Sampled By : James C
Received On : October 6, 2021-14:35
Matrix : Ground Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	283	2.5	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Calcium	46	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Magnesium	41	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Potassium	2	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Sodium	51	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Total Cations	7.9	---	meq/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Boron	0.2	0.1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Copper	10	10	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Iron	40	30	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Manganese	50	10	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Zinc	40	20	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215761
SAR	1.3	0.1	--		200.7	10/08/21:211698	200.7	10/08/21:215748
Total Alkalinity (as CaCO3)	250	10	mg/L		2320B	10/18/21:212102	2320B	10/18/21:216254
Hydroxide as OH	ND	10	mg/L		2320B	10/18/21:212102	2320B	10/18/21:216254
Carbonate as CO3	ND	10	mg/L		2320B	10/18/21:212102	2320B	10/18/21:216254
Bicarbonate as HCO3	300	10	mg/L		2320B	10/18/21:212102	2320B	10/18/21:216254
Sulfate	55.0	0.5	mg/L		300.0	11/02/21:212706	300.0	11/02/21:217182
Chloride	95	1	mg/L		300.0	11/02/21:212706	300.0	11/02/21:217182
Nitrate as NO3	ND	0.4	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Nitrite as N	ND	0.2	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Fluoride	ND	0.1	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Total Anions	8.7	---	meq/L		2320B	10/18/21:212102	2320B	10/18/21:216254
pH (Field)	7.47	---	units		4500-H B	10/06/21:211692	4500HB	10/06/21:215770
Specific Conductance	874	1	umhos/cm		2510B	10/19/21:212117	2510B	10/19/21:216255
Total Dissolved Solids	510	20	mg/L		2540CE	10/11/21:211730	2540C	10/12/21:215881
MBAS Screen	Negative	0.1	mg/L		5540C	10/07/21:212168	5540C	10/07/21:216332
Aggressiveness Index	11.9	1	--		4500-H B	10/06/21:211692	4500HB	10/06/21:215770
Langelier Index (20°C)	0.06	1	--		4500-H B	10/06/21:211692	4500HB	10/06/21:215770
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724

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

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November 12, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 1862 (LA15) LA 15
Project : Los Osos BMC Monitoring

Lab ID : CC 2183607-002
Customer ID : 8-514

Sampled On : October 6, 2021-12:59
Sampled By : James C
Received On : October 6, 2021-14:35
Matrix : Ground Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	295	2.5	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Calcium	49	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Magnesium	42	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Potassium	2	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Sodium	37	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Total Cations	7.6	---	meq/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Boron	ND	0.1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Copper	ND	10	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Iron	ND	30	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Manganese	ND	10	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Zinc	30	20	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215761
SAR	0.9	0.1	--		200.7	10/08/21:211698	200.7	10/08/21:215748
Total Alkalinity (as CaCO3)	210	10	mg/L		2320B	10/18/21:212102	2320B	10/18/21:216254
Hydroxide as OH	ND	10	mg/L		2320B	10/18/21:212102	2320B	10/18/21:216254
Carbonate as CO3	ND	10	mg/L		2320B	10/18/21:212102	2320B	10/18/21:216254
Bicarbonate as HCO3	250	10	mg/L		2320B	10/18/21:212102	2320B	10/18/21:216254
Sulfate	32.8	0.5	mg/L		300.0	11/02/21:212706	300.0	11/02/21:217182
Chloride	107	3*	mg/L		300.0	11/02/21:212706	300.0	11/03/21:217182
Nitrate as NO3	2.2	0.4	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Nitrite as N	ND	0.2	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Nitrate + Nitrite as N	0.5	0.1	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Fluoride	ND	0.1	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Total Anions	7.8	---	meq/L		2320B	10/18/21:212102	2320B	10/18/21:216254
pH (Field)	727	---	units		4500-H B	10/06/21:211692	4500HB	10/06/21:215770
Specific Conductance	856	1	umhos/cm		2510B	10/19/21:212117	2510B	10/19/21:216255
Total Dissolved Solids	490	20	mg/L		2540CE	10/11/21:211730	2540C	10/12/21:215881
MBAS Screen	Negative	0.1	mg/L		5540C	10/07/21:212168	5540C	10/07/21:216332
Aggressiveness Index	731	1	--		4500-H B	10/06/21:211692	4500HB	10/06/21:215770
Langelier Index (20°C)	720	1	--		4500-H B	10/06/21:211692	4500HB	10/06/21:215770
Nitrate Nitrogen	0.5	0.1	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724

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

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November 12, 2021

Lab ID : CC 2183781-001
Customer ID : 8-514

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

Sampled On : October 19, 2021-12:27
Sampled By : James C
Received On : October 19, 2021-15:15
Matrix : Ground Water

Description : 18K8 (LA18) LA 18
Project : Los Osos BMC Monitoring

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	287	2.5	mg/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Calcium	59	1	mg/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Magnesium	34	1	mg/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Potassium	2	1	mg/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Sodium	28	1	mg/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Total Cations	7.0	---	meq/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Boron	ND	0.1	mg/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Copper	ND	10	ug/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Iron	70	30	ug/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Manganese	80	10	ug/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Zinc	ND	20	ug/L		200.7	10/22/21:212304	200.7	10/22/21:216606
SAR	0.7	0.1	--		200.7	10/22/21:212304	200.7	10/22/21:216606
Total Alkalinity (as CaCO3)	240	10	mg/L		2320B	10/27/21:212505	2320B	10/28/21:216943
Hydroxide as OH	ND	10	mg/L		2320B	10/27/21:212505	2320B	10/28/21:216943
Carbonate as CO3	ND	10	mg/L		2320B	10/27/21:212505	2320B	10/28/21:216943
Bicarbonate as HCO3	300	10	mg/L		2320B	10/27/21:212505	2320B	10/28/21:216943
Sulfate	38.4	0.5	mg/L		300.0	10/20/21:212225	300.0	10/20/21:216523
Chloride	32	1	mg/L		300.0	10/20/21:212225	300.0	10/20/21:216523
Nitrate as NO3	ND	0.4	mg/L		300.0	10/20/21:212225	300.0	10/20/21:216523
Nitrite as N	ND	0.2	mg/L		300.0	10/20/21:212225	300.0	10/20/21:216523
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/20/21:212225	300.0	10/20/21:216523
Fluoride	0.2	0.1	mg/L		300.0	10/20/21:212225	300.0	10/20/21:216523
Total Anions	6.6	---	meq/L		2320B	10/27/21:212505	2320B	10/28/21:216943
pH (Field)	7.4	---	units		4500-H B	10/19/21:212399	4500HB	10/19/21:216625
Specific Conductance	657	1	umhos/cm		2510B	10/28/21:212519	2510B	10/28/21:216814
Total Dissolved Solids	400	20	mg/L		2540CE	10/21/21:212237	2540C	10/22/21:216502
MBAS Screen	Negative	0.1	mg/L		5540C	10/20/21:212222	5540C	10/20/21:216397
Aggressiveness Index	11.9	1	--		4500-H B	10/19/21:212399	4500HB	10/19/21:216625
Langelier Index (20°C)	0.09	1	--		4500-H B	10/19/21:212399	4500HB	10/19/21:216625
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/20/21:212225	300.0	10/20/21:216523

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

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October 28, 2021

Lab ID : CC 2183663-001
Customer ID : 8-514

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

Sampled On : October 7, 2021-09:00
Sampled By : Seth Stocking
Received On : October 8, 2021-17:00
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	245	2.5	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Calcium	37	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Magnesium	37	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Potassium	2	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Sodium	43	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Total Cations	6.8	---	meq/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Boron	0.1	0.1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Copper	ND	10	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Iron	ND	30	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Manganese	ND	10	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Zinc	ND	20	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
SAR	1.2	0.1	--		200.7	10/11/21:211733	200.7	10/11/21:215874
Total Alkalinity (as CaCO3)	240	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Hydroxide as OH	ND	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Carbonate as CO3	ND	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Bicarbonate as HCO3	290	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Sulfate	27.8	0.5	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Chloride	40	1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrate as NO3	2.9	0.4	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrite as N	ND	0.2	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrate + Nitrite as N	0.7	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Fluoride	0.1	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Total Anions	6.5	---	meq/L		2320B	10/20/21:212153	2320B	10/20/21:216434
pH (Field)	6.8	---	units		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Specific Conductance	633	1	umhos/cm		2510B	10/20/21:212184	2510B	10/20/21:216352
Total Dissolved Solids	340	20	mg/L		2540CE	10/12/21:211803	2540C	10/13/21:215942
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/21:212169	5540C	10/08/21:216335
Aggressiveness Index	11.1	1	--		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Langelier Index (20°C)	-0.7	1	--		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Nitrate Nitrogen	0.7	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852

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

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October 28, 2021

Lab ID : CC 2183663-001
Customer ID : 8-514

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

Sampled On : October 7, 2021-09:00
Sampled By : Seth Stocking
Received On : October 8, 2021-17:00
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								
pH (Field)	6.8		units			10/07/21 09:00	4500HB	10/07/21 09:00
Temperature	67		°C			10/07/21 09:00	2550B	10/07/21 09:00
Conductivity	0.67		umhos/cm			10/07/21 09:00	2510B	10/07/21 09:00

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

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November 12, 2021

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 2183781-002
Customer ID : 8-514

Sampled On : October 19, 2021-14:28
Sampled By : James C
Received On : October 19, 2021-15:15
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	181	2.5	mg/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Calcium	28	1	mg/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Magnesium	27	1	mg/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Potassium	1	1	mg/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Sodium	29	1	mg/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Total Cations	4.9	---	meq/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Boron	ND	0.1	mg/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Copper	ND	10	ug/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Iron	ND	30	ug/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Manganese	60	10	ug/L		200.7	10/22/21:212304	200.7	10/22/21:216606
Zinc	ND	20	ug/L		200.7	10/22/21:212304	200.7	10/22/21:216606
SAR	0.9	0.1	--		200.7	10/22/21:212304	200.7	10/22/21:216606
Total Alkalinity (as CaCO3)	140	10	mg/L		2320B	10/27/21:212505	2320B	10/28/21:216943
Hydroxide as OH	ND	10	mg/L		2320B	10/27/21:212505	2320B	10/28/21:216943
Carbonate as CO3	ND	10	mg/L		2320B	10/27/21:212505	2320B	10/28/21:216943
Bicarbonate as HCO3	170	10	mg/L		2320B	10/27/21:212505	2320B	10/28/21:216943
Sulfate	14.9	0.5	mg/L		300.0	10/20/21:212226	300.0	10/20/21:216525
Chloride	41	1	mg/L		300.0	10/20/21:212226	300.0	10/20/21:216525
Nitrate as NO3	25.8	0.4	mg/L		300.0	10/20/21:212226	300.0	10/20/21:216525
Nitrite as N	ND	0.2	mg/L		300.0	10/20/21:212226	300.0	10/20/21:216525
Nitrate + Nitrite as N	5.8	0.1	mg/L		300.0	10/20/21:212226	300.0	10/20/21:216525
Fluoride	ND	0.1	mg/L		300.0	10/20/21:212226	300.0	10/20/21:216525
Total Anions	4.7	---	meq/L		2320B	10/27/21:212505	2320B	10/28/21:216943
pH (Field)	7.43	---	units		4500-H B	10/19/21:212399	4500HB	10/19/21:216625
Specific Conductance	480	1	umhos/cm		2510B	10/22/21:212298	2510B	10/22/21:216495
Total Dissolved Solids	310	20	mg/L		2540CE	10/20/21:212190	2540C	10/21/21:216419
MBAS Screen	Negative	0.1	mg/L		5540C	10/20/21:212222	5540C	10/20/21:216397
Aggressiveness Index	11.4	1	--		4500-H B	10/19/21:212399	4500HB	10/19/21:216625
Langelier Index (20°C)	-0.4	1	--		4500-H B	10/19/21:212399	4500HB	10/19/21:216625
Nitrate Nitrogen	5.8	0.1	mg/L		300.0	10/20/21:212226	300.0	10/20/21:216525

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

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CA ELAP Certification No. 2810

October 28, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 20H1 (LA30) LA 30
Project : Los Osos BMC Monitoring

Lab ID : CC 2183662-001
Customer ID : 8-514

Sampled On : October 7, 2021-11:28
Sampled By : James C
Received On : October 8, 2021-17:00
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	407	2.5	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Calcium	66	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Magnesium	59	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Potassium	1	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Sodium	38	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Total Cations	9.8	---	meq/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Boron	0.1	0.1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Copper	ND	10	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Iron	800	30	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Manganese	230	10	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Zinc	ND	20	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
SAR	0.8	0.1	--		200.7	10/11/21:211733	200.7	10/11/21:215874
Total Alkalinity (as CaCO3)	330	10	mg/L		2320B	10/20/21:212153	2320B	10/21/21:216434
Hydroxide as OH	ND	10	mg/L		2320B	10/20/21:212153	2320B	10/21/21:216434
Carbonate as CO3	ND	10	mg/L		2320B	10/20/21:212153	2320B	10/21/21:216434
Bicarbonate as HCO3	410	10	mg/L		2320B	10/20/21:212153	2320B	10/21/21:216434
Sulfate	103	0.5	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Chloride	56	1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrate as NO3	ND	0.4	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrite as N	ND	0.2	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Fluoride	0.2	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Total Anions	10.5	---	meq/L		2320B	10/20/21:212153	2320B	10/21/21:216434
pH (Field)	7.44	---	units		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Specific Conductance	943	1	umhos/cm		2510B	10/20/21:212184	2510B	10/20/21:216352
Total Dissolved Solids	560	20	mg/L		2540CE	10/12/21:211803	2540C	10/13/21:215942
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/21:212169	5540C	10/08/21:216335
Aggressiveness Index	12.2	1	--		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Langelier Index (20°C)	0.3	1	--		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852

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

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December 2, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 13M2 (LA31) LA 31
Project : Los Osos BMC

Lab ID : CC 2184023-001
Customer ID : 8-514

Sampled On : November 4, 2021-11:12
Sampled By : Andrea Berge
Received On : November 4, 2021-12:00
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	509	2.5	mg/L		200.7	11/08/21:213009	200.7	11/08/21:217490
Calcium	77	1	mg/L		200.7	11/08/21:213009	200.7	11/08/21:217490
Magnesium	77	1	mg/L		200.7	11/08/21:213009	200.7	11/08/21:217490
Potassium	4	1	mg/L		200.7	11/08/21:213009	200.7	11/08/21:217490
Sodium	305	1	mg/L		200.7	11/08/21:213009	200.7	11/08/21:217490
Total Cations	23.5	---	meq/L		200.7	11/08/21:213009	200.7	11/08/21:217490
Boron	0.1	0.1	mg/L		200.7	11/08/21:213009	200.7	11/08/21:217490
Copper	ND	10	ug/L		200.7	11/08/21:213009	200.7	11/08/21:217490
Iron	230	30	ug/L		200.7	11/08/21:213009	200.7	11/08/21:217490
Manganese	30	10	ug/L		200.7	11/08/21:213009	200.7	11/08/21:217490
Zinc	ND	20	ug/L		200.7	11/08/21:213009	200.7	11/08/21:217490
SAR	5.9	0.1	--		200.7	11/08/21:213009	200.7	11/08/21:217490
Total Alkalinity (as CaCO3)	50	10	mg/L		2320B	11/11/21:213151	2320B	11/11/21:217682
Hydroxide as OH	ND	10	mg/L		2320B	11/11/21:213151	2320B	11/11/21:217682
Carbonate as CO3	ND	10	mg/L		2320B	11/11/21:213151	2320B	11/11/21:217682
Bicarbonate as HCO3	70	10	mg/L		2320B	11/11/21:213151	2320B	11/11/21:217682
Sulfate	124	2.5*	mg/L		300.0	11/22/21:213639	300.0	11/23/21:218308
Chloride	629	15*	mg/L		300.0	11/23/21:213682	300.0	11/23/21:218412
Nitrate as NO3	2.9	0.2	mg/L		4500NO3F	11/05/21:212930	4500NO3F	11/05/21:217325
Nitrite as N	ND	0.2	mg/L		4500NO3F	11/05/21:212931	4500NO3F	11/05/21:217324
Nitrate + Nitrite as N	0.6	0.2	mg/L		4500NO3F	11/05/21:212930	4500NO3F	11/05/21:217325
Fluoride	ND	0.5*	mg/L		300.0	11/22/21:213639	300.0	11/23/21:218308
Total Anions	21.5	---	meq/L		2320B	11/11/21:213151	2320B	11/11/21:217682
pH	7.9	--	units		4500-H B	11/29/21:213797	4500HB	11/29/21:218491
Specific Conductance	2780	1	umhos/cm		2510B	11/15/21:213300	2510B	11/15/21:217795
Total Dissolved Solids	1700	20*	mg/L		2540CE	11/09/21:213042	2540C	11/10/21:217543
MBAS Screen	Negative	0.1	mg/L		5540C	11/05/21:212955	5540C	11/05/21:217354
Aggressiveness Index	11.9	1	--		4500-H B	11/29/21:213797	4500HB	11/29/21:218491
Langelier Index (20°C)	-0.05	1	--		4500-H B	11/29/21:213797	4500HB	11/29/21:218491
Nitrate Nitrogen	0.6	0.2	mg/L		4500NO3F	11/05/21:212930	4500NO3F	11/05/21:217325

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

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November 12, 2021

Cleath-Harris Geologists
Attn: Spencer Harris
75 Zaca Lane
Suite 110
San Luis Obispo, CA 93401
Description : 18K9 (LA32) LA 32
Project : Los Osos BMC Monitoring

Lab ID : CC 2183607-003
Customer ID : 8-514

Sampled On : October 6, 2021-13:25
Sampled By : James C
Received On : October 6, 2021-14:35
Matrix : Ground Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
General Mineral								
Total Hardness as CaCO3	68.6	2.5	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Calcium	11	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Magnesium	10	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Potassium	ND	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Sodium	20	1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Total Cations	2.2	---	meq/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Boron	ND	0.1	mg/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Copper	30	10	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Iron	ND	30	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Manganese	ND	10	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215748
Zinc	170	20	ug/L		200.7	10/08/21:211698	200.7	10/08/21:215761
SAR	1.1	0.1	--		200.7	10/08/21:211698	200.7	10/08/21:215748
Total Alkalinity (as CaCO3)	50	10	mg/L		2320B	10/18/21:212102	2320B	10/18/21:216254
Hydroxide as OH	ND	10	mg/L		2320B	10/18/21:212102	2320B	10/18/21:216254
Carbonate as CO3	ND	10	mg/L		2320B	10/18/21:212102	2320B	10/18/21:216254
Bicarbonate as HCO3	60	10	mg/L		2320B	10/18/21:212102	2320B	10/18/21:216254
Sulfate	5.7	0.5	mg/L		300.0	11/02/21:212706	300.0	11/02/21:217182
Chloride	30	1	mg/L		300.0	11/02/21:212706	300.0	11/02/21:217182
Nitrate as NO3	17.2	0.4	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Nitrite as N	ND	0.2	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Nitrate + Nitrite as N	3.9	0.1	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724
Fluoride	ND	0.1	mg/L		300.0	11/02/21:212706	300.0	11/02/21:217182
Total Anions	2.2	---	meq/L		2320B	10/18/21:212102	2320B	10/18/21:216254
pH (Field)	7.73	---	units		4500-H B	10/06/21:211692	4500HB	10/06/21:215770
Specific Conductance	255	1	umhos/cm		2510B	10/19/21:212117	2510B	10/19/21:216255
Total Dissolved Solids	150	20	mg/L		2540CE	10/11/21:211730	2540C	10/12/21:215881
MBAS Screen	Negative	0.1	mg/L		5540C	10/07/21:212168	5540C	10/07/21:216332
Aggressiveness Index	10.9	1	--		4500-H B	10/06/21:211692	4500HB	10/06/21:215770
Langelier Index (20°C)	-0.9	1	--		4500-H B	10/06/21:211692	4500HB	10/06/21:215770
Nitrate Nitrogen	3.9	0.1	mg/L		300.0	10/07/21:211666	300.0	10/07/21:215724

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

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October 28, 2021

Lab ID : CC 2183663-003
Customer ID : 8-514

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

Sampled On : October 7, 2021-09:40
Sampled By : Seth Stocking
Received On : October 8, 2021-17:00
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	253	2.5	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Calcium	37	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Magnesium	39	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Potassium	2	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Sodium	45	1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Total Cations	7.1	---	meq/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Boron	ND	0.1	mg/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Copper	ND	10	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Iron	ND	30	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Manganese	ND	10	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
Zinc	ND	20	ug/L		200.7	10/11/21:211733	200.7	10/11/21:215874
SAR	1.2	0.1	--		200.7	10/11/21:211733	200.7	10/11/21:215874
Total Alkalinity (as CaCO3)	240	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Hydroxide as OH	ND	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Carbonate as CO3	ND	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Bicarbonate as HCO3	300	10	mg/L		2320B	10/20/21:212153	2320B	10/20/21:216434
Sulfate	29.3	0.5	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Chloride	37	1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrate as NO3	ND	0.4	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrite as N	ND	0.2	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Fluoride	0.1	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852
Total Anions	6.6	---	meq/L		2320B	10/20/21:212153	2320B	10/20/21:216434
pH (Field)	7.4	---	units		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Specific Conductance	638	1	umhos/cm		2510B	10/20/21:212184	2510B	10/20/21:216352
Total Dissolved Solids	360	20	mg/L		2540CE	10/12/21:211803	2540C	10/13/21:215942
MBAS Screen	Negative	0.1	mg/L		5540C	10/08/21:212169	5540C	10/08/21:216335
Aggressiveness Index	11.7	1	--		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Langelier Index (20°C)	-0.1	1	--		4500-H B	10/07/21:211692	4500HB	10/07/21:215770
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/08/21:211746	300.0	10/08/21:215852

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

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October 28, 2021

Lab ID : CC 2183663-003
Customer ID : 8-514

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

Sampled On : October 7, 2021-09:40
Sampled By : Seth Stocking
Received On : October 8, 2021-17:00
Matrix : Ground Water

Description : 18K (LA39-Los Olivos #5) LA 39
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								
pH (Field)	7.4		units			10/07/21 09:40	4500HB	10/07/21 09:40
Temperature	69		°C			10/07/21 09:40	2550B	10/07/21 09:40
Conductivity	0.67		umhos/cm			10/07/21 09:40	2510B	10/07/21 09:40

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

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CA ELAP Certification No. 2810

November 23, 2021

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

Lab ID : CC 2183703-001
Customer ID : 8-514

Sampled On : October 13, 2021-09:56
Sampled By : James C
Received On : October 13, 2021-11:35
Matrix : Ground Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
General Mineral								
Total Hardness as CaCO3	3540	2.5	mg/L		200.7	10/15/21:211998	200.7	10/15/21:216303
Calcium	544	1	mg/L		200.7	10/15/21:211998	200.7	10/15/21:216303
Magnesium	530	5*	mg/L		200.7	10/15/21:211998	200.7	10/19/21:216350
Potassium	6	1	mg/L		200.7	10/15/21:211998	200.7	10/15/21:216303
Sodium	190	1	mg/L		200.7	10/15/21:211998	200.7	10/15/21:216303
Total Cations	79.2	---	meq/L		200.7	10/15/21:211998	200.7	10/15/21:216303
Boron	ND	0.1	mg/L		200.7	10/15/21:211998	200.7	10/15/21:216303
Copper	ND	10	ug/L		200.7	10/15/21:211998	200.7	10/15/21:216303
Iron	60	30	ug/L		200.7	10/15/21:211998	200.7	10/15/21:216303
Manganese	480	10	ug/L		200.7	10/15/21:211998	200.7	10/15/21:216303
Zinc	ND	20	ug/L		200.7	10/15/21:211998	200.7	10/15/21:216303
SAR	1.4	0.1	--		200.7	10/15/21:211998	200.7	10/15/21:216303
Total Alkalinity (as CaCO3)	230	10	mg/L		2320B	10/25/21:212415	2320B	10/26/21:216721
Hydroxide as OH	ND	10	mg/L		2320B	10/25/21:212415	2320B	10/26/21:216721
Carbonate as CO3	ND	10	mg/L		2320B	10/25/21:212415	2320B	10/26/21:216721
Bicarbonate as HCO3	270	10	mg/L		2320B	10/25/21:212415	2320B	10/26/21:216721
Sulfate	201	5*	mg/L		300.0	11/12/21:213248	300.0	11/13/21:217861
Chloride	2910	60*	mg/L		300.0	11/12/21:213248	300.0	11/13/21:217861
Nitrate as NO3	ND	0.9	mg/L		4500NO3F	10/14/21:211959	4500NO3F	10/14/21:216057
Nitrite as N	ND	0.2	mg/L		4500NO3F	10/14/21:211960	4500NO3F	10/14/21:216055
Nitrate + Nitrite as N	ND	0.2	mg/L		4500NO3F	10/14/21:211959	4500NO3F	10/14/21:216057
Fluoride	ND	1*	mg/L		300.0	11/12/21:213248	300.0	11/13/21:217861
Total Anions	90.7	---	meq/L		2320B	10/25/21:212415	2320B	10/26/21:216721
pH (Field)	7.39	---	units		4500-H B	10/13/21:212054	4500HB	10/13/21:216184
Specific Conductance	8930	1	umhos/cm		2510B	11/08/21:213010	2510B	11/08/21:217401
Total Dissolved Solids	7430	20*	mg/L		2540CE	10/15/21:211970	2540C	10/18/21:216196
MBAS Extraction	ND	0.1	mg/L		5540C	10/14/21:212210	5540C	10/14/21:216379
Aggressiveness Index	12.9	1	--		4500-H B	10/13/21:212054	4500HB	10/13/21:216184
Langelier Index (20°C)	0.9	1	--		4500-H B	10/13/21:212054	4500HB	10/13/21:216184
Nitrate Nitrogen	ND	0.2	mg/L		4500NO3F	10/14/21:211959	4500NO3F	10/14/21:216057

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

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October 28, 2021

Lab ID : CC 2183675-001
Customer ID : 8-514

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

Sampled On : October 11, 2021-14:15
Sampled By : James C
Received On : October 11, 2021-15:20
Matrix : Ground Water

Description : Zone D Well (CA41) LA 41
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	309	2.5	mg/L		200.7	10/13/21:211872	200.7	10/13/21:216047
Calcium	58	1	mg/L		200.7	10/13/21:211872	200.7	10/13/21:216047
Magnesium	40	1	mg/L		200.7	10/13/21:211872	200.7	10/13/21:216047
Potassium	2	1	mg/L		200.7	10/13/21:211872	200.7	10/13/21:216047
Sodium	64	1	mg/L		200.7	10/13/21:211872	200.7	10/13/21:216047
Total Cations	9.0	---	meq/L		200.7	10/13/21:211872	200.7	10/13/21:216047
Boron	ND	0.1	mg/L		200.7	10/13/21:211872	200.7	10/13/21:216047
Copper	ND	10	ug/L		200.7	10/13/21:211872	200.7	10/13/21:216047
Iron	130	30	ug/L		200.7	10/13/21:211872	200.7	10/13/21:216047
Manganese	70	10	ug/L		200.7	10/13/21:211872	200.7	10/13/21:216047
Zinc	ND	20	ug/L		200.7	10/13/21:211872	200.7	10/13/21:216047
SAR	1.6	0.1	--		200.7	10/13/21:211872	200.7	10/13/21:216047
Total Alkalinity (as CaCO3)	280	10	mg/L		2320B	10/20/21:212202	2320B	10/21/21:216440
Hydroxide as OH	ND	10	mg/L		2320B	10/20/21:212202	2320B	10/21/21:216440
Carbonate as CO3	ND	10	mg/L		2320B	10/20/21:212202	2320B	10/21/21:216440
Bicarbonate as HCO3	340	10	mg/L		2320B	10/20/21:212202	2320B	10/21/21:216440
Sulfate	79.6	0.5	mg/L		300.0	10/12/21:211822	300.0	10/12/21:216023
Chloride	48	1	mg/L		300.0	10/12/21:211822	300.0	10/12/21:216023
Nitrate as NO3	ND	0.4	mg/L		300.0	10/12/21:211822	300.0	10/12/21:216023
Nitrite as N	ND	0.2	mg/L		300.0	10/12/21:211822	300.0	10/12/21:216023
Nitrate + Nitrite as N	ND	0.1	mg/L		300.0	10/12/21:211822	300.0	10/12/21:216023
Fluoride	0.1	0.1	mg/L		300.0	10/12/21:211822	300.0	10/12/21:216023
Total Anions	8.6	---	meq/L		2320B	10/20/21:212202	2320B	10/21/21:216440
pH (Field)	7.24	---	units		4500-H B	10/11/21:212054	4500HB	10/11/21:216184
Specific Conductance	812	1	umhos/cm		2510B	10/21/21:212235	2510B	10/21/21:216409
Total Dissolved Solids	460	20	mg/L		2540CE	10/14/21:211921	2540C	10/15/21:216097
MBAS Extraction	ND	0.1	mg/L		5540C	10/13/21:212208	5540C	10/13/21:216378
Aggressiveness Index	11.8	1	--		4500-H B	10/11/21:212054	4500HB	10/11/21:216184
Langelier Index (20°C)	-0.01	1	--		4500-H B	10/11/21:212054	4500HB	10/11/21:216184
Nitrate Nitrogen	ND	0.1	mg/L		300.0	10/12/21:211822	300.0	10/12/21:216023

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

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CA ELAP Certification No. 2810

CEC Testing

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/26/2021
Operator: Andrea Berge, Tanner Mihelic
Well number and location: 30S/11E-13Q2 (FW5)
Site and wellhead conditions: Sunny, cool. Site secure.

Static water depth (feet):	81.4
Well depth (feet):	105
Water column (feet):	23.6
Casing diameter (inches):	2
Minimum purge volume (gal)	12
Purge rate (gpm):	1
Pumping water level (feet):	--
Pump setting (feet):	100
Minimum purge time (min):	45
Time begin purge:	9:30 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
9:30	1	1005	7.16	17.9	Orange, cloudy, odorless
9:35	5	987.3	6.56	18.4	Slightly colorless, odorless
9:40	10	981.4	6.24	18.5	Clear, colorless, odorless
9:45	15	984.3	6.14	18.5	Clear, colorless, odorless
9:50	20	984.5	6.10	18.5	Clear, colorless, odorless
9:55	25	987.5	6.06	18.6	Clear, colorless, odorless
10:00	30	985.2	6.03	18.6	Clear, colorless, odorless
10:05	35	983.1	6.02	18.5	Clear, colorless, odorless
					Sampled @ 10:12 AM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/26/2021
Operator: Andrea Berge, Tanner Mihelic
Well number and location: 30S/10E-24A (FW6)
Site and wellhead conditions: Sunny, clear. Site secure.

Static water depth (feet): 141.91
Well depth (feet): 165.93
Water column (feet): 24.02
Casing diameter (inches): 2
Minimum purge volume (gal) 15
Purge rate (gpm): 0.5
Pumping water level (feet): --
Pump setting (feet): 150
Minimum purge time (min): 35
Time begin purge: 11:29 AM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
11:29	1	951.4	7.70	19.1	Clear, colorless, odorless
11:41	5	955.1	6.31	20.6	Clear, colorless, odorless
11:55	10	958.4	6.32	21	Clear, colorless, odorless
12:10	15	959.6	6.34	20.6	Clear, colorless, odorless
					Sampled @ 12:15PM

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

Groundwater Monitoring Field Log
LOBP Monitoring Program

Date: 10/26/2021
Operator: Andrea Berge, Tanner Mihelic
Well number and location: 30S/11E-20A2 (FW26)
Site and wellhead conditions: Sunny, clear. Site secure

Static water depth (feet): 25.68
Well depth (feet): 60
Water column (feet): 34.32
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: 1:11 PM

Time	Gallons	EC (µS/cm)	pH	Temp. (°C)	Comments*
1:11	1	655	6.82	16.7	Clear, colorless, sulfur odor
1:16	30	650.1	6.76	16.7	Clear, colorless, sulfur odor
1:18	50	647.1	6.70	16.9	Clear, colorless, sulfur odor
1:21	100	650.2	6.67	17	Clear, colorless, sulfur odor
1:25	150	647.6	6.67	17.2	Clear, colorless, odorless
1:52	200	644.5	6.67	17.9	Clear, colorless, odorless
					Sampled @ 1:53 PM

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

Certificate of Analysis

FINAL REPORT

Work Orders:	1J13001	**Report Date:**	1/03/2022
		Received Date:	10/27/2021
Project:	Los Osos Groundwater CECs	**Turnaround Time:**	Normal
		Phones:	(805) 543-1413
		Fax:	
Attn:	Spencer Harris	**P.O. #:**	
Client:	Cleath-Harris Geologists, Inc. 75 Zaca Lane, Suite 110 San Luis Obispo, CA 93401	**Billing Code:**	

ELAP-CA #1132 • EPA-UCMR #CA00211 • Guam-EPA #17-008R • HW-DOH #4047 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015 • NV-DEP #NAC 445A • SCAQMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear Spencer Harris,

Enclosed are the results of analyses for samples received 10/27/21 with the Chain-of-Custody document. The samples were received in good condition, at 4.0 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Brandon Gee
Operations Manager/Senior PM

14859 Clark Avenue,City of Industry CA, 91745 | Phone: (626) 336-2139 | Fax: (626) 336-2634
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Certificate of Analysis

FINAL REPORT

WECK LABORATORIES, INC.

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

Project Number: Los Osos Groundwater CECs

Project Manager: Spencer Harris

Reported:
01/03/2022 08:29

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
FW5 (13Q2)	A. BERGE	1J13001-01	Water	10/26/21 10:12	
FW6 (24A)	A. BERGE	1J13001-02	Water	10/26/21 12:15	
FW26 (20A1)	A. BERGE	1J13001-03	Water	10/26/21 13:53	

Analyses Accreditation Summary

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

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

Project Number: Los Osos Groundwater CECs

Project Manager: Spencer Harris

Reported: 01/03/2022 08:29

Sample Results

Sample: FW5 (13Q2) — 1J13001-01 (Water)

Sampled: 10/26/21 10:12 by A. BERGE

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods						
Method: EPA 350.1		**Instr:** AA06				
Batch ID: W1K0040 — **Preparation:** _NONE (WETCHEM)		**Prepared:** 11/01/21 13:45				**Analyst:** SBN
Ammonia as N	ND	0.10	mg/l	1	11/02/21	
Method: EPA 353.2		**Instr:** AA01				
Batch ID: W1J1912 — **Preparation:** _NONE (WETCHEM)		**Prepared:** 10/27/21 14:02				**Analyst:** ism
Nitrate as N	**32**	1.0	mg/l	5	10/27/21 20:15	
Method: SM 2510B		**Instr:** AA02				
Batch ID: W1K0134 — **Preparation:** _NONE (WETCHEM)		**Prepared:** 11/02/21 12:03				**Analyst:** vat
Specific Conductance (EC)	**1000**	2.0	umhos/cm	1	11/03/21	
Method: SM 5310B		**Instr:** TOC02				
Batch ID: W1K0468 — **Preparation:** _NONE (TOC/TOX)		**Prepared:** 11/05/21 12:10				**Analyst:** ajc
Total Organic Carbon (TOC)	**0.58**	0.30	mg/l	1	11/06/21	
Method: SM 5910B		**Instr:** UVVIS04				
Batch ID: W1J1942 — **Preparation:** _NONE (WETCHEM)		**Prepared:** 10/27/21 18:40				**Analyst:** ism
UV 254	**0.021**	0.009	1/cm	1	10/27/21 20:07	
Nitrosamines by isotopic dilution GC/MS CI Mode						
Method: EPA 1625M		**Instr:** GCMS09				
Batch ID: W1J2044 — **Preparation:** EPA 3535/SPE		**Prepared:** 10/29/21 08:37				**Analyst:** mld
N-Nitrosodimethylamine	**7.9**	2.0	ng/l	1	11/03/21	
PPCPs - Hormones by LC/MSMS-APCI						
Method: EPA 1694M-APCI		**Instr:** LCMS03				
Batch ID: W1K1523 — **Preparation:** EPA 3535/SPE		**Prepared:** 11/22/21 08:43				**Analyst:** jna
17-a-Ethynylestradiol	ND	4.0	ng/l	1	12/03/21	
17-b-Estradiol	ND	4.0	ng/l	1	12/03/21	
Estrone	ND	4.0	ng/l	1	12/03/21	
Progesterone	ND	4.0	ng/l	1	12/03/21	
Testosterone	ND	4.0	ng/l	1	12/03/21	
PPCPs - Pharmaceuticals by LC/MSMS-ESI-						
Method: EPA 1694M-ESI-		**Instr:** LCMS03				
Batch ID: W1K1527 — **Preparation:** EPA 3535/SPE		**Prepared:** 11/22/21 08:57				**Analyst:** jna
Bisphenol A	**54**	4.0	ng/l	1	12/03/21	B, BS-H
Diclofenac	ND	4.0	ng/l	1	12/03/21	
Gemfibrozil	ND	4.0	ng/l	1	12/03/21	
Ibuprofen	ND	4.0	ng/l	1	12/03/21	
Iopromide	ND	4.0	ng/l	1	12/03/21	
Naproxen	ND	4.0	ng/l	1	12/03/21	
Salicylic Acid	ND	100	ng/l	1	12/03/21	
Triclosan	ND	8.0	ng/l	1	12/03/21	

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Sample Results

(Continued)

Sample: FW5 (13Q2) Sampled: 10/26/21 10:12 by A. BERGE

1J13001-01 (Water) (Continued)

PPCPs - Pharmaceuticals by LC/MSMS-ESI+

Method: EPA 1694M-ESI+ **Instr:** LCMS03

Batch ID: W1K1525 **Preparation:** EPA 3535/SPE **Prepared:** 11/22/21 08:45 **Analyst:** jna

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Acetaminophen	ND	5.0	ng/l	1	11/29/21	
Atenolol	ND	4.0	ng/l	1	11/29/21	
Atorvastatin	ND	4.0	ng/l	1	11/29/21	
Azithromycin	ND	20	ng/l	1	11/29/21	
Caffeine	ND	4.0	ng/l	1	11/29/21	
Carbamazepine	ND	4.0	ng/l	1	11/29/21	
Ciprofloxacin	ND	20	ng/l	1	11/29/21	
Cotinine	ND	8.0	ng/l	1	11/29/21	
DEET	ND	4.0	ng/l	1	11/29/21	
Diazepam	ND	4.0	ng/l	1	11/29/21	
Fluoxetine	ND	4.0	ng/l	1	11/29/21	
Meprobamate	ND	4.0	ng/l	1	11/29/21	
Methadone	ND	4.0	ng/l	1	11/29/21	
Sulfamethoxazole	**130**	4.0	ng/l	1	11/29/21	
TCEP	**10**	10	ng/l	1	11/29/21	
TCPP	ND	50	ng/l	1	11/29/21	
Trimethoprim	ND	4.0	ng/l	1	11/29/21	

Sample Results

(Continued)

Sample: FW5 (13Q2) Sampled: 10/26/21 10:12 by A. BERGE

1J13001-01RE1 (Water)

PPCPs - Pharmaceuticals by LC/MSMS-ESI+

Method: EPA 1694M-ESI+ **Instr:** LCMS03

Batch ID: W1K1525 **Preparation:** EPA 3535/SPE **Prepared:** 11/22/21 08:45 **Analyst:** jna

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Phenytoin (Dilantin)	**5.3**	4.0	ng/l	1	12/03/21	
Primidone	**34**	4.0	ng/l	1	12/03/21	
Sucralose	**2600**	20	ng/l	1	12/03/21	E-01
TDCPP	ND	50	ng/l	1	12/03/21	

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

Project Number: Los Osos Groundwater CECs

Project Manager: Spencer Harris

Reported: 01/03/2022 08:29

Sample Results

(Continued)

Sample: FW5 (13Q2)

1J13001-01RE2 (Water)

Sampled: 10/26/21 10:12 by A. BERGE

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
PPCPs - Pharmaceuticals by LC/MSMS-ESI+						
Method: EPA 1694M-ESI+		**Instr:** LCMS03				
Batch ID: W1K1806 **Preparation:** EPA 3535/SPE		**Prepared:** 11/23/21 15:28				**Analyst:** jna
Amoxicillin	ND	20	ng/l	1	11/24/21	

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

Project Number: Los Osos Groundwater CECs

Project Manager: Spencer Harris

Reported: 01/03/2022 08:29

Sample Results

(Continued)

Sample: FW6 (24A) — 1J13001-02 (Water) — Sampled: 10/26/21 12:15 by A. BERGE

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods						
Method: EPA 350.1		**Instr:** AA06				
Batch ID: W1K0040 — **Preparation:** _NONE (WETCHEM)		**Prepared:** 11/01/21 13:45				**Analyst:** SBN
Ammonia as N	ND	0.10	mg/l	1	11/02/21	
Method: EPA 353.2		**Instr:** AA01				
Batch ID: W1J1912 — **Preparation:** _NONE (WETCHEM)		**Prepared:** 10/27/21 14:02				**Analyst:** ism
Nitrate as N	**2.7**	0.20	mg/l	1	10/27/21 20:06	
Method: SM 2510B		**Instr:** AA02				
Batch ID: W1K0134 — **Preparation:** _NONE (WETCHEM)		**Prepared:** 11/02/21 12:03				**Analyst:** vat
Specific Conductance (EC)	**980**	2.0	umhos/cm	1	11/03/21	
Method: SM 5310B		**Instr:** TOC02				
Batch ID: W1K0468 — **Preparation:** _NONE (TOC/TOX)		**Prepared:** 11/05/21 12:10				**Analyst:** ajc
Total Organic Carbon (TOC)	**1.1**	0.30	mg/l	1	11/06/21	
Method: SM 5910B		**Instr:** UVVIS04				
Batch ID: W1J1942 — **Preparation:** _NONE (WETCHEM)		**Prepared:** 10/27/21 18:40				**Analyst:** ism
UV 254	**0.016**	0.009	1/cm	1	10/27/21 20:08	
Nitrosamines by isotopic dilution GC/MS CI Mode						
Method: EPA 1625M		**Instr:** GCMS09				
Batch ID: W1J2044 — **Preparation:** EPA 3535/SPE		**Prepared:** 10/29/21 08:37				**Analyst:** mld
N-Nitrosodimethylamine	**7.5**	2.0	ng/l	1	11/03/21	
PPCPs - Hormones by LC/MSMS-APCI						
Method: EPA 1694M-APCI		**Instr:** LCMS03				
Batch ID: W1K0859 — **Preparation:** EPA 3535/SPE		**Prepared:** 11/11/21 08:57				**Analyst:** jna
17-a-Ethynylestradiol	ND	4.0	ng/l	1	11/16/21	
17-b-Estradiol	ND	4.0	ng/l	1	11/16/21	
Estrone	ND	4.0	ng/l	1	11/16/21	
Progesterone	ND	4.0	ng/l	1	11/16/21	
Testosterone	ND	4.0	ng/l	1	11/16/21	
PPCPs - Pharmaceuticals by LC/MSMS-ESI-						
Method: EPA 1694M-ESI-		**Instr:** LCMS03				
Batch ID: W1K0858 — **Preparation:** EPA 3535/SPE		**Prepared:** 11/11/21 08:51				**Analyst:** jna
Bisphenol A	**170**	4.0	ng/l	1	11/16/21	B, BS-H
Diclofenac	ND	4.0	ng/l	1	11/16/21	
Gemfibrozil	ND	4.0	ng/l	1	11/16/21	
Ibuprofen	ND	4.0	ng/l	1	11/16/21	
Iopromide	ND	4.0	ng/l	1	11/16/21	
Naproxen	ND	4.0	ng/l	1	11/16/21	
Salicylic Acid	ND	100	ng/l	1	11/16/21	
Triclosan	ND	8.0	ng/l	1	11/16/21	

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Sample Results

(Continued)

Sample: FW6 (24A) — 1J13001-02 (Water) — Sampled: 10/26/21 12:15 by A. BERGE (Continued)

PPCPs - Pharmaceuticals by LC/MSMS-ESI+

Method: EPA 1694M-ESI+ **Instr:** LCMS03

Batch ID: W1K0857 **Preparation:** EPA 3535/SPE **Prepared:** 11/11/21 08:48 **Analyst:** jna

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Acetaminophen	ND	5.0	ng/l	1	11/12/21	
Atenolol	ND	4.0	ng/l	1	11/12/21	
Atorvastatin	ND	4.0	ng/l	1	11/12/21	
Azithromycin	ND	20	ng/l	1	11/12/21	
Caffeine	ND	4.0	ng/l	1	11/12/21	
Carbamazepine	**120**	4.0	ng/l	1	11/12/21	
Ciprofloxacin	ND	20	ng/l	1	11/12/21	
Cotinine	ND	8.0	ng/l	1	11/12/21	
DEET	**17**	4.0	ng/l	1	11/12/21	
Diazepam	ND	4.0	ng/l	1	11/12/21	
Fluoxetine	ND	4.0	ng/l	1	11/12/21	
Meprobamate	**8.1**	4.0	ng/l	1	11/12/21	BS-04
Methadone	ND	4.0	ng/l	1	11/12/21	
Sulfamethoxazole	**30**	4.0	ng/l	1	11/12/21	
TCEP	**130**	10	ng/l	1	11/12/21	
TCPP	**97**	50	ng/l	1	11/12/21	
Trimethoprim	ND	4.0	ng/l	1	11/12/21	

Sample Results

(Continued)

Sample: FW6 (24A) — 1J13001-02RE1 (Water) — Sampled: 10/26/21 12:15 by A. BERGE

PPCPs - Pharmaceuticals by LC/MSMS-ESI+

Method: EPA 1694M-ESI+ **Instr:** LCMS03

Batch ID: W1K0857 **Preparation:** EPA 3535/SPE **Prepared:** 11/11/21 08:48 **Analyst:** jna

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Phenytoin (Dilantin)	**13**	4.0	ng/l	1	11/16/21	
Primidone	**110**	4.0	ng/l	1	11/16/21	
Sucralose	**12000**	20	ng/l	1	11/16/21	E-01
TDCPP	**54**	50	ng/l	1	11/16/21	

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Sample Results

(Continued)

Sample: FW6 (24A) — Sampled: 10/26/21 12:15 by A. BERGE

1J13001-02RE2 (Water)

PPCPs - Pharmaceuticals by LC/MSMS-ESI+

Method: EPA 1694M-ESI+ **Instr:** LCMS03

Batch ID: W1K0910 **Preparation:** EPA 3535/SPE **Prepared:** 11/11/21 12:13 **Analyst:** jna

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Amoxicillin	ND	20	ng/l	1	11/11/21	

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Sample Results

(Continued)

Sample: FW26 (20A1) — 1J13001-03 (Water) — Sampled: 10/26/21 13:53 by A. BERGE

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods						
Method: EPA 350.1 — **Instr:** AA06						
Batch ID: W1K0040 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 11/01/21 13:45 — **Analyst:** SBN						
Ammonia as N	**0.19**	0.10	mg/l	1	11/02/21	
Method: EPA 353.2 — **Instr:** AA01						
Batch ID: W1J1912 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 10/27/21 14:02 — **Analyst:** ism						
Nitrate as N	ND	0.20	mg/l	1	10/27/21 20:07	
Method: SM 2510B — **Instr:** AA02						
Batch ID: W1K0134 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 11/02/21 12:03 — **Analyst:** vat						
Specific Conductance (EC)	**650**	2.0	umhos/cm	1	11/03/21	
Method: SM 5310B — **Instr:** TOC02						
Batch ID: W1K0468 — **Preparation:** _NONE (TOC/TOX) — **Prepared:** 11/05/21 12:10 — **Analyst:** ajc						
Total Organic Carbon (TOC)	**1.3**	0.30	mg/l	1	11/07/21	
Method: SM 5910B — **Instr:** UVVIS04						
Batch ID: W1J1942 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 10/27/21 18:40 — **Analyst:** ism						
UV 254	**0.025**	0.009	1/cm	1	10/27/21 20:09	
Nitrosamines by isotopic dilution GC/MS CI Mode						
Method: EPA 1625M — **Instr:** GCMS09						
Batch ID: W1J2044 — **Preparation:** EPA 3535/SPE — **Prepared:** 10/29/21 08:37 — **Analyst:** mld						
N-Nitrosodimethylamine	ND	2.0	ng/l	1	11/03/21	
PPCPs - Hormones by LC/MSMS-APCI						
Method: EPA 1694M-APCI — **Instr:** LCMS03						
Batch ID: W1K0859 — **Preparation:** EPA 3535/SPE — **Prepared:** 11/11/21 08:57 — **Analyst:** jna						
17-a-Ethynylestradiol	ND	4.0	ng/l	1	11/16/21	
17-b-Estradiol	ND	4.0	ng/l	1	11/16/21	
Estrone	ND	4.0	ng/l	1	11/16/21	
Progesterone	ND	4.0	ng/l	1	11/16/21	
Testosterone	ND	4.0	ng/l	1	11/16/21	
PPCPs - Pharmaceuticals by LC/MSMS-ESI-						
Method: EPA 1694M-ESI- — **Instr:** LCMS03						
Batch ID: W1K0858 — **Preparation:** EPA 3535/SPE — **Prepared:** 11/11/21 08:51 — **Analyst:** jna						
Bisphenol A	**82**	4.0	ng/l	1	11/16/21	B, BS-H
Diclofenac	ND	4.0	ng/l	1	11/16/21	
Gemfibrozil	ND	4.0	ng/l	1	11/16/21	
Ibuprofen	ND	4.0	ng/l	1	11/16/21	
Iopromide	ND	4.0	ng/l	1	11/16/21	
Naproxen	ND	4.0	ng/l	1	11/16/21	
Salicylic Acid	ND	100	ng/l	1	11/16/21	
Triclosan	ND	8.0	ng/l	1	11/16/21	

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Sample Results

(Continued)

Sample: FW26 (20A1) Sampled: 10/26/21 13:53 by A. BERGE

1J13001-03 (Water) (Continued)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
PPCPs - Pharmaceuticals by LC/MSMS-ESI+						
Method: EPA 1694M-ESI+		**Instr:** LCMS03				
Batch ID: W1K0857 **Preparation:** EPA 3535/SPE		**Prepared:** 11/11/21 08:48				**Analyst:** jna
Acetaminophen	ND	5.0	ng/l	1	11/12/21	
Atenolol	ND	4.0	ng/l	1	11/12/21	
Atorvastatin	ND	4.0	ng/l	1	11/12/21	
Azithromycin	ND	20	ng/l	1	11/12/21	
Caffeine	ND	4.0	ng/l	1	11/12/21	
Carbamazepine	ND	4.0	ng/l	1	11/12/21	
Ciprofloxacin	ND	20	ng/l	1	11/12/21	
Cotinine	ND	8.0	ng/l	1	11/12/21	
DEET	ND	4.0	ng/l	1	11/12/21	
Diazepam	ND	4.0	ng/l	1	11/12/21	
Fluoxetine	ND	4.0	ng/l	1	11/12/21	
Meprobamate	ND	4.0	ng/l	1	11/12/21	
Methadone	ND	4.0	ng/l	1	11/12/21	
Sulfamethoxazole	ND	4.0	ng/l	1	11/12/21	
TCEP	ND	10	ng/l	1	11/12/21	
TCPP	ND	50	ng/l	1	11/12/21	
Trimethoprim	ND	4.0	ng/l	1	11/12/21	

Sample Results

(Continued)

Sample: FW26 (20A1) Sampled: 10/26/21 13:53 by A. BERGE

1J13001-03RE1 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
PPCPs - Pharmaceuticals by LC/MSMS-ESI+						
Method: EPA 1694M-ESI+		**Instr:** LCMS03				
Batch ID: W1K0857 **Preparation:** EPA 3535/SPE		**Prepared:** 11/11/21 08:48				**Analyst:** jna
Phenytoin (Dilantin)	ND	4.0	ng/l	1	11/16/21	
Primidone	ND	4.0	ng/l	1	11/16/21	
Sucralose	**43**	20	ng/l	1	11/16/21	
TDCPP	ND	50	ng/l	1	11/16/21	

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Sample Results

(Continued)

Sample: FW26 (20A1) Sampled: 10/26/21 13:53 by A. BERGE

1J13001-03RE2 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
PPCPs - Pharmaceuticals by LC/MSMS-ESI+						
Method: EPA 1694M-ESI+		**Instr:** LCMS03				
Batch ID: W1K0910 **Preparation:** EPA 3535/SPE		**Prepared:** 11/11/21 12:13				**Analyst:** jna
Amoxicillin	ND	20	ng/l	1	11/11/21	

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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: W1J1912 - EPA 353.2										
Blank (W1J1912-BLK1)				**Prepared & Analyzed: 10/27/21**						
Nitrate as N	ND	0.15	mg/l							
LCS (W1J1912-BS1)				**Prepared & Analyzed: 10/27/21**						
Nitrate as N	1.00	0.15	mg/l	1.00		100	90-110			
Duplicate (W1J1912-DUP1)	**Source: 1J26124-03**			**Prepared & Analyzed: 10/27/21**						
Nitrate as N	ND	0.15	mg/l		ND				20	
Matrix Spike (W1J1912-MS1)	**Source: 1J26084-14**			**Prepared & Analyzed: 10/27/21**						
Nitrate as N	8.47	0.15	mg/l	2.00	6.46	100	90-110			
Matrix Spike (W1J1912-MS2)	**Source: 1J26091-01**			**Prepared & Analyzed: 10/27/21**						
Nitrate as N	6.59	0.15	mg/l	2.00	4.56	102	90-110			
Matrix Spike Dup (W1J1912-MSD1)	**Source: 1J26084-14**			**Prepared & Analyzed: 10/27/21**						
Nitrate as N	8.47	0.15	mg/l	2.00	6.46	100	90-110	0	20	
Matrix Spike Dup (W1J1912-MSD2)	**Source: 1J26091-01**			**Prepared & Analyzed: 10/27/21**						
Nitrate as N	6.59	0.15	mg/l	2.00	4.56	102	90-110	0	20	
Batch: W1J1942 - SM 5910B										
Blank (W1J1942-BLK1)				**Prepared & Analyzed: 10/27/21**						
UV 254	ND	0.009	1/cm							
LCS (W1J1942-BS1)				**Prepared & Analyzed: 10/27/21**						
UV 254	0.080	0.009	1/cm	0.0880		91	90-110			
Duplicate (W1J1942-DUP1)	**Source: 1J27009-01**			**Prepared & Analyzed: 10/27/21**						
UV 254	0.017	0.009	1/cm		0.017			0	10	
Batch: W1K0040 - EPA 350.1										
Blank (W1K0040-BLK1)				**Prepared: 11/01/21 Analyzed: 11/02/21**						
Ammonia as N	ND	0.10	mg/l							
Blank (W1K0040-BLK2)				**Prepared: 11/01/21 Analyzed: 11/02/21**						
Ammonia as N	ND	0.10	mg/l							
LCS (W1K0040-BS1)				**Prepared: 11/01/21 Analyzed: 11/02/21**						
Ammonia as N	0.236	0.10	mg/l	0.250		94	90-110			
LCS (W1K0040-BS2)				**Prepared: 11/01/21 Analyzed: 11/02/21**						
Ammonia as N	0.239	0.10	mg/l	0.250		95	90-110			
Matrix Spike (W1K0040-MS1)	**Source: 1J13001-01**			**Prepared: 11/01/21 Analyzed: 11/02/21**						
Ammonia as N	0.239	0.10	mg/l	0.250	ND	96	90-110			
Matrix Spike (W1K0040-MS2)	**Source: 1J15002-13**			**Prepared: 11/01/21 Analyzed: 11/02/21**						
Ammonia as N	0.574	0.10	mg/l	0.250	0.335	96	90-110			
Matrix Spike Dup (W1K0040-MSD1)	**Source: 1J13001-01**			**Prepared: 11/01/21 Analyzed: 11/02/21**						
Ammonia as N	0.241	0.10	mg/l	0.250	ND	96	90-110	0.7	15	
Matrix Spike Dup (W1K0040-MSD2)	**Source: 1J15002-13**			**Prepared: 11/01/21 Analyzed: 11/02/21**						
Ammonia as N	0.574	0.10	mg/l	0.250	0.335	96	90-110	0.08	15	

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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: W1K0134 - SM 2510B										
Blank (W1K0134-BLK1)				**Prepared: 11/02/21**	**Analyzed: 11/03/21**					
Specific Conductance (EC)	ND	2.0	umhos/cm							
LCS (W1K0134-BS1)				**Prepared: 11/02/21**	**Analyzed: 11/04/21**					
Specific Conductance (EC)	438	2.0	umhos/cm	445		98	95-105			
Duplicate (W1K0134-DUP1)	**Source: 1J26001-02**			**Prepared: 11/02/21**	**Analyzed: 11/03/21**					
Specific Conductance (EC)	4350	10	umhos/cm		4290			1	5	
Batch: W1K0468 - SM 5310B										
Blank (W1K0468-BLK1)				**Prepared: 11/05/21**	**Analyzed: 11/06/21**					
Total Organic Carbon (TOC)	ND	0.30	mg/l							
LCS (W1K0468-BS1)				**Prepared: 11/05/21**	**Analyzed: 11/06/21**					
Total Organic Carbon (TOC)	0.918	0.30	mg/l	1.00		92	85-115			
Matrix Spike (W1K0468-MS1)	**Source: 1H19005-02**			**Prepared: 11/05/21**	**Analyzed: 11/06/21**					
Total Organic Carbon (TOC)	9.78	0.30	mg/l	5.00	4.83	99	76-115			
Matrix Spike Dup (W1K0468-MSD1)	**Source: 1H19005-02**			**Prepared: 11/05/21**	**Analyzed: 11/08/21**					
Total Organic Carbon (TOC)	9.75	0.30	mg/l	5.00	4.83	98	76-115	0.3	20	

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: W1J2044 - EPA 1625M										
Blank (W1J2044-BLK1)				**Prepared: 10/29/21**	**Analyzed: 11/03/21**					
N-Nitrosodimethylamine	ND	2.0	ng/l							
LCS (W1J2044-BS1)				**Prepared: 10/29/21**	**Analyzed: 11/03/21**					
N-Nitrosodimethylamine	1.90	2.0	ng/l	2.00		95	50-150			
LCS Dup (W1J2044-BSD1)				**Prepared: 10/29/21**	**Analyzed: 11/03/21**					
N-Nitrosodimethylamine	1.90	2.0	ng/l	2.00		95	50-150	0	50	

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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: W1K0859 - EPA 1694M-APCI										
Blank (W1K0859-BLK1)				**Prepared: 11/11/21 Analyzed: 11/15/21**						
17-a-Ethynylestradiol	ND	4.0	ng/l							
17-b-Estradiol	ND	4.0	ng/l							
Estrone	ND	4.0	ng/l							
Progesterone	ND	4.0	ng/l							
Testosterone	ND	4.0	ng/l							
LCS (W1K0859-BS1)				**Prepared: 11/11/21 Analyzed: 11/15/21**						
17-a-Ethynylestradiol	33.3	4.0	ng/l	40.0		83	68-159			
17-b-Estradiol	34.7	4.0	ng/l	40.0		87	65-146			
Estrone	37.6	4.0	ng/l	40.0		94	59-141			
Progesterone	39.7	4.0	ng/l	40.0		99	58-154			
Testosterone	34.9	4.0	ng/l	40.0		87	60-172			
LCS Dup (W1K0859-BSD1)				**Prepared: 11/11/21 Analyzed: 11/15/21**						
17-a-Ethynylestradiol	48.5	4.0	ng/l	40.0		121	68-159	37	30	Q-12
17-b-Estradiol	44.9	4.0	ng/l	40.0		112	65-146	26	30	
Estrone	39.4	4.0	ng/l	40.0		98	59-141	5	30	
Progesterone	42.4	4.0	ng/l	40.0		106	58-154	6	30	
Testosterone	40.4	4.0	ng/l	40.0		101	60-172	15	30	
Batch: W1K1523 - EPA 1694M-APCI										
Blank (W1K1523-BLK1)				**Prepared: 11/22/21 Analyzed: 12/03/21**						
17-a-Ethynylestradiol	ND	4.0	ng/l							
17-b-Estradiol	ND	4.0	ng/l							
Estrone	ND	4.0	ng/l							
Progesterone	ND	4.0	ng/l							
Testosterone	ND	4.0	ng/l							
LCS (W1K1523-BS1)				**Prepared: 11/22/21 Analyzed: 12/03/21**						
17-a-Ethynylestradiol	47.7	4.0	ng/l	40.0		119	68-159			
17-b-Estradiol	52.4	4.0	ng/l	40.0		131	65-146			
Estrone	38.1	4.0	ng/l	40.0		95	59-141			
Progesterone	49.0	4.0	ng/l	40.0		122	58-154			
Testosterone	43.9	4.0	ng/l	40.0		110	60-172			
LCS Dup (W1K1523-BSD1)				**Prepared: 11/22/21 Analyzed: 12/03/21**						
17-a-Ethynylestradiol	39.4	4.0	ng/l	40.0		98	68-159	19	30	
17-b-Estradiol	42.6	4.0	ng/l	40.0		106	65-146	21	30	
Estrone	36.4	4.0	ng/l	40.0		91	59-141	4	30	
Progesterone	50.2	4.0	ng/l	40.0		125	58-154	2	30	
Testosterone	42.4	4.0	ng/l	40.0		106	60-172	3	30	
Duplicate (W1K1523-DUP1)	**Source: 1J28053-03**			**Prepared: 11/22/21 Analyzed: 12/03/21**						
17-a-Ethynylestradiol	ND	4.0	ng/l		ND				30	

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Quality Control Results

(Continued)

PPCPs - Hormones by LC/MSMS-APCI (Continued)

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W1K1523 - EPA 1694M-APCI (Continued)										
Duplicate (W1K1523-DUP1)	**Source: 1J28053-03**			**Prepared: 11/22/21**	**Analyzed: 12/03/21**					
17-b-Estradiol	ND	4.0	ng/l		ND				30	
Estrone	ND	4.0	ng/l		ND				30	
Progesterone	ND	4.0	ng/l		ND				30	
Testosterone	ND	4.0	ng/l		ND				30	

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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: W1K0858 - EPA 1694M-ESI-										
Blank (W1K0858-BLK1)				**Prepared: 11/11/21 Analyzed: 11/15/21**						
Bisphenol A	33.8	4.0	ng/l							B
Diclofenac	ND	4.0	ng/l							
Gemfibrozil	ND	4.0	ng/l							
Ibuprofen	ND	4.0	ng/l							
Iopromide	ND	4.0	ng/l							
Naproxen	ND	4.0	ng/l							
Salicylic Acid	ND	100	ng/l							
Triclosan	ND	8.0	ng/l							
LCS (W1K0858-BS1)				**Prepared: 11/11/21 Analyzed: 11/15/21**						
Bisphenol A	88.1	4.0	ng/l	40.0		220	53-168			BS-H
Diclofenac	34.5	4.0	ng/l	40.0		86	37-218			
Gemfibrozil	38.3	4.0	ng/l	40.0		96	76-122			
Ibuprofen	43.9	4.0	ng/l	40.0		110	67-139			
Iopromide	281	4.0	ng/l	40.0		703	0.1-163			Q-08
Naproxen	50.0	4.0	ng/l	40.0		125	64-138			
Salicylic Acid	1120	100	ng/l	1000		112	56-229			
Triclosan	74.1	8.0	ng/l	80.0		93	76-139			
LCS Dup (W1K0858-BSD1)				**Prepared: 11/11/21 Analyzed: 11/15/21**						
Bisphenol A	108	4.0	ng/l	40.0		269	53-168	20	30	BS-H
Diclofenac	41.0	4.0	ng/l	40.0		103	37-218	17	30	
Gemfibrozil	45.9	4.0	ng/l	40.0		115	76-122	18	30	
Ibuprofen	59.0	4.0	ng/l	40.0		148	67-139	29	30	BS-04
Iopromide	674	4.0	ng/l	40.0		NR	0.1-163	82	30	Q-08
Naproxen	54.8	4.0	ng/l	40.0		137	64-138	9	30	
Salicylic Acid	1300	100	ng/l	1000		130	56-229	15	30	
Triclosan	62.3	8.0	ng/l	80.0		78	76-139	17	30	
Batch: W1K1527 - EPA 1694M-ESI-										
Blank (W1K1527-BLK1)				**Prepared: 11/22/21 Analyzed: 12/03/21**						
Bisphenol A	63.4	4.0	ng/l							B
Diclofenac	ND	4.0	ng/l							
Gemfibrozil	ND	4.0	ng/l							
Ibuprofen	ND	4.0	ng/l							
Iopromide	ND	4.0	ng/l							
Naproxen	ND	4.0	ng/l							
Salicylic Acid	ND	100	ng/l							
Triclosan	ND	8.0	ng/l							
LCS (W1K1527-BS1)				**Prepared: 11/22/21 Analyzed: 12/03/21**						
Bisphenol A	127	4.0	ng/l	40.0		317	53-150			BS-H

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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: W1K1527 - EPA 1694M-ESI- (Continued)										
LCS (W1K1527-BS1)				**Prepared: 11/22/21**	**Analyzed: 12/03/21**					
Diclofenac	62.2	4.0	ng/l	40.0		155	50-150			BS-04
Gemfibrozil	40.5	4.0	ng/l	40.0		101	76-122			
Ibuprofen	76.1	4.0	ng/l	40.0		190	67-139			BS-H
Iopromide	218	4.0	ng/l	40.0		544	50-150			Q-08
Naproxen	75.7	4.0	ng/l	40.0		189	64-138			BS-H
Salicylic Acid	1190	100	ng/l	1000		119	56-150			
Triclosan	91.7	8.0	ng/l	80.0		115	76-139			
LCS Dup (W1K1527-BSD1)				**Prepared: 11/22/21**	**Analyzed: 12/03/21**					
Bisphenol A	76.6	4.0	ng/l	40.0		191	53-150	49	25	BS-H
Diclofenac	53.5	4.0	ng/l	40.0		134	50-150	15	25	
Gemfibrozil	42.8	4.0	ng/l	40.0		107	76-122	6	25	
Ibuprofen	64.2	4.0	ng/l	40.0		161	67-139	17	25	BS-H
Iopromide	245	4.0	ng/l	40.0		614	50-150	12	25	Q-08
Naproxen	68.7	4.0	ng/l	40.0		172	64-138	10	25	BS-H
Salicylic Acid	1190	100	ng/l	1000		119	56-150	0.3	25	
Triclosan	79.4	8.0	ng/l	80.0		99	76-139	14	25	
Duplicate (W1K1527-DUP1)	**Source: 1J28053-04**			**Prepared: 11/22/21**	**Analyzed: 12/03/21**					
Bisphenol A	11.9	4.0	ng/l		81.3			149	35	B, BS-H
Diclofenac	ND	4.0	ng/l		23.2			200	35	R-03
Gemfibrozil	ND	4.0	ng/l		6.34			200	35	R-03
Ibuprofen	ND	4.0	ng/l		6.87			200	35	R-03
Iopromide	ND	4.0	ng/l		ND				35	
Naproxen	ND	4.0	ng/l		13.7			200	35	R-03
Salicylic Acid	ND	100	ng/l		ND				35	
Triclosan	ND	8.0	ng/l		ND				35	

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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: W1K0857 - EPA 1694M-ESI+										
Blank (W1K0857-BLK1)				**Prepared: 11/11/21 Analyzed: 11/12/21**						
Acetaminophen	ND	5.0	ng/l							
Atenolol	ND	4.0	ng/l							
Atorvastatin	ND	4.0	ng/l							
Azithromycin	ND	20	ng/l							
Caffeine	ND	4.0	ng/l							
Carbamazepine	ND	4.0	ng/l							
Ciprofloxacin	55.3	20	ng/l							B
Cotinine	ND	8.0	ng/l							
DEET	ND	4.0	ng/l							
Diazepam	ND	4.0	ng/l							
Fluoxetine	ND	4.0	ng/l							
Meprobamate	ND	4.0	ng/l							
Methadone	ND	4.0	ng/l							
Oxybenzone	ND	4.0	ng/l							
Praziquantel	ND	4.0	ng/l							
Quinoline	ND	4.0	ng/l							
Sulfamethoxazole	ND	4.0	ng/l							
TCEP	ND	10	ng/l							
TCPP	ND	50	ng/l							
Trimethoprim	ND	4.0	ng/l							
Blank (W1K0857-BLK2)				**Prepared: 11/11/21 Analyzed: 11/15/21**						
Galaxolide (HHCB)	ND	40	ng/l							QC-2
Phenytoin (Dilantin)	ND	4.0	ng/l							QC-2
Primidone	ND	4.0	ng/l							QC-2
Sucralose	ND	20	ng/l							QC-2
TDCPP	ND	50	ng/l							QC-2
LCS (W1K0857-BS1)				**Prepared: 11/11/21 Analyzed: 11/12/21**						
Acetaminophen	43.0	5.0	ng/l	50.0		86	66-156			
Atenolol	41.4	4.0	ng/l	40.0		104	56-164			
Atorvastatin	37.3	4.0	ng/l	40.0		93	0.1-173			
Azithromycin	184	20	ng/l	200		92	52-166			
Caffeine	36.6	4.0	ng/l	40.0		91	55-152			
Carbamazepine	41.5	4.0	ng/l	40.0		104	60-135			
Ciprofloxacin	224	20	ng/l	200		112	51-168			
Cotinine	78.6	8.0	ng/l	80.0		98	68-155			
DEET	39.3	4.0	ng/l	40.0		98	45-135			
Diazepam	31.7	4.0	ng/l	40.0		79	58-127			
Fluoxetine	35.9	4.0	ng/l	40.0		90	55-150			
Meprobamate	46.8	4.0	ng/l	40.0		117	11-166			

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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: W1K0857 - EPA 1694M-ESI+ (Continued)										
LCS (W1K0857-BS1)				**Prepared: 11/11/21 Analyzed: 11/12/21**						
Methadone	40.2	4.0	ng/l	40.0		101	62-137			
Oxybenzone	27.6	4.0	ng/l	40.0		69	50-150			
Praziquantel	39.5	4.0	ng/l	40.0		99	50-150			
Quinoline	27.0	4.0	ng/l	40.0		68	50-150			
Sulfamethoxazole	41.8	4.0	ng/l	40.0		104	60-133			
TCEP	103	10	ng/l	100		103	25-149			
TCPP	466	50	ng/l	500		93	24-149			
Trimethoprim	39.1	4.0	ng/l	40.0		98	67-139			
LCS (W1K0857-BS2)				**Prepared: 11/11/21 Analyzed: 11/15/21**						
Galaxolide (HHCB)	244	40	ng/l	400		61	50-150			QC-2
Phenytoin (Dilantin)	35.1	4.0	ng/l	40.0		88	69-138			QC-2
Primidone	40.3	4.0	ng/l	40.0		101	54-147			QC-2
Sucralose	200	20	ng/l	200		100	50-150			QC-2
TDCPP	723	50	ng/l	500		145	20-158			QC-2
LCS Dup (W1K0857-BSD1)				**Prepared: 11/11/21 Analyzed: 11/12/21**						
Acetaminophen	42.8	5.0	ng/l	50.0		86	66-156	0.5	30	
Atenolol	38.6	4.0	ng/l	40.0		96	56-164	7	30	
Atorvastatin	37.4	4.0	ng/l	40.0		94	0.1-173	0.3	30	
Azithromycin	197	20	ng/l	200		98	52-166	7	30	
Caffeine	38.1	4.0	ng/l	40.0		95	55-152	4	30	
Carbamazepine	41.5	4.0	ng/l	40.0		104	60-135	0.03	30	
Ciprofloxacin	208	20	ng/l	200		104	51-168	7	30	
Cotinine	78.5	8.0	ng/l	80.0		98	68-155	0.2	30	
DEET	46.1	4.0	ng/l	40.0		115	45-135	16	30	
Diazepam	40.8	4.0	ng/l	40.0		102	58-127	25	30	
Fluoxetine	40.0	4.0	ng/l	40.0		100	55-150	11	30	
Meprobamate	87.4	4.0	ng/l	40.0		218	11-166	60	30	BS-04
Methadone	38.7	4.0	ng/l	40.0		97	62-137	4	30	
Oxybenzone	31.6	4.0	ng/l	40.0		79	50-150	14	30	
Praziquantel	41.3	4.0	ng/l	40.0		103	50-150	4	30	
Quinoline	25.6	4.0	ng/l	40.0		64	50-150	6	30	
Sulfamethoxazole	40.8	4.0	ng/l	40.0		102	60-133	2	30	
TCEP	109	10	ng/l	100		109	25-149	6	30	
TCPP	519	50	ng/l	500		104	24-149	11	30	
Trimethoprim	35.7	4.0	ng/l	40.0		89	67-139	9	30	
LCS Dup (W1K0857-BSD2)				**Prepared: 11/11/21 Analyzed: 11/15/21**						
Galaxolide (HHCB)	257	40	ng/l	400		64	50-150	5	30	QC-2
Phenytoin (Dilantin)	35.9	4.0	ng/l	40.0		90	69-138	2	30	QC-2
Primidone	41.5	4.0	ng/l	40.0		104	54-147	3	30	QC-2

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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: W1K0857 - EPA 1694M-ESI+ (Continued)										
LCS Dup (W1K0857-BSD2)				**Prepared: 11/11/21 Analyzed: 11/15/21**						
Sucralose	206	20	ng/l	200		103	50-150	3	30	QC-2
TDCPP	745	50	ng/l	500		149	20-158	3	30	QC-2
Batch: W1K0910 - EPA 1694M-ESI+										
Blank (W1K0910-BLK1)				**Prepared & Analyzed: 11/11/21**						
Amoxicillin	ND	20	ng/l							
LCS (W1K0910-BS1)				**Prepared & Analyzed: 11/11/21**						
Amoxicillin	192	20	ng/l	200		96	14-167			
LCS Dup (W1K0910-BSD1)				**Prepared & Analyzed: 11/11/21**						
Amoxicillin	158	20	ng/l	200		79	14-167	20	30	
Batch: W1K1525 - EPA 1694M-ESI+										
Blank (W1K1525-BLK1)				**Prepared: 11/22/21 Analyzed: 11/29/21**						
Acetaminophen	ND	5.0	ng/l							
Atenolol	ND	4.0	ng/l							
Atorvastatin	ND	4.0	ng/l							
Azithromycin	ND	20	ng/l							
Caffeine	ND	4.0	ng/l							
Carbamazepine	ND	4.0	ng/l							
Ciprofloxacin	26.7	20	ng/l							B-06
Cotinine	ND	8.0	ng/l							
DEET	ND	4.0	ng/l							
Diazepam	ND	4.0	ng/l							
Fluoxetine	ND	4.0	ng/l							
Meprobamate	ND	4.0	ng/l							
Methadone	ND	4.0	ng/l							
Sulfamethoxazole	ND	4.0	ng/l							
TCEP	ND	10	ng/l							
TCPP	ND	50	ng/l							
Trimethoprim	ND	4.0	ng/l							
Blank (W1K1525-BLK2)				**Prepared: 11/22/21 Analyzed: 12/03/21**						
Phenytoin (Dilantin)	ND	4.0	ng/l							QC-2
Primidone	ND	4.0	ng/l							QC-2
Sucralose	ND	20	ng/l							QC-2
TDCPP	ND	50	ng/l							QC-2
LCS (W1K1525-BS1)				**Prepared: 11/22/21 Analyzed: 11/29/21**						
Acetaminophen	52.9	5.0	ng/l	50.0		106	66-156			
Atenolol	40.2	4.0	ng/l	40.0		101	56-164			
Atorvastatin	61.0	4.0	ng/l	40.0		152	0.1-173			
Azithromycin	182	20	ng/l	200		91	52-166			

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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: W1K1525 - EPA 1694M-ESI+ (Continued)										
LCS (W1K1525-BS1)				**Prepared: 11/22/21 Analyzed: 11/29/21**						
Caffeine	56.8	4.0	ng/l	40.0		142	55-152			
Carbamazepine	44.9	4.0	ng/l	40.0		112	60-135			
Ciprofloxacin	205	20	ng/l	200		102	51-168			
Cotinine	87.6	8.0	ng/l	80.0		110	68-155			
DEET	52.7	4.0	ng/l	40.0		132	45-135			
Diazepam	46.1	4.0	ng/l	40.0		115	58-127			
Fluoxetine	37.7	4.0	ng/l	40.0		94	55-150			
Meprobamate	48.4	4.0	ng/l	40.0		121	11-166			
Methadone	41.1	4.0	ng/l	40.0		103	62-137			
Sulfamethoxazole	48.6	4.0	ng/l	40.0		121	60-133			
TCEP	91.2	10	ng/l	100		91	25-149			
TCPP	717	50	ng/l	500		143	24-149			
Trimethoprim	43.3	4.0	ng/l	40.0		108	67-139			
LCS (W1K1525-BS2)				**Prepared: 11/22/21 Analyzed: 12/03/21**						
Phenytoin (Dilantin)	38.1	4.0	ng/l	40.0		95	69-138			QC-2
Primidone	41.3	4.0	ng/l	40.0		103	54-147			QC-2
Sucralose	214	20	ng/l	200		107	50-150			QC-2
TDCPP	662	50	ng/l	500		132	20-158			QC-2
LCS Dup (W1K1525-BSD1)				**Prepared: 11/22/21 Analyzed: 11/29/21**						
Acetaminophen	46.8	5.0	ng/l	50.0		94	66-156	12	30	
Atenolol	37.0	4.0	ng/l	40.0		92	56-164	8	30	
Atorvastatin	48.0	4.0	ng/l	40.0		120	0.1-173	24	30	
Azithromycin	191	20	ng/l	200		96	52-166	5	30	
Caffeine	44.2	4.0	ng/l	40.0		110	55-152	25	30	
Carbamazepine	37.2	4.0	ng/l	40.0		93	60-135	19	30	
Ciprofloxacin	212	20	ng/l	200		106	51-168	3	30	
Cotinine	84.3	8.0	ng/l	80.0		105	68-155	4	30	
DEET	46.0	4.0	ng/l	40.0		115	45-135	13	30	
Diazepam	45.5	4.0	ng/l	40.0		114	58-127	1	30	
Fluoxetine	36.8	4.0	ng/l	40.0		92	55-150	3	30	
Meprobamate	44.2	4.0	ng/l	40.0		110	11-166	9	30	
Methadone	40.4	4.0	ng/l	40.0		101	62-137	2	30	
Sulfamethoxazole	45.2	4.0	ng/l	40.0		113	60-133	7	30	
TCEP	94.3	10	ng/l	100		94	25-149	3	30	
TCPP	705	50	ng/l	500		141	24-149	2	30	
Trimethoprim	42.0	4.0	ng/l	40.0		105	67-139	3	30	
LCS Dup (W1K1525-BSD2)				**Prepared: 11/22/21 Analyzed: 12/03/21**						
Phenytoin (Dilantin)	36.2	4.0	ng/l	40.0		90	69-138	5	30	QC-2
Primidone	40.4	4.0	ng/l	40.0		101	54-147	2	30	QC-2

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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: W1K1525 - EPA 1694M-ESI+ (Continued)										
LCS Dup (W1K1525-BSD2)				**Prepared: 11/22/21**	**Analyzed: 12/03/21**					
Sucralose	207	20	ng/l	200		104	50-150	3	30	QC-2
TDCPP	697	50	ng/l	500		139	20-158	5	30	QC-2
Batch: W1K1806 - EPA 1694M-ESI+										
Blank (W1K1806-BLK1)				**Prepared: 11/23/21**	**Analyzed: 11/24/21**					
Amoxicillin	ND	20	ng/l							
LCS (W1K1806-BS1)				**Prepared: 11/23/21**	**Analyzed: 11/24/21**					
Amoxicillin	199	20	ng/l	200		99	14-167			
LCS Dup (W1K1806-BSD1)				**Prepared: 11/23/21**	**Analyzed: 11/24/21**					
Amoxicillin	205	20	ng/l	200		102	14-167	3	30	

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

Project Number: Los Osos Groundwater CECs

Project Manager: Spencer Harris

Reported: 01/03/2022 08:29

Notes and Definitions

Item	Definition
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.
E-01	The concentration indicated for this analyte is an estimated value above the calibration range.
Q-08	High bias in the QC sample does not affect sample result since analyte was not detected or below the reporting limit.
Q-12	The RPD result exceeded the QC control limits; however, both percent recoveries were acceptable. Sample results for the QC batch were accepted based on the percent recoveries and/or other acceptable QC data.
QC-2	This QC sample was reanalyzed to complement samples that require re-analysis on different date. See analysis date.
R-03	The RPD is not applicable for result below the reporting limit (either ND or J value).
%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 E

Field Methods

Groundwater Level Measurement Procedures for the Los Osos Basin Plan Groundwater Monitoring Program

Introduction

This document establishes procedures for measuring and recording groundwater levels for the Los Osos Basin Plan (LOBP) Groundwater Monitoring Program, and describes various methods used for collecting meaningful groundwater data.

Static groundwater levels obtained for the LOBP Groundwater Monitoring Program are determined by measuring the distance to water in a non-pumping well from a reference point that has been referenced to sea level. Subtracting the distance to water from the elevation of the reference point determines groundwater surface elevations above or below sea level. This is represented by the following equation:

$$E_{GW} = E_{RP} - D$$

Where:

E_{GW} = Elevation of groundwater above mean sea level (feet)
E_{RP} = Elevation above sea level at reference point (feet)
D = Depth to water (feet)

References

Procedures for obtaining and reporting water level data for the LOBP Groundwater Monitoring Program are based on a review of the following documents.

- State of California, Department of Water Resources, 2010, *Groundwater Elevation Monitoring Guidelines*, prepared for use in the California Statewide Groundwater Elevation Monitoring (CASGEM) program, December. 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: **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

Non-equipped wells

1) Calibrate field monitoring instruments each day prior to sampling;
2) Inspect wellhead condition and note any maintenance required (perform at earliest convenience);
3) Measure depth to static water (record to 0.01 inches) from surveyed reference point;
4) Install temporary purge pump to at least three feet below the water surface (deeper setting may be needed if water level draw down is too great);
5) Begin well purge, record flow rate;
6) Measure discharge water EC (measured to 10 µmhos/cm), pH (measured to 0.01 units), and temperature (measured to 0.1 degrees C) at regular intervals during well purging. Record time and gallons purged. Note discharge water color, odor, and turbidity (visual);
7) A minimum of three casing volumes of water should be removed during purging, or one borehole volume opposite perforated interval, whichever is greater*. In addition, a set of at least three consecutive field monitoring measurements with stable values should be recorded. For EC, stability within 5 percent of the first value in the set is sufficient (typically within 20-50 µmhos/cm). For pH, stability within 0.3 units is sufficient. For temperature, stability within 0.2 degrees C is sufficient;
8) Collect sample directly from discharge tube, note sample color, odor, turbidity (visual). Use only laboratory-provided containers. Wear powder-free nitrile gloves when collecting groundwater samples;
9) Place samples on-ice for transport to the laboratory;
10) Remove temporary pump and rinse with clean water;
11) Close well and secure well box lid;

*note: If well is pumped dry at the minimum pumping rate, the well may be allowed to recover and then sampled by bailer within 24 hours.

Equipped wells

The sampling port for an equipped well must be upstream of any water filtration or chemical feeds. Sample from the discharge line as close to the wellhead as possible. Sampling procedures for equipped wells will vary. For active wells (i.e. wells used daily), the need for purging three casing volumes is unnecessary. Flush supply line from well or holding tank to sampling port, and record one set of EC, pH, and temperature readings prior to sampling. For inactive wells, a field monitoring procedure similar to that described for non-equipped wells above is appropriate. Static water level measurements should also be taken before sampling. Water samples should always be transported on-ice to the laboratory.

Chain-of-Custody

The chain-of-custody and associated sample bottle labels are used to document sample identification, specify the analyses to be performed, and trace possession and handling of a sample from the time of collection through delivery to the analytical laboratory. The sampler should fill out the sample identification labels and affix them to the sample bottles prior to, or upon, sample collection. A chain-of-custody form should be filled out by the sampler and a signature and date/time of sample transfers are required for each relinquishing and receiving party between sample collection and laboratory delivery.

Groundwater Sampling Equipment Decontamination

Field equipment should be cleaned prior to the sampling event and between sampling locations. Sampling pumps and hand bailers should be brushed with a nylon-bristle brush using a solution of 0.1 to 0.2-percent (volume/volume) non-phosphate soap in municipal-source tap water. The equipment should then be triple-rinsed with deionized water. Purge the pump hose of well water between sampling locations by pumping deionized through the hose. Groundwater sampling equipment should be protected from contact with the ground, or other potentially contaminating materials, at all times.

Special procedures for sampling for CEC compounds from unequipped well:

1) A new, teflon-lined polyethylene discharge hose or bailer will be used at each unequipped well sampling location;
2) The sampling pump will be decontaminated prior to each well sampled: Decontamination will consist of brushing pump body, inlet screen, and submerged portion of power cable in a phosphate-free cleaning solution, followed by rinsing, pumping distilled water, and final rinse;

3) Personnel collecting the sample will use powder-free nitrile gloves and observe special precautions for testing as directed by the laboratory (such as no caffeinated drink consumption on day of sampling, standing downwind of sampling port during sample collection, double-bag sample bottles, etc.);

4) Equipment blanks of distilled water pumped through the sampling pump are recommended;

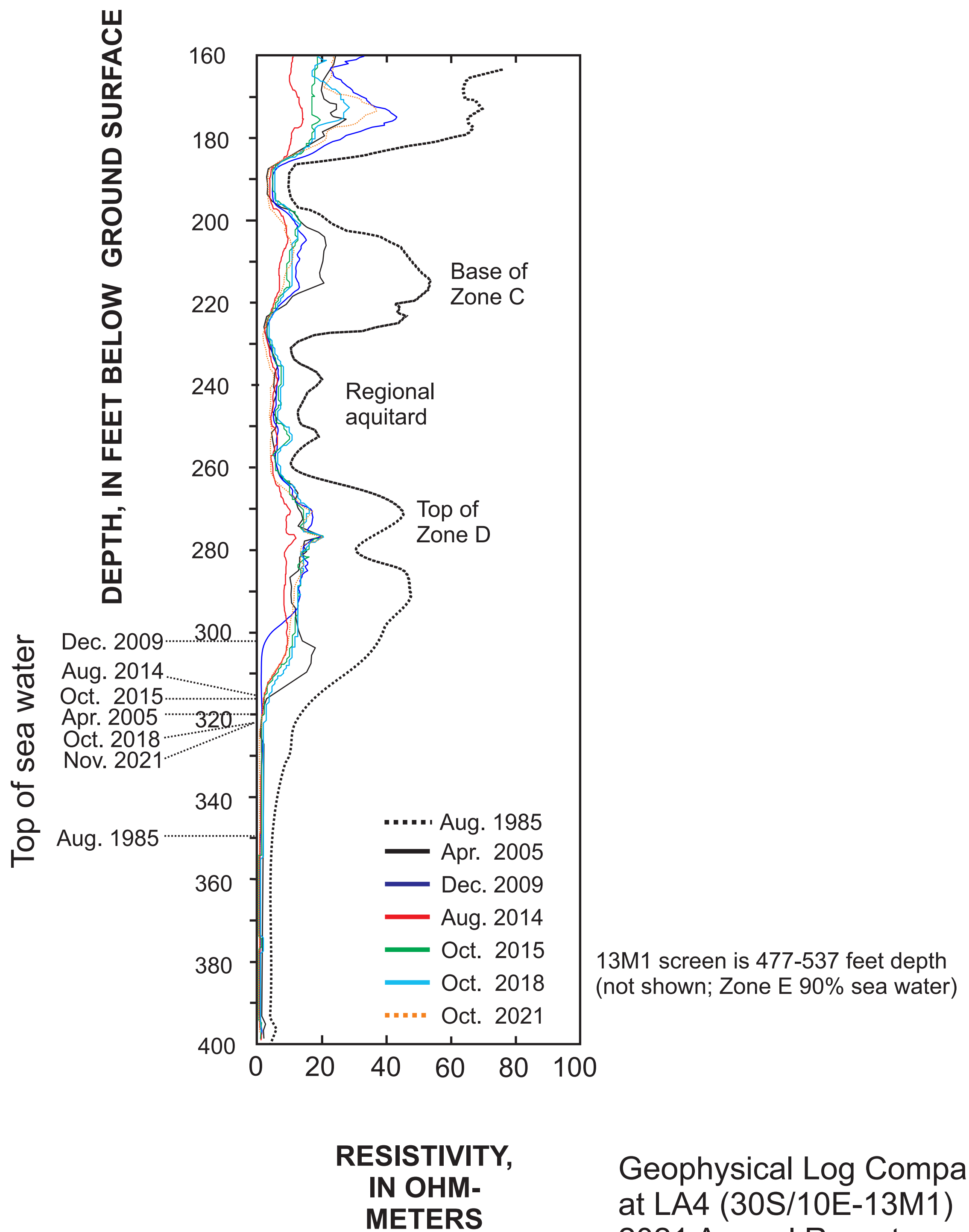
5) A clean water/travel blank of distilled water (from the same source used for pump decontamination) is recommended.

APPENDIX F

Geophysics at LA4
Geophysics at LA14
Geophysics at LA40

LA4 GEOPHYSICS

Well 30S/10E-13M1



Geophysical Log Comparison
at LA4 (30S/10E-13M1)
2021 Annual Report
Los Osos BMC

Cleath-Harris Geologists

U.S. GEOLOGICAL SURVEY

GAMMA, SINGLE POINT, RESISTIVITY LOG

Well No. (USGS): TH #1
(Other): T30S R10E Sec 13M1
Digital Identifiers:

DATE: 18 March 85
LOCATION: State: California County: SANLuis Obispo

LOGGING INFORMATION

Operator(s): USGS McCullough
Equipment Address: DFC Denver
Logger Type: 37.0 No: 2
TOOL LENGTH - Cable head to gamma: 29 ft.
Resistivity: 37 ft.
Resistance and SP: ft.
Logging Speed: ft./min. up down (circle one)
Vertical Log Scale: ft./in.

MODULE SETTINGS

GAMMA

Scale Switch(rate): 20 cps/div. Displacement:
Time Constant: 3 sec. Channel: Pen:
Full Scale: cps

RESISTIVITY ~~Scale~~ scale #1 15K shr

Scale Switch 0-50 ohm-m/~~div~~ ½ Channel: Pen: 2 Red Ing
Full Scale: ohm-meters

SINGLE POINT RESISTANCE

Scale Switch: ohms/div. Displacement:
Channel: Pen:
Full Scale: ohms

SPONTANEOUS POTENTIAL

Scale Switch: mv/div. Bias: mv
Polarity: Plus Minus (circle one)
Channel: Pen:
Full Scale: millivolts
Remarks:

WELL INFORMATION

Agency or Owner: US Geol Survey
Address:

Altitude: L.S.: M.P.:
Measuring Point:
Btm log interval: ft. Top log interval: ft
Well TD: ft. Log TD: ft
Casing:
I.D. , from to , type
I.D. , from to , type

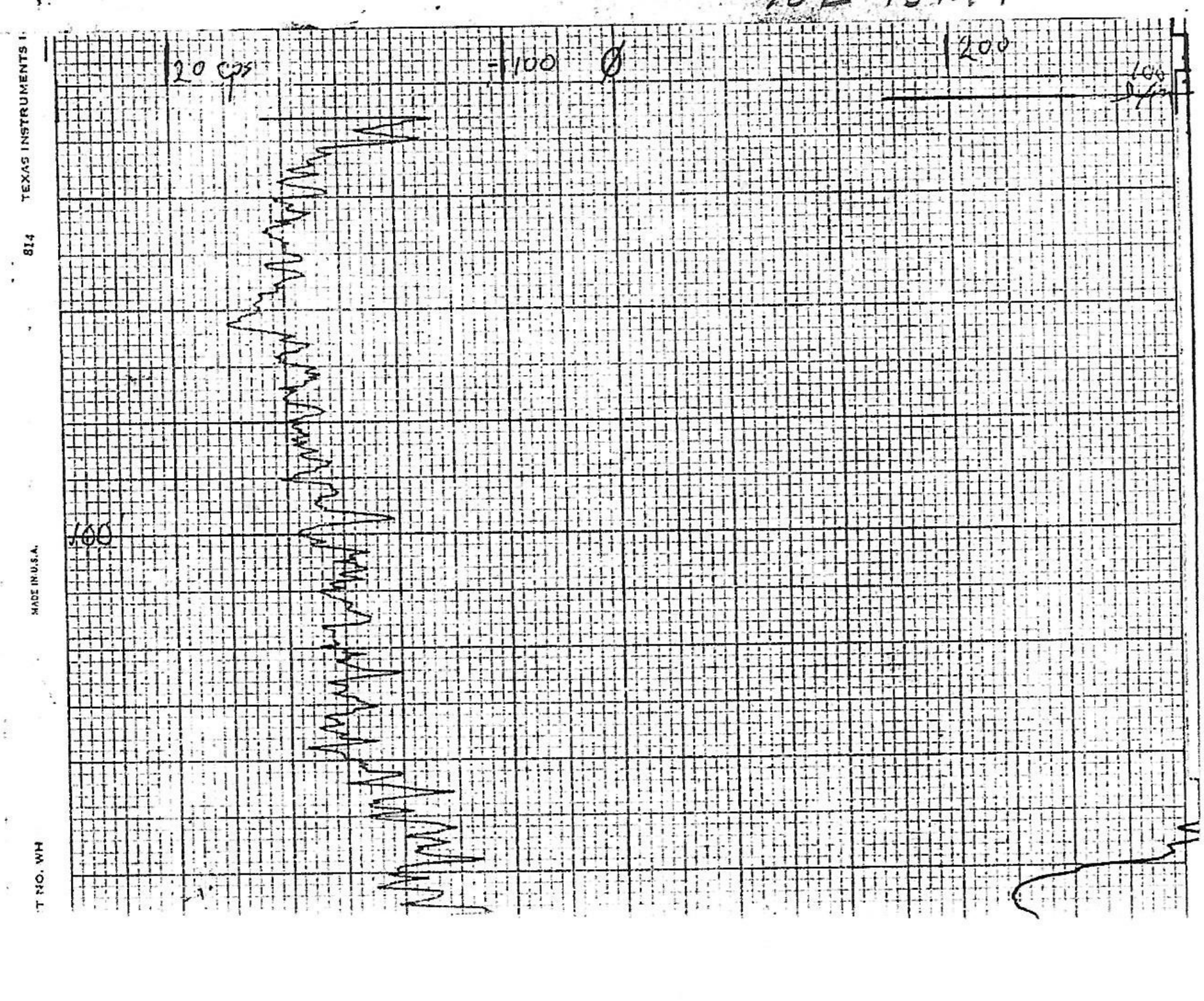
Perf. Interval(s): from to , type
from to , type

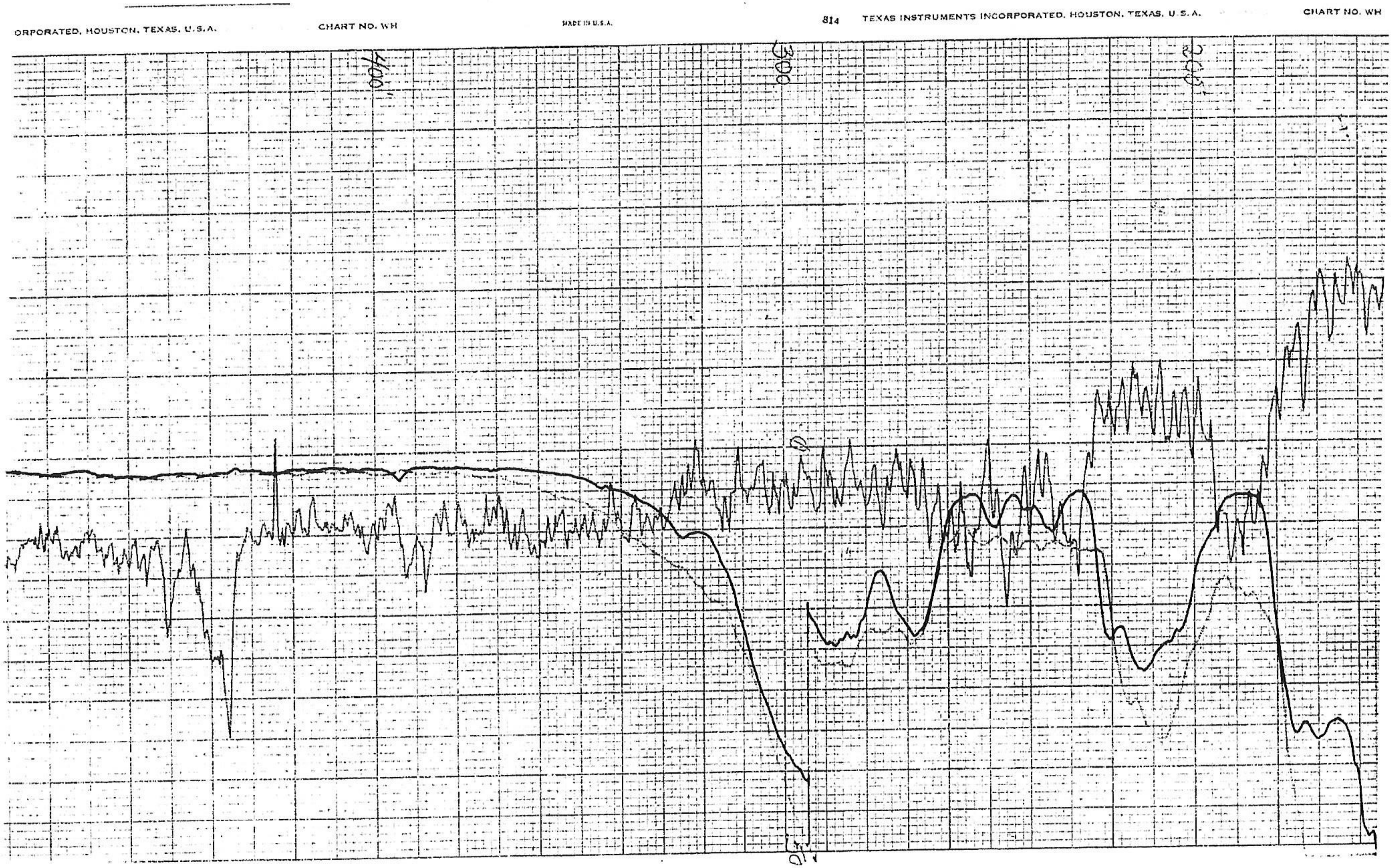
Open-hole diameter: from to
Cement: from to type
Fluid Level: ft. Above / At / Below L.S. / M.P. Temp.: °F, °C
Fluid Resist.: ohm-m Filtrate Resist.: ohm-m
Driller:
Address:

Aquifer information:
Other data and logs available for this well:

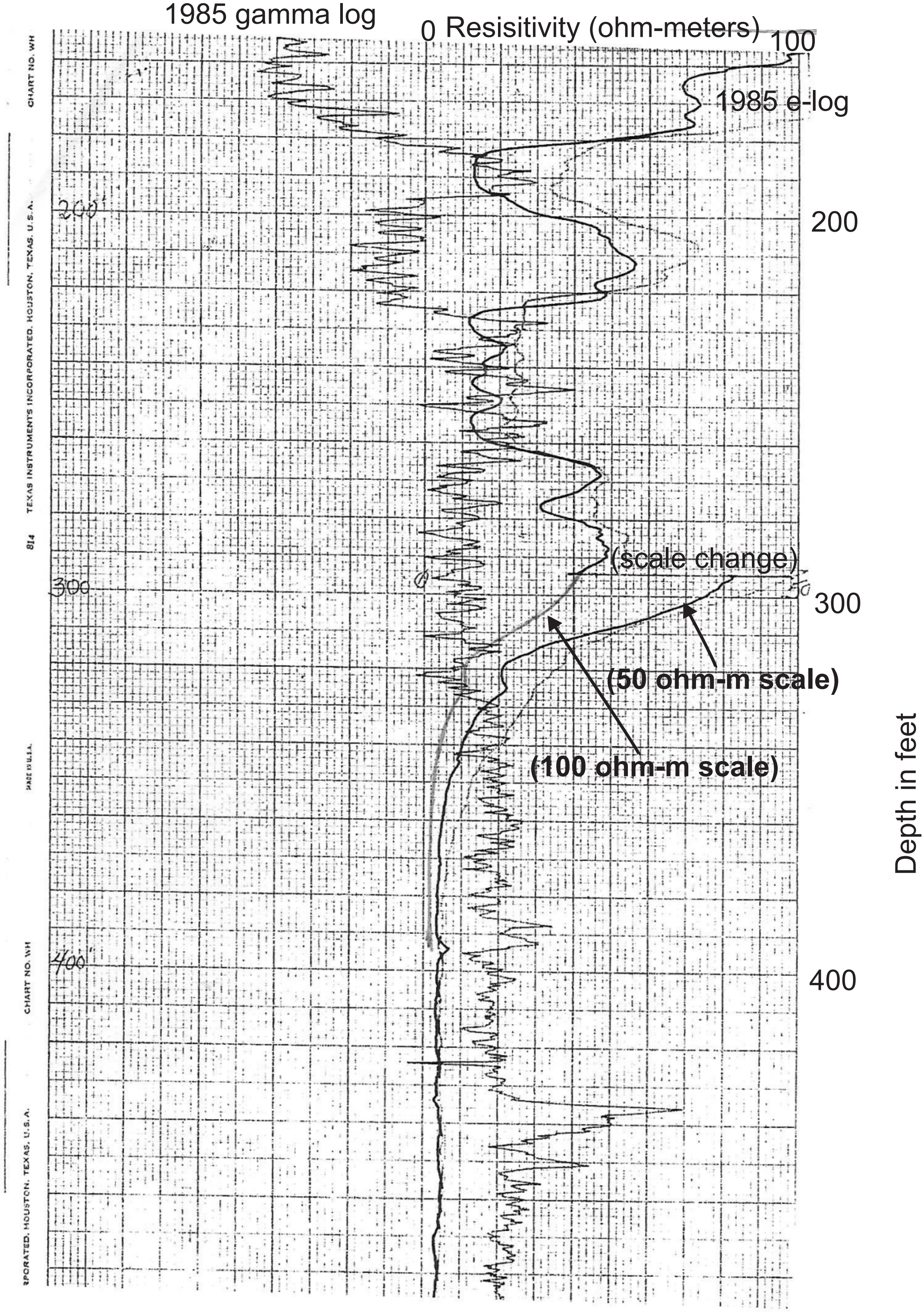
NOTE: This log is not to be used to fulfill private contractual obligations.

10E 13M1





ORPORATED, HOUSTON, TEXAS, U.S.A.
CHART NO. WH
MADE IN U.S.A.
814
TEXAS INSTRUMENTS INCORPORATED, HOUSTON, TEXAS, U.S.A.
CHART NO. WH
400'
300
200'
0
150

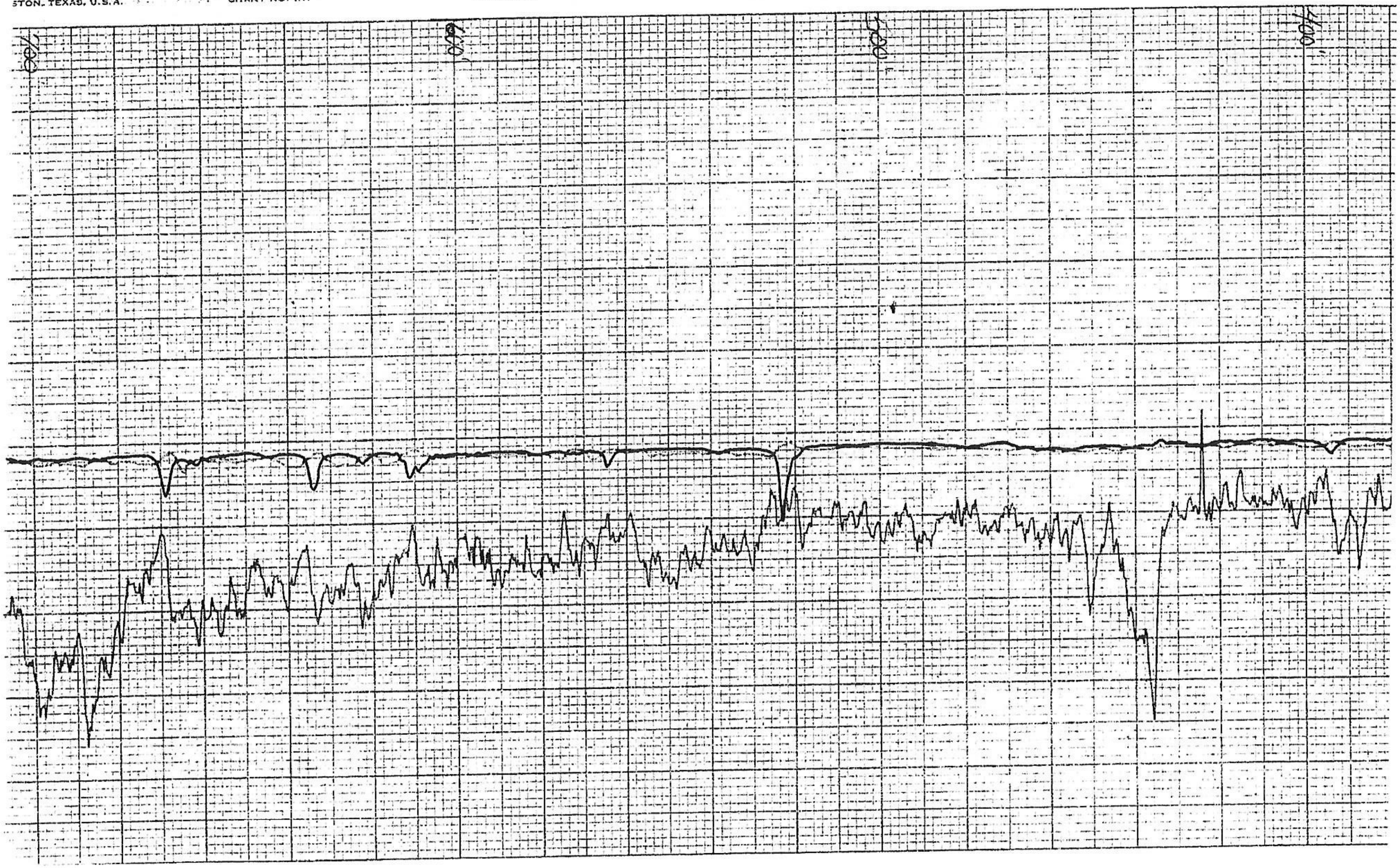


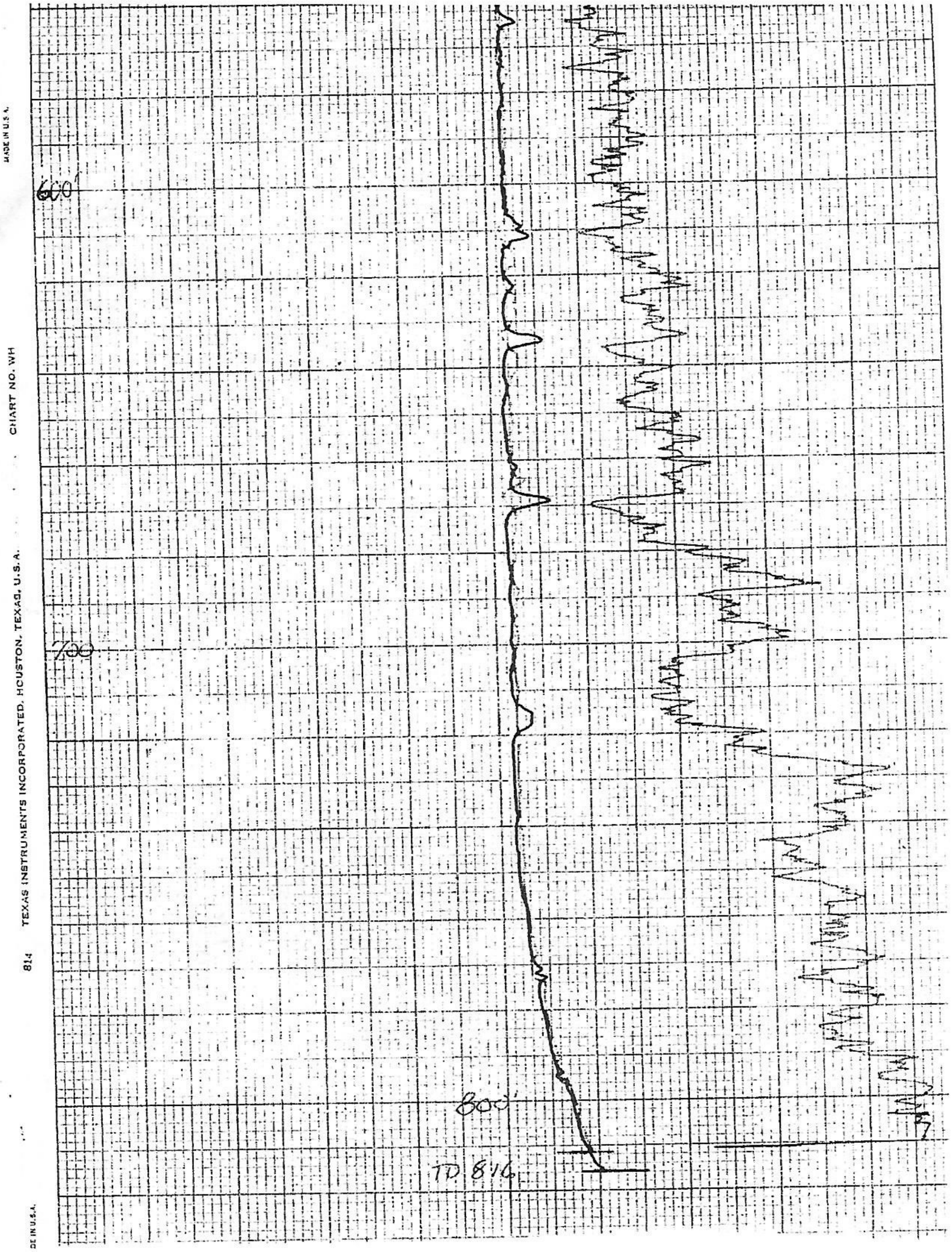
DATE: March 19, 1985

Page annotated by CHG to
highlight resistivity scale change

1985 Geophysics
LA4 (30S/10E-13M1)

STON, TEXAS, U.S.A. CHART NO. WH MADE IN U.S.A. 814 TEXAS INSTRUMENTS INCORPORATED, HOUSTON, TEXAS, U.S.A. CHART NO. WH




814 TEXAS INSTRUMENTS INCORPORATED, HOUSTON, TEXAS, U.S.A.
CHART NO. WH
MADE IN U.S.A.
600'
700
800'
TD 816

welenco

5201 Woodmere Drive, Bakersfield, CA 93313-- www.welenco.com--(800) 445-9914

INDUCTION / GAMMA RAY LOGS

FILING NO.

JOB NO. 4301

COMPANY: Cleath & Associates
WELL: 30S / 10E - 13M1
FIELD: Los Osos
STATE: California COUNTY: San Luis Obispo

LOCATION:

SEC: ____ TWP: ____ RGE: ____ LONG.: ____ LAT.: ____

OTHER SERVICES: None

Permanent Datum: ____, Elev. ____ Ft.
Log Measured From: Top Of Casing, 0 Ft. Above Perm. Datum
Drilling Measured From: ____

Elev.: K.B. ____ Ft.
D.F. ____ Ft.
G.L. ____ Ft.

Date	Apr. 14, 2005	Apr. 14, 2005		
Type Of Log	Induction	Gamma Ray		
Run No.	One	Two	Three	Four
Depth-Driller	550 Ft	550 Ft	Ft	Ft
Depth-Logger	539 Ft	539 Ft	Ft	Ft
Top Logged Interval	0 Ft	0 Ft	Ft	Ft
Btm. Logged Interval	538 Ft	539 Ft	Ft	Ft
Type Fluid In Hole	Water	Water		
Fluid Level	N/A Ft	N/A Ft	Ft	Ft
Max Temp	N/A °F	N/A °F	°F	°F
Operating Rig Time	Hr	Hr	Hr	Hr
Van No. / Location	L15 / Bfld	L15 / Bfld		
Recorded By	Bobinski			
Witnessed By	N. Kelley			

RUN NO.	BOREHOLE RECORD BIT	FROM	TO	CASING RECORD SIZE	TYPE	FROM	TO
1	In	Ft	Ft	6 In	PVC	0 Ft	550 Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

Miscellaneous Information

Remarks:

Perforations: 477-537 ft.

Induction Log below 320 ft depth is consistent with presence of long
object in or in close proximity to the well. It could be an old steel cas
around of PVC liner or sounder line or air line inside the PVC casing

Perforated Intervals:

Line Speed:

Borehole Volume Calculations:

Other Information:

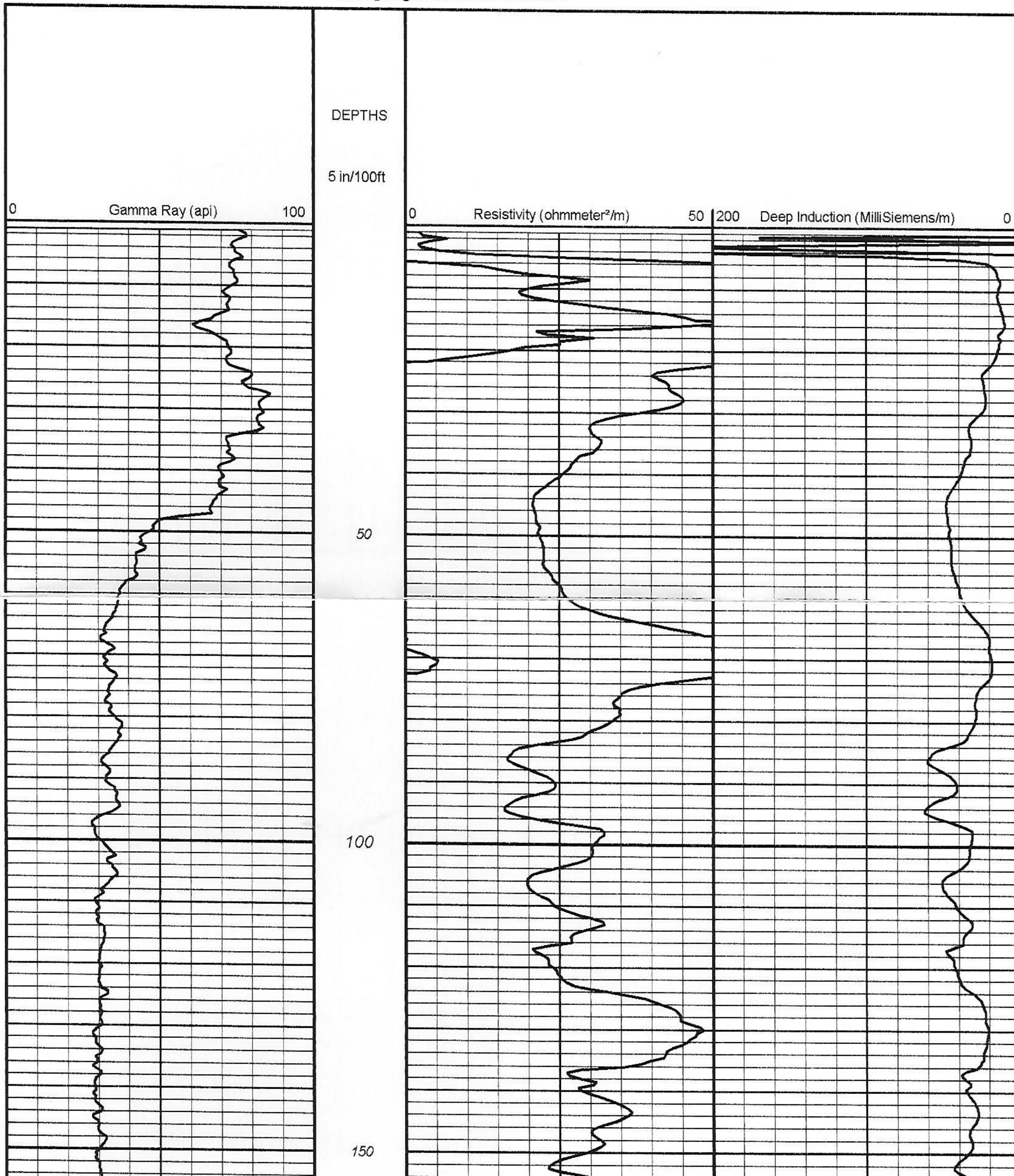
NOTICE

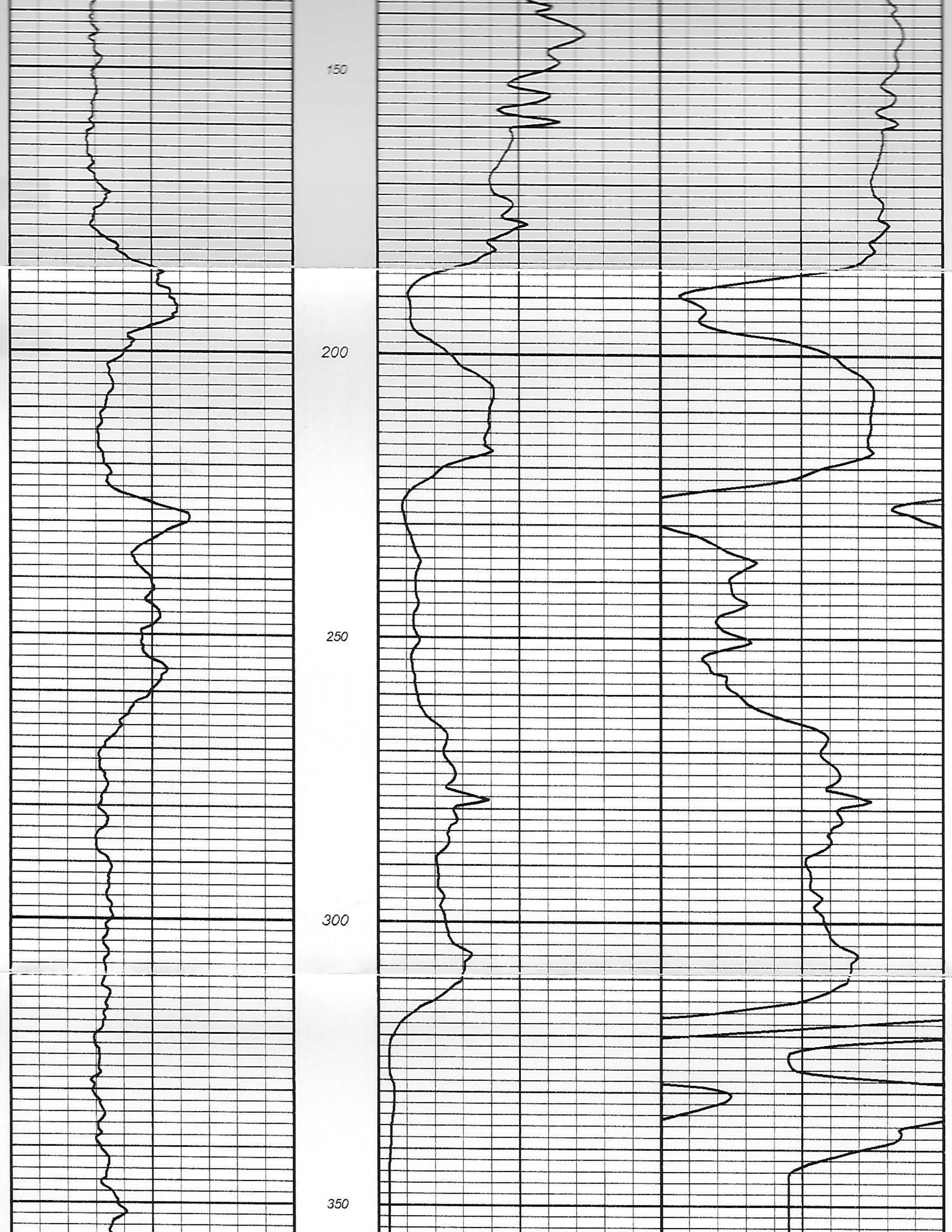
All interpretations are opinions based on inferences from electrical and othe
and we do not guarantee the accuracy or correctness of any verbal or written
and we shall not, except in the case of gross or willful negligence on our par
responsible for any loss, costs, damages or expenses incurred or sustained b
from any interpretation made by one of our officers, agents or employees. The
are also subject to our General Terms and Conditions as set out in our curre

welenco, inc. April 18, 2005

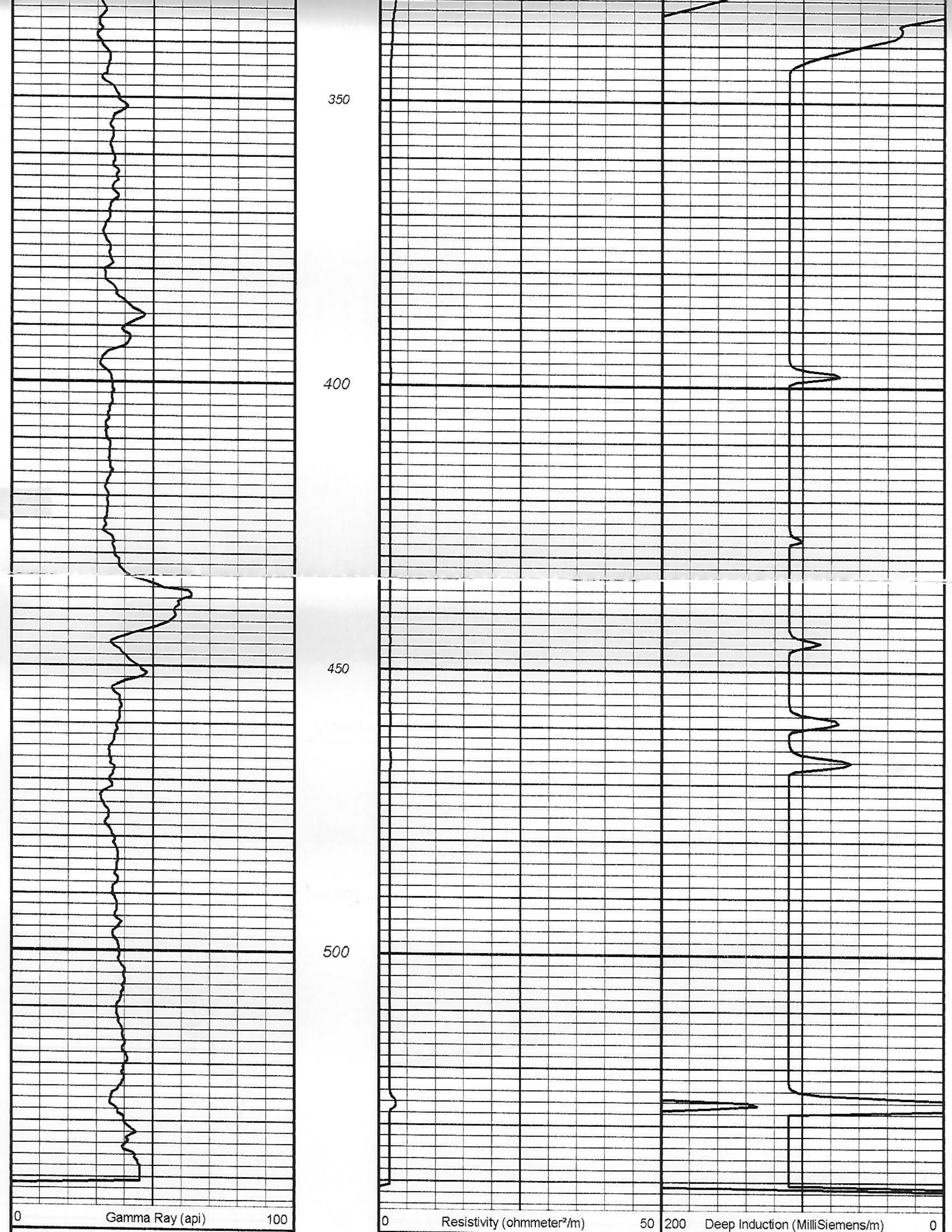
Geophysical Well Log

Cleath & Associates 30S / 10E - 13M1 L:\Zbig\Logs\4301GI\13M1\13m1.lhf





150
200
250
300
350


350
400
450
500
0
Gamma Ray (api)
100
0
Resistivity (ohmmeter²/m)
50
200
Deep Induction (MilliSiemens/m)
0

welenco

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California Contractor's License No. 722373

DUAL INDUCTION - GAMMA RAY LOG

FILING NO.

COMPANY Cleath-Harris

WELL 30S/10E-13M1

FIELD Los Osos

STATE California COUNTY San Luis Obispo

LOCATION:
End of Howard St.

OTHER SERVICES:
None

JOB NO.
12270

SEC: ______ TWP: ______ RGE: ______ LAT.: ______ LONG.: ______ MERIDIAN.: ______

Permanent Datum: Ground Level , Elev. ______ Ft. Elev.: K.B. ______ Ft.
Log Measured From: Ground Level , 0 Ft. Above Perm. Datum D.F. ______ Ft.
Drilling Measured From: Ground Level G.L. ______ Ft.

Date	Dec. 09, 2009			
Type Of Log	Dind			
Run	One			
Depth-Driller	547 Ft	Ft	Ft	Ft
Depth-Logger	541 Ft	Ft	Ft	Ft
Top Logged Interval	2 Ft	Ft	Ft	Ft
Btm. Logged Interval	540 Ft	Ft	Ft	Ft
Type Fluid In Hole	Salt Water			
Fluid Level	49.5 Ft	Ft	Ft	Ft
Max Temp	n/a °F	°F	°F	°F
Operating Rig Time	n/a Hr	Hr	Hr	Hr
Van No. / Location	LV-2 / Sac			
Recorded By	M. Sharpless			
Witnessed By	S. Harris			

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	TYPE	FROM	TO
1	In	Ft	Ft	6 In	PVC	0 Ft	TD Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

Miscellaneous Information

Remarks:

A recreational GPS accurate to +/- 45 feet set for Datum NAD27 was used to calculate Latitude, Longitude & Elevation values. The Section, Township, and Range then determined using the TRS program (TRS accuracy is not guaranteed). The TRS program converts Latitude and Longitude to Section, Township, and Range. The NOTICE at the bottom of this heading also applies.

Perforated Intervals:

477 Ft. To 537 Ft.		

Line Speed:

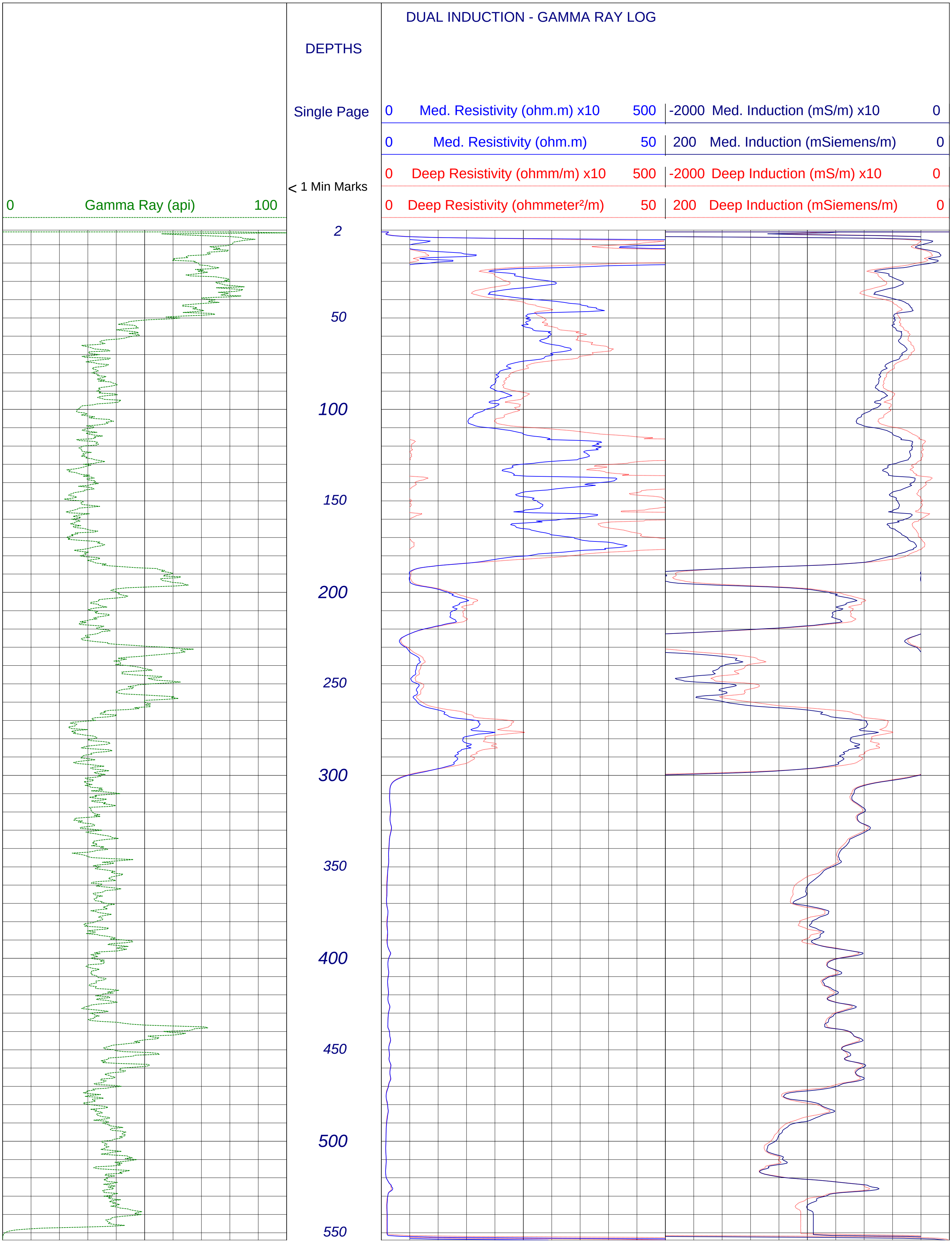
Borehole Volume Calculations:

Other Information:

NOTICE: All interpretations are opinions based on inferences from electrical and other measurements and we do not guarantee the accuracy or correctness of any verbal or written interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by one of our officers, agents or employees. These interpretations are also subject to our General Terms and Conditions as set out in our current Price Schedule.

welenco, inc. December 09, 2009

DUAL INDUCTION - GAMMA RAY LOG



DUAL INDUCTION-GAMMA RAY LOG

boredata

FILING NO.	
COMPANY	Cleath-Harris Geologists
WELL	30S/10E-13M1
FIELD	Los Osos
STATE	California
COUNTY	San Luis Obispo
LOCATION:	End of Howard Ave.
OTHER SERVICES:	None
JOB NO.	1412

SEC: ____ TWP: ____ RGE: ____ LAT.: ____ LONG.: ____

Permanent Datum: Ground Level, Elev. ____ Ft. Elev.: K.B. ____ Ft.
Log Measured From: Ground Level, 0 Ft. Above Perm. Datum D.F. ____ Ft.
Drilling Measured From: Ground Level G.L. ____ Ft.

Date	Aug 04, 2014			
Type Of Log	Induction			
Run	One			
Depth-Driller	547 Ft	Ft	Ft	Ft
Depth-Logger	541 Ft	Ft	Ft	Ft
Top Logged Interval	6 Ft	Ft	Ft	Ft
Btm. Logged Interval	541 Ft	Ft	Ft	Ft
Type Fluid In Hole	Water			
Fluid Level	46.4 Ft	Ft	Ft	Ft
Max Temp	N/A °F	°F	°F	°F
Operating Rig Time	.75 Hr	Hr	Hr	Hr
Van No. / Location	BD-1 / Bfld			
Recorded By	Craig Corbell			
Witnessed By	Spencer Harris			

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	TYPE	FROM	TO
1	In	Ft	Ft	6 In	PVC	0 Ft	TD Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

This Heading Conforms To API RP 31A-----Eagle Plot

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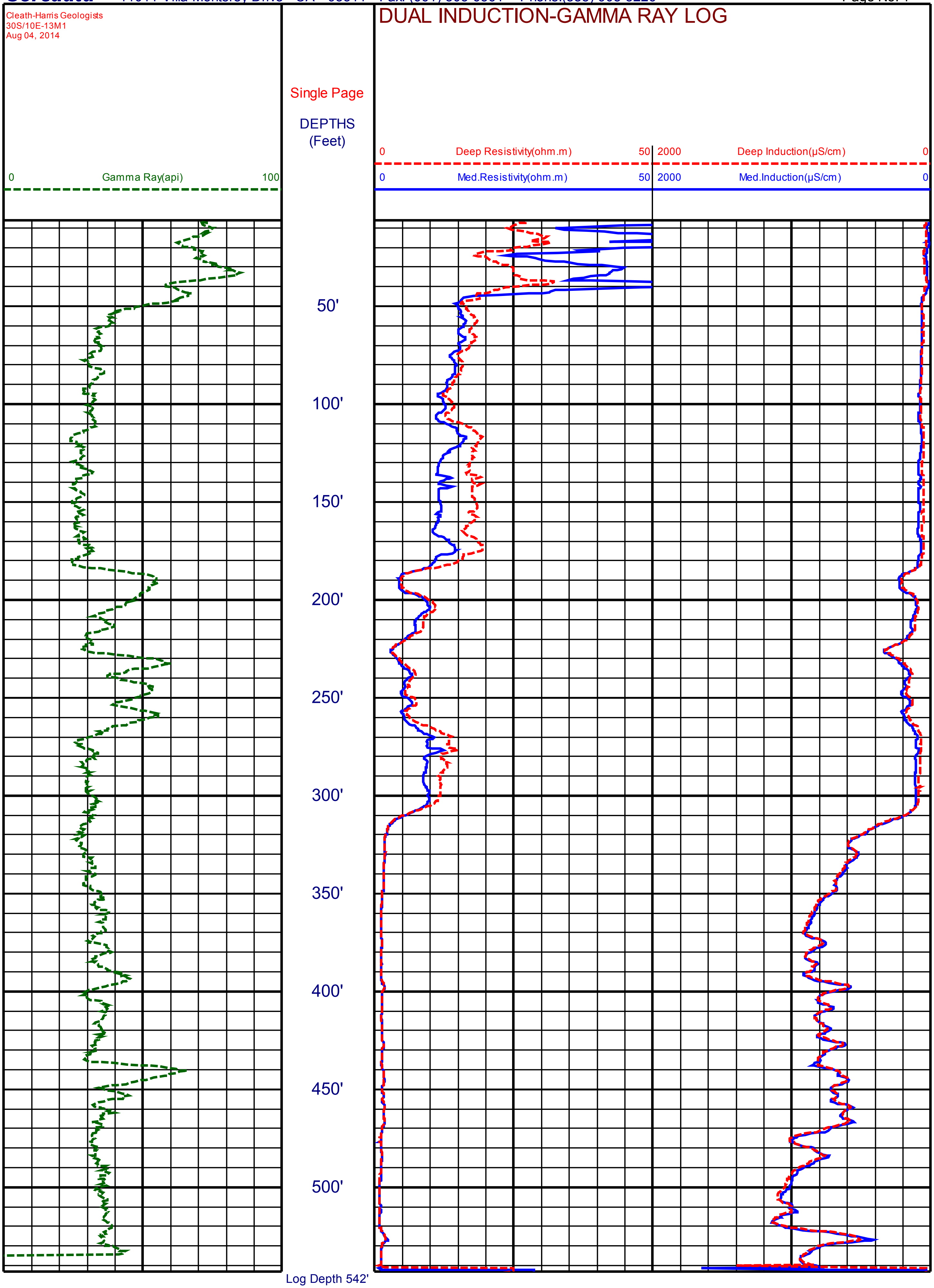
DUAL INDUCTION-GAMMA RAY LOG



DUAL INDUCTION - GAMMA RAY LOG

boredata

Filing No.

COMPANY **Cleath - Harris Geologists**

WELL **30S/10E-13M1**

FIELD **Los Osos**

STATE **California** COUNTY **San Luis Obispo**

LOCATION:
End of Howard Ave

OTHER SERVICES:
None

Job No.
1917B

SEC: ____ TWP: ____ RGE: ____ LAT.: ____________ LONG.: ____________

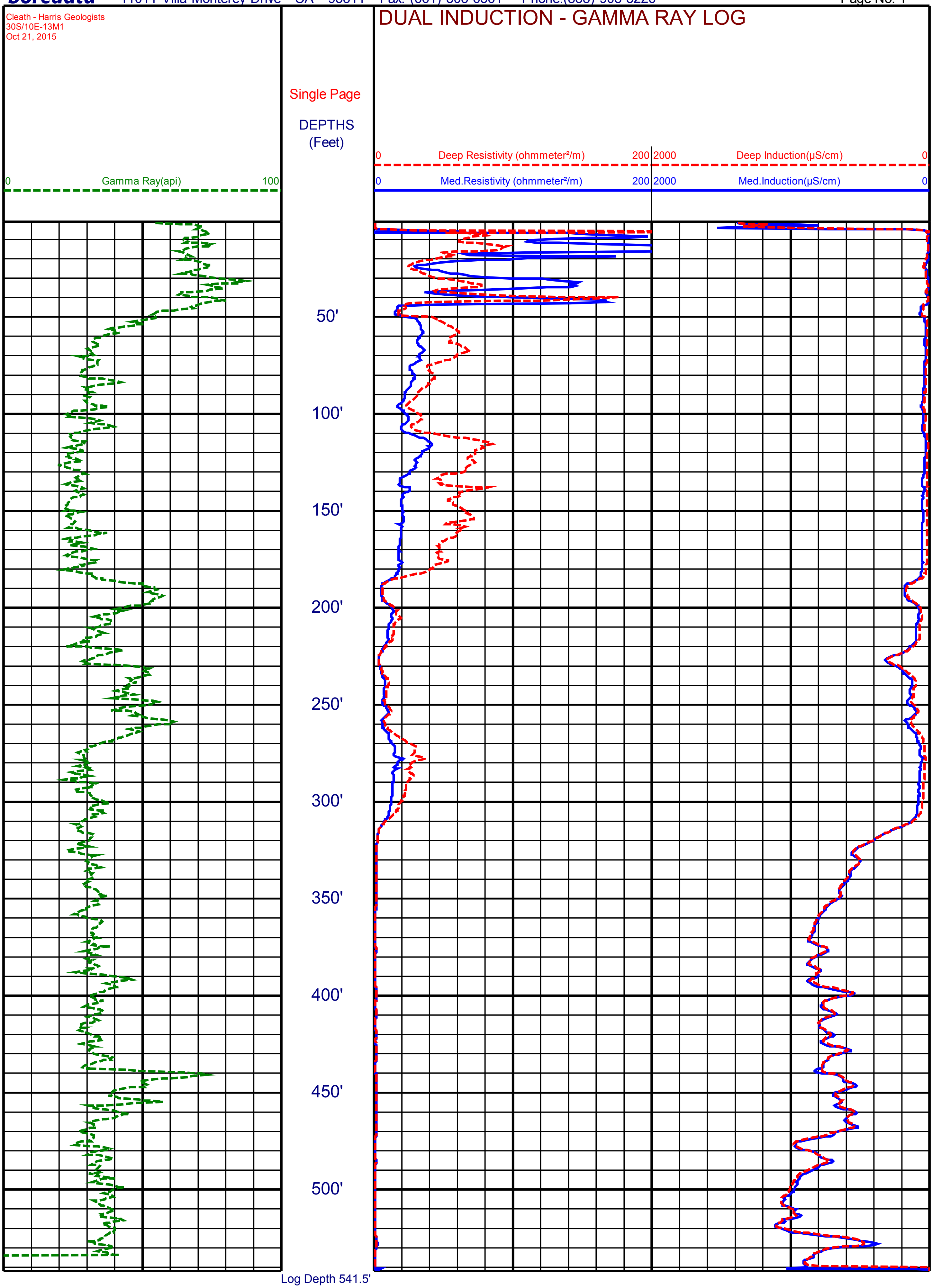
Permanent Datum: **Ground Level** Elev.: ________ Ft. Elevs.: K.B. ______ Ft.

Log Measured From: **Ground Level** , **0** Ft. Above Perm. Datum D.F. ______ Ft.

Drilling Measured From: **Ground Level** G.L. ______ Ft.

Date	**Oct 21, 2015**			
Type Log	**Induction**			
Run	**One**			
Depth-Driller	**547** Ft	Ft	Ft	Ft
Depth-Logger	**541** Ft	Ft	Ft	Ft
Top Logged Interval	**1** Ft	Ft	Ft	Ft
Btm Logged Interval	**541** Ft	Ft	Ft	Ft
Type Fluid In Hole	**Water**			
Fluid Level	**44.8** Ft	Ft	Ft	Ft
Max Temp	**N/A** °F	°F	°F	°F
Operating Rig Time	**.75** °Hr	°Hr	°Hr	°Hr
Van No. / Location				
Recorded By	**Craig Corbell**			
Witnessed By				

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT SIZE	FROM	TO	CASING SIZE	CASING TYPE	FROM	TO
1	In	Ft	Ft	**6** In	**PVC**	**0** Ft	**TD** Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft



Cleath - Harris Geologists
30S/10E-13M1
Oct 21, 2015
DUAL INDUCTION - GAMMA RAY LOG
Single Page
DEPTHS
(Feet)
0 Deep Resistivity (ohmmeter²/m) 200
2000 Deep Induction(µS/cm) 0
0 Med.Resistivity (ohmmeter²/m) 200
2000 Med.Induction(µS/cm) 0
0 Gamma Ray(api) 100
50'
100'
150'
200'
250'
300'
350'
400'
450'
500'
Log Depth 541.5'

DUAL INDUCTION - GAMMA RAY LOG

Cased Hole Survey

· Phone: (888) 908-5226 Fax: (661) 505-6561 · Web: www.boredata.com Email: ccorbell@boredata.com

Filing No.

COMPANY **Cleath - Harris Geologists**

WELL **30S/10E-13M1**

FIELD **Los Osos**

STATE **California** COUNTY **San Luis Obispo**

LOCATION: **End of Howard Ave**

OTHER SERVICES: **None**

Job No. 2676B

SEC: ____ TWP: ____ RGE: ____ LAT.: ____ LONG.: ____

Permanent Datum: **Ground Level** Elev.: ____ Ft. Elevs.: K.B. ____ Ft.

Log Measured From: **Ground Level**, **0** Ft. Above Perm. Datum D.F. ____ Ft.

Drilling Measured From: **Ground Level** G.L. ____ Ft.

Date	**Oct 17, 2018**			
Type Log	**Induction**			
Run	**One**			
Depth-Driller	**547** Ft	Ft	Ft	Ft
Depth-Logger	**542** Ft	Ft	Ft	Ft
Top Logged Interval	**6** Ft	Ft	Ft	Ft
Btm Logged Interval	**542** Ft	Ft	Ft	Ft
Type Fluid In Hole	**Water**			
Fluid Level	**44.8** Ft	Ft	Ft	Ft
Max Temp	**N/A** °F	°F	°F	°F
Operating Rig Time	**.75** °Hr	°Hr	°Hr	°Hr
Van No. / Location				
Recorded By	**Craig Corbell**			
Witnessed By	**Andrea Berge**			

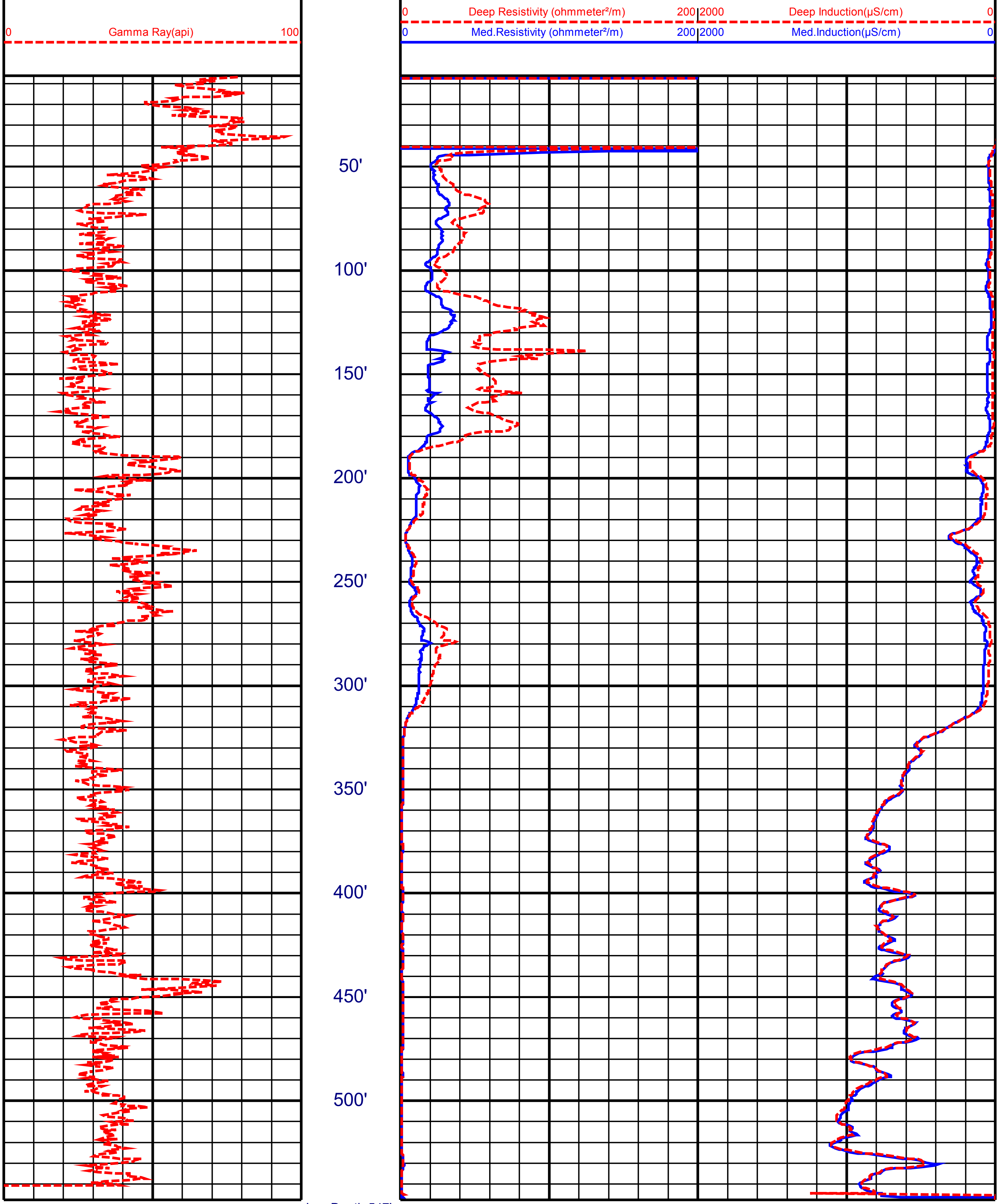
RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT SIZE	FROM	TO	CASING SIZE	CASING TYPE	FROM	TO
1	In	Ft	Ft	**6** In	**PVC**	**0** Ft	**TD** Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

DUAL INDUCTION - GAMMA RAY LOG

Cleath - Harris Geologists
30S/10E-13M1
Oct 17, 2018

Single Page

DEPTHS
(Feet)



Log Depth 547'

DUAL INDUCTION - GAMMA RAY LOG

Cased Hole Survey

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Filing No.

Job No. 3328C

COMPANY **Cleath Harris Geologists**

WELL **30S/10E-13M1**

FIELD **Los Osos**

STATE **California** COUNTY **San Luis Obispo**

LOCATION: **End of Howard Ave**

OTHER SERVICES: **None**

SEC: ____ TWP: ____ RGE: ____ LAT.: ____ LONG.: ____

Permanent Datum: **Ground Level** Elev.: ____ Ft. Elevs.: K.B. ____ Ft.

Log Measured From: **Ground Level** , **0** Ft. Above Perm. Datum D.F. ____ Ft.

Drilling Measured From: **Ground Level** G.L. ____ Ft.

Date	Nov 05, 2021			
Type Log	Induction			
Run	One			
Depth-Driller	547 Ft	Ft	Ft	Ft
Depth-Logger	544 Ft	Ft	Ft	Ft
Top Logged Interval	2 Ft	Ft	Ft	Ft
Btm Logged Interval	542 Ft	Ft	Ft	Ft
Type Fluid In Hole	Water			
Fluid Level	43.3 Ft	Ft	Ft	Ft
Max Temp	N/A °F	°F	°F	°F
Operating Rig Time	N/A °Hr	°Hr	°Hr	°Hr
Van No. / Location	BD-2 / VTU			
Recorded By	Craig Corbell			
Witnessed By	Andrea Berge			

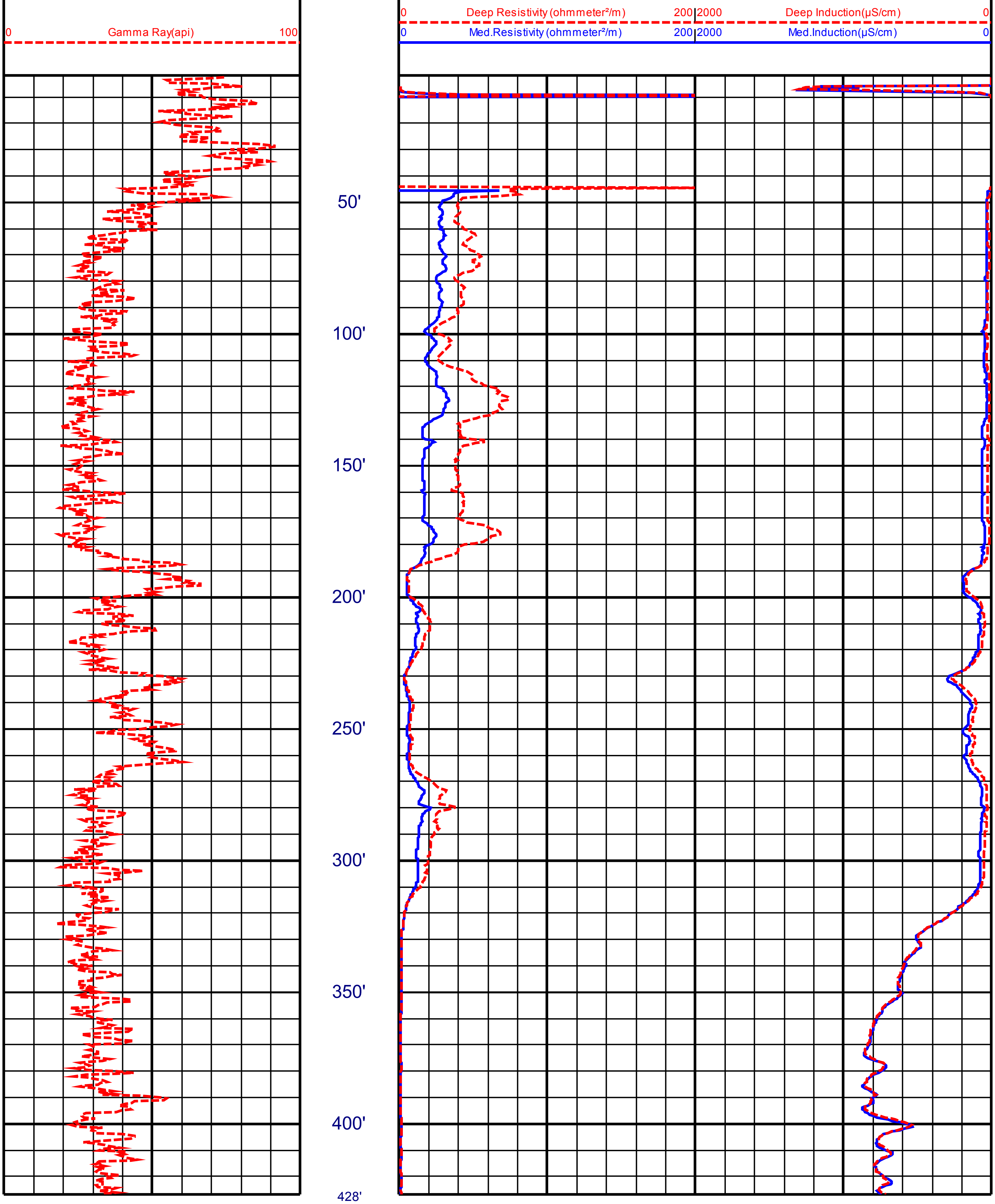
RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT SIZE	FROM	TO	CASING SIZE	CASING TYPE	FROM	TO
1	In	Ft	Ft	6 In	PVC	0 Ft	TD Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

Cleath Harris Geologists
30S/10E-13M1
Nov 05, 2021

DUAL INDUCTION - GAMMA RAY LOG

Mult. Pages
2"/100'

DEPTHS
(Feet)



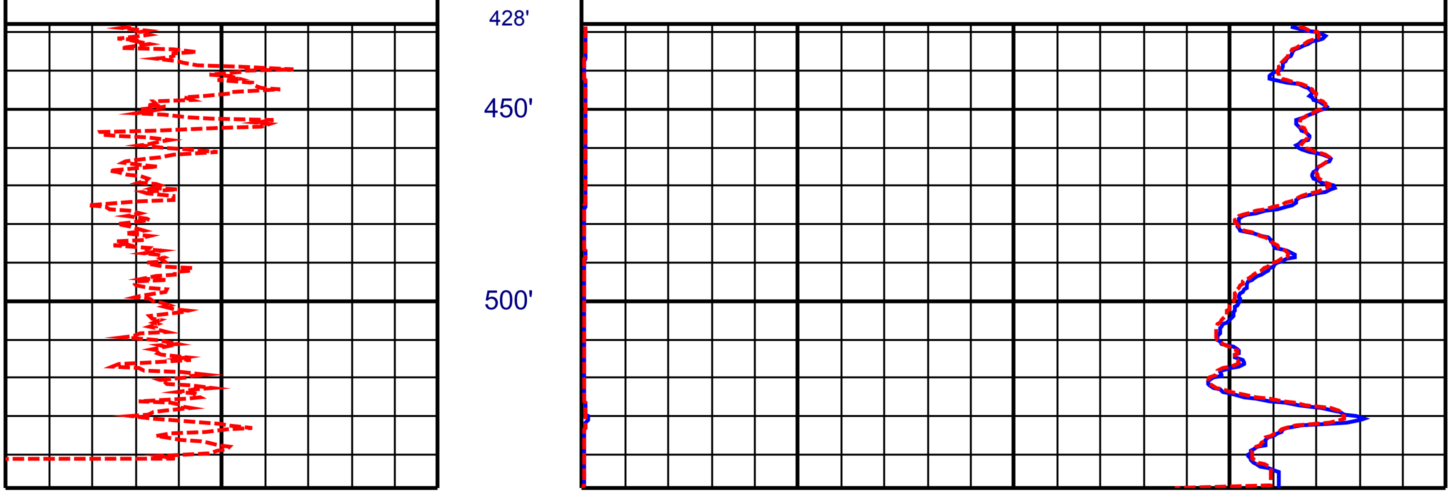
Cleath Harris Geologists
30S/10E-13M1
Nov 05, 2021

DUAL INDUCTION - GAMMA RAY LOG

Mult. Pages
2"/100'

DEPTHS
(Feet)

0 Gamma Ray(api) 100		0 Deep Resistivity (ohmmeter²/m) 200	2000 Deep Induction(µS/cm) 0
		0 Med.Resistivity (ohmmeter²/m) 200	2000 Med.Induction(µS/cm) 0



Log Depth 547'

LA14 GEOPHYSICS

ELECTRIC LOG

TYPE: Spontaneous Potential / Single Point Resistance   DATE: MAY 17, 1985

LOCATION: State: CALIFORNIA   County: San Luis Obispo

LOGGING INFORMATION

Operator(s): JEFF TOLHURST

Equipment Address: U.S.G.S. SANTA BARBARA, CAL.

Logger type: Well Reconnaissance/Temp. Lab No.

Logging speed: 20 ft./min. (up) down

Log vert. scale: 10 ft./in.

MODULE SETTINGS

SINGLE POINT RESISTANCE

Scale switch(range): 20 ohms/div.

Displacement: Zero

Full scale: 100 ohms

SPONTANEOUS POTENTIAL

Scale switch: 200 millivolts/div.

Bias:

Polarity: Plus Minus (circle one)

Full scale: 1000 millivolts

RESISTIVITY

______ inch normal ______ inch normal

Scale switch: ____ ohm-meters Scale switch: ____ ohm-meters

Full scale: ____ ohm-meters Full scale: ____ ohm-meters

Digital system identifiers:

Remarks:

Well No. (USGS):

Other:

WELL INFORMATION

Agency or Owner: U.S.G.S. / S.L.O. COUNTY

Address:

Altitude of L.S.:

M.P.:

Btm log interval: 600.0 ft. Well TD: 600.0 ft.

Top log interval: ____ ft. Log TD: 600.0 ft.

Casing:

I.D. ____, from ____ to ____, type ____

I.D. ____, from ____ to ____, type ____

I.D. ____, from ____ to ____, type ____

Cement: from ____ to ____

Perf. interval(s) from ____ to ____, type ____

Open hole diameter: ____ from ____ to ____

____ from ____ to ____

Fluid level: ____ ft. Above / At / Below L.S., M.P.

Fluid type: MUD ; temp. ____ °F, °C

Fluid resist.: ____ ohm-m

Driller: JOHN SINGER / DAVE WILEY

Address: 126 W. FIGUEROA ST. SANTA BARBARA, CAL. 93117

Aquifer or formation: PASO ROBLES FM.

Other data and logs available for this well:

TD = 600'
USGS #2
1866

NOTE: This log is not to be used to fulfill private contractual obligations.

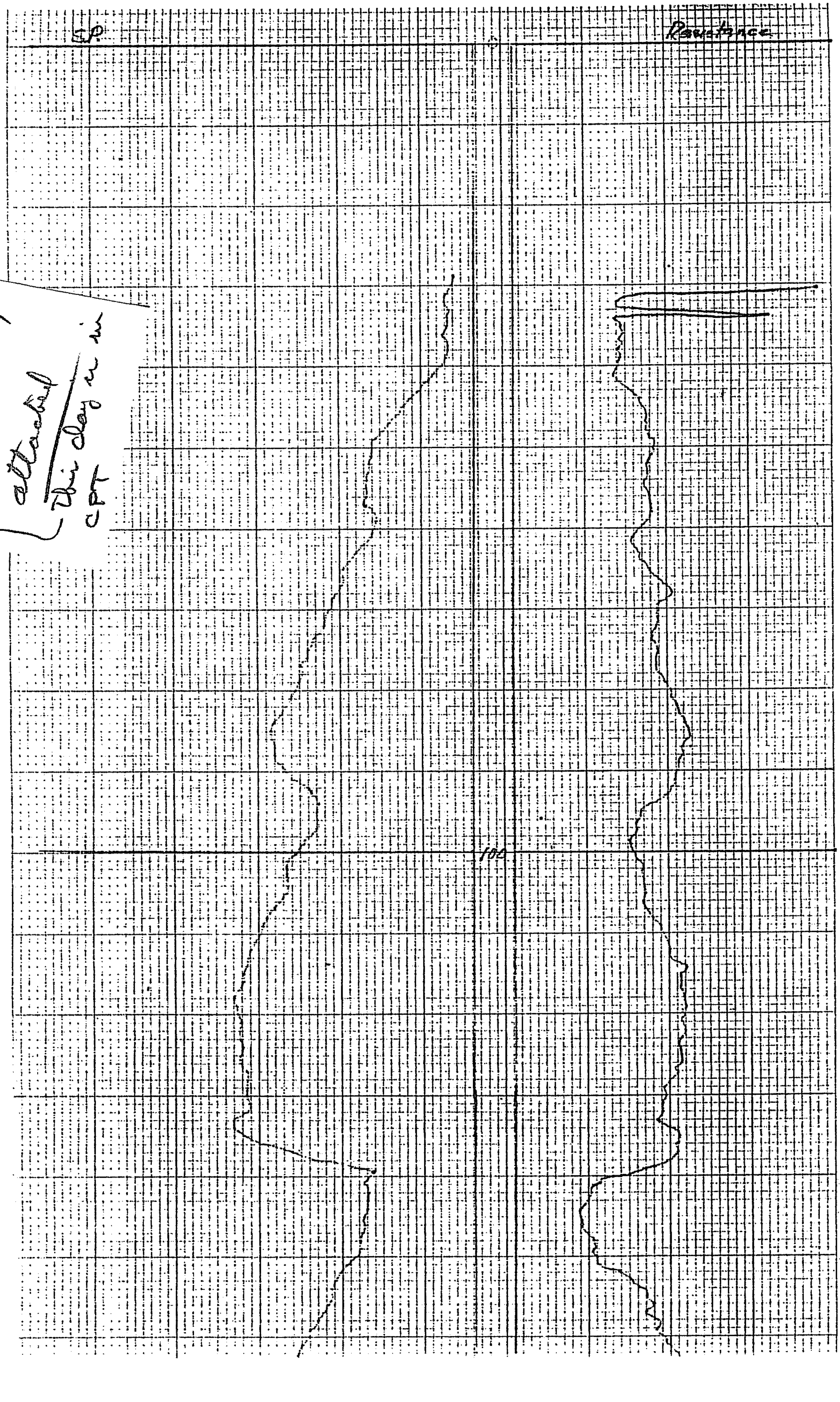
USGS #2 Los Osos Basin Study
Palisade Ave. No. of Library

May 17, 1985

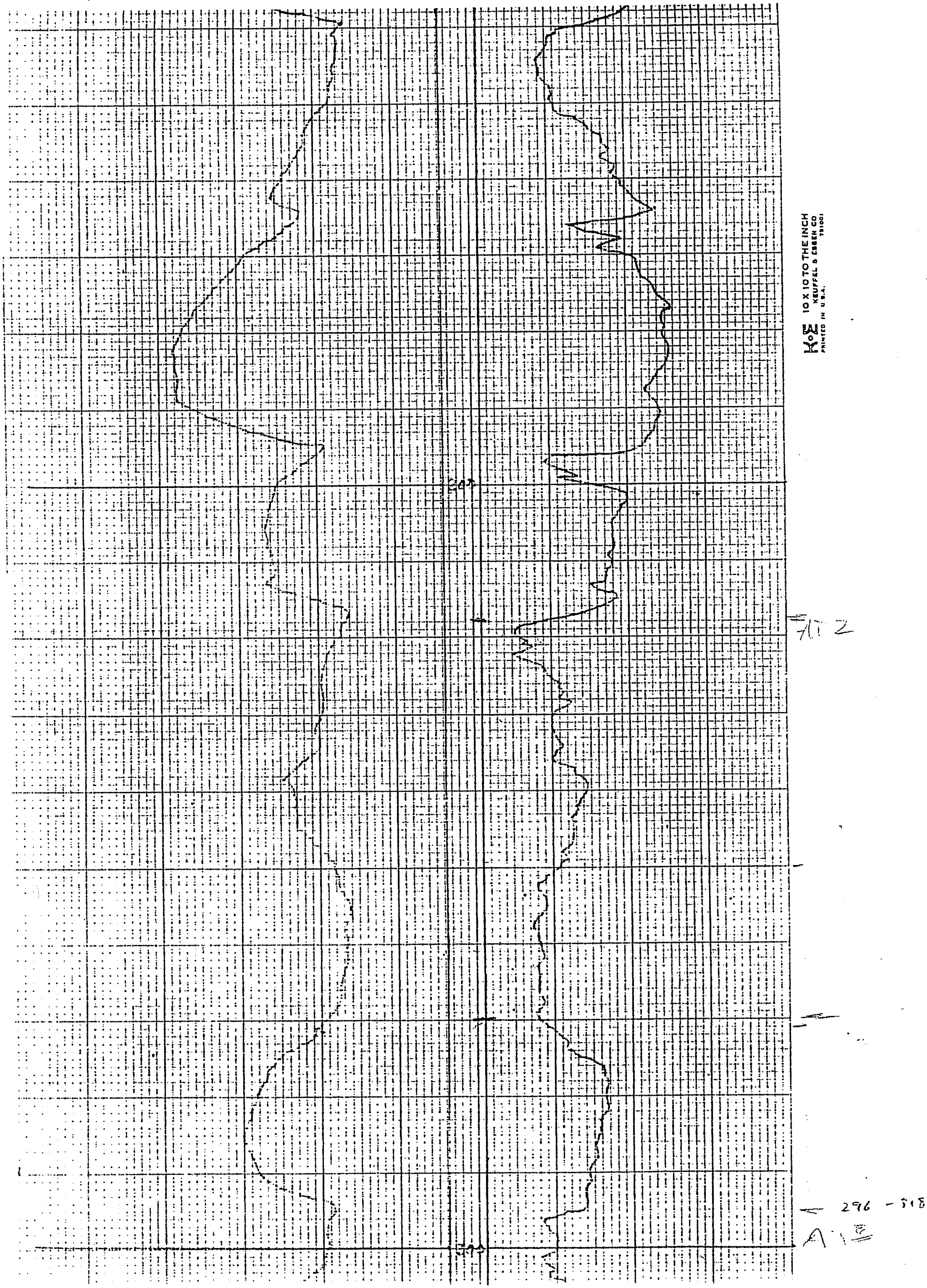
Elev. 100' ± (Topo)

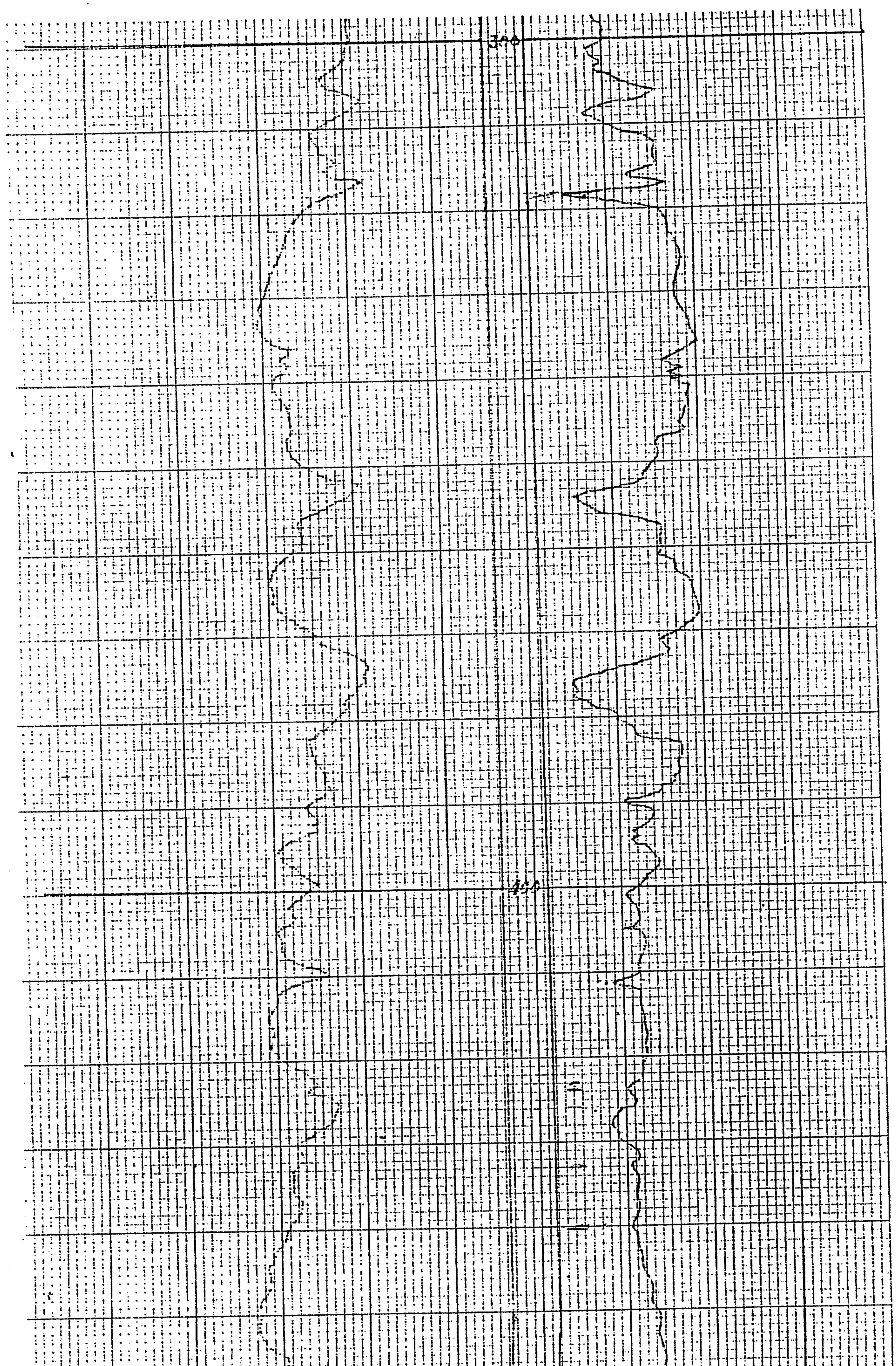
S.P.

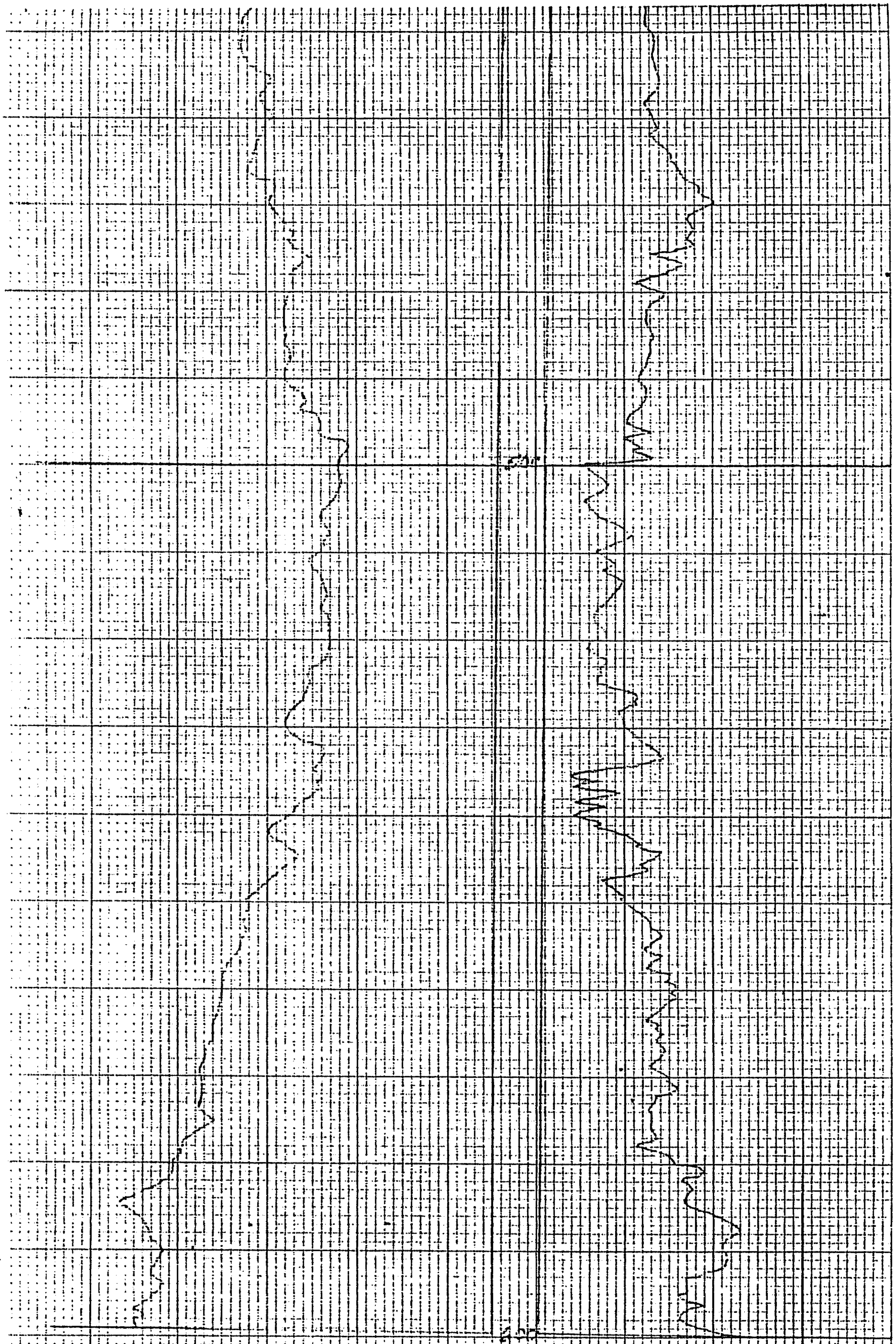
Resistance



see CPT #1 attached
This log is in CPT


600
702
296 - 318
A-18
300
K&E 10 X 10 TO THE INCH
KEUFFEL & ESSER CO.
PRINTED IN U.S.A.


300
400



T.D. 650'

U.S.G.S. No. 2
Los Osos Basin Study

welenco

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INDUCTION / GAMMA RAY LOGS

FILING NO.

COMPANY Cleath & Associates

WELL 30S / 11E - 18L6

FIELD Los Osos

STATE California COUNTY San Luis Obispo

LOCATION:

OTHER SERVICES: None

JOB NO. 4301

SEC: ____ TWP: ____ RGE: ____ LONG.: ____ LAT.: ____

Permanent Datum: ____, Elev. ____ Ft.

Log Measured From: Top Of Casing, 0 Ft. Above Perm. Datum

Drilling Measured From: ____

Elev.: K.B. ____ Ft.
D.F. ____ Ft.
G.L. ____ Ft.

Date	Apr. 14, 2005	Apr. 14, 2005		
Type Of Log	Induction	Gamma Ray		
Run No.	One	Two	Three	Four
Depth-Driller	605 Ft	605 Ft	Ft	Ft
Depth-Logger	550 Ft	550 Ft	Ft	Ft
Top Logged Interval	0 Ft	0 Ft	Ft	Ft
Btm. Logged Interval	550 Ft	550 Ft	Ft	Ft
Type Fluid In Hole	Water	Water		
Fluid Level	N/A Ft	N/A Ft	Ft	Ft
Max Temp	N/A °F	N/A °F	°F	°F
Operating Rig Time	Hr	Hr	Hr	Hr
Van No. / Location	L15 / Bfld	L15 / Bfld		
Recorded By	Bobinski			
Witnessed By	N. Kelley			

RUN NO.	BOREHOLE RECORD BIT	FROM	TO	CASING RECORD SIZE	TYPE	FROM	TO
1	In	Ft	Ft	6 In	PVC	0 Ft	605 Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

Miscellaneous Information

Remarks:

Perforations: 355-375 ft, 430-480 ft, 550-600 ft.

Perforated Intervals:

Line Speed:

Borehole Volume Calculations:

Other Information:

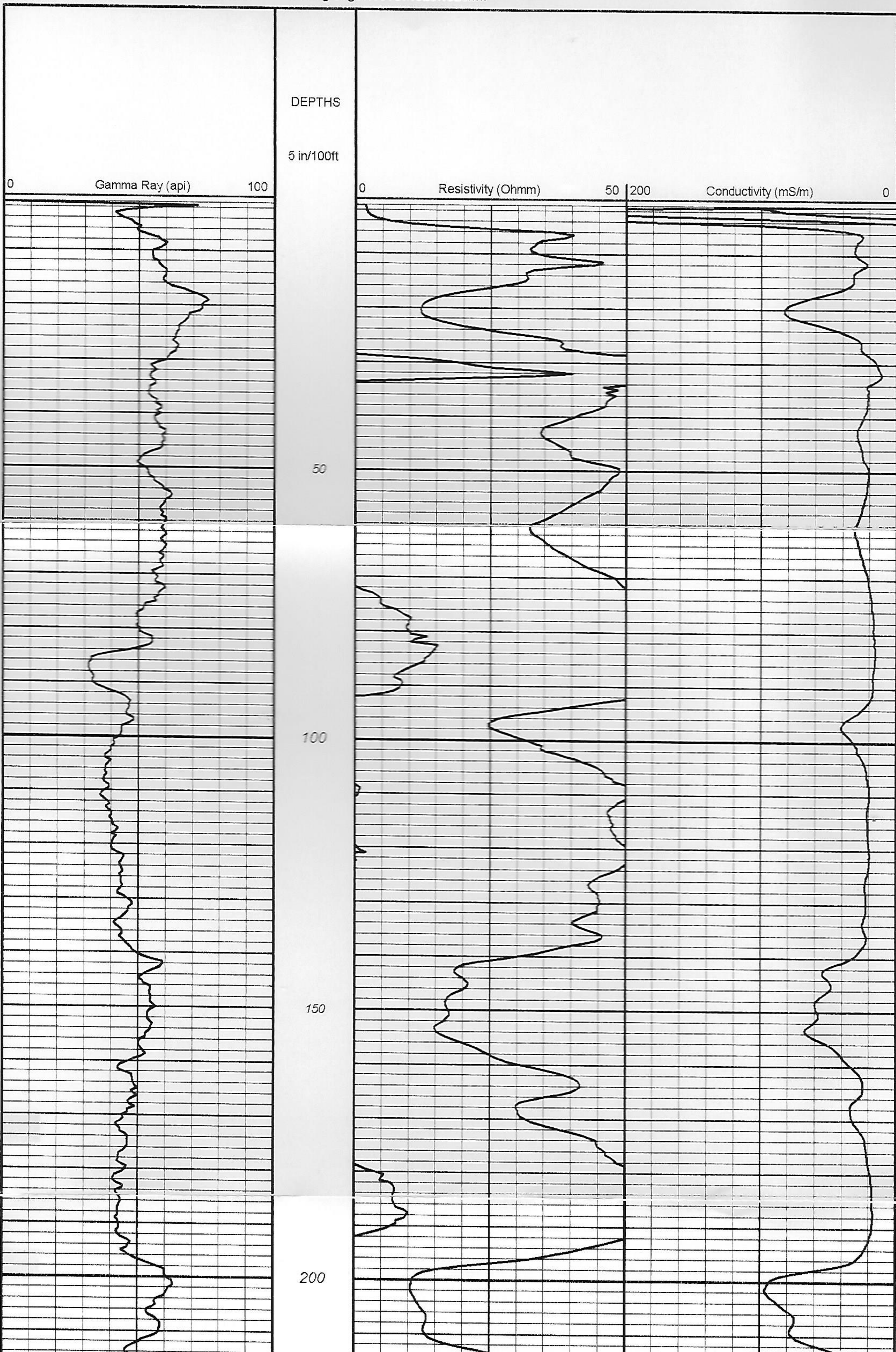
NOTICE

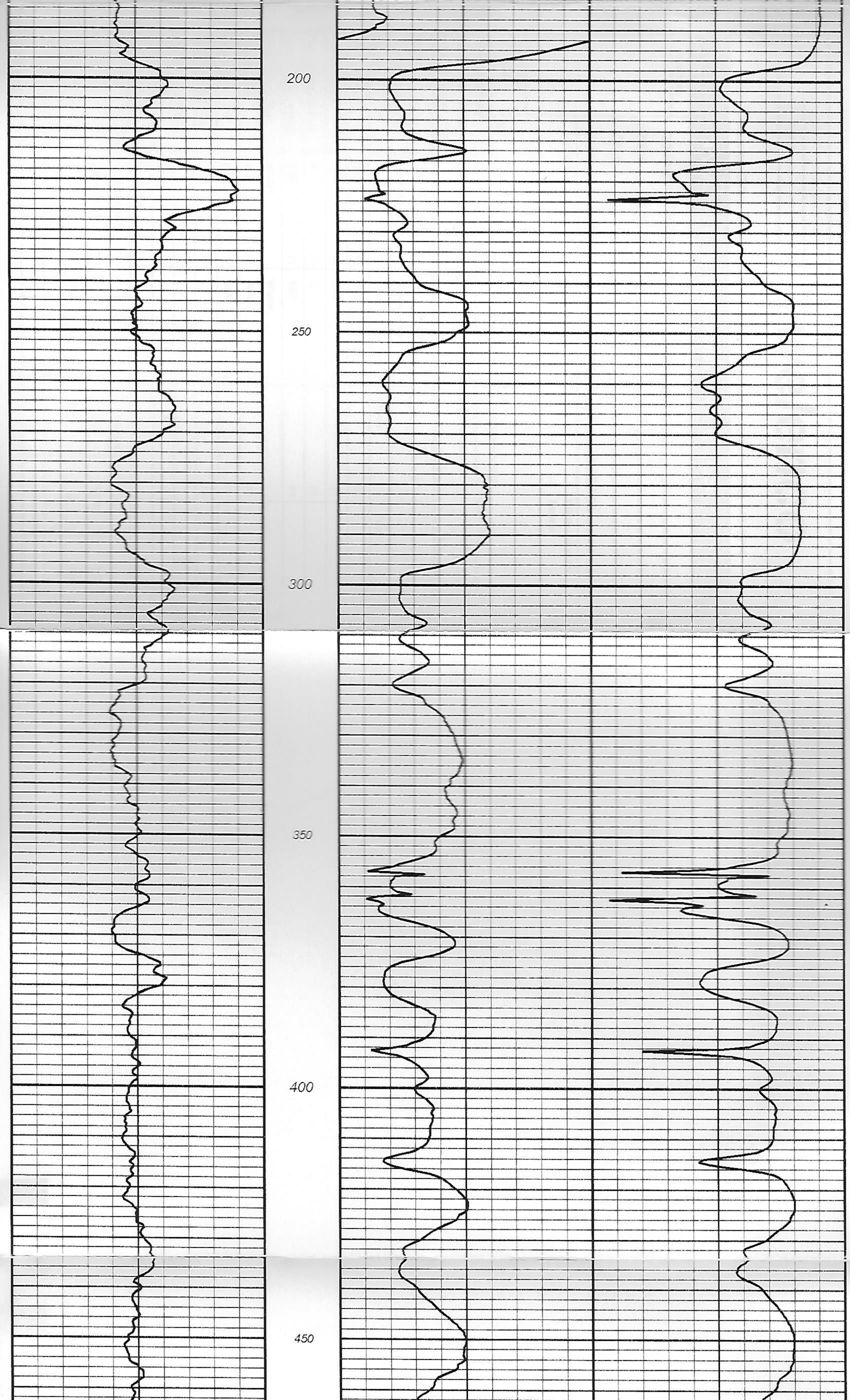
Geophysical Well Log

Cleath & Associates 30S / 11E - 18L6 L:\Zbig\Logs\4301GI\18L6\18L6.lhf

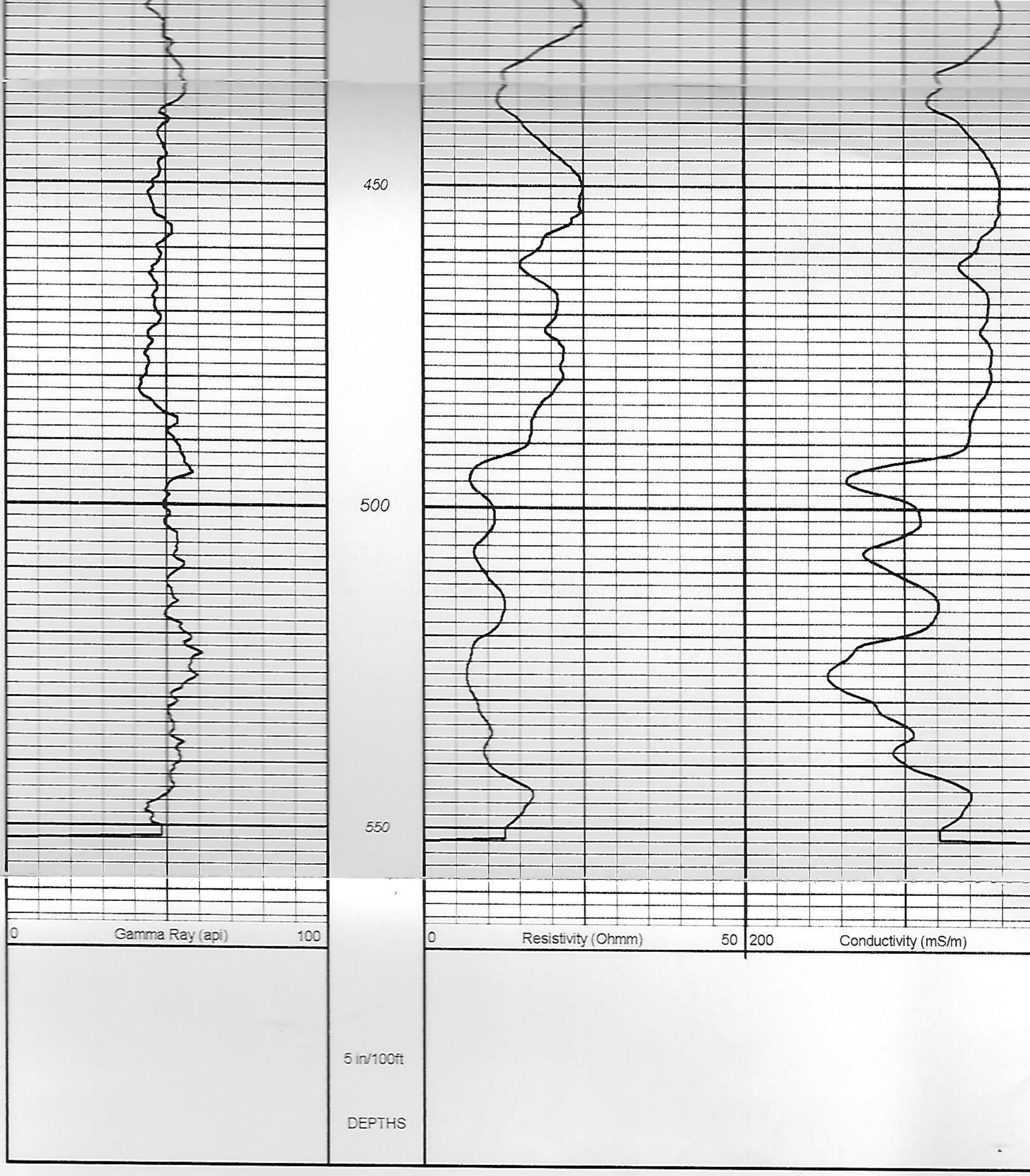
Geophysical Well Log

Cleath & Associates 30S / 11E - 18L6 L:\Zbig\Logs\4301GI\18L6\18L6.lhf





200
250
300
350
400
450


450
500
550
0
Gamma Ray (api)
100
0
Resistivity (Ohmm)
50
200
Conductivity (mSm/m)
5 in/100ft
DEPTHS

welenco

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California Contractor's License No. 722373

DUAL INDUCTION - GAMMA RAY LOG

FILING NO.

COMPANY Cleath-Harris

WELL 30S/11E-18L6

FIELD Los Osos

STATE California COUNTY San Luis Obispo

LOCATION: North of Palisades Dr.

OTHER SERVICES: Samples Spinner

JOB NO. 12270

SEC: ____ TWP: ____ RGE: ____ LAT.: ____ LONG.: ____ MERIDIAN.: ____

Permanent Datum: Ground Level **, Elev.** ____ **Ft. Elev.: K.B.** ____ **Ft.**

Log Measured From: Ground Level **,** 0 **Ft. Above Perm. Datum** **D.F.** ____ **Ft.**

Drilling Measured From: Ground Level **G.L.** ____ **Ft.**

Date	Dec. 09, 2009							
Type Of Log	Dind							
Run	One							
Depth-Driller	605 Ft		Ft		Ft		Ft	
Depth-Logger	551 Ft		Ft		Ft		Ft	
Top Logged Interval	0 Ft		Ft		Ft		Ft	
Btm. Logged Interval	550 Ft		Ft		Ft		Ft	
Type Fluid In Hole	Water							
Fluid Level	88.3 Ft		Ft		Ft		Ft	
Max Temp	n/a °F		°F		°F		°F	
Operating Rig Time	n/a Hr		Hr		Hr		Hr	
Van No. / Location	LV-2	Sac						
Recorded By	M. Sharpless							
Witnessed By	S.Harris							

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	TYPE	FROM	TO
1	In	Ft	Ft	6 In	PVC	0 Ft	TD Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

Miscellaneous Information

Remarks:

A recreational GPS accurate to +/- 45 feet set for Datum NAD27 was used to calculate Latitude, Longitude & Elevation values. The Section, Township, and Range then determined using the TRS program (TRS accuracy is not guaranteed). The TRS program converts Latitude and Longitude to Section, Township, and Range. The NOTICE at the bottom of this heading also applies.

Perforated Intervals:

355 Ft. To 375 Ft.		
430 Ft. To 480 Ft.		
550 Ft. To 600 Ft.		

Line Speed:

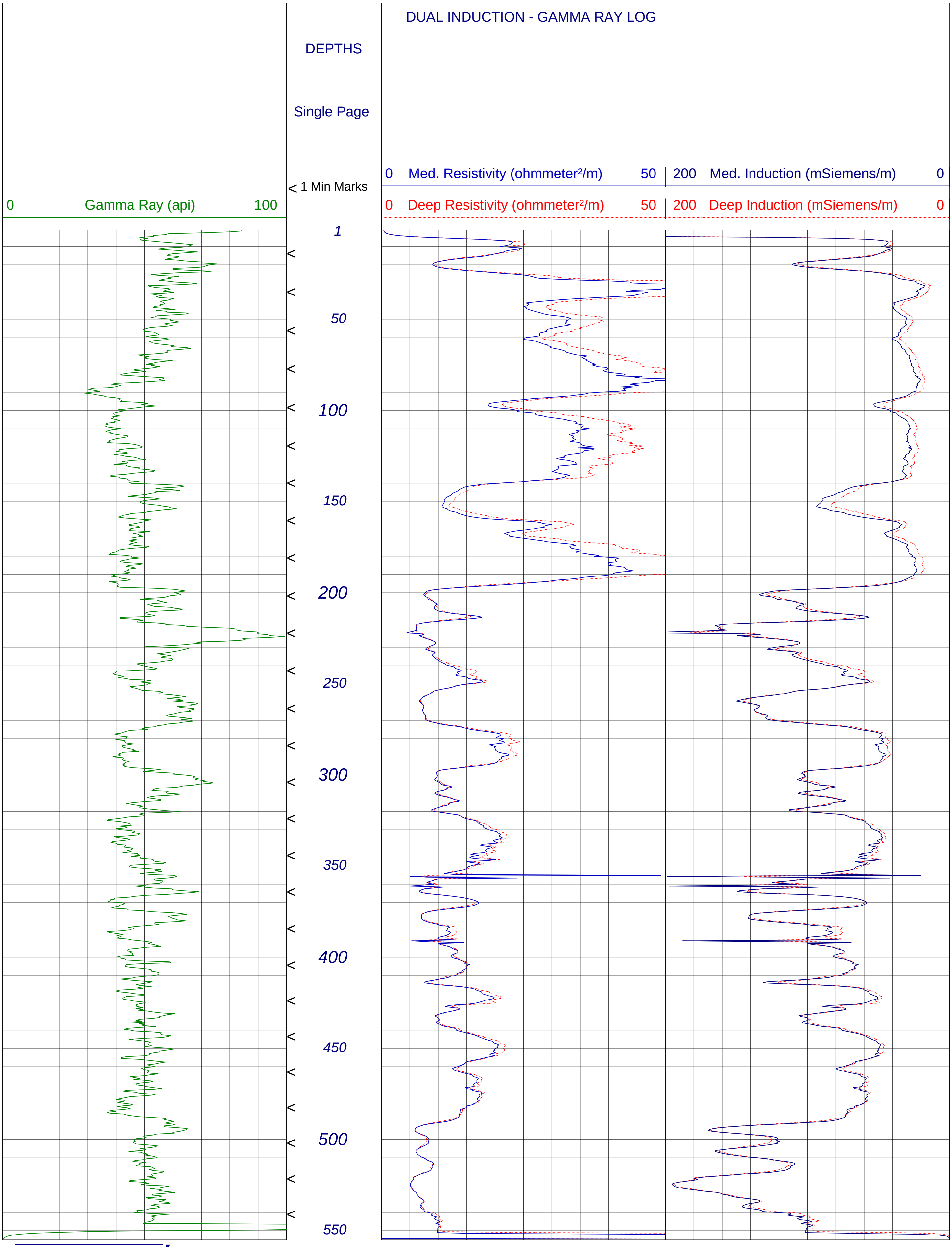
Borehole Volume Calculations:

Other Information:

NOTICE: All interpretations are opinions based on inferences from electrical and other measurements and we do not guarantee the accuracy or correctness of any verbal or written interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by one of our officers, agents or employees. These interpretations are also subject to our General Terms and Conditions as set out in our current Price Schedule.

welenco, inc. December 09, 2009

DUAL INDUCTION - GAMMA RAY LOG



boredata

DUAL INDUCTION-GAMMA RAY LOG

FILING NO.

COMPANY **Cleath-Harris Geologists**

WELL **30S/11E-18L6**

FIELD **Los Osos**

STATE **California** COUNTY **San Luis Obispo**

LOCATION:

North of Palisades Dr.

OTHER SERVICES:
None

JOB NO.
1412B

SEC: ____ TWP: ____ RGE: ____ LAT.: ____ LONG.: ____

Permanent Datum: **Ground Level** , Elev. ____ Ft. Elev.: K.B. ____ Ft.

Log Measured From: **Ground Level** , **0** Ft. Above Perm. Datum D.F. ____ Ft.

Drilling Measured From: **Ground Level** G.L. ____ Ft.

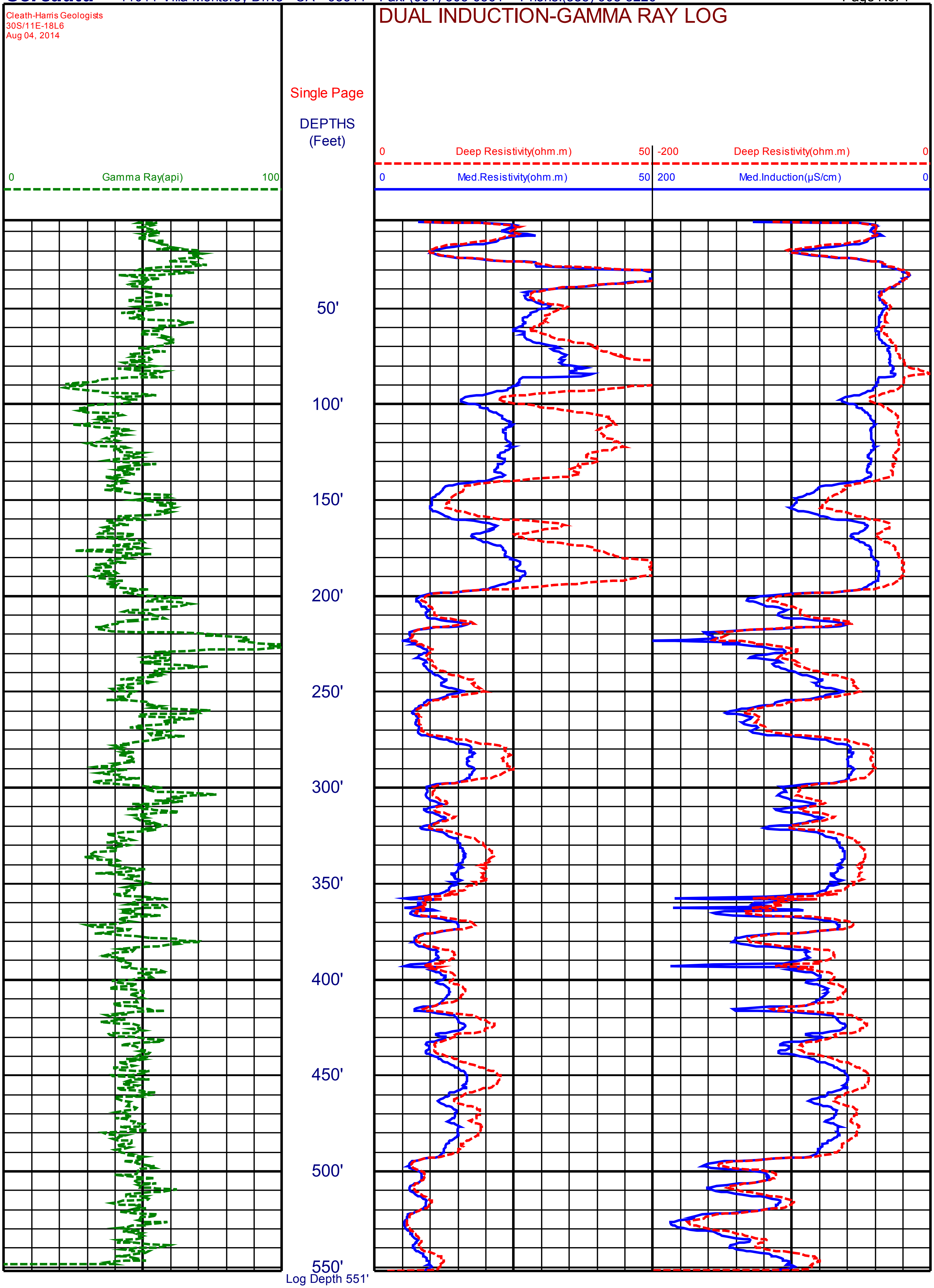
Date	**Aug 04, 2014**			
Type Of Log	**Induction**			
Run	**One**			
Depth-Driller	**605** Ft	Ft	Ft	Ft
Depth-Logger	**551** Ft	Ft	Ft	Ft
Top Logged Interval	**4** Ft	Ft	Ft	Ft
Btm. Logged Interval	**551** Ft	Ft	Ft	Ft
Type Fluid In Hole	**Water**			
Fluid Level	**83.1** Ft	Ft	Ft	Ft
Max Temp	**N/A** °F	°F	°F	°F
Operating Rig Time	**.75** Hr	Hr	Hr	Hr
Van No. / Location	**BD-1** / **Bfld**			
Recorded By	**Craig Corbell**			
Witnessed By	**Spencer Harris**			

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	TYPE	FROM	TO
1	In	Ft	Ft	**6** In	**PVC**	**0** Ft	**TD** Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

This Heading Conforms To API RP 31A-----Eagle Plot

DUAL INDUCTION-GAMMA RAY LOG

Cleath-Harris Geologists
30S/11E-18L6
Aug 04, 2014



DUAL INDUCTION - GAMMA RAY LOG

boredata

Filing No.

COMPANY **Cleath Harris Geologists**

WELL **30S/11E-18L6**

FIELD **Los Osos**

STATE **California** COUNTY **San Luis Obispo**

LOCATION:
North of Palisades Dr.

OTHER SERVICES:
None

Job No.
1917

SEC: ____ TWP: ____ RGE: ____ LAT.: ____________ LONG.: ____________

Permanent Datum: **Ground Level** Elev.: ________ Ft. Elevs.: K.B. ______ Ft.

Log Measured From: **Ground Level** , **0** Ft. Above Perm. Datum D.F. ______ Ft.

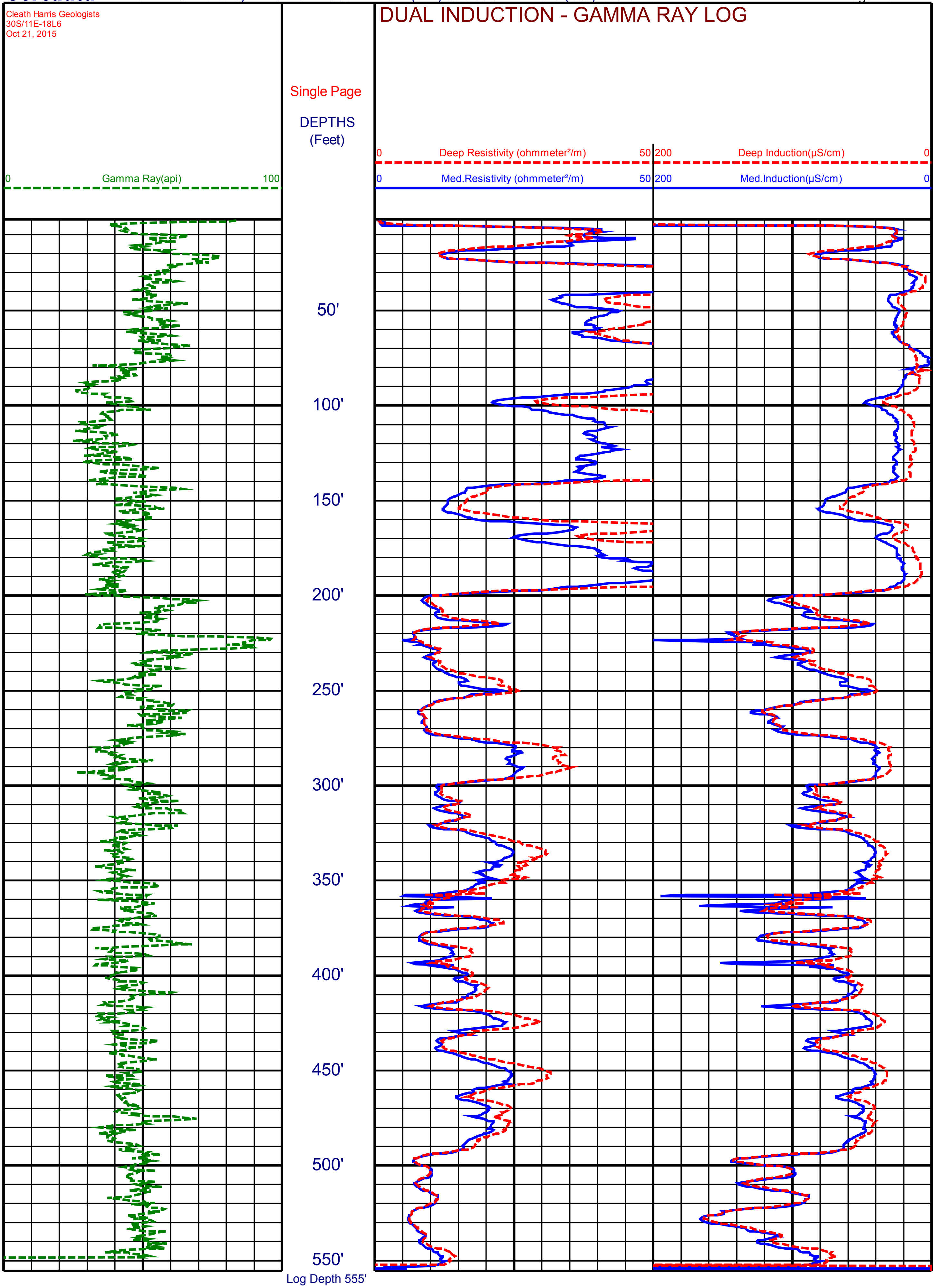
Drilling Measured From: **Ground Level** G.L. ______ Ft.

Date	**Oct 21, 2015**			
Type Log	**Induction**			
Run	**One**			
Depth-Driller	**605** Ft	Ft	Ft	Ft
Depth-Logger	**555** Ft	Ft	Ft	Ft
Top Logged Interval	**2** Ft	Ft	Ft	Ft
Btm Logged Interval	**552** Ft	Ft	Ft	Ft
Type Fluid In Hole	**Water**			
Fluid Level	**80.1** Ft	Ft	Ft	Ft
Max Temp	**N/A** °F	°F	°F	°F
Operating Rig Time	**N/A** °Hr	°Hr	°Hr	°Hr
Van No. / Location				
Recorded By	**Craig Corbell**			
Witnessed By				

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT SIZE	FROM	TO	CASING SIZE	CASING TYPE	FROM	TO
1	In	Ft	Ft	**6** In	**PVC**	**0** Ft	**TD** Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

Cleath Harris Geologists
30S/11E-18L6
Oct 21, 2015

DUAL INDUCTION - GAMMA RAY LOG



DUAL INDUCTION - GAMMA RAY LOG

boredata

Cased Hole Survey

· Phone: (888) 908-5226 Fax: (661) 505-6561 · Web: www.boredata.com Email: ccorbell@boredata.com

Filing No.

COMPANY **Cleath Harris Geologists**

WELL **30S/11E-18L6**

FIELD **Los Osos**

STATE **California** COUNTY **San Luis Obispo**

LOCATION:
North of Palisades Dr.

OTHER SERVICES:
None

Job No.
2676A

SEC: ____ TWP: ____ RGE: ____ LAT.: ____ LONG.: ____

Permanent Datum: **Ground Level** Elev.: ____ Ft. Elevs.: K.B. ____ Ft.

Log Measured From: **Ground Level** , **0** Ft. Above Perm. Datum D.F. ____ Ft.

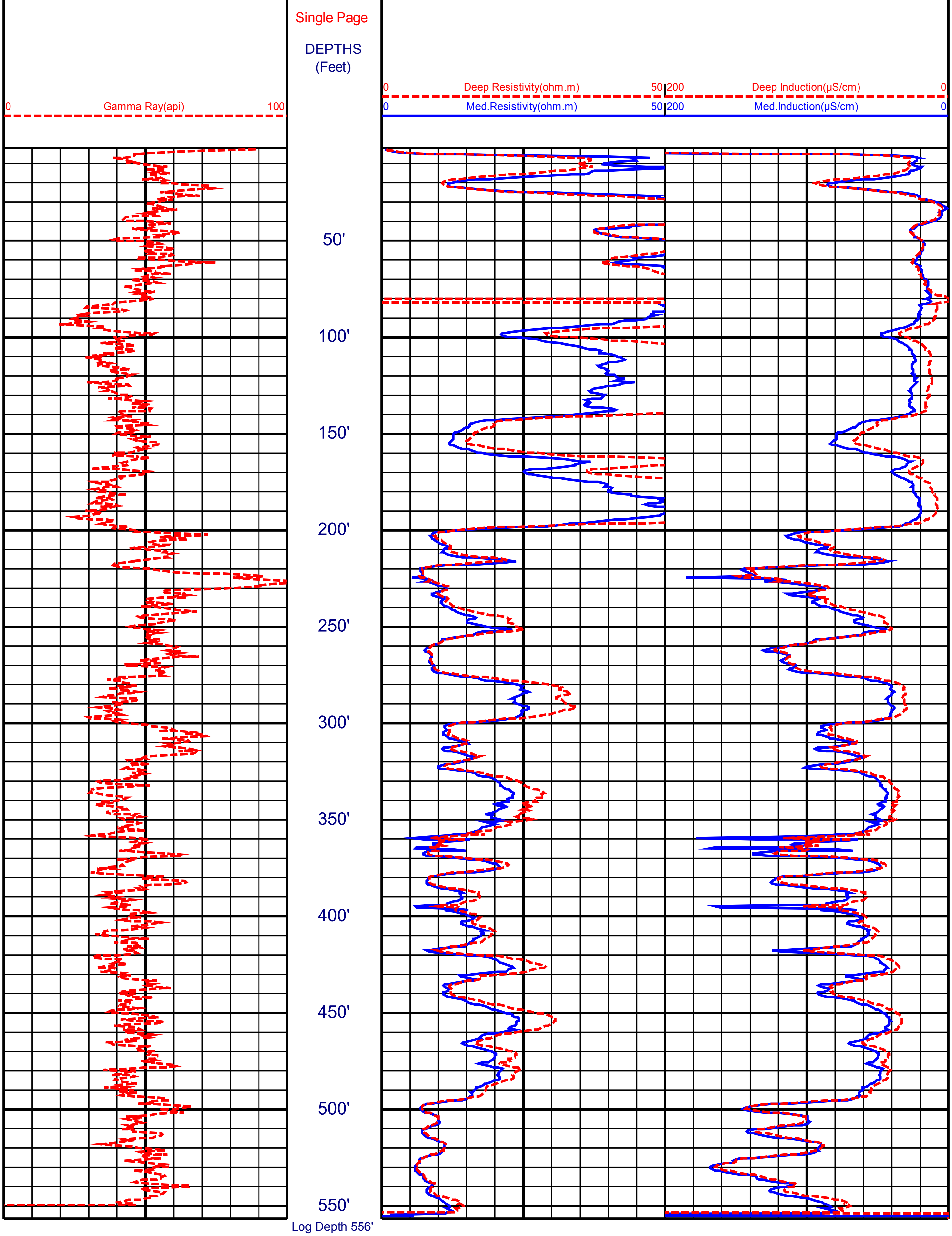
Drilling Measured From: **Ground Level** G.L. ____ Ft.

Date	**Oct 17, 2018**			
Type Log	**Induction**			
Run	**One**			
Depth-Driller	**605** Ft	Ft	Ft	Ft
Depth-Logger	**555** Ft	Ft	Ft	Ft
Top Logged Interval	**2** Ft	Ft	Ft	Ft
Btm Logged Interval	**552** Ft	Ft	Ft	Ft
Type Fluid In Hole	**Water**			
Fluid Level	**92** Ft	Ft	Ft	Ft
Max Temp	**N/A** °F	°F	°F	°F
Operating Rig Time	**N/A** °Hr	°Hr	°Hr	°Hr
Van No. / Location				
Recorded By	**Craig Corbell**			
Witnessed By	**Andrea Berge**			

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT SIZE	FROM	TO	CASING SIZE	CASING TYPE	FROM	TO
1	In	Ft	Ft	**6** In	**PVC**	**0** Ft	**TD** Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

Cleath Harris Geologists
30S/11E-18L6
Oct 17, 2018

DUAL INDUCTION - GAMMA RAY LOG



DUAL INDUCTION - GAMMA RAY LOG

Cased Hole Survey

, Ventura CA · Phone: (888) 908-5226 Fax: (661) 505-6561 · Web: www.boredata.com Email: ccorbell@boredata.com

Filing No.

COMPANY **Cleath Harris Geologists**

WELL **30S/11E-18L6**

FIELD **Los Osos**

STATE **California** COUNTY **San Luis Obispo**

LOCATION:
North of Palisades Dr.

OTHER SERVICES:
None

Job No.
3328A

SEC: ____ TWP: ____ RGE: ____ LAT.: ____ LONG.: ____

Permanent Datum: **Ground Level** Elev.: ____ Ft. Elevs.: K.B. ____ Ft.

Log Measured From: **Ground Level** , **0** Ft. Above Perm. Datum D.F. ____ Ft.

Drilling Measured From: **Ground Level** G.L. ____ Ft.

Date	**Nov 05, 2021**			
Type Log	**Induction**			
Run	**One**			
Depth-Driller	**605** Ft	Ft	Ft	Ft
Depth-Logger	**555** Ft	Ft	Ft	Ft
Top Logged Interval	**2** Ft	Ft	Ft	Ft
Btm Logged Interval	**552** Ft	Ft	Ft	Ft
Type Fluid In Hole	**Water**			
Fluid Level	**75.03** Ft	Ft	Ft	Ft
Max Temp	**N/A** °F	°F	°F	°F
Operating Rig Time	**N/A** °Hr	°Hr	°Hr	°Hr
Van No. / Location	**BD-2** / **VTU**			
Recorded By	**Craig Corbell**			
Witnessed By	**Andrea Berge**			

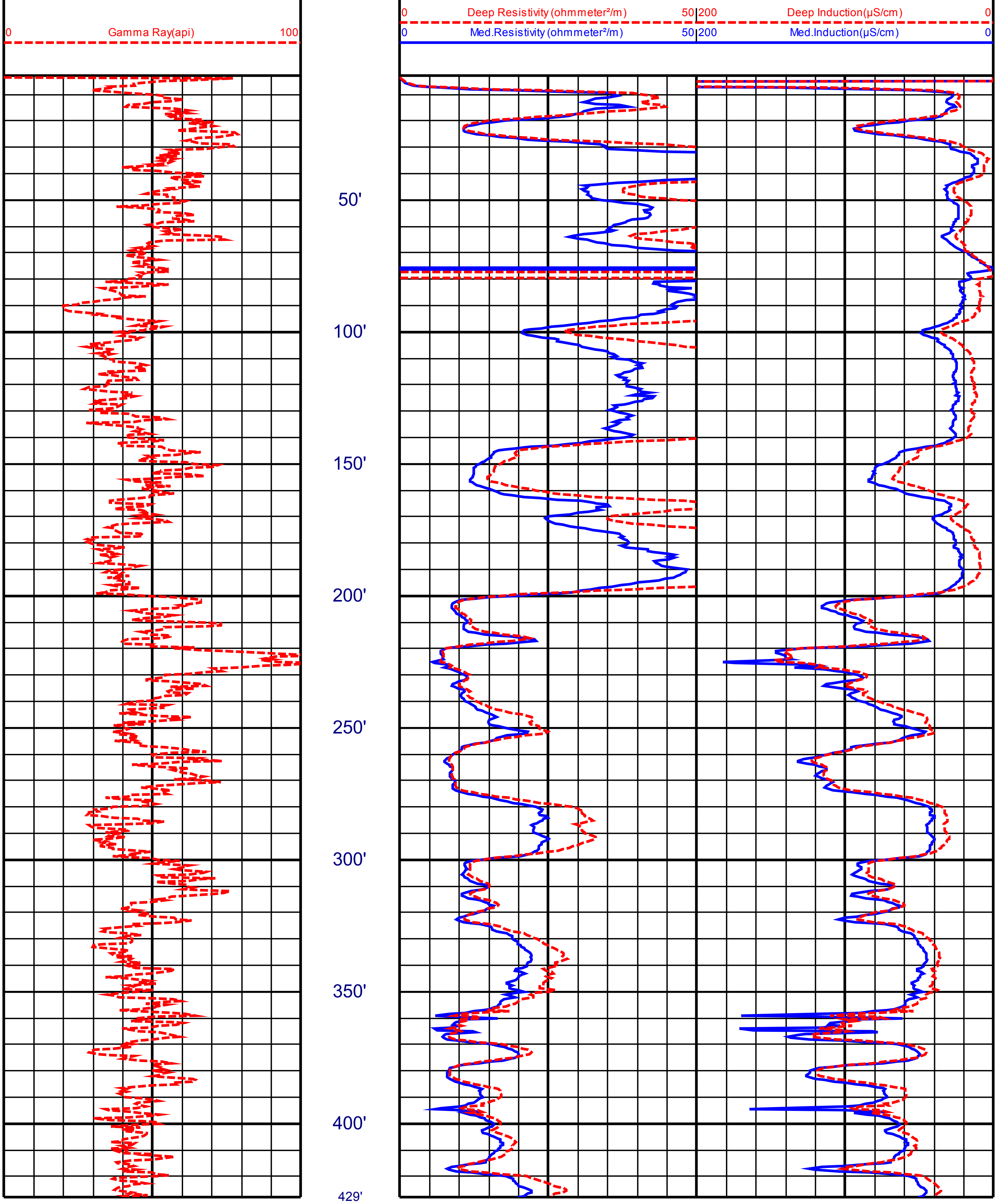
RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT SIZE	FROM	TO	CASING SIZE	CASING TYPE	FROM	TO
1	In	Ft	Ft	**6** In		Ft	Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

Cleath Harris Geologists
30S/11E-18L6
Nov 05, 2021

DUAL INDUCTION - GAMMA RAY LOG

Mult. Pages
2"/100'

DEPTHS
(Feet)

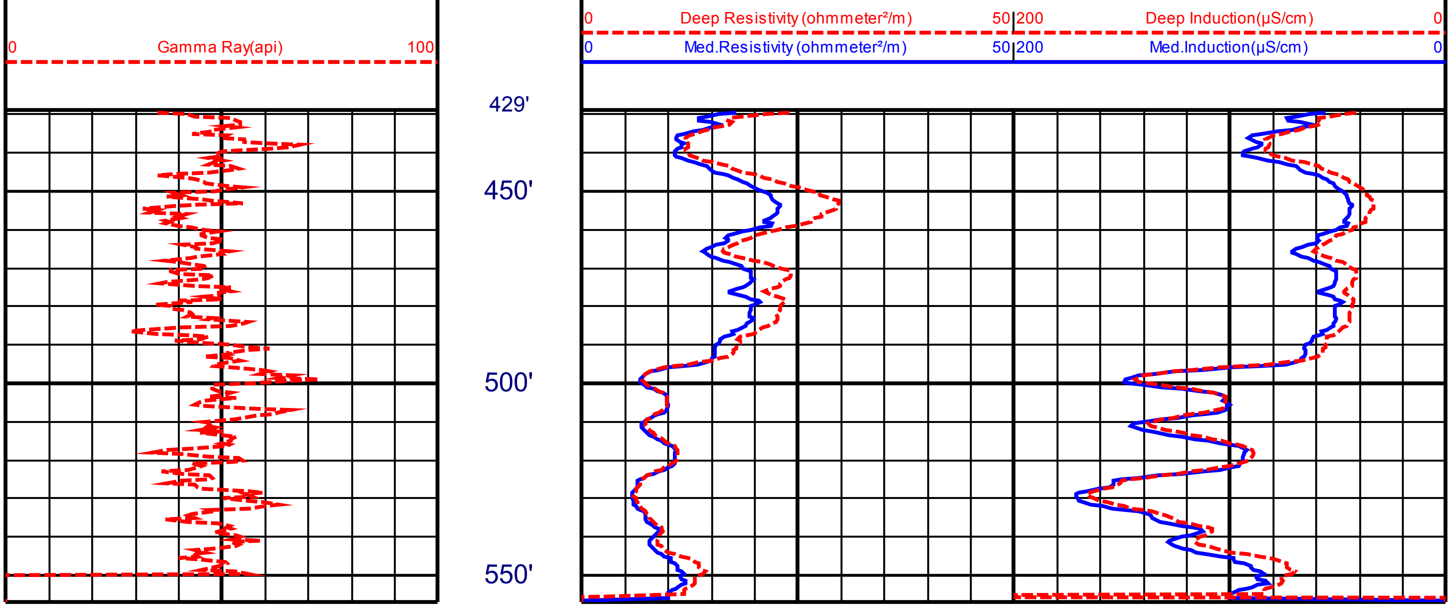


Cleath Harris Geologists
30S/11E-18L6
Nov 05, 2021

DUAL INDUCTION - GAMMA RAY LOG

Mult. Pages
2"/100'

DEPTHS
(Feet)



Log Depth 555.5'

LA40 GEOPHYSICS

PACIFIC SURVEYS

ELECTRIC LOG
GAMMA RAY

Job No. 26131	Company	FILIPPONI & THOMPSON DRILLING
	Well	LOS OSOS CSD
File No.	Field	LOS OSOS
	County	SAN LUIS OBISPO State CA

Location:

CORNER OF LUPINE ST & DONNA AVE
GPS: 35.3196 -120.8472

Sec. Twp. Rge.

Other Services:

SONIC/VDL
CALIPER

				Elevation
Permanent Datum	G.L.		Elevation	K.B.
Log Measured From	G.L.	0'	above perm. datum	D.F.
Drilling Measured From	G.L.			G.L.

Date	10/22/2019		
Run Number	ONE		
Depth Driller	503'		
Depth Logger	503'		
Bottom Logged Interval	503'		
Top Log Interval	30'		
Casing Driller	14" @ 57'		
Casing Logger	N/A		
Bit Size	12"		
Type Fluid in Hole	BENTONITE		
Density / Viscosity	N/A		
pH / Fluid Loss	N/A		
Source of Sample	N/A		
Rm @ Meas. Temp	6.4 @ 91F		
Rmf @ Meas. Temp	6.17 @ 91F		
Rmc @ Meas. Temp	N/A		
Source of Rmf / Rmc	MEAS		
Rm @ BHT	N/A		
Time Circulation Stopped	13:00		
Time Logger on Bottom	14:15		
Max. Recorded Temperature	N/A		
Equipment Number	PS1		
Location	BFL		
Recorded By	MEDRANO		
Witnessed By	---		

<<< Fold Here >>>

Comments

RLN CORRECTED

Calibration Report

Database File	26131.db
Dataset Pathname	elog
Dataset Creation	Tue Oct 22 14:14:55 2019

ELOG Calibration Report

Serial:	ELOG-1
Model:	DTQ
Shop Calibration Performed:	Wed Jan 10 15:03:40 2018
Before Survey Verification Performed:	Wed Jan 10 15:11:46 2018
After Survey Verification Performed:	Wed Jan 10 15:12:17 2018

Shop Calibration

	Readings			References			Results	
	Zero	Cal		Zero	Cal		Gain	Offset
Short	0.848	51.473		0.500	50.000	Ohm-m	0.978	-0.329
Long	3.217	205.082		2.000	200.000	Ohm-m	0.981	-1.156
IEE	21.320	5750.280	counts	0.023	6.293	A		
VSN	98.980	6539.640	counts	1.888	124.736	V		
VLN	110.720	1659.200	counts	2.112	31.647	V		

Before Survey Verification

	Readings			References			Results	
	Zero	Cal		Zero	Cal		Gain	Offset
Short	0.000	101.390		413.223	101.225	Ohm-m	-3.077	413.223
Long	0.000	101.409		1848.940	102.729	Ohm-m	-17.220	1848.940
IEE	0.000	5596.300	counts	0.000	6.125	A		
VSN	47.700	6374.860	counts	0.910	121.593	V		
VLN	97.400	1594.020	counts	1.858	30.404	V		

After Survey Verification

	Readings			References			Results	
	Zero	Cal		Zero	Cal		Gain	Offset
Short	0.000	101.389		0.000	101.390	Ohm-m	1.000	0.000
Long	0.000	101.424		0.000	101.409	Ohm-m	1.000	0.000
IEE	0.000	5631.180	counts	0.000	6.163	A		
VSN	47.660	6414.560	counts	0.909	122.350	V		
VLN	102.800	1604.200	counts	1.961	30.598	V		

After Survey Verification compared to Before Survey Calibration

	Zero			Cal		
	Before	After		Before	After	
Short	413.223	0.000	Ohm-m	101.225	101.390	Ohm-m
Long	1848.940	0.000	Ohm-m	102.729	101.409	Ohm-m

Gamma Ray Calibration Report

Serial Number:	D4	
Tool Model:	ELOG	
Performed:	Sat Jan 27 14:45:53 2018	
Calibrator Value:	162.0	GAPI
Background Reading:	101.7	cps
Calibrator Reading:	326.7	cps
Sensitivity:	0.7200	GAPI/cps

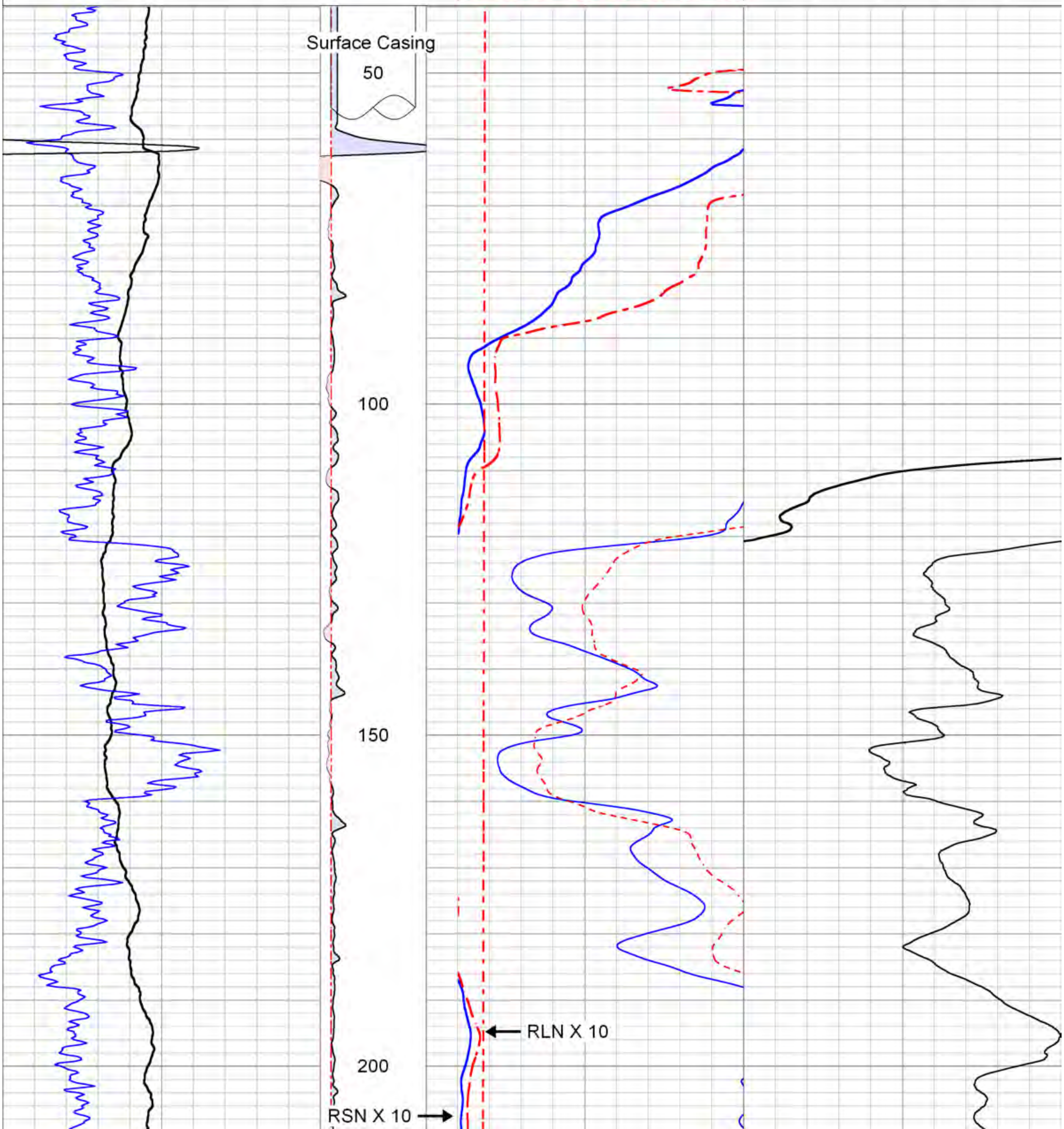
Database File	26131.db
Dataset Pathname	elog
Presentation Format	elog_cwa
Dataset Creation	Tue Oct 22 14:14:55 2019
Charted by	Depth in Feet scaled 1:240

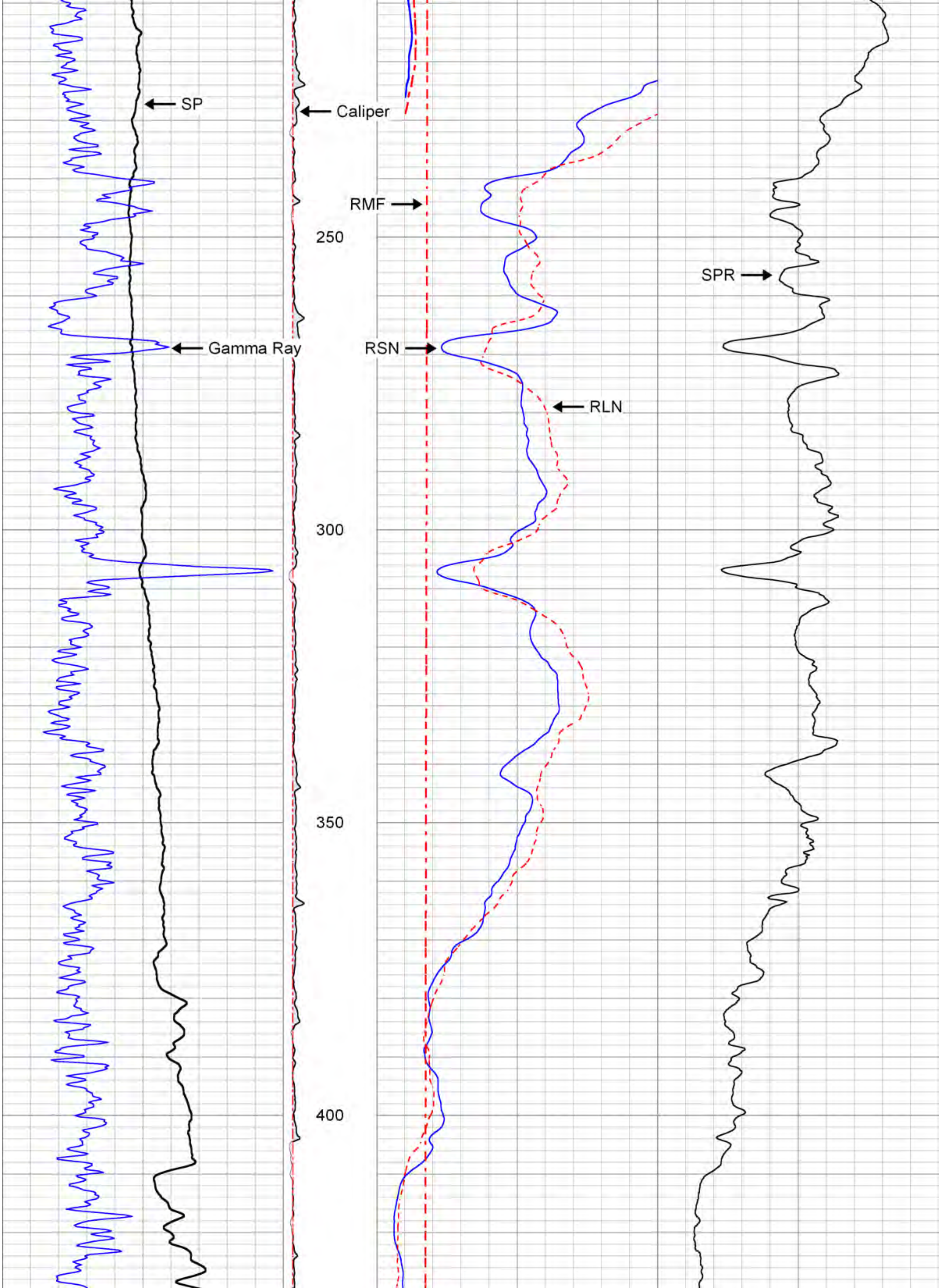
-70 SP (mV) 30
20 Gamma-Ray (GAPI) 120
20 Caliper (in) 40

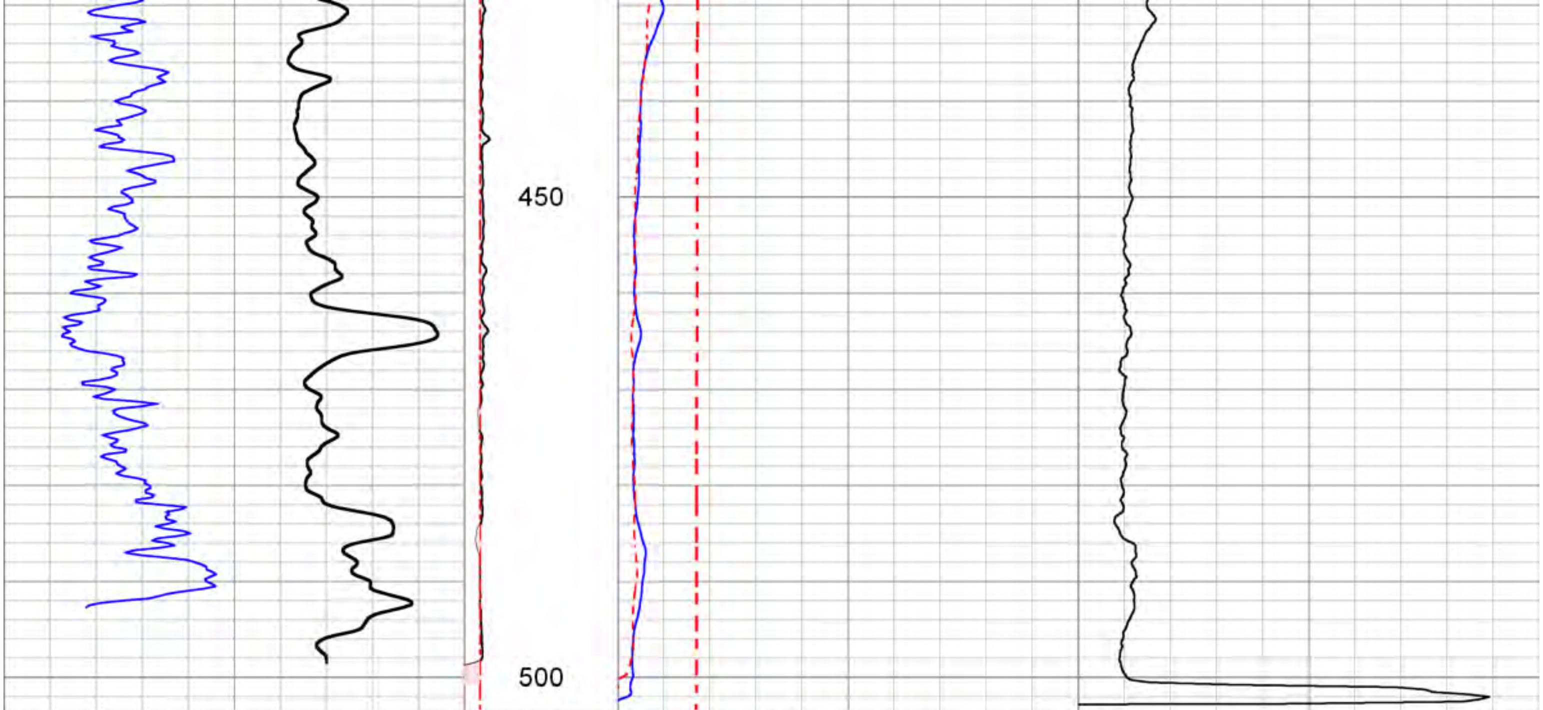
XCAL
10 (in) 30
Bit Size
10 (in) 30

0 RSN (Ohm-m) 50
0 RLN (Ohm-m) 50
0 RMF (Ohm-m) 50
50 RSN X 10 (Ohm-m) 500
50 RLN X 10 (Ohm-m) 500

10 SPR (Ohm-m) 60
60 SPR Backup (Ohm-m) 110




SP
Caliper
RMF
250
SPR
Gamma Ray
RSN
RLN
300
350
400



-70 SP (mV) 30	XCAL	0 RSN (Ohm-m) 50	10 SPR (Ohm-m) 60
20 Gamma-Ray (GAPI) 120	10 (in) 30	0 RLN (Ohm-m) 50	60 SPR Backup (Ohm-m) 110
20 Caliper (in) 40	Bit Size	0 RMF (Ohm-m) 50	
	10 (in) 30	50 RSN X 10 (Ohm-m) 500	
		50 RLN X 10 (Ohm-m) 500	

Log Variables

DatabaseC:\ProgramData\Warrior\Data\26131.db
Dataset field/well/run1/elog/_vars_

Top - Bottom

BOREID in	BOTTEMP degF	CASEOD in	CASETHCK in	PERFS	RM_MEAS_R Ohm-m	RM_MEAS_T degF
12	64.2	5.5	0	No	6.4	91

RMF Ohm-m	RSH Ohm-m	SPSHIFT mV	SRFTEMP degF	TDEPTH ft	TempGrad DegF/ft
6.17	20	0	58	500	0.01235

Variable Description

BOREID : Borehole I.D.
BOTTEMP : Bottom Hole Temperature
CASEOD : Casing O.D.
CASETHCK : Casing Thickness
PERFS : Perforation Flag
RM_MEAS_R : Mud Resistivity Measured
RM_MEAS_T : Mud Temperature Measured
RMF : Resistivity of Mud Filtrate
RSH : Resistivity of Shale
SPSHIFT : S.P. Baseline Offset
SRFTEMP : Surface Temperature
TDEPTH : Total Depth
TempGrad : Temperature Gradient

DUAL INDUCTION - GAMMA RAY LOG

Cased Hole Survey

, Ventura CA · Phone: (888) 908-5226 Fax: (661) 505-6561 · Web: www.boredata.com Email: ccorbell@boredata.com

Filing No.

COMPANY Cleath Harris Geologists

WELL Zone E LA40

FIELD Los Osos

STATE California COUNTY San Luis Obispo

LOCATION:
Corner of Doris Ave and Lupin St

OTHER SERVICES:
None

Job No.
3328B

SEC: ____ TWP: ____ RGE: ____ LAT.: ____ LONG.: ____

Permanent Datum: Ground Level Elev.: ____ Ft. Elevs.: K.B. ____ Ft.

Log Measured From: Ground Level , 0 Ft. Above Perm. Datum D.F. ____ Ft.

Drilling Measured From: Ground Level G.L. ____ Ft.

Date	Nov 05, 2021			
Type Log	Induction			
Run	One			
Depth-Driller	480 Ft	Ft	Ft	Ft
Depth-Logger	477 Ft	Ft	Ft	Ft
Top Logged Interval	2 Ft	Ft	Ft	Ft
Btm Logged Interval	474 Ft	Ft	Ft	Ft
Type Fluid In Hole	Water			
Fluid Level	8 Ft	Ft	Ft	Ft
Max Temp	N/A °F	°F	°F	°F
Operating Rig Time	N/A °Hr	°Hr	°Hr	°Hr
Van No. / Location	BD-2 / VTU			
Recorded By	Craig Corbell			
Witnessed By	Andrea Berge			

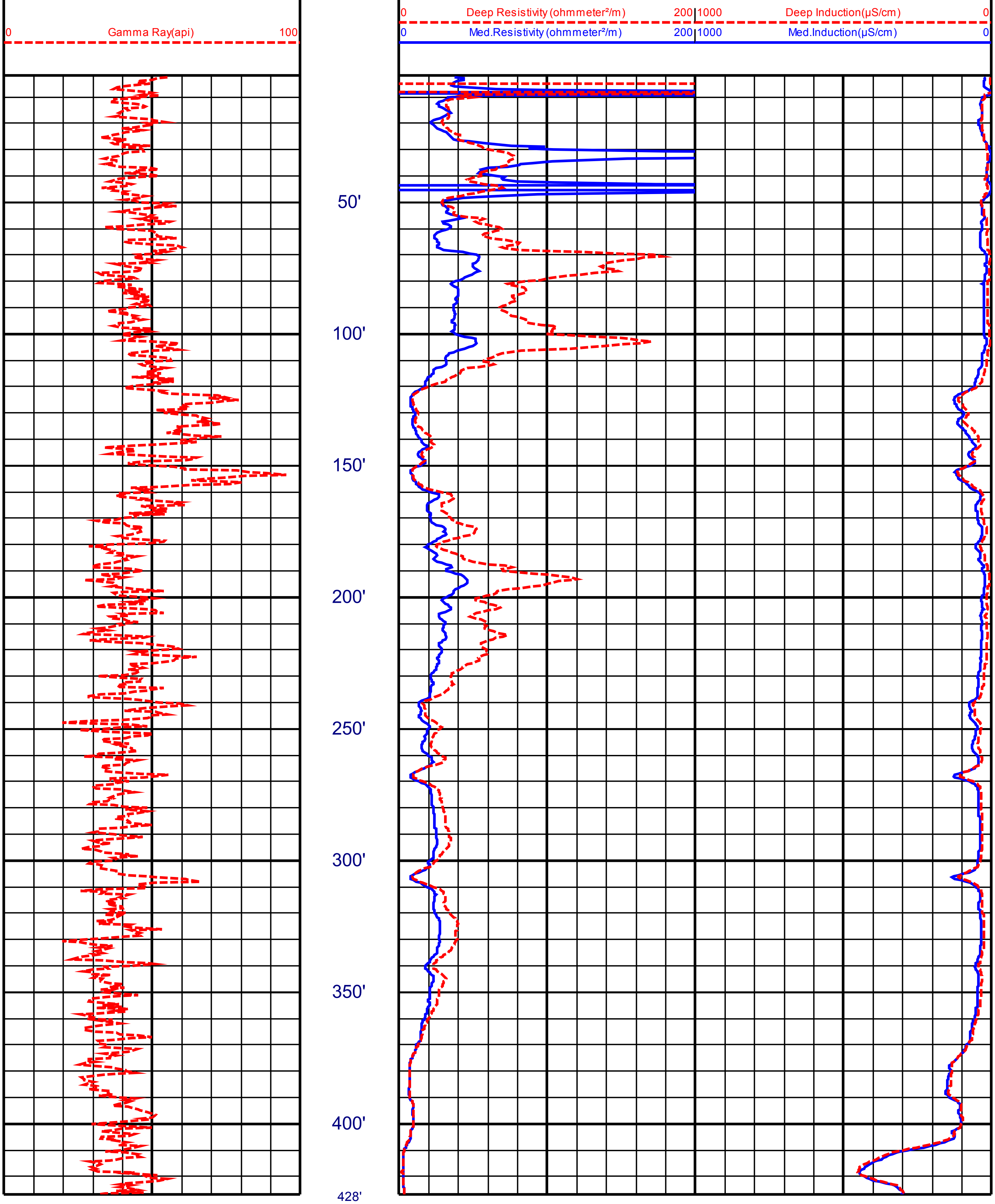
RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT SIZE	FROM	TO	CASING SIZE	CASING TYPE	FROM	TO
1	In	Ft	Ft	2.5 In	PVC	0 Ft	480 Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

Cleath Harris Geologists
Zone E LA40
Nov 05, 2021

DUAL INDUCTION - GAMMA RAY LOG

Mult. Pages
2"/100'

DEPTHS
(Feet)

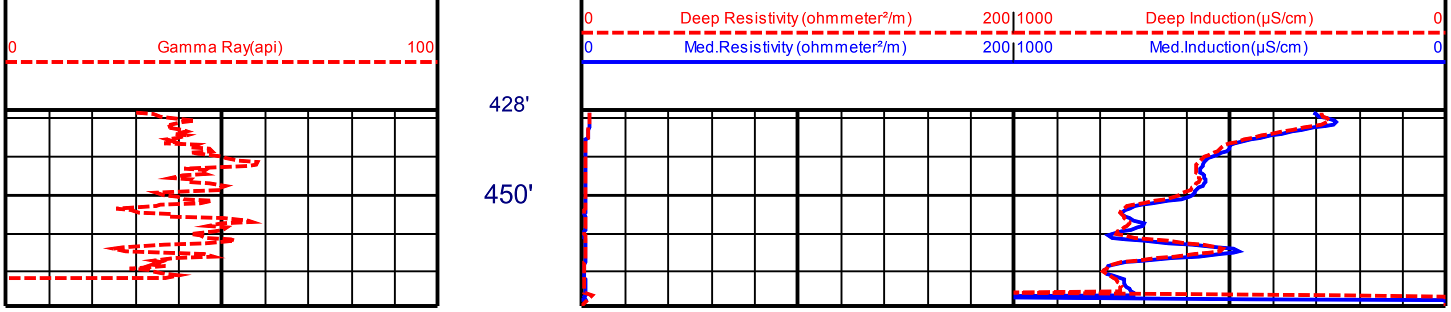


Cleath Harris Geologists
Zone E LA40
Nov 05, 2021

Mult. Pages
2"/100'

DEPTHS
(Feet)

DUAL INDUCTION - GAMMA RAY LOG



Log Depth 477.5'

APPENDIX G

Land Use and Water Use Areas
(from LOBP)

Figure 5. Land Uses in the Plan Area

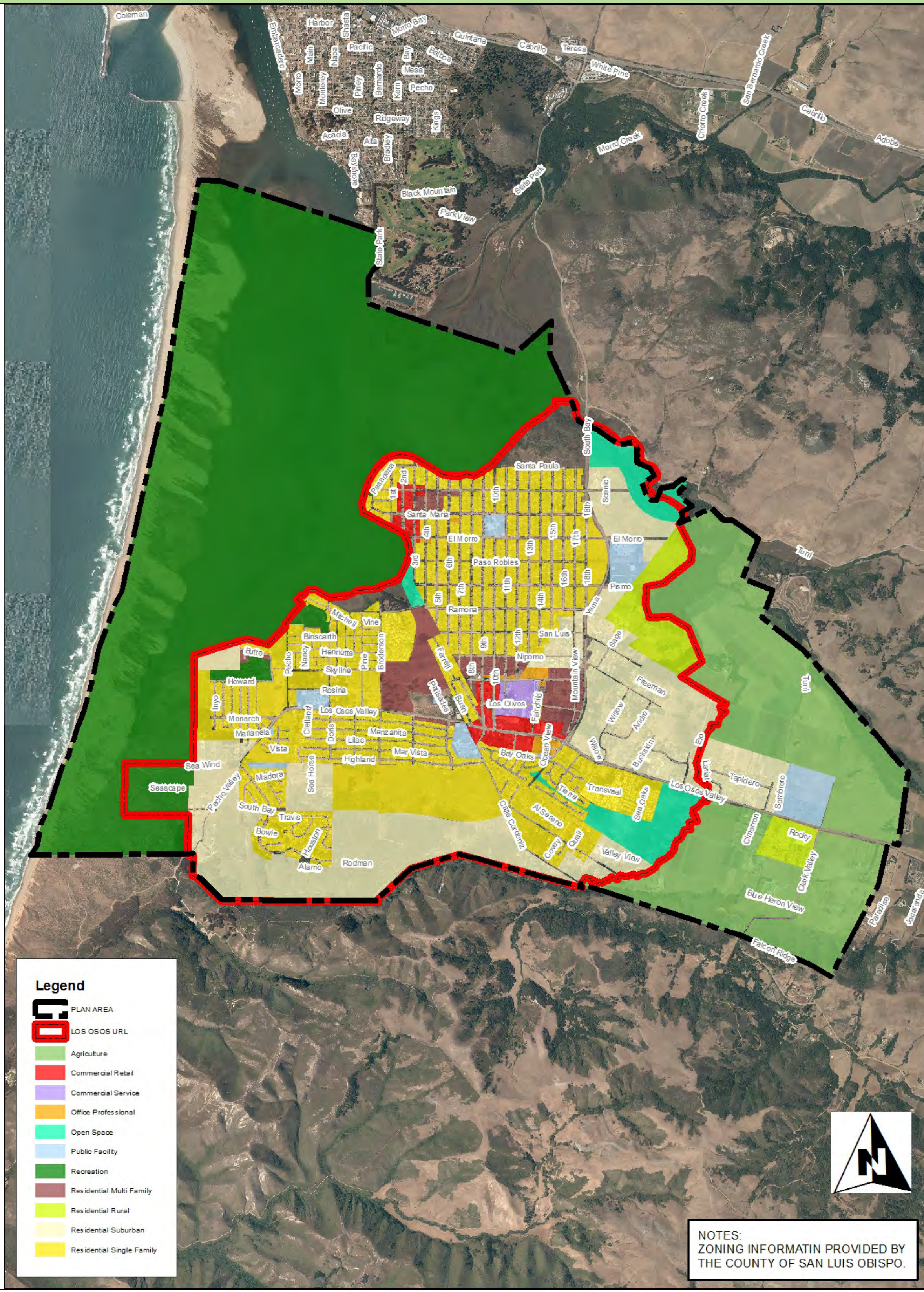
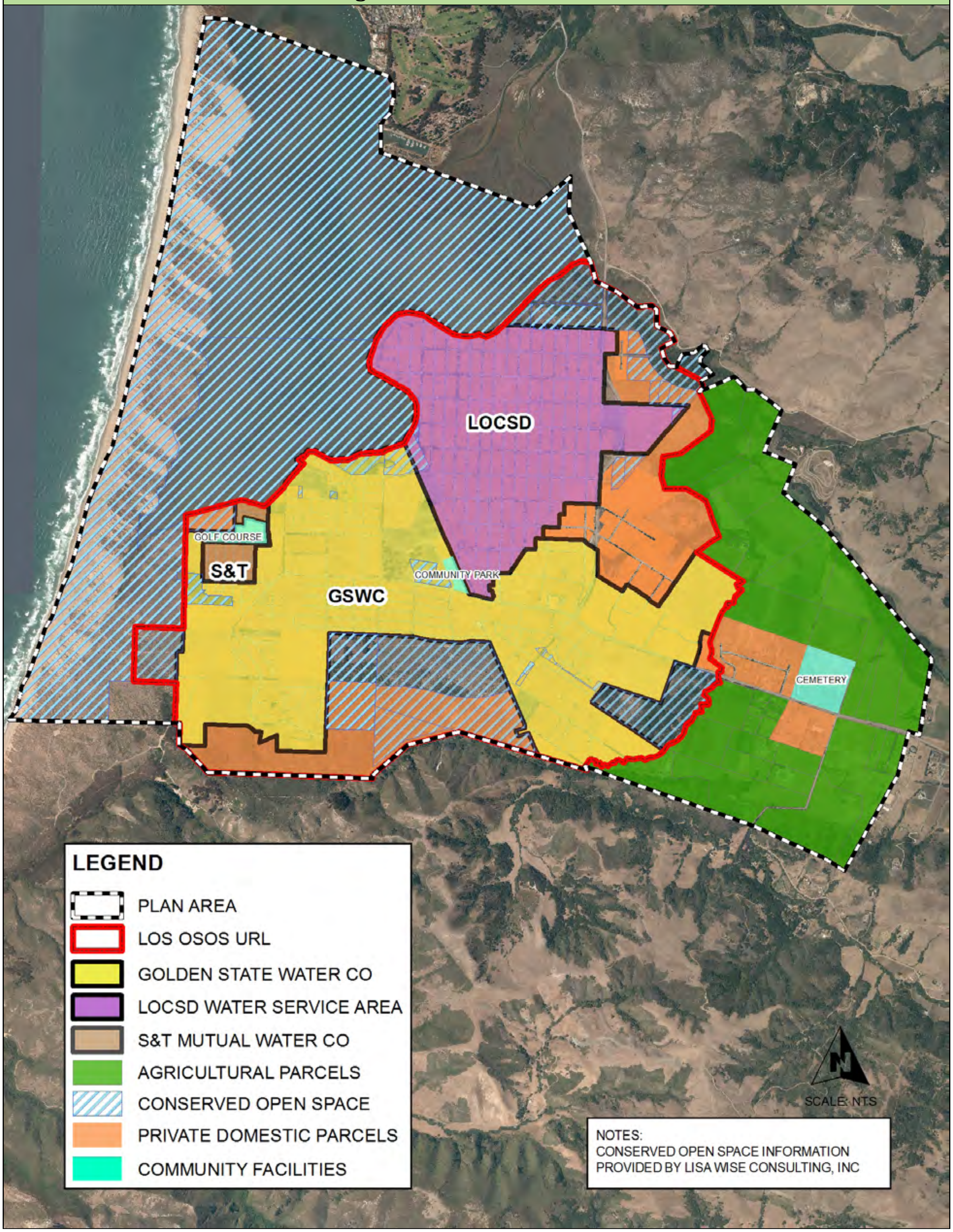


Figure 10. Water Use Areas



APPENDIX H

2021 Agricultural and Community Turf Water Use Estimates

Agriculture and Community Turf Applied Irrigation Water Estimate - 2021

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 (2021).
- Daily rainfall from County rain gage 727 (former Los Osos Landfill).
- Daily reference evapotranspiration from the California Irrigated Management Information System (CIMIS) Station 160 (San Luis Obispo West - Chorro Valley) located in DWR Climate Zone 6, which is the same climate zone as the Los Osos Valley.
- Water holding capacity and rooting depths from UC Davis Cooperative Extension at http://UCManageDrought.ucdavis.edu
- Crop Coefficients (Kc) from prior work in the Los Osos basin.

The soil-moisture budget methodology used accounts for soil holding capacity, crop rooting depth, leaching fraction, irrigation efficiency, local precipitation, and local reference evapotranspiration. The following equation, modified from a general formula for irrigation water requirements, was used for the soil-moisture budget (Carollo, 2012, modified from Burt et al., 2002):

Applied Irrigation Water = (ETc - ER) / (EF)

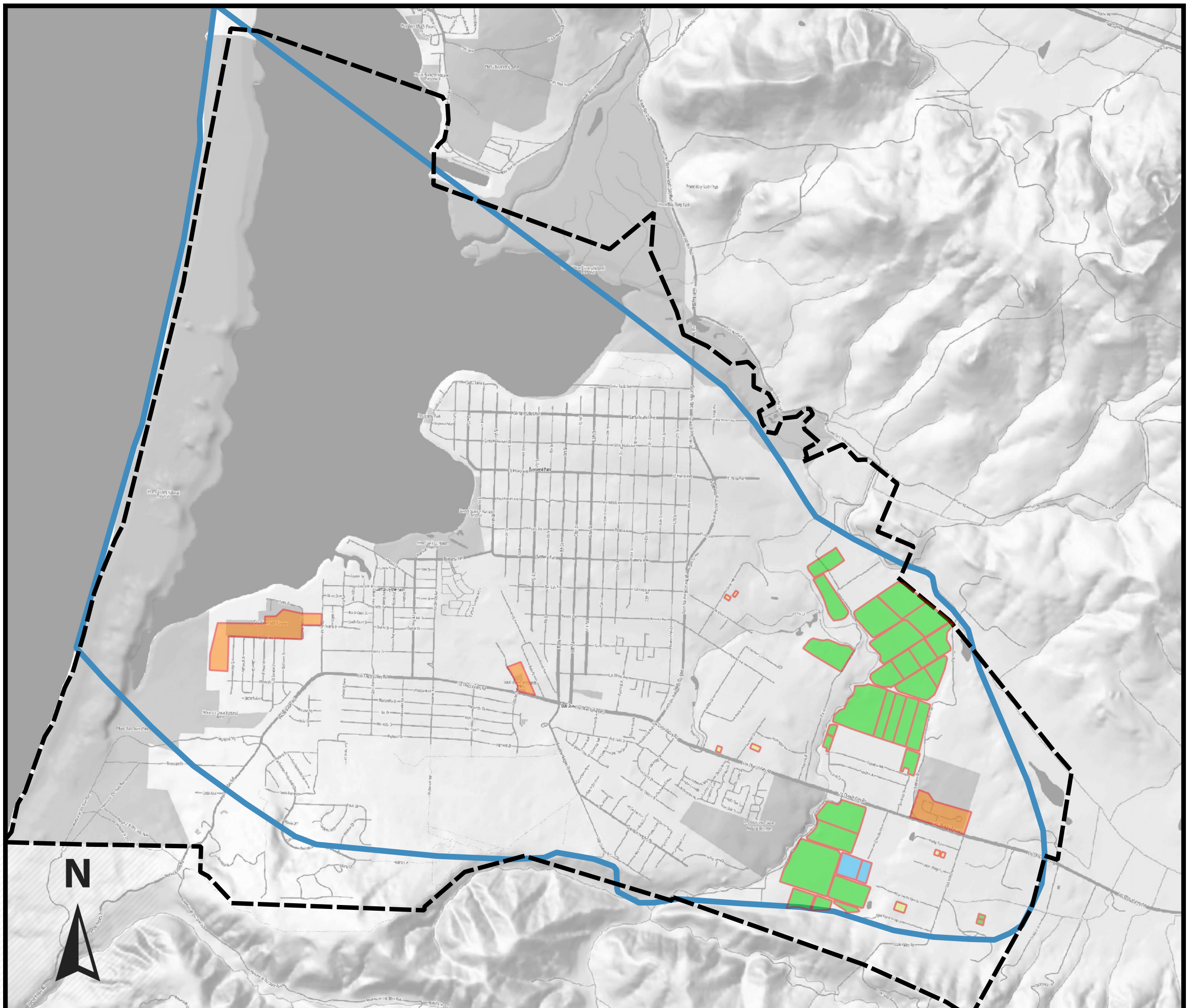
Where:

ETc [Crop evapotranspiration] = ETo [reference evapotranspiration] x Kc [crop coefficient]
ER [effective rainfall] = rainfall stored in soil and available to crop
EF [efficiency factor] = (1-LF[leaching fraction]) x IE [irrigation efficiency]
Assumes no frost protection for crops in the Los Osos Creek Valley.

Irrigated Acreage

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 2020. 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 2020 dataset was used as the basis for irrigated acreage in the adjudicated area and updated for 2021 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 (2020) dataset and showed evidence of irrigation in 2021 NDVI images were added to a modified 2020 shapefile. 2021 crop acreages were then estimated using this updated dataset for use in soil moisture budget modeling.

A land use survey map for 2021 is shown in Figure H-1. Tabulation of the irrigated acreages is presented in Table H-1.



Base Image: Stamen Terrain in Greyscale

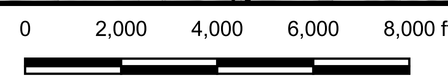
<u>Explanation</u>

Crop Type - 2020 County of SLO Data (Modified for 2021)

- Nursery
- Pasture
- Vegetables
- Vineyard

- LOBP Basin Boundary
- Adjudicated Plan Area

- Community Facilities with Turf Areas



Scale: 1 inch ≈ 4,000 feet

Figure H1

2021 Crop Types
Los Osos Groundwater Basin

2021 Annual Report

Cleath-Harris Geologists

Table H-1
2021 County Crop Survey
Eastern Area

Crop Type	Acres
Nursery	3.3
Pasture[1]	8.7
Vegetables	251
Total	263

[1]Sod farm listed as nursery in survey

Crop acreages listed in Table H-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 H-2 presents these areas below.

Table H-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.

Soil-Moisture Budget

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.

As noted above:

Applied Irrigation Water = (**ETc - ER**) / (**EF**)

Where:

ETc [Crop evapotranspiration] = ETo [reference evapotranspiration] x Kc [crop coefficient]

ETo: Reference evapotranspiration is imported from CIMIS Station 160 (San Luis Obispo West - Chorro Valley available on-line at: https://cimis.water.ca.gov/

Kc: The crop coefficient for turfgrass (Memorial Park, Golf Course, Community Park and the sod farm) is by definition 1, since the reference ETo crop is turfgrass. The crop coefficient for vegetables/row crops are based on prior investigations and summarized in Table H-3 below.

Table H-3
Crop Coefficients - Vegetables

Month	Kc
JAN	0.41
FEB	0.41
MAR	0.53
APR	0.51
MAY	0.73
JUN	0.86
JUL	0.83
AUG	0.76
SEP	0.71
OCT	0.56
NOV	0.46
DEC	0.34

Source: Yates & Williams (2003)

ER [effective rainfall] = rainfall stored in soil and available to crop

ER is accounted for in the daily soil moisture budget. An example of the moisture budget is presented at the end of this appendix.

The water holding capacity was estimated based on the typical soils present in the Los Osos Creek valley: Marimel silty clay loam, Marimel sandy clay loam, and Salinas silty clay loam. Using NRCS Soil Survey accessible here: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm, and assuming a typical rooting depth of 2 feet, the resulting water holding capacity for the soil moisture budget calculations was estimated at 4 inches.

EF [efficiency factor] = (1-LF[leaching fraction]) x IE [irrigation efficiency]

The efficiency factor was substituted with a calibration factor of 92 percent. The purpose of the substitution was to reconcile 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 but used a different methodology (CHG, 2009b). The intent was to develop a methodology that provided variation in irrigation estimates from year to year based on both rainfall and acreages, but that was also consistent with historical estimates. Calibration factor development is shown in Table H-4.

Table H-4
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 2017 Annual Report Table F-3;
[2]From 2017 Annual Report 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 H-4 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, and an example of the soil moisture is attached to the end of this appendix.

Tables H-5 and H-6 present irrigation demand as crop evapotranspiration for calendar years 2019 through 2021. The soil-moisture budget results show irrigation demand for vegetables was greater in 2021, compared to 2020, despite significantly greater rainfall. This can be explained by the distribution of rainfall. In 2021, 18 inches out of the 23 inches of annual rainfall came in either January or December, which are the months with the lowest crop ET. By contrast, in 2020 only 2.2 inches of rain fell during January and December, and the remaining months received 7.5 inches of rain, compared to only 4.5 inches from February to November in 2021. Irrigation demand for turfgrass was similar between 2020 and 2021.

Table H-5
Soil-Moisture Budget Results (Vegetables)

Year	Irrigation demand	ETo	ETc	Precip*
	(inches)			
2019	23.71	51.11	33.33	25.03
2020	24.19	52.88	34.03	9.76
2021	25.13	52.89	34.18	23.12

*calendar year

Table H-6
Soil-Moisture Budget Results (Pasture/Turf)

Year	Irrigation Demand (ETaw)	ETo	ETc	Precip*
	(inches)			
2019	36.79	51.11	51.11	25.03
2020	42.30	52.88	52.88	9.76
2021	42.45	52.89	52.89	23.12

*calendar year

Table H-7 summarizes the estimated applied irrigation for the various agricultural land uses. Due to the relatively minor acreage involved, nursery acres 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 2021 is 610 acre-feet (a decrease of 40 acre-feet from 2020).

Table H-7
Applied Irrigation for Agriculture

Description	Units	2019	2020	2021
Irrigation demand vegetables	inches	23.71[1]	24.19[1]	25.13[1]
Irrigation demand pasture	inches	36.79[2]	42.3[2]	42.45[2]
Irrigation Calibration Factor[3]	factor	0.92	0.92	0.92
Applied irrigation vegetables	feet	2.15	2.19	2.28
Applied irrigation pasture	feet	3.33	3.83	3.85
Vegetables acreage[4]	acres	281.6	282.6	255.3
Vegetables applied water	acre-feet	605.4	618.9	582.1
Pasture acreage[5]	acres	8.7	8.7	8.7
Pasture applied water	acre-feet	29.1	33.5	33.5
TOTAL applied agricultural irrigation (closest 10 acre-feet)	acre-feet	630	650	620

[1]From Table H-5;
[2]From Table H-6;
[3] From 2006-2009 calibration (Table H-4)
[4]2021 acreage from County GIS 2020 (nursery acres counted as 3.8 acres in vegetables, based on equivalent water demand conversion using 2012 County Master Water Plan Table A1 [Carollo, 2012]).
[5]From Table H-1

Table H-8 summarizes the estimated applied irrigation for community facilities. The total estimated water demand for community facilities in the 2021 calendar year was 145 acre-feet, which was met with 16.5 acre-feet of recycled water use and 129 acre-feet of groundwater production.

Table H-8
2021 Applied Irrigation for Community Facilities

Description	Units	Memorial Park	Sea Pines Golf*	Community Park	Total
Turf Area (from Table H-2)	acres	12.5	24	1.2	37.7
Applied Irrigation (from Table H-6)	feet	3.85	3.85	3.85	3.85
TOTAL Applied Irrigation	acre-feet	48.1	92.4	4.6	145

*includes an estimated 16.5 acre-feet of recycled water (76 acre-feet net production)

Sample Calculations:
Daily Soil-Moisture Budget

NOTE: Wilting point (maximum allowable deficit), irrigation efficiencies, leaching fraction, and specific growing season dates are collectively approximated with the Efficiency Factor (EF), which calibrates the soil-moisture budget results to the prior estimates for 2006-2008 (CHG, 2009b). The soil-moisture budget is a tool developed to assist basin management and is not an irrigation schedule.

[A], [B]: Day and month used for sample calculation: October 23, 2022
[C]: ETo = 0.11 inches
[D]: Kc = 0.56
[E]: ETc = ETo*Kc = 0.06 inches
[F]: Precipitation + Irrigation = **[N]** + **[M]** = 0.0 inches + 0.06 inches = 0.06 inches
[G]: Water Available from Soil Profile = WHC of active root zone (4 inches) + soil moisture deficit on October 22 (-4.00 inches) = 0.0 inches
[H]: ETc Met by Precipitation + Irrigation = **[E]** *OR* **[F],** whichever is smaller. Both are equal, so **[H]** = 0.06 inches
[I]: ETc Met by Profile = **[G]** *OR* (**[E]** - **[H]**), whichever is smaller. Both are equal, so **[I]** = 0.0 inches
[J] Precip Available for Profile = **[F]** - **[H]** = 0.06 inches -0.06 inches = 0.0 inches
[K] Soil Moisture Deficit = whichever is greater between (a) -WHC (-4.0 inches) and (b) minimum of either (c) 0 inches or (d) October 22 Soil Moisture Deficit (-4.00 inches) - **[I]** **(**0 inches) + **[J]** (0.0 inches) = -4.00 inches. In this case (a) and (d) are the same and less than (c), therefore **[K]** = (a) = -4.00 inches
[L] Monthly Deep Percolation and Runoff = whichever is greater between (a) 0 inches and (b) Oct 22 Soil Moisture Deficit (-4.00 inches) + **[J]** (0.0 inches) = -4.00 inches, therefore **[L]** = 0 inches
[M] Irrigation Demand = **[E]** - **[N]** - **[G]** if greater than zero, otherwise 0 inches. In this case [M]= 0.06 inches
[N] Precipitation = 0.0 inches

[A], [B]: Day and month used for sample calculation: October 25, 2022
[C]: ETo = 0.07 inches
[D]: Kc = 0.56
[E]: ETc = ETo*Kc = 0.04 inches
[F]: Precipitation + Irrigation = **[N]** + **[M]** = 2.52 inches + 0.0 inches = 2.52 inches
[G]: Water Available from Soil Profile = WHC of active root zone (4 inches) + soil moisture deficit on October 24 (-3.86 inches) = 0.14 inches
[H]: ETc Met by Precipitation + Irrigation = **[E]** *OR* **[F],** whichever is smaller. In this case **[E]** is smaller, so **[H]** = 0.04 inches
[I]: ETc Met by Profile = **[G]** *OR* (**[E]** - **[H]**), whichever is smaller. In this case **[E]** - **[H]** = 0.0 inches
[J] Precip Available for Profile = **[F]** - **[H]** = 2.52 inches - 0.04 inches = 2.48 inches
[K] Soil Moisture Deficit = whichever is greater between (a) -WHC (-4.0 inches) and (b) minimum of either (c) 0 inches or (d) October 24 Soil Moisture Deficit (-3.86 inches) - **[I]** **(**0.0 inches) + **[J]** (2.48 inches) = -1.38 inches. In this case (d) is less than (c) and greater than (a), therefore **[K]** = (d) = -1.38 inches
[L] Monthly Deep Percolation and Runoff = whichever is greater between (a) 0 inches and (b) Oct 24 Soil Moisture Deficit (-3.86 inches) + **[J]** (2.48 inches) = -1.38 inches, therefore **[L]** = 0 inches
[M] Irrigation Demand = **[E]** (0.04 inches) - **[N]** (2.52 inches) - **[G]** (0.14 inches) if greater than zero, otherwise 0 inches. On this date **[M]** = 0.0 inches
[N] Precipitation = 2.52 inches

Water Holding Capacity (WHC) (in/ft) **2**
Active Root Zone Depth (ft) **2.0**
WHC of Active Root Zone (in) **4.0**
Crop Coeficient (Kc) **Variable**

Highlighted rows used for example calcuations

[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	]J]	[K]	[L]	[M]	[N]
Day	Month	Refernce ET (ETo) CIMIS Sta. 160	Crop Coefficient (Kc)	Crop ET (ETc)	Precip. + Irrigation	Water Available from Soil Profile	ETc met by Precip + Irrig	ETc met by Profile	Precip Available for Profile	Soil Moisture Deficit	Monthly Deep Percolation and Runoff	Irrigation Demand	Precip Sta. 727
2021		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
1	October	0.17	0.56	0.10	0.10	0.00	0.10	0.00	0.00	-4.00	0.00	0.10	0.00
2		0.16	0.56	0.09	0.09	0.00	0.09	0.00	0.00	-4.00	0.00	0.09	0.00
3		0.16	0.56	0.09	0.09	0.00	0.09	0.00	0.00	-4.00	0.00	0.09	0.00
4		0.12	0.56	0.07	0.07	0.00	0.07	0.00	0.00	-4.00	0.00	0.07	0.00
5		0.15	0.56	0.08	0.08	0.00	0.08	0.00	0.00	-4.00	0.00	0.08	0.00
6		0.13	0.56	0.07	0.07	0.00	0.07	0.00	0.00	-4.00	0.00	0.07	0.00
7		0.13	0.56	0.07	0.07	0.00	0.07	0.00	0.00	-4.00	0.00	0.07	0.00
8		0.14	0.56	0.08	0.08	0.00	0.08	0.00	0.00	-4.00	0.00	0.08	0.00
9		0.16	0.56	0.09	0.09	0.00	0.09	0.00	0.00	-4.00	0.00	0.09	0.00
10		0.16	0.56	0.09	0.09	0.00	0.09	0.00	0.00	-4.00	0.00	0.09	0.00
11		0.16	0.56	0.09	0.09	0.00	0.09	0.00	0.00	-4.00	0.00	0.09	0.00
12		0.16	0.56	0.09	0.09	0.00	0.09	0.00	0.00	-4.00	0.00	0.09	0.00
13		0.14	0.56	0.08	0.08	0.00	0.08	0.00	0.00	-4.00	0.00	0.08	0.00
14		0.19	0.56	0.11	0.11	0.00	0.11	0.00	0.00	-4.00	0.00	0.11	0.00
15		0.19	0.56	0.11	0.11	0.00	0.11	0.00	0.00	-4.00	0.00	0.11	0.00
16		0.23	0.56	0.13	0.13	0.00	0.13	0.00	0.00	-4.00	0.00	0.13	0.00
17		0.14	0.56	0.08	0.08	0.00	0.08	0.00	0.00	-4.00	0.00	0.08	0.00
18		0.13	0.56	0.07	0.07	0.00	0.07	0.00	0.00	-4.00	0.00	0.07	0.00
19		0.13	0.56	0.07	0.07	0.00	0.07	0.00	0.00	-4.00	0.00	0.07	0.00
20		0.13	0.56	0.07	0.07	0.00	0.07	0.00	0.00	-4.00	0.00	0.07	0.00
21		0.09	0.56	0.05	0.05	0.00	0.05	0.00	0.00	-4.00	0.00	0.05	0.00
22		0.05	0.56	0.03	0.03	0.00	0.03	0.00	0.00	-4.00	0.00	0.03	0.00
23		0.11	0.56	0.06	0.06	0.00	0.06	0.00	0.00	-4.00	0.00	0.06	0.00
24		0.03	0.56	0.02	0.16	0.00	0.02	0.00	0.14	-3.86	0.00	0.00	0.16
25		0.07	0.56	0.04	2.52	0.14	0.04	0.00	2.48	-1.38	0.00	0.00	2.52
26		0.12	0.56	0.07	0.00	2.62	0.00	0.07	0.00	-1.44	0.00	0.00	0.00
27		0.17	0.56	0.10	0.00	2.56	0.00	0.10	0.00	-1.54	0.00	0.00	0.00
28		0.15	0.56	0.08	0.00	2.46	0.00	0.08	0.00	-1.62	0.00	0.00	0.00
29		0.12	0.56	0.07	0.00	2.38	0.00	0.07	0.00	-1.69	0.00	0.00	0.00
30		0.06	0.56	0.03	0.00	2.31	0.00	0.03	0.00	-1.72	0.00	0.00	0.00
31		0.09	0.56	0.05	0.00	2.28	0.00	0.05	0.00	-1.77	0.00	0.00	0.00

APPENDIX I

Precipitation and Streamflow Data

Note: Rainfall data for 2020 and 2021 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, 2020-2021

Day	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1												
2												
3												
4												
5							0.04					
6												
7												
8												
9									0.20			
10									0.72			
11									0.04			
12						0.04		0.16	0.04			
13		0.04			0.40	0.16						
14						0.12						
15								0.04	0.16			
16												
17											0.04	
18					0.04							
19					0.04				0.12			
20												
21												
22							0.12					
23							0.04					
24							0.12					
25												
26						0.04	0.20					
27						0.56	5.76					
28						1.08	3.56					
29							0.24					
30												
31						0.04						
Total	***0.00***	***0.04***	***0.00***	***0.00***	***0.48***	***2.04***	***10.08***	***0.20***	***1.28***	***0.00***	***0.04***	***0.00***
Cumu Total	***0.00***	***0.04***	***0.04***	***0.04***	***0.52***	***2.56***	***12.64***	***12.84***	***14.12***	***14.12***	***14.16***	***14.16***

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						0.12						
30					0.48	0.04						
31												
Total	***0.04***	***0.04***	***0.00***	***0.00***	***2.12***	***4.48***	***0.20***	***0.04***	***4.88***	***1.92***	***0.12***	***0.04***
Cumu Total	***0.04***	***0.08***	***0.08***	***0.08***	***2.20***	***6.68***	***6.88***	***6.92***	***11.80***	***13.72***	***13.84***	***13.88***

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

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	
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

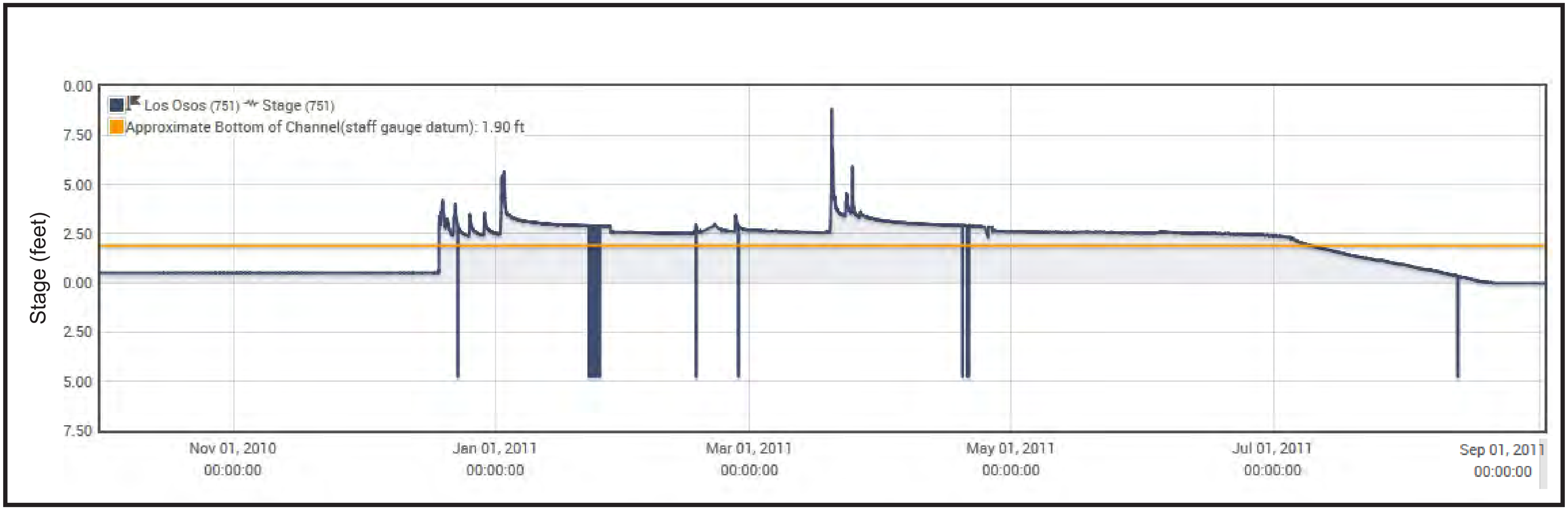
DAILY PRECIPITATION
(inches)

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

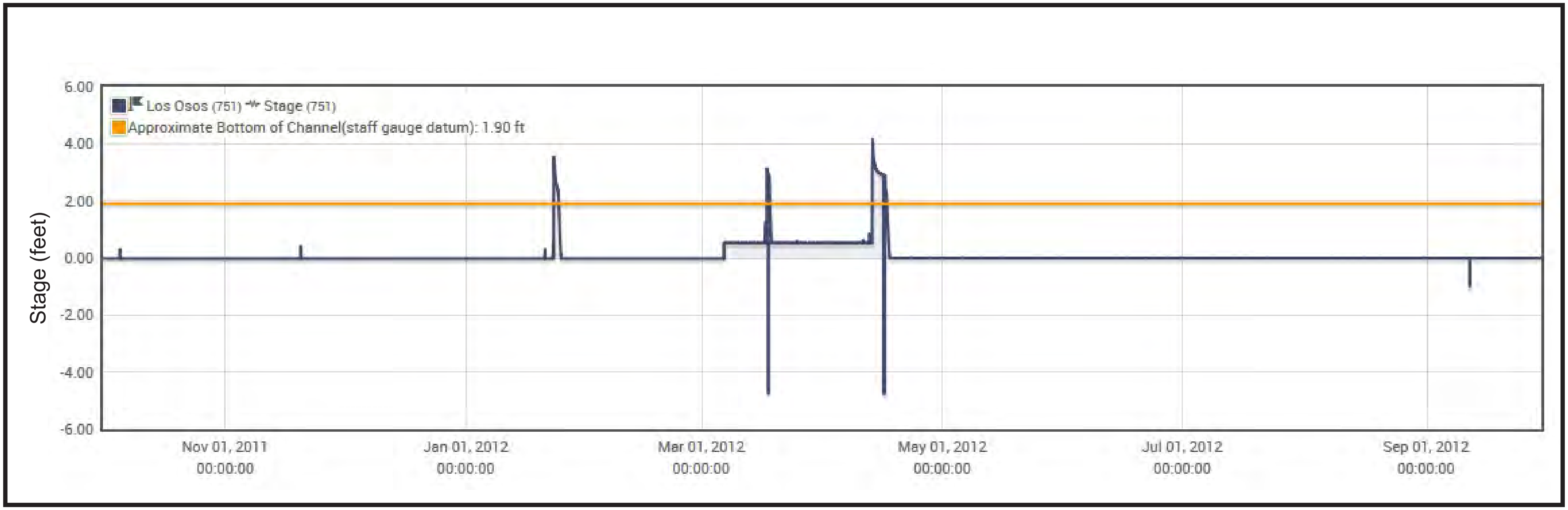
Total	0.04	0.20	0.63	0.24	0.75	2.52	4.45	3.70	3.90	3.70	2.64	0.00	
Cum. Total	0.04	0.24	0.87	1.10	1.85	4.37	8.82	12.52	16.42	20.12	22.76	22.76	

Season Total **22.76**



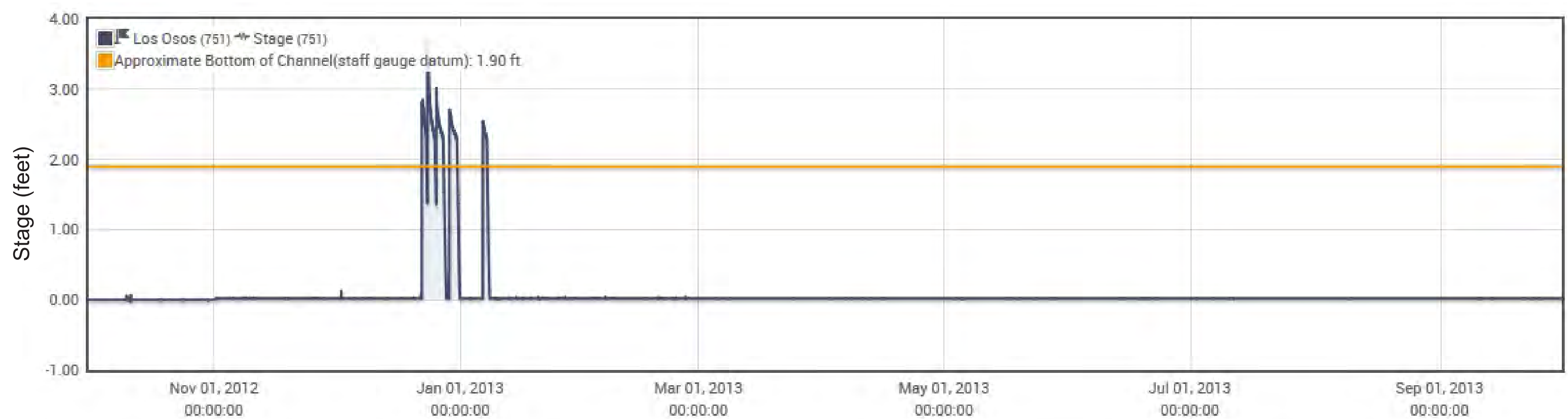
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

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



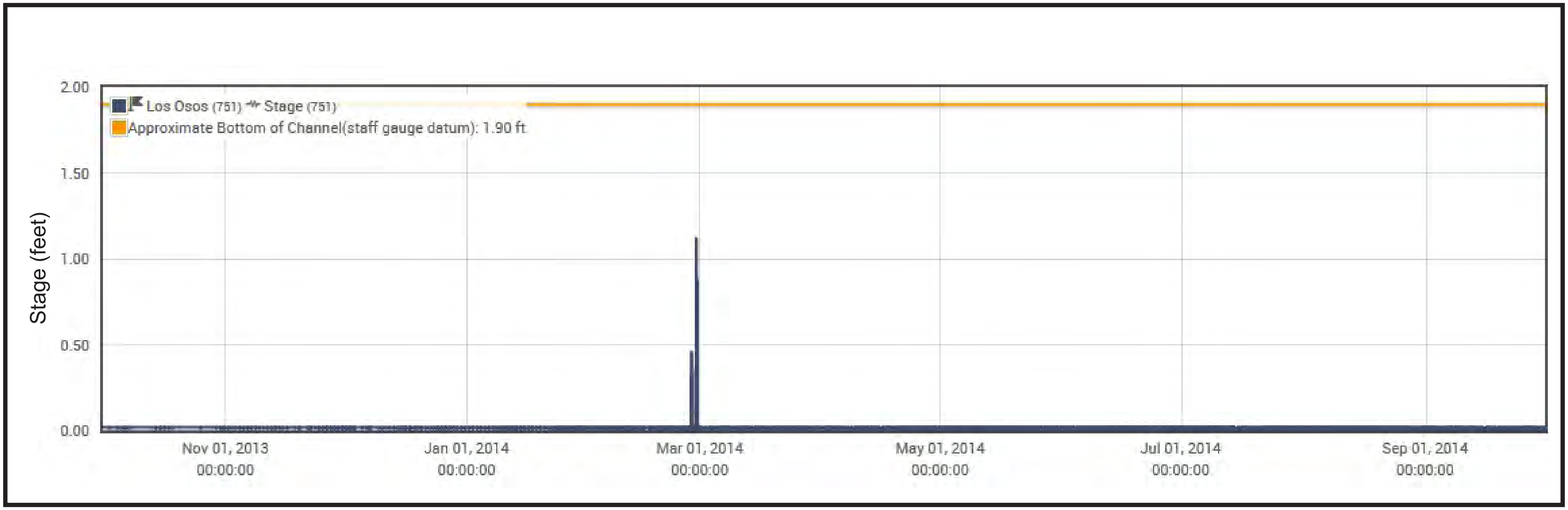
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

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



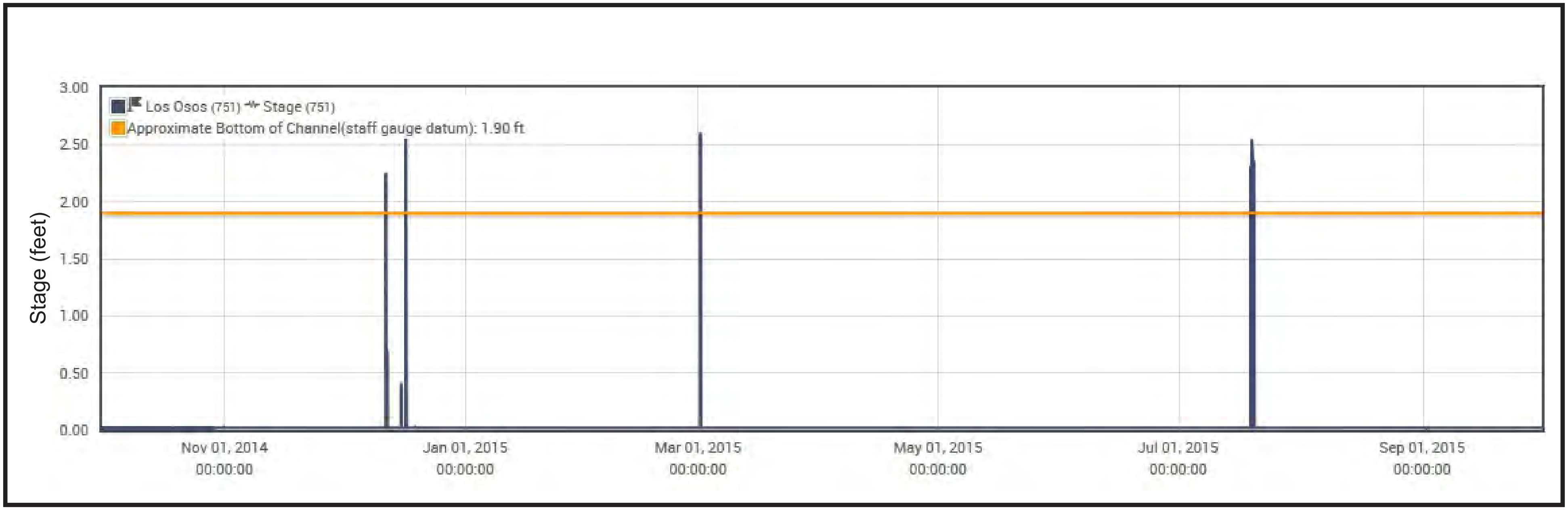
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

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



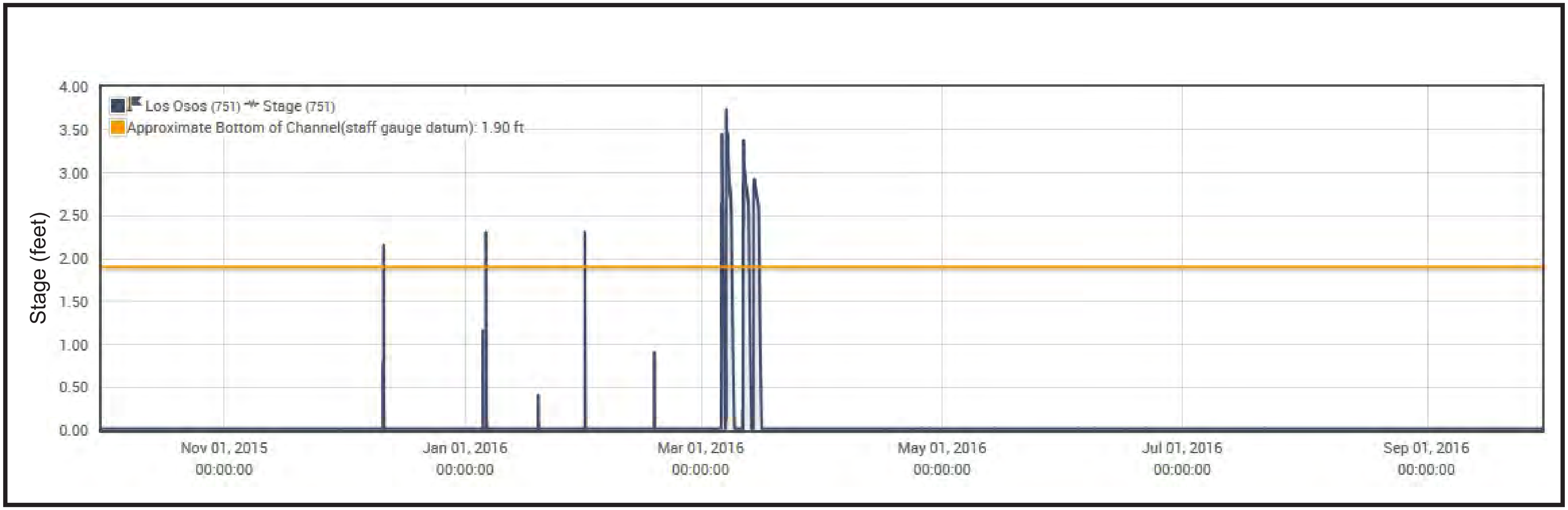
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

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



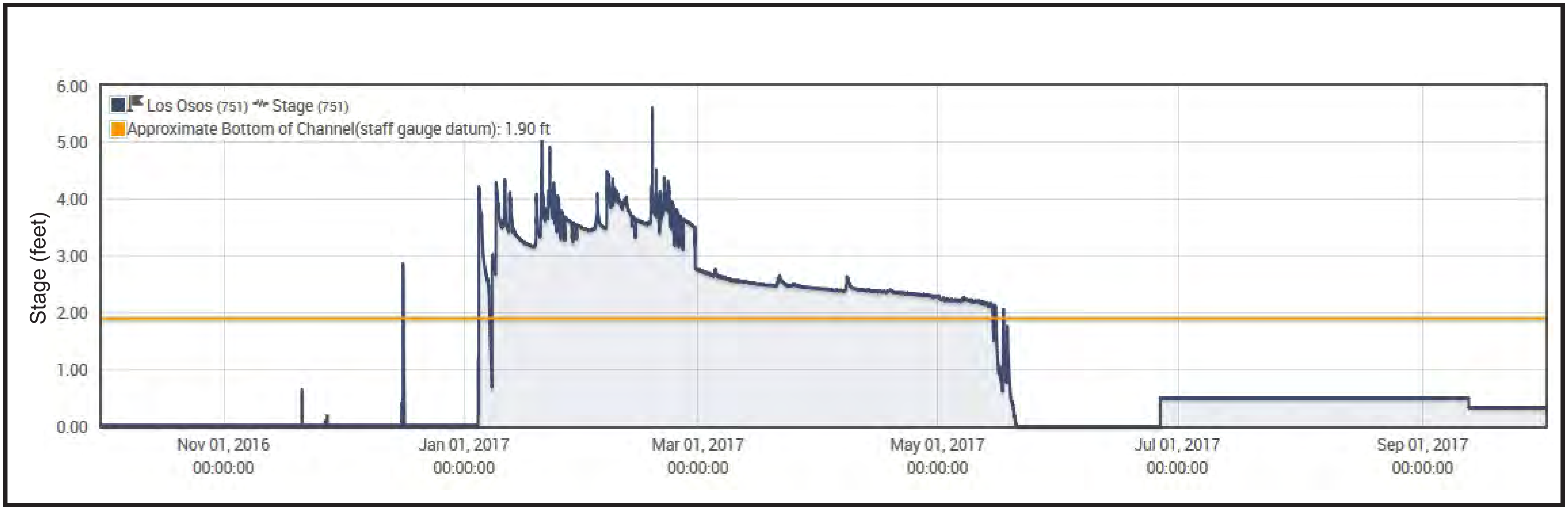
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

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



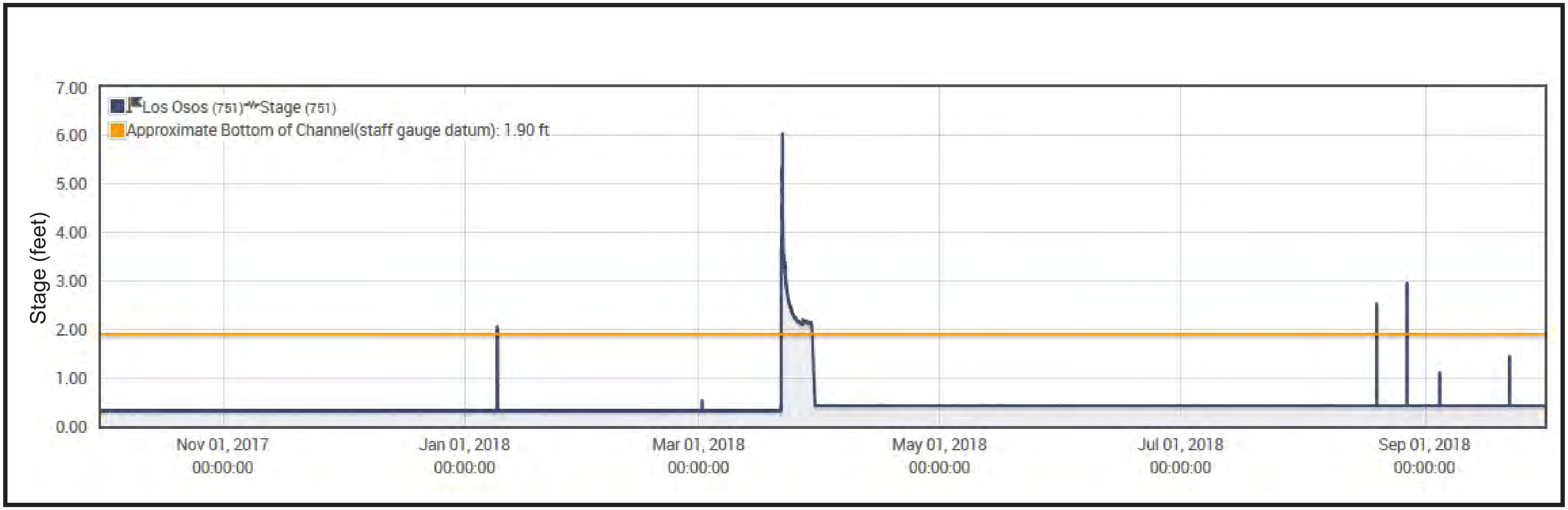
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

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



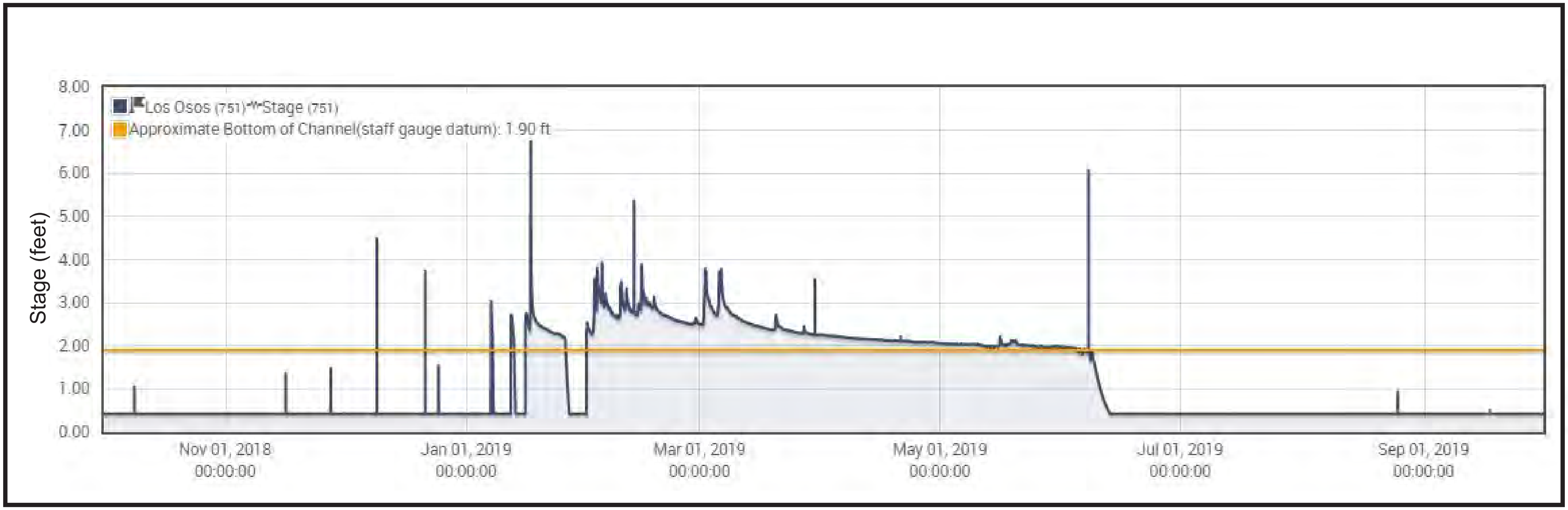
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

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



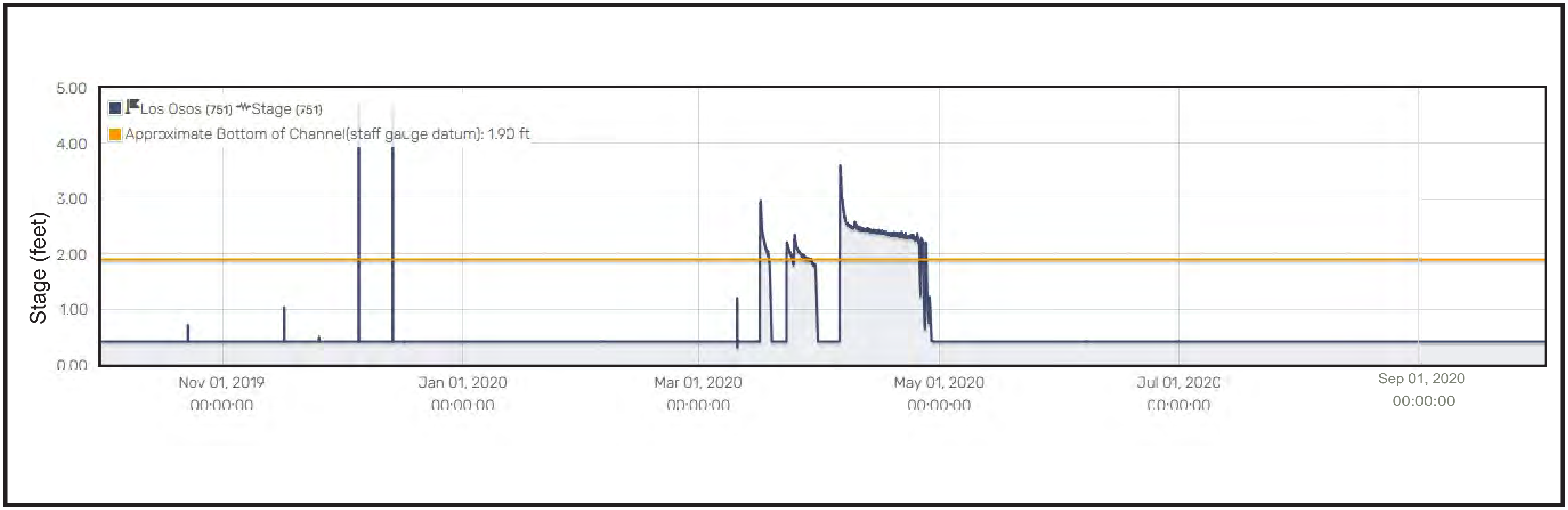
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H8
Stream Stage for 2018 Water Year
Los Osos Creek, Gage #751



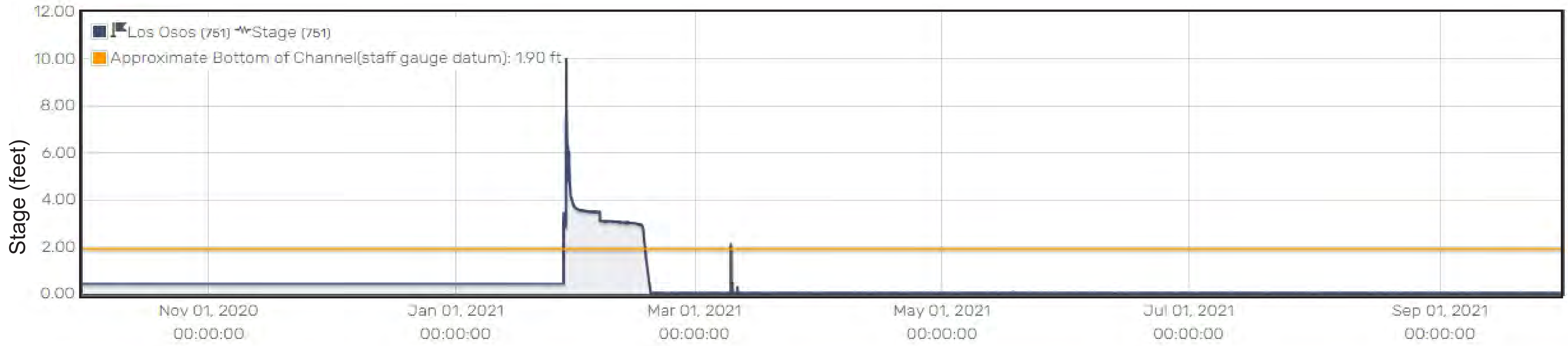
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

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



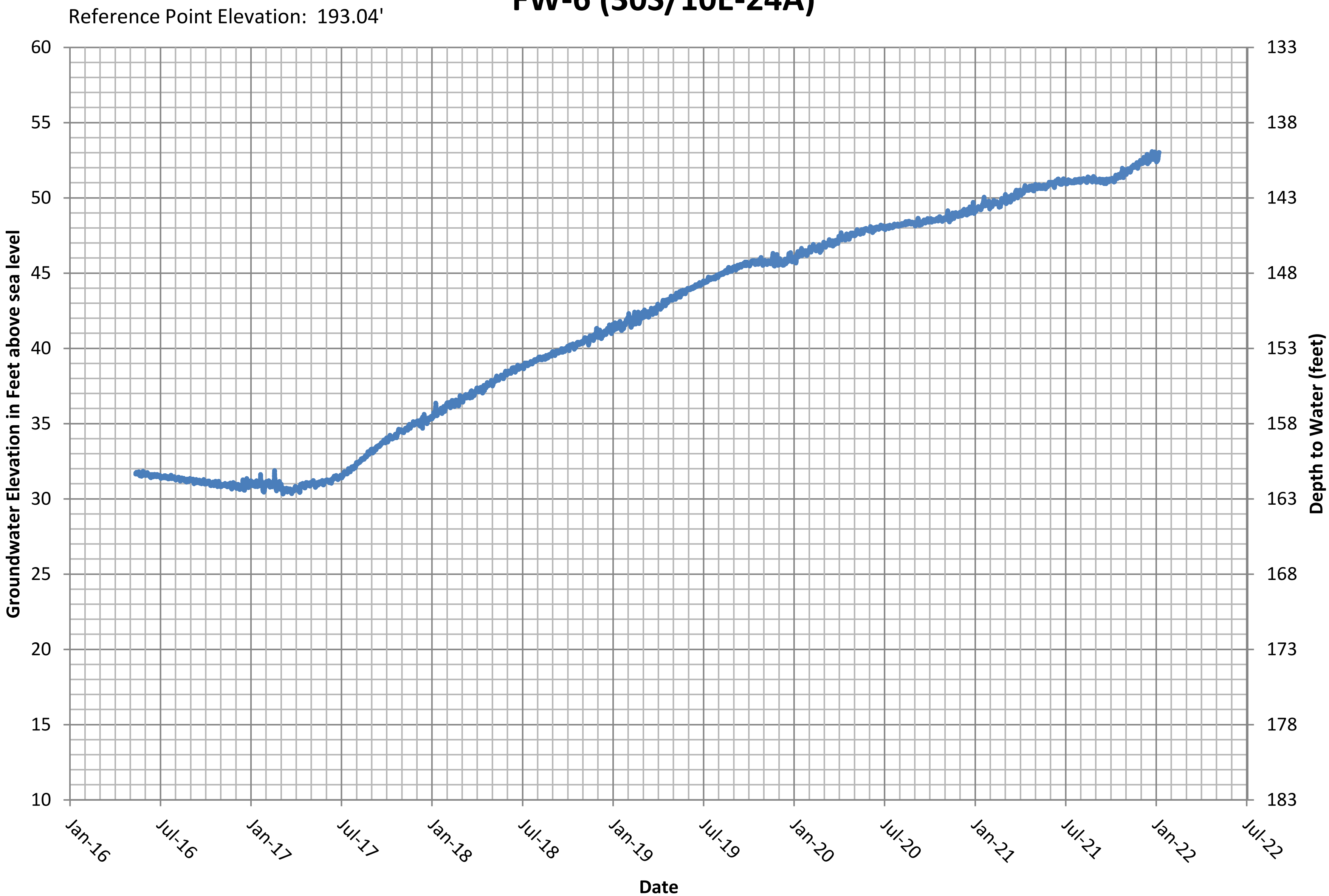
Source: County of San Luis Obispo Public Works Department, Stream Gage #751

Figure H11
Stream Stage for 2021 Water Year
Los Osos Creek, Gage #751

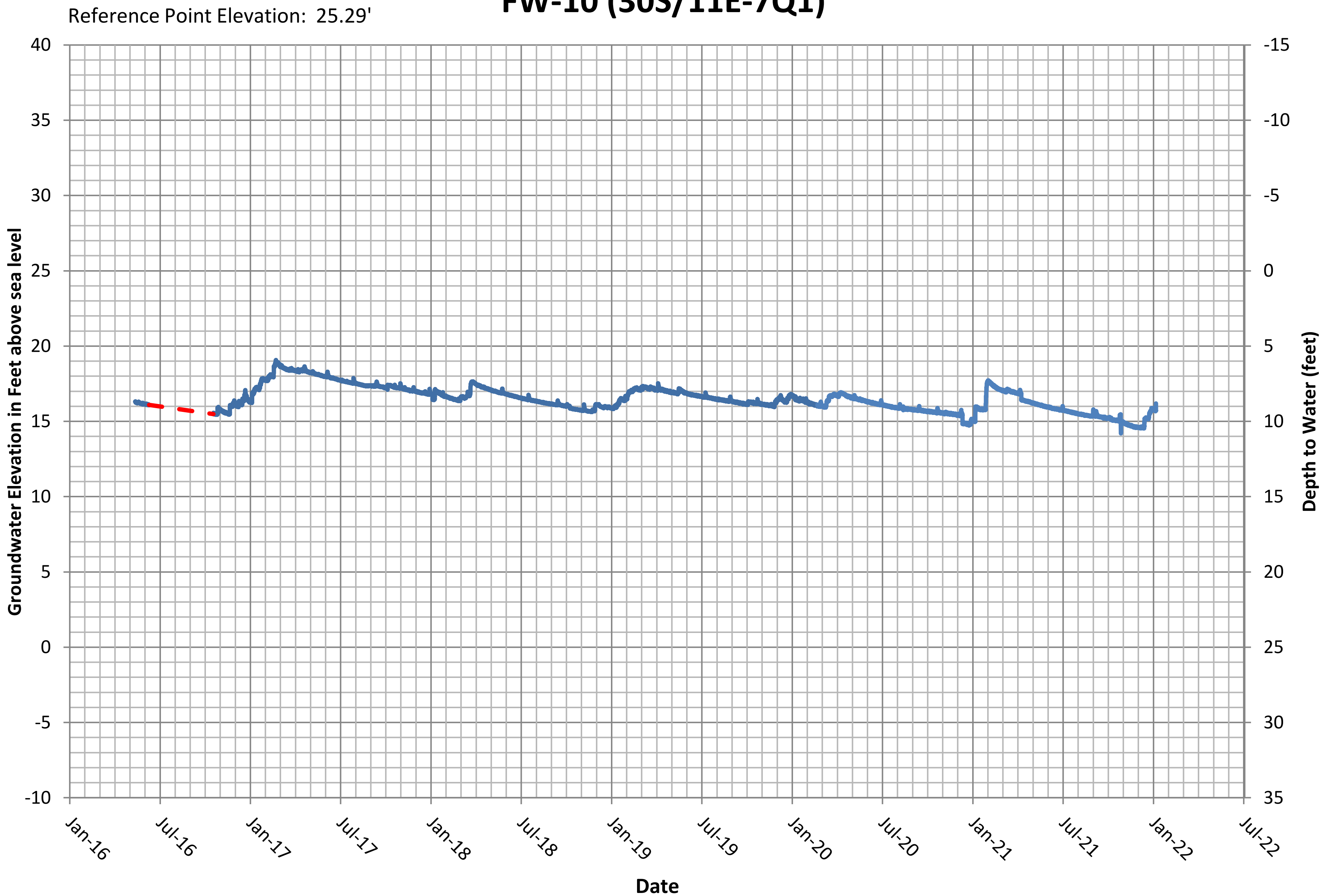
APPENDIX J

Transducer Hydrographs

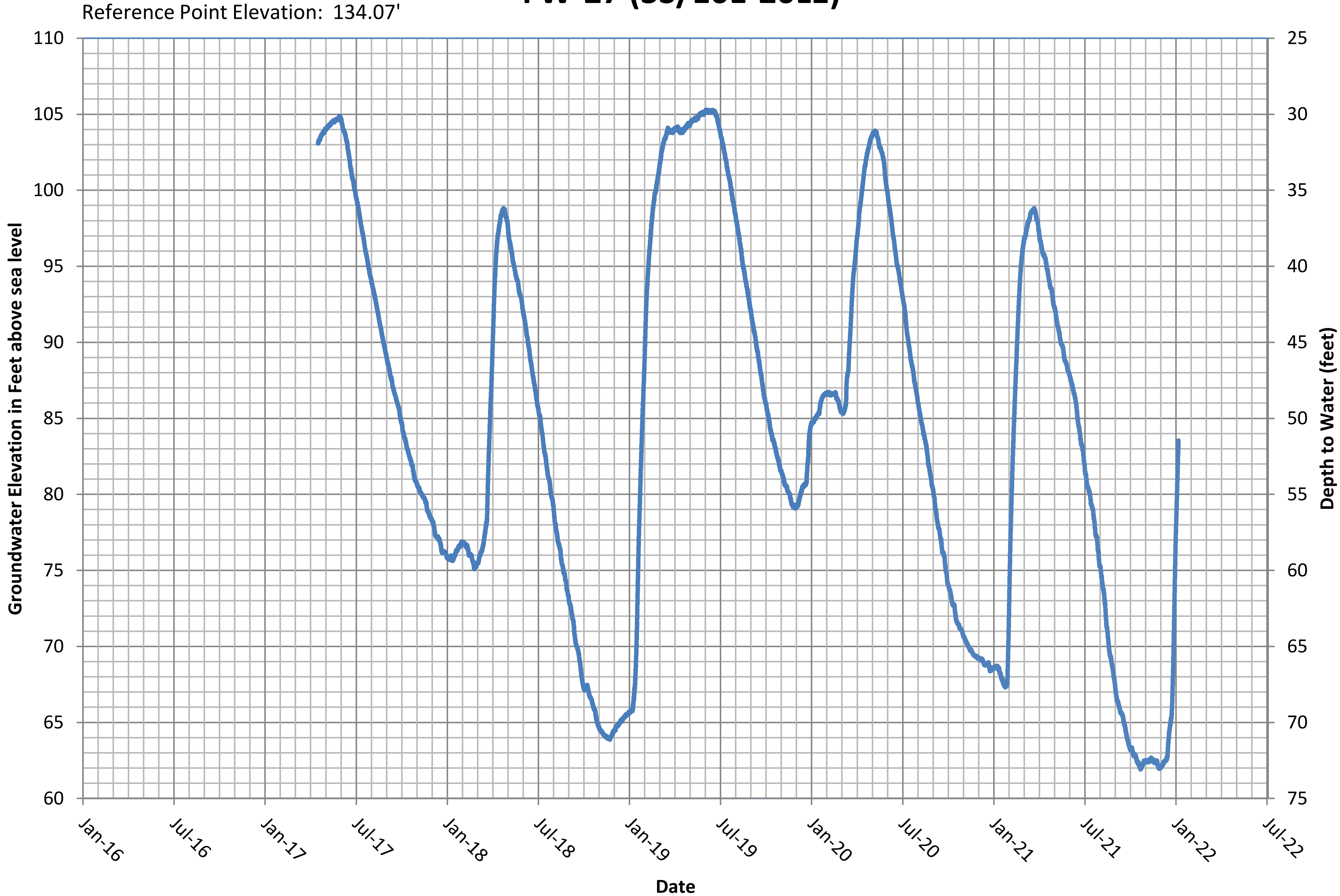
Hydrograph
FW-6 (30S/10E-24A)



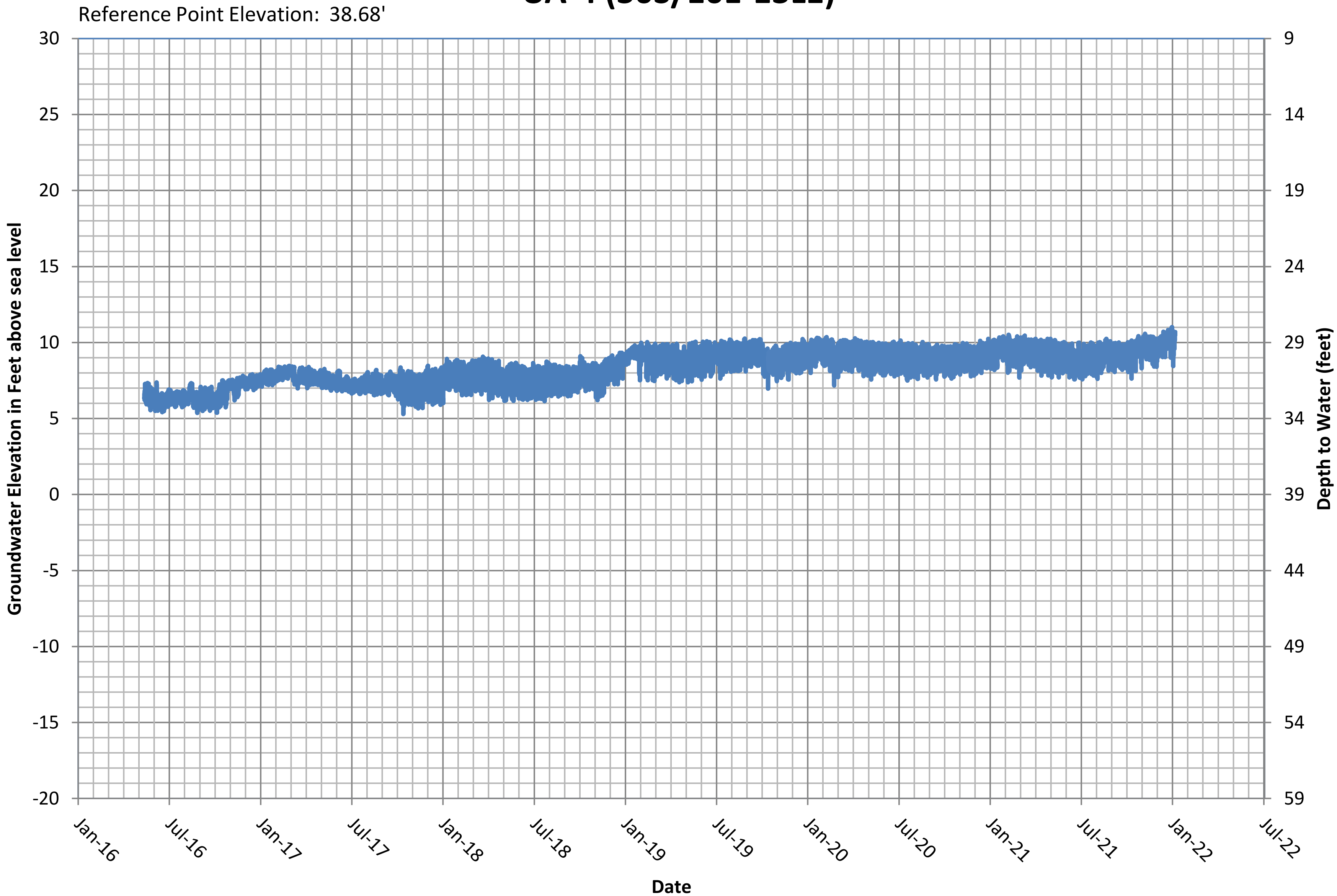
Hydrograph
FW-10 (30S/11E-7Q1)

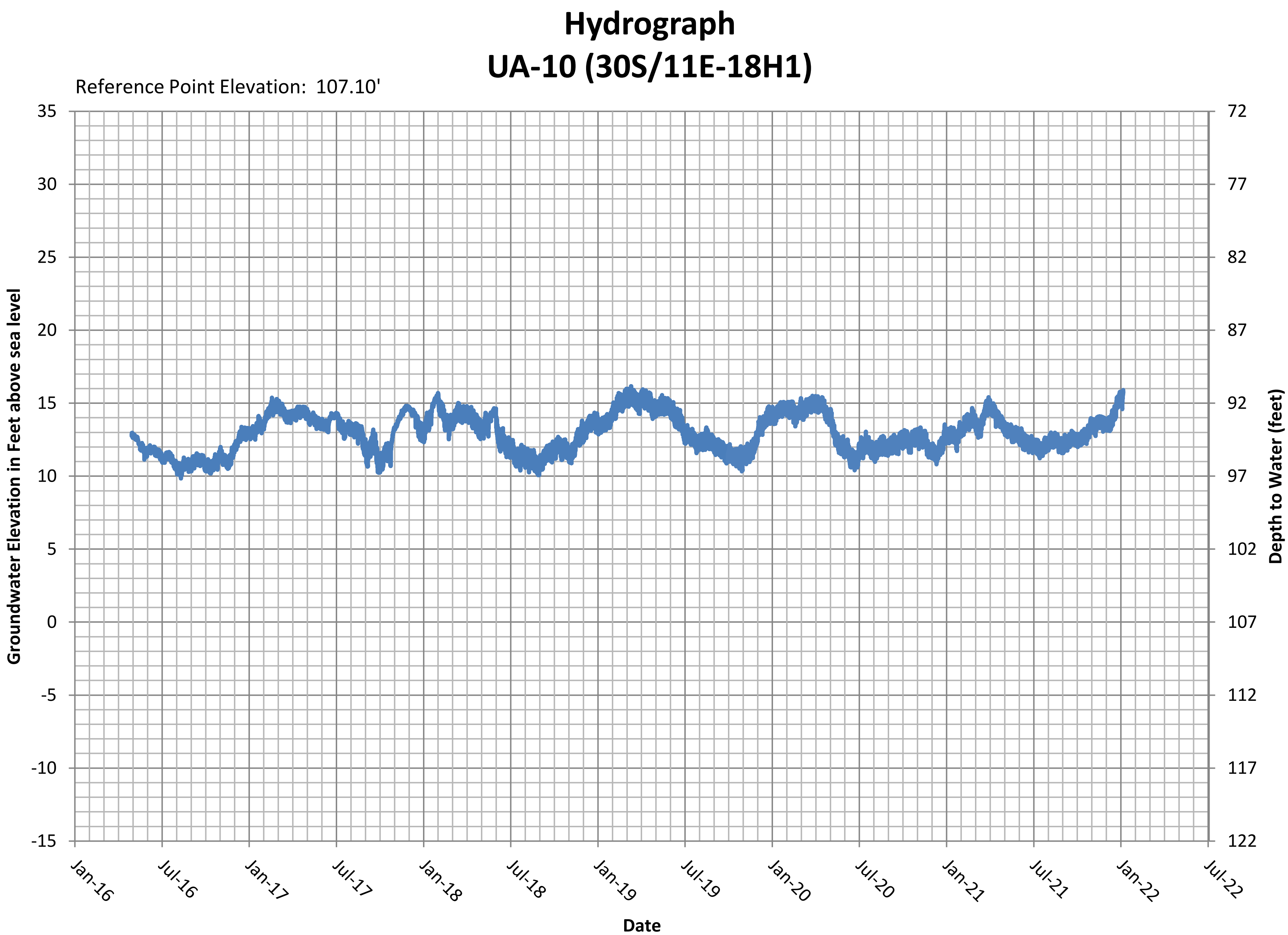


Hydrograph
FW-27 (3S/10E-20L1)

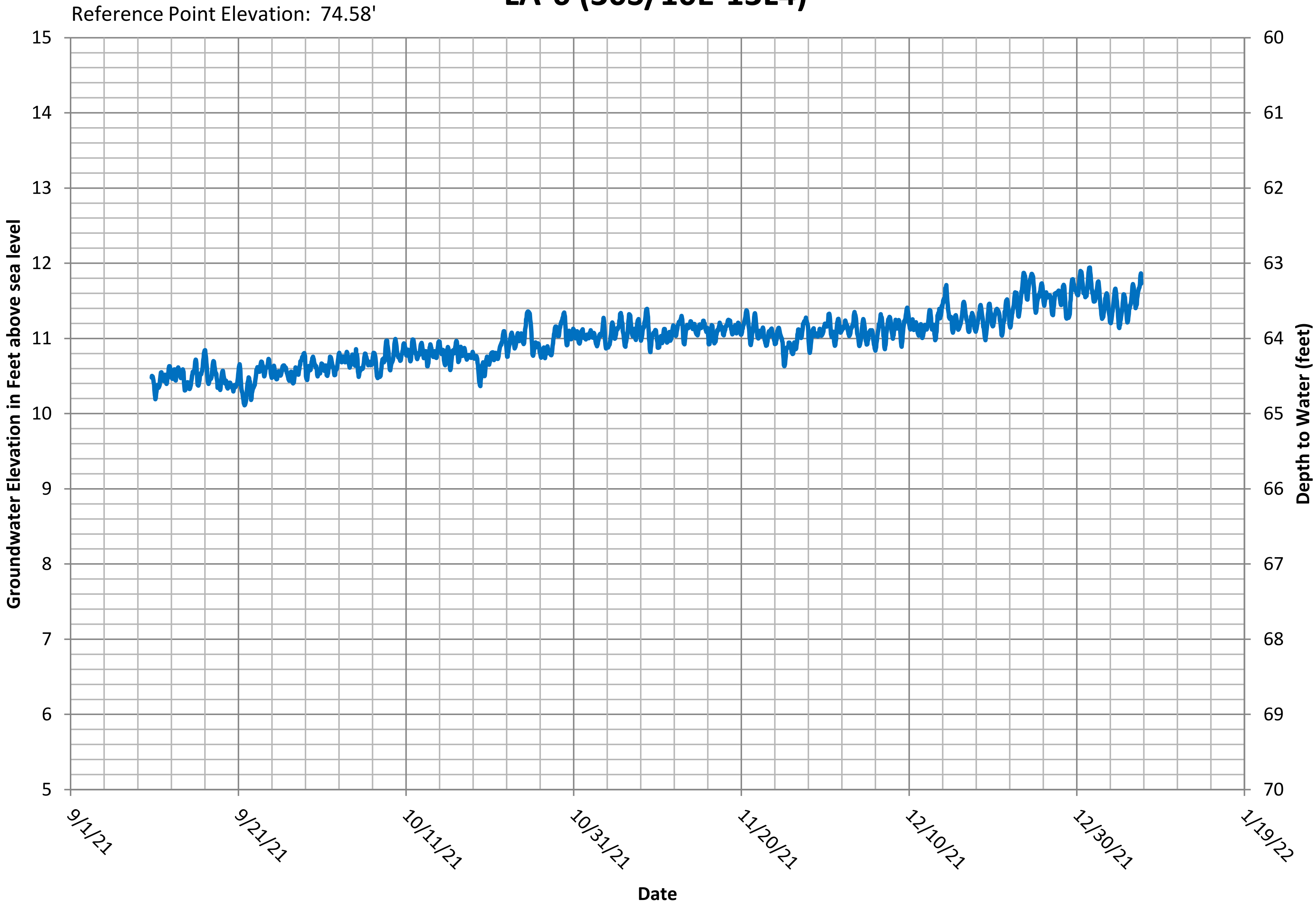


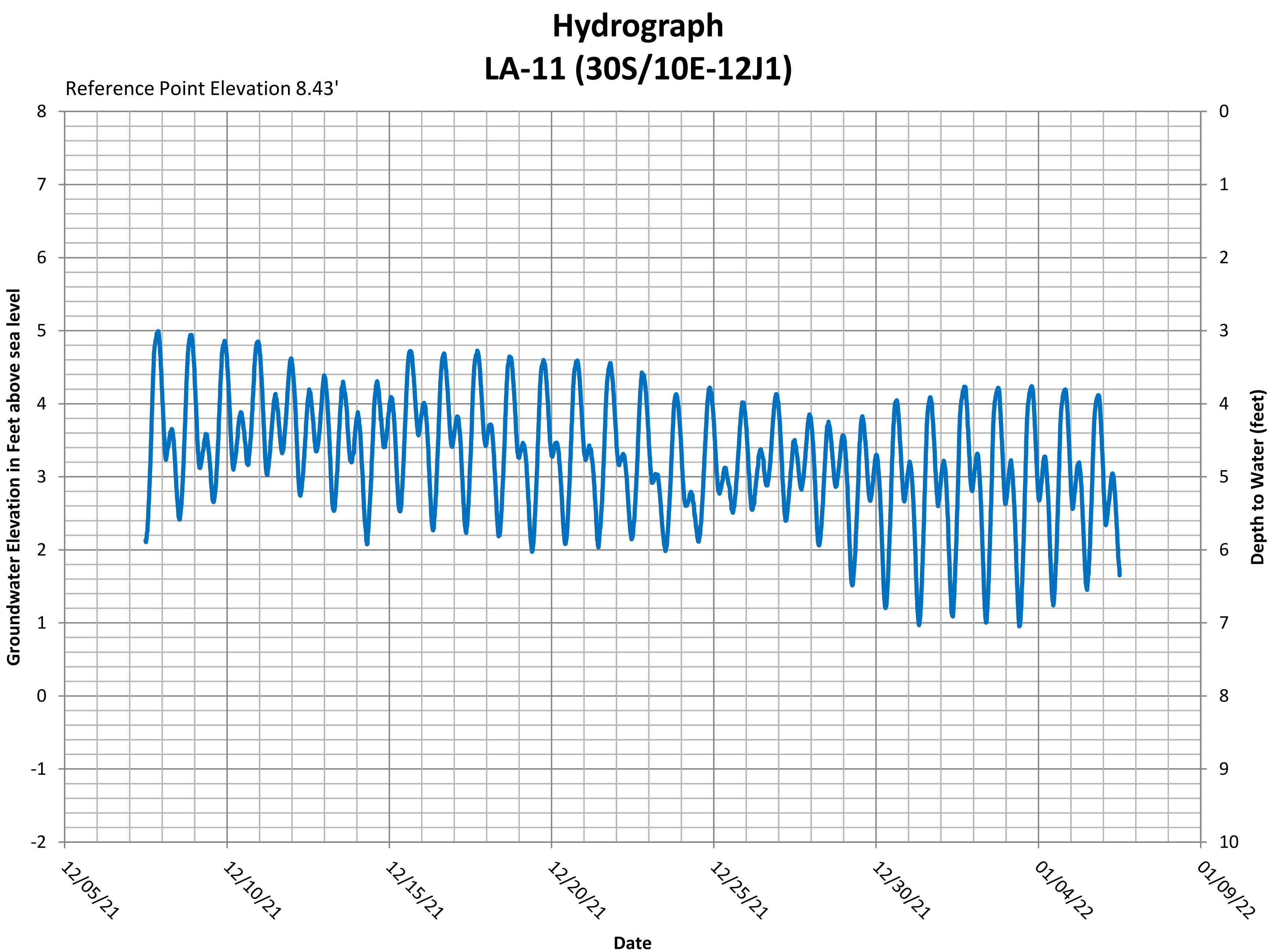
Hydrograph
UA-4 (30S/10E-13L1)

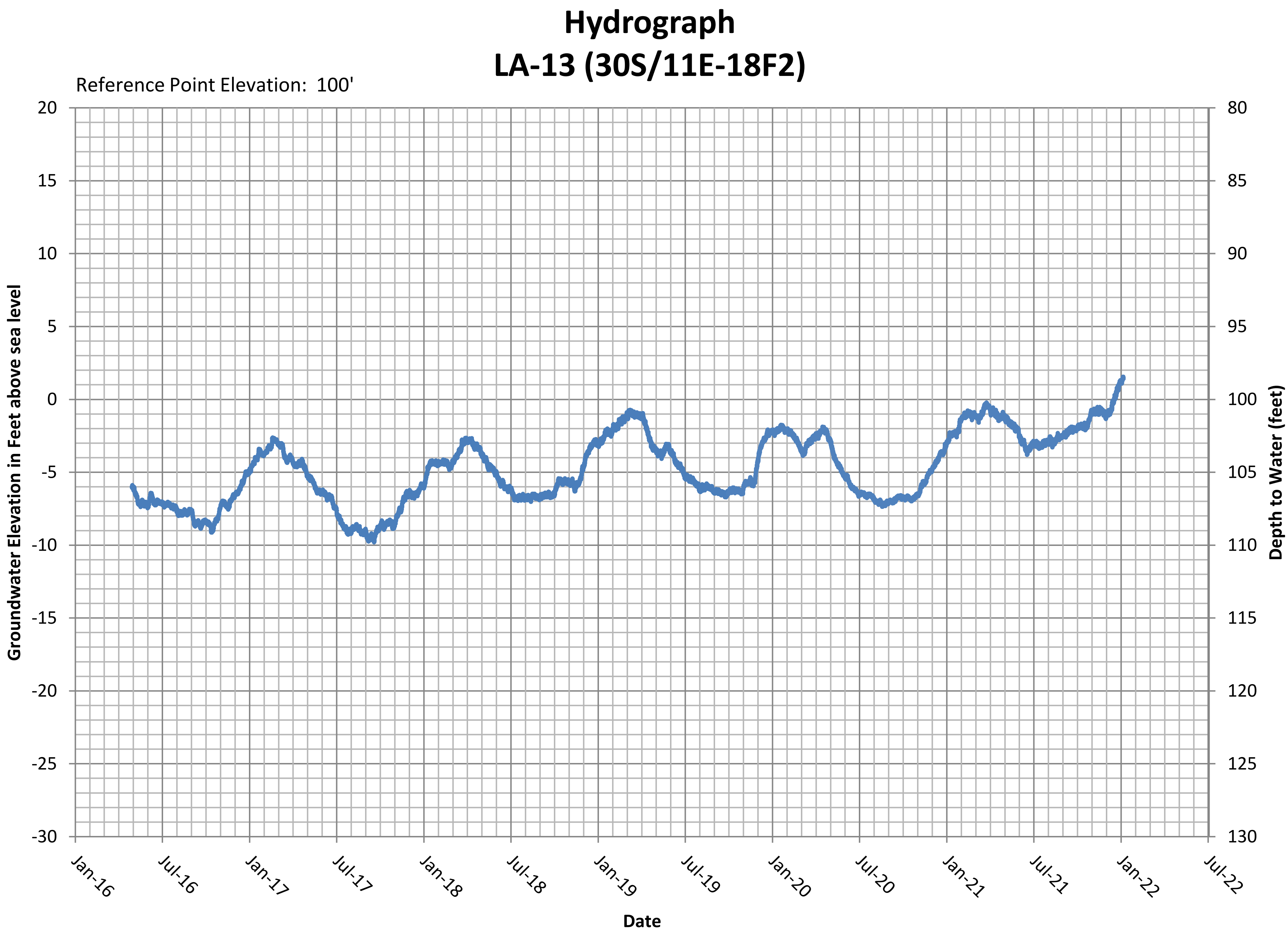



Hydrograph
UA-10 (30S/11E-18H1)
Reference Point Elevation: 107.10'
Groundwater Elevation in Feet above sea level
35
30
25
20
15
10
5
0
-5
-10
-15
Depth to Water (feet)
72
77
82
87
92
97
102
107
112
117
122
Jan-16
Jul-16
Jan-17
Jul-17
Jan-18
Jul-18
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Date

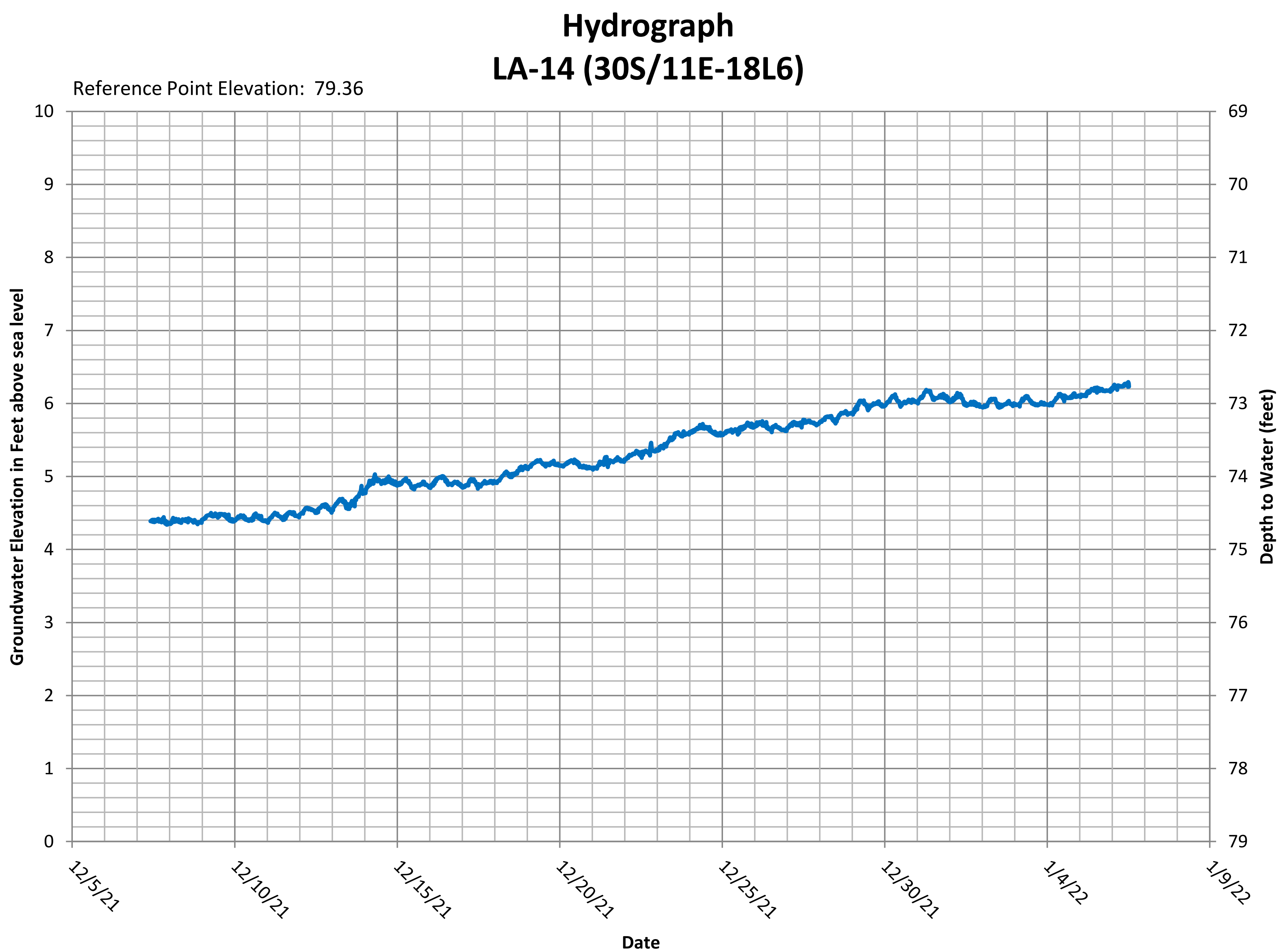
Hydrograph
LA-6 (30S/10E-13L4)



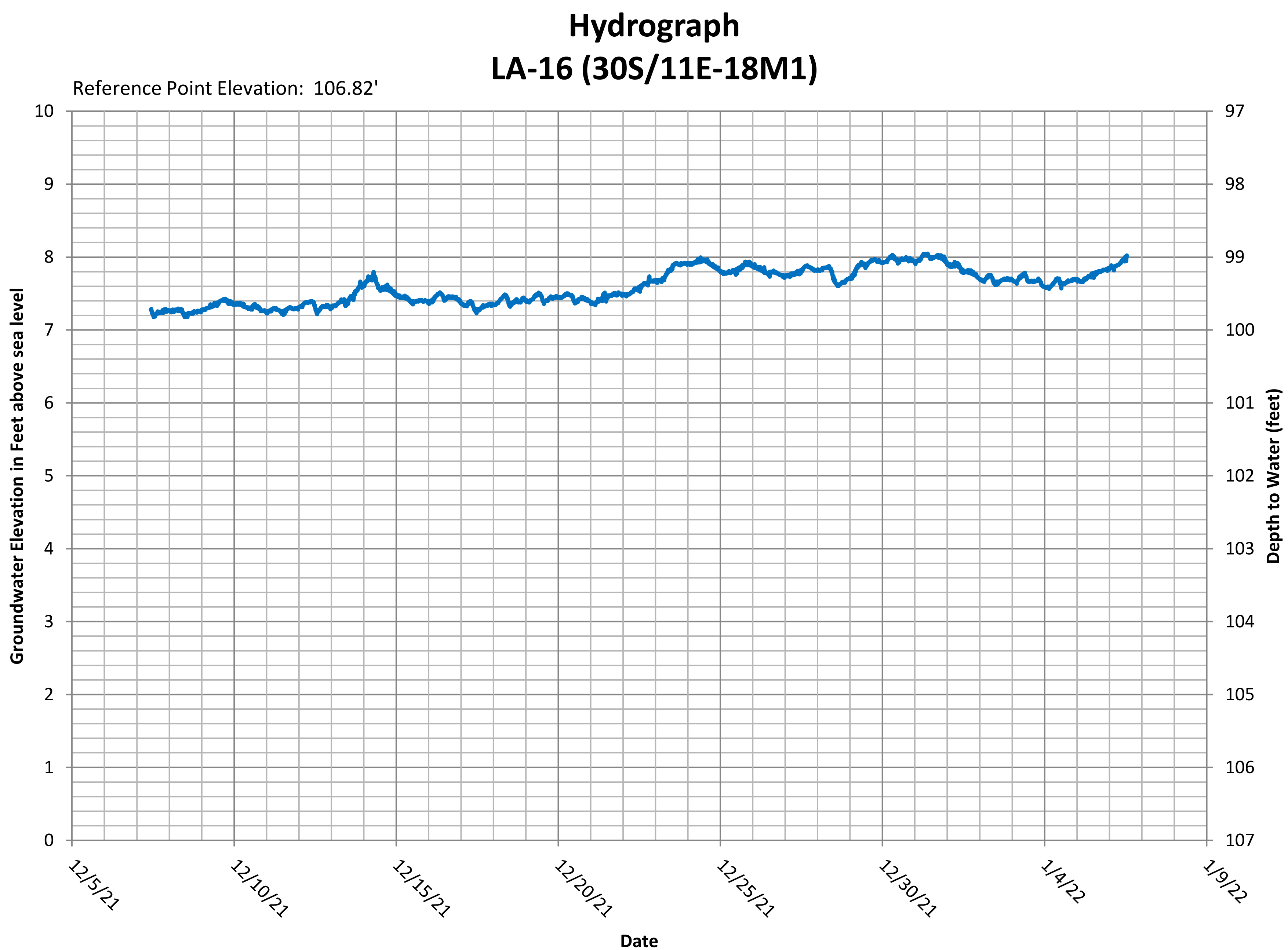

Hydrograph
LA-11 (30S/10E-12J1)
Reference Point Elevation 8.43'
Groundwater Elevation in Feet above sea level
Depth to Water (feet)
Date
12/05/21
12/10/21
12/15/21
12/20/21
12/25/21
12/30/21
01/04/22
01/09/22
8
7
6
5
4
3
2
1
0
-1
-2
0
1
2
3
4
5
6
7
8
9
10



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
Jan-22
Jul-22

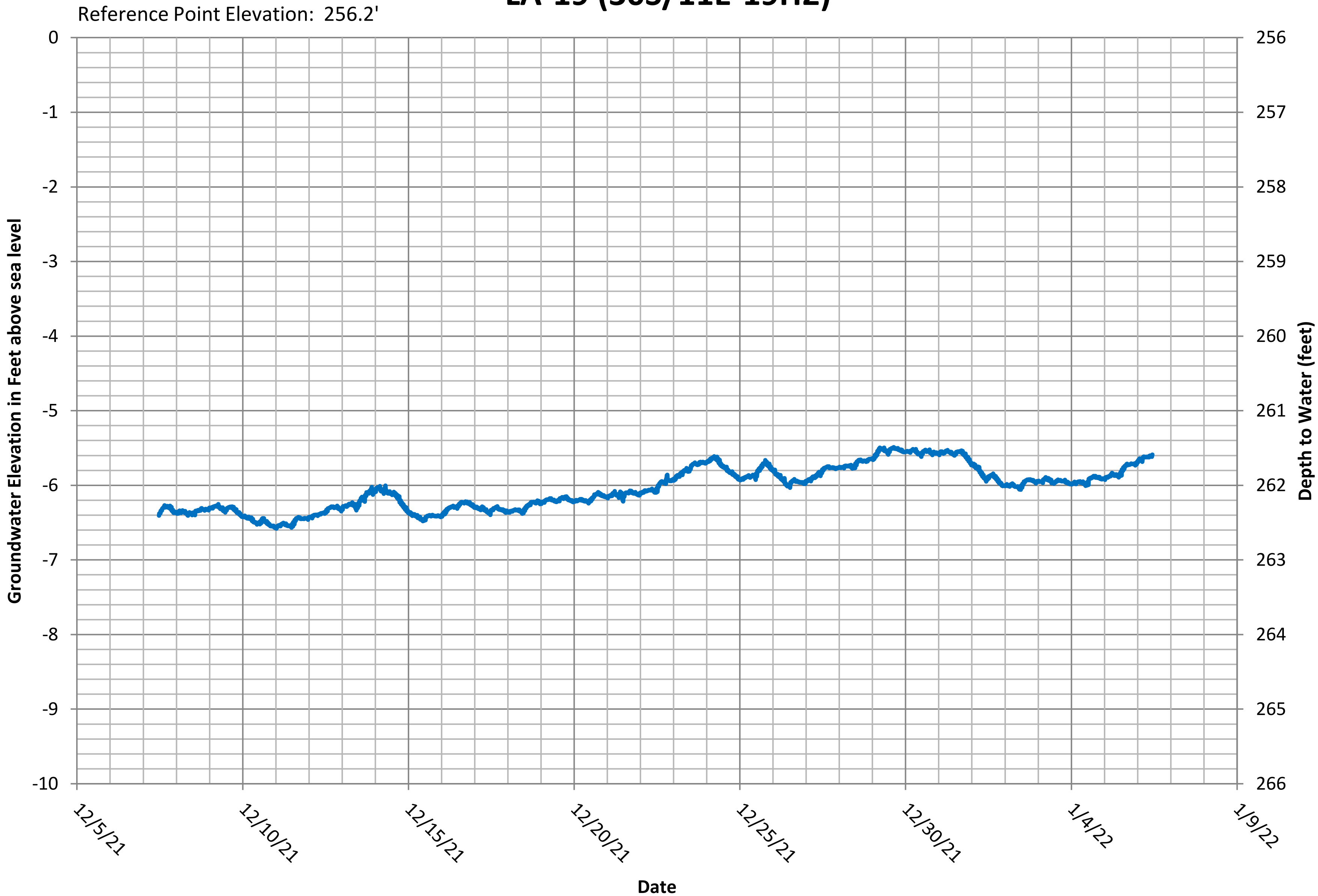


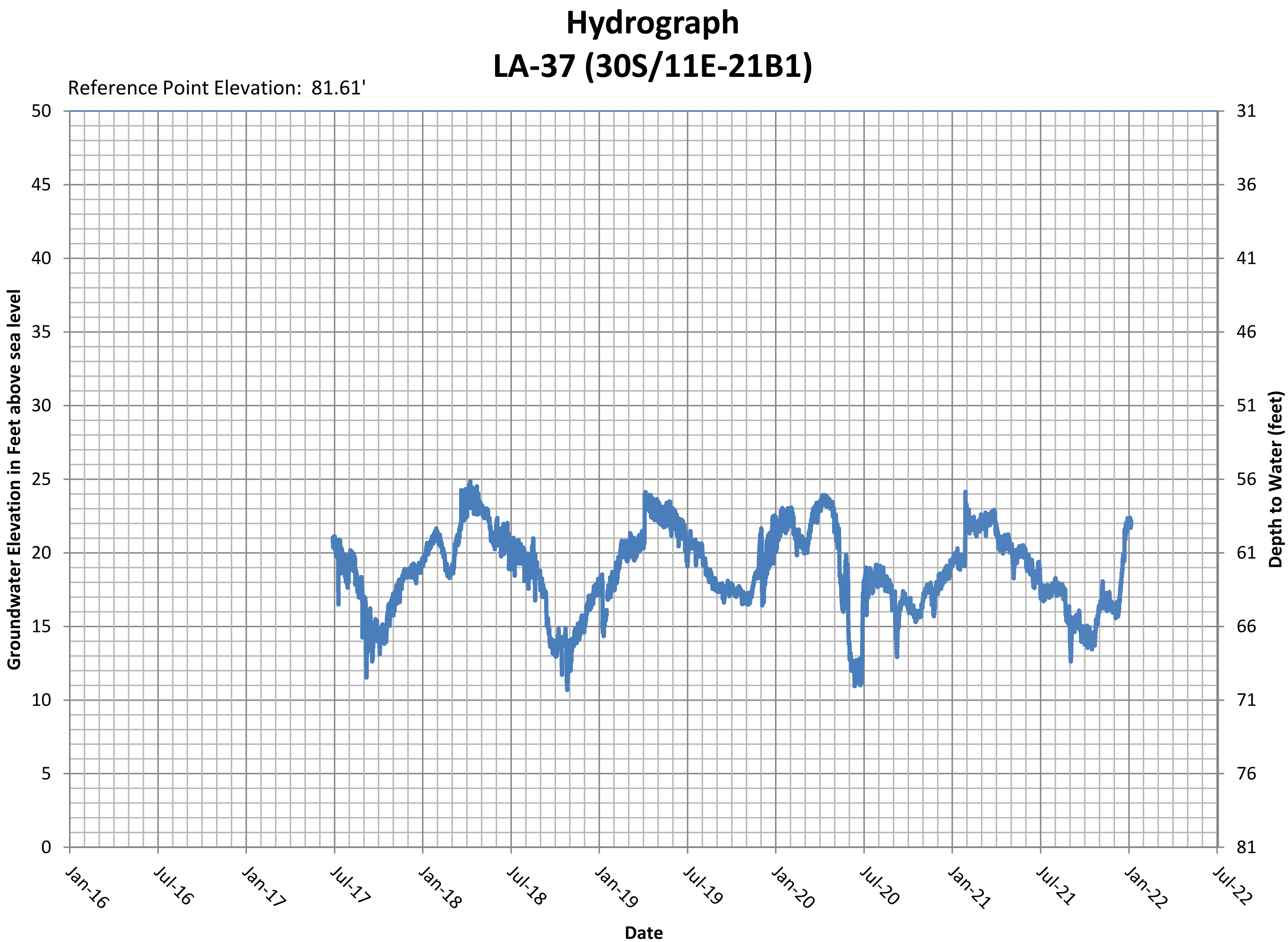
Hydrograph
LA-14 (30S/11E-18L6)
Reference Point Elevation: 79.36
Groundwater Elevation in Feet above sea level
Depth to Water (feet)
Date
10
9
8
7
6
5
4
3
2
1
0
69
70
71
72
73
74
75
76
77
78
79
12/5/21
12/10/21
12/15/21
12/20/21
12/25/21
12/30/21
1/4/22
1/9/22



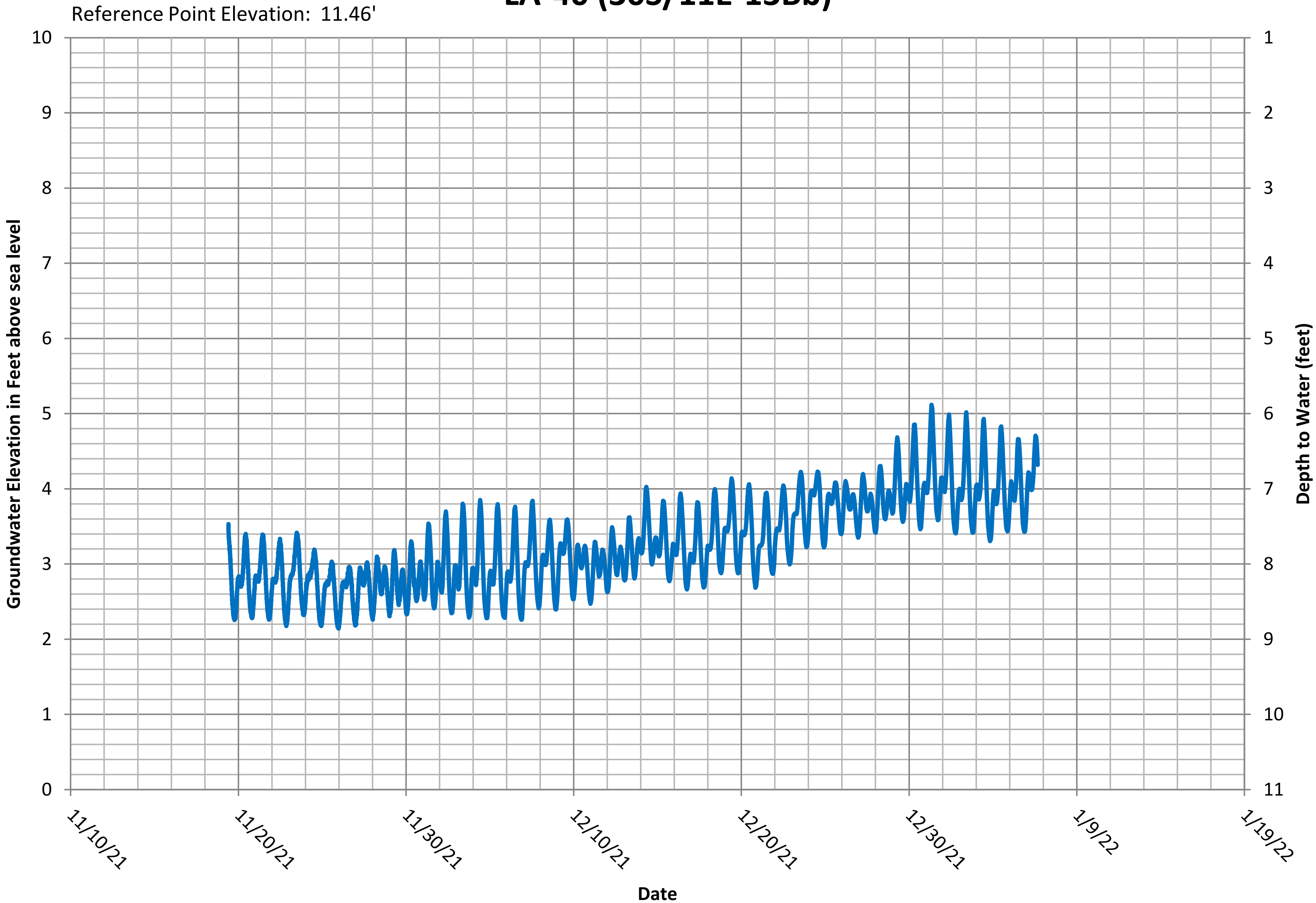
Hydrograph
LA-16 (30S/11E-18M1)
Reference Point Elevation: 106.82'
Groundwater Elevation in Feet above sea level
Depth to Water (feet)
Date
10
9
8
7
6
5
4
3
2
1
0
97
98
99
100
101
102
103
104
105
106
107
12/5/21
12/10/21
12/15/21
12/20/21
12/25/21
12/30/21
1/4/22
1/9/22

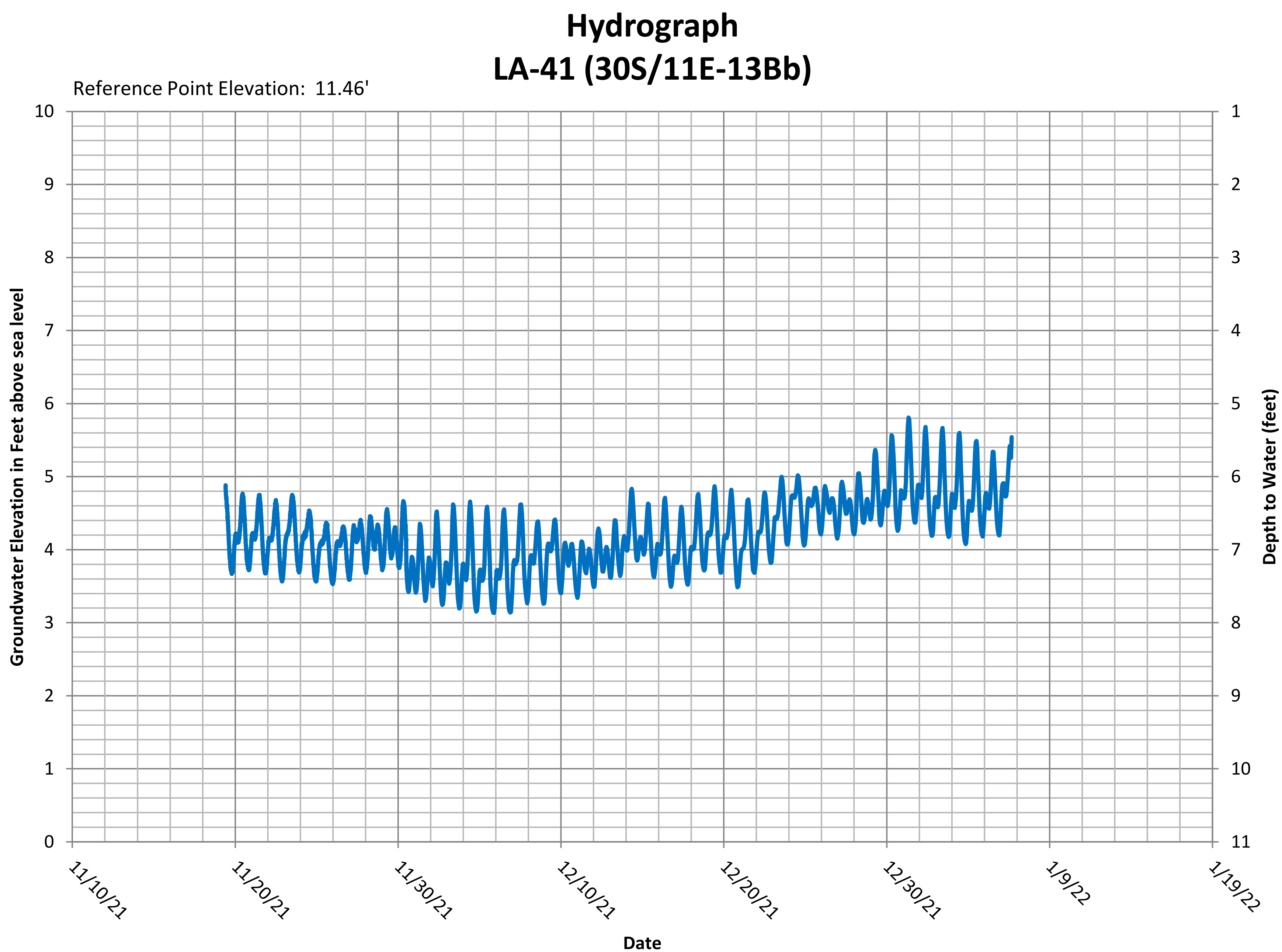
Hydrograph
LA-19 (30S/11E-19H2)




Hydrograph
LA-37 (30S/11E-21B1)
Reference Point Elevation: 81.61'
Groundwater Elevation in Feet above sea level
Depth to Water (feet)
Date
50
45
40
35
30
25
20
15
10
5
0
31
36
41
46
51
56
61
66
71
76
81
Jan-16
Jul-16
Jan-17
Jul-17
Jan-18
Jul-18
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22

Hydrograph
LA-40 (30S/11E-13Bb)





Hydrograph
LA-41 (30S/11E-13Bb)
Reference Point Elevation: 11.46'
Groundwater Elevation in Feet above sea level
Depth to Water (feet)
Date
0
1
2
3
4
5
6
7
8
9
10
11
11/10/21
11/20/21
11/30/21
12/10/21
12/20/21
12/30/21
1/9/22
1/19/22

APPENDIX K

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	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-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
				4/5/2021	345	612	1630	7.6	1050	256	ND	192	88	96	5	91
				10/6/2021	340	569	1710	7.3	1020	**258**	ND	176	83	88	5	82

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-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
				4/14/2021	333	289	855	7.9	505	66	ND	86	53	38	2	60
				10/11/2021	340	309	812	7.2	460	**48**	ND	80	58	40	2	64
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
				4/15/2021	274	3760	8590	7.4	6760	2510	ND	217	558	576	7	210
				10/13/2021	270	3540	8930	7.4	7430	**2910**	ND	201	544	530	6	190
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
				4/6/2021	81	405	1110	7.6	815	258	2.1	16.1	66	58	2	36
				10/8/2021	80	413	1180	7.2	790	**289**	2.1	16.8	65	61	2	37

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 4/1/2021 sample results show Upper Aquifer influence due to reduced pumping	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
				4/1/2021	218	187	1010	8.3	581	161	2.9	47	31	27	20	113
				11/4/2021	70	509	2780	7.9	1700	**629**	0.6	124	77	77	4	305
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
				4/6/2021	63	103	438	7.4	302	78	7.8	13.1	17	15	1.4	38
				10/8/2021	60	108	443	7.8	290	**77**	7.5	13.3	17	16	2	41

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-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
				4/6/2021	63	98.6	443	7.89	287	78	6.8	12.2	16	15	1	39
				10/8/2021	60	112	490	7.7	280	**86**	6.4	16	17	17	2	44

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
				4/5/2021	305	297	849	7.7	504	94	ND	54.1	48	43	2	54
				10/6/2021	300	283	874	7.5	510	**95**	ND	55	46	41	2	51
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
				4/8/2021	159	154	470	7.5	329	46	5.8	12.5	24	23	1	27
				10/19/2021	170	181	480	7.4	310	**41**	5.8	14.9	28	27	1	29

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-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
				4/6/2021	204	178	529	7.9	329	43	3	21.1	29	26	2	33
				10/7/2021	290	245	633	6.8	340	**40**	0.7	27.8	37	37	2	43
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
				4/12/2021	298	267	621	7.6	389	32	ND	41.2	54	32	2	27
				10/19/2021	300	287	657	7.4	400	**32**	ND	38.4	59	34	2	28

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-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
				4/5/2021	143	128	390	7.8	247	34	2.1	15.7	20	19	1	27
				10/6/2021	60	68.6	255	7.7	150	**30**	3.9	5.7	11	10	ND	20
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
				4/6/2021	301	226	629	8.0	382	38	ND	25.8	34	34	2	40
				10/8/2021	300	253	638	7.4	360	**37**	ND	29.3	37	39	2	45

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-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
				4/6/2021	234	290	780	7.7	444	108	1	27.2	47	42	2	38
				10/6/2021	250	295	856	7.3	490	**107**	0.5	32.8	49	42	2	37

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 L

Groundwater Storage Calculation Example

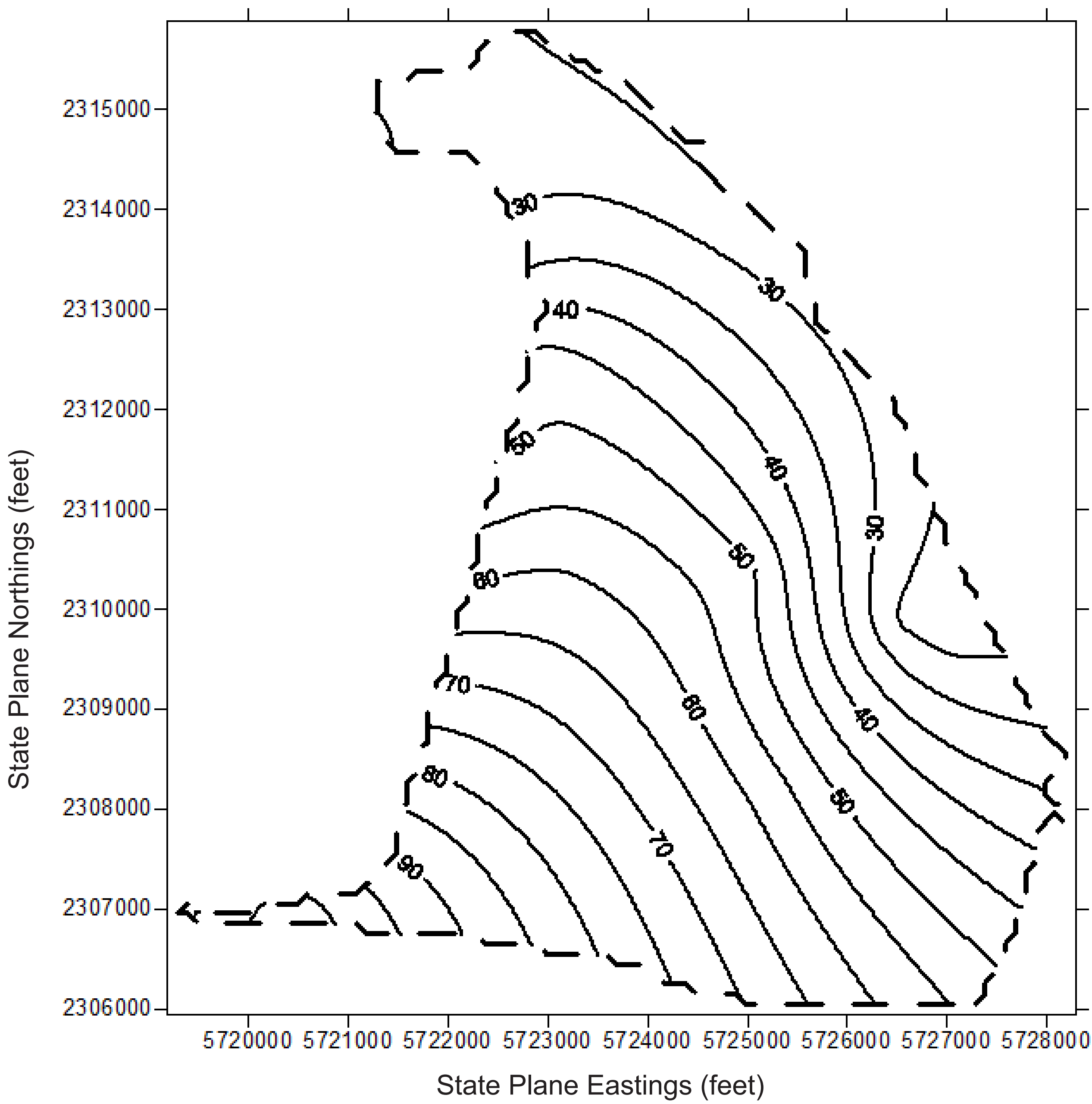
WELLS USED FOR GROUNDWATER ELEVATION CONTOURS
2021 GROUNDWATER STORAGE CALCULATIONS

FIRST WATER		UPPER AQUIFER		LOWER AQUIFER	
SPRING	FALL	SPRING	FALL	SPRING	FALL
FW2	FW2	UA1	UA1	LA1	LA1
FW3	FW3	UA2	UA2	LA2	LA2
FW4	FW4	UA3	UA3	LA3	LA3
FW5	FW5	UA4	UA4	LA4	LA4
FW6	FW6	UA5	UA5	LA5	LA5
FW8	FW8	UA6	UA6	LA6	LA6
FW9	FW9	UA8	UA8	LA8	LA8
FW10	FW10	UA9	UA9	LA9	LA9
FW11	FW11	UA10	UA10	LA10	LA10
FW12	FW12	UA12	UA12	LA11	LA11
FW13	FW13	UA16	UA16	LA12	LA12
FW15	FW15	UA17	UA17	LA13	LA13
FW17	FW17	FW2	FW2	LA14	LA14
FW18	FW18	FW3	FW3	LA15	LA15
FW19	FW19	FW4	FW4	LA16	LA16
FW20	FW21	FW5	FW5	LA18	LA18
FW21	FW22	FW6	FW6	LA19	LA19
FW22	FW23	FW8	FW8	LA20	LA20
FW23	FW24	FW9	FW9	LA21	LA21
FW24	FW26	FW10	FW10	LA24	LA24
FW26	FW27	FW11	FW11	LA25	LA25
FW27	FW28	FW12	FW12	LA26	LA26
FW28	FW30	FW15	FW15	LA27	LA27
FW30	FW31	FW24	FW24	LA29	LA29
FW31	FW32	FW26	FW26	LA30	LA30
FW32	FW33	FW27	FW27	LA33	LA33
FW33	LA34	FW32	FW32	LA34	LA34
LA34	LA35	FW33	FW33	LA35	LA35
LA35	LA37	LA34	LA34	LA37	LA37
LA37	LA38	LA35	LA35	LA38	LA38
LA38		LA37	LA37	LA39	LA39
		LA38	LA38	LA41	LA41
				FW27	FW27

NOTE: Wells LA34, LA35, LA37, and LA38 represent the shallowest available water level data in the Eastern Area, and are included in the First Water and Upper Aquifer contour data sets for improved lateral control. Well FW27 is located where maximum recharge to lower aquifer from stream seepage likely occurs and provides control for all aquifers locally.

EXAMPLE STORAGE CALCULATION FOR EASTERN AREA:

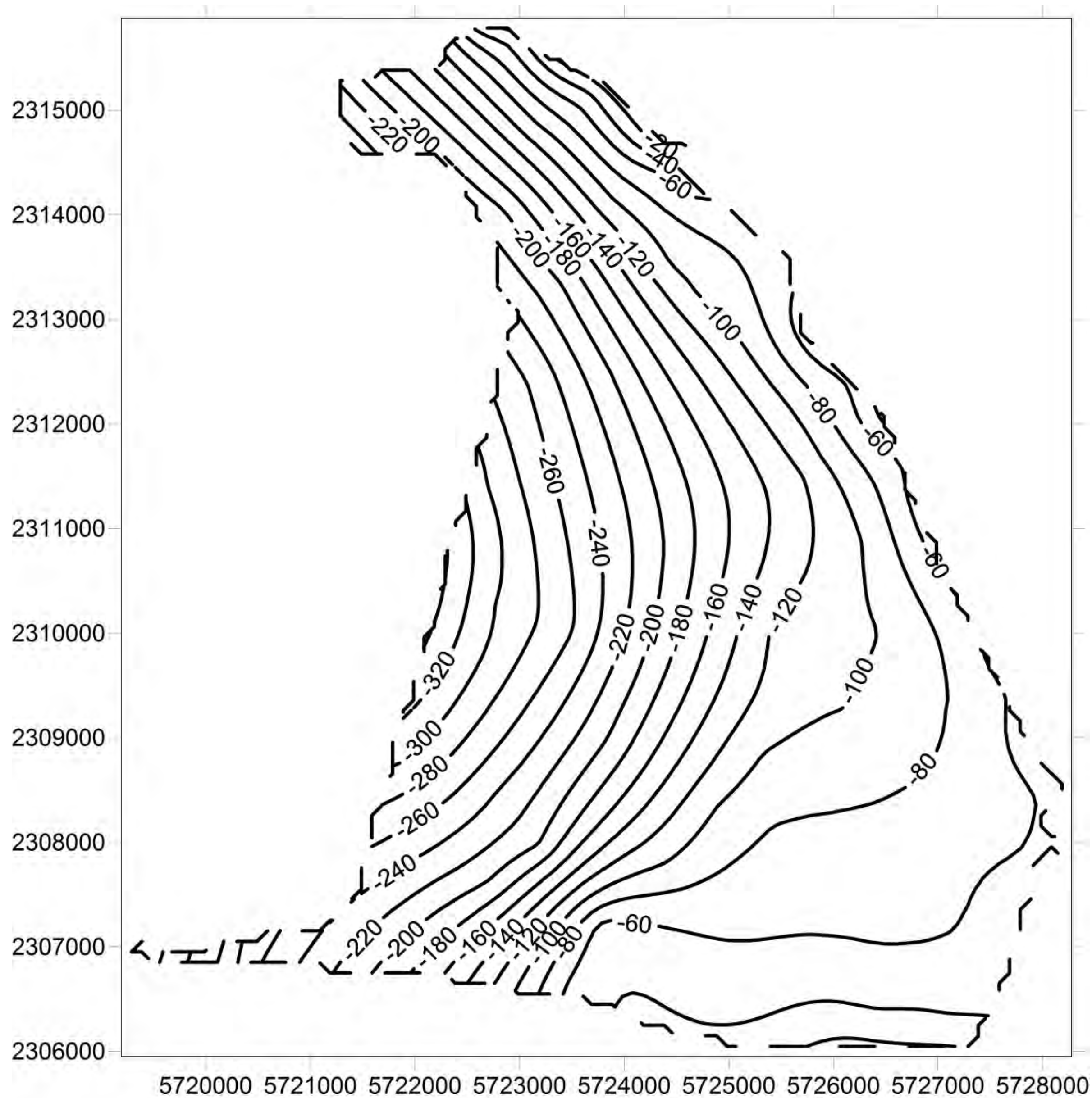
STEP 1: GRID AND TRIM WATER LEVEL CONTOURS



Spring 2021
Eastern Area Water Levels
Alluvial Aquifer and Lower Aquifer

EXAMPLE STORAGE CALCULATION FOR EASTERN AREA:

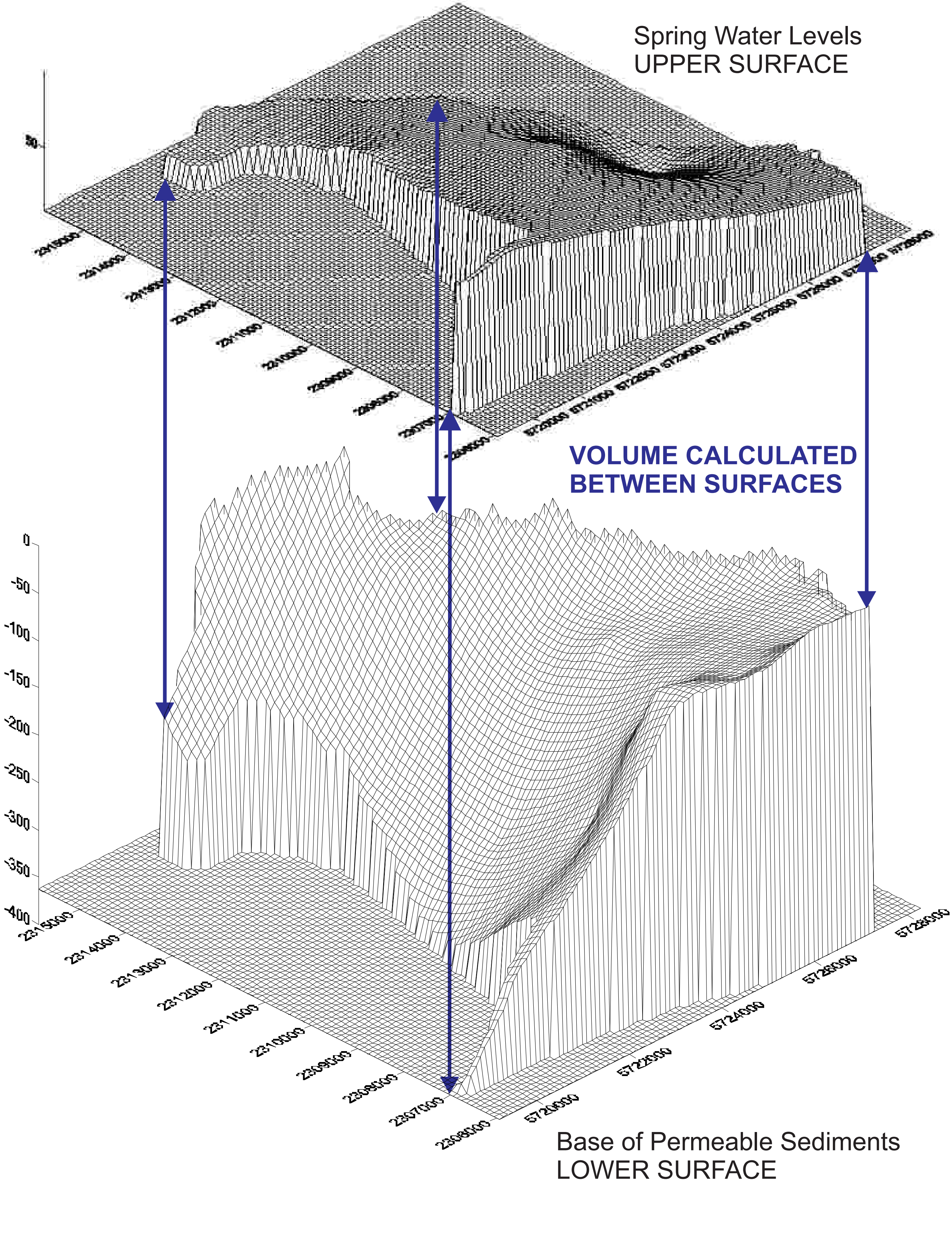
STEP 2: GRID AND TRIM BASE OF PERMEABLE SEDIMENTS



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

Mon Mar 21 11:39:28 2022

Upper Surface

Grid File Name: C:\Users\andre\Desktop\Projects\Los Osos BMC\2021\BMC 2021 Annual Report\Working Data - REPORT\Contouring and Storage\BLANKED FILES\EASTERN\UpperEasternSpringBlanked2021.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: 11.466706668191
Z Maximum: 97.249142917905

Lower Surface

Grid File Name: C:\Users\andre\Desktop\Projects\Los Osos BMC\2021\BMC 2021 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:	8234475813.6132
Simpson's Rule:	8230083201.1265
Simpson's 3/8 Rule:	8226416876.2976

Cut & Fill Volumes

Positive Volume [Cut]:	8234475813.6132
Negative Volume [Fill]:	0
Net Volume [Cut-Fill]:	8234475813.6132

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]:	41785453.300557
Negative Surface Area [Fill]:	0

STORAGE CALCULATION

Positive Volume: 8,234,475,813.61 ft^3 * 0.101 specific yield ÷ 43,560 ft^3 per acre-foot = 19,093 acre-feet

APPENDIX M

Agenda Item 8a from 7/21/21 BMC Meeting
Agenda Item 8b from 9/29/21 BMC Meeting
Agenda Item 8a from 10/27/21 BMC Meeting
Broderson Site Groundwater Mound Development 2017-2021

TO: Los Osos Basin Management Committee

FROM: Dan Heimel, Executive Director

DATE: July 21, 2021

SUBJECT: Item 8a – Requirements, Framework and Methodology for Preparation of SJ Required Annual Report

Recommendations

Receive information on requirements, framework, and methodology for the SJ Required Annual Report for the Los Osos Basin and provide direction to Staff.

Discussion

Background

The Stipulated Judgement (SJ) and Basin Plan for the Los Osos Basin, requires the BMC Parties (County of San Luis Obispo, Golden State Water Company, Los Osos Community Services District, and S & T Mutual Water Company) to prepare and submit an Annual Report to the Court on or before 180 days after December 31 of each year. The Annual Report and associated monitoring program are necessary to accomplish the following continuing goal set forth in Section 2.4 of the Basin Plan.

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

A critical component of meeting this goal and part of the BMC's 2021 Workplan includes reviewing and consideration of an update of estimate of the Sustainable Yield of the Basin. In the SJ and the Basin Plan, the BMC Parties agreed on a framework and methodology for estimating and updating the Sustainable Yield for the Basin and refers to it as Sustainable Yield$_x$, where "X" represents the Sustainable Yield estimate for that year. Based on the agreed upon calculation methodology, described below, the SJ established an initial Sustainable Yield$_x$ of 2,400 Acre Feet per Year (AFY) for the Los Osos Basin based on assumptions regarding the infrastructure that was in place in 2012.

Sustainable Yield$_x$ Methodology

As specified in the Basin Plan, the Sustainable Yield$_x$ equals the maximum amount of groundwater that may be extracted from the Basin in Year X without causing seawater to advance further inland and with no active well producing water with chloride concentrations above 250 mg/L. The amount of water that can be extracted is determined using the numeric groundwater model (Model) created for the Los Osos Basin, which is described in the next section.

Groundwater Model

The original MODFLOW model of the Basin was developed as part of a USGS study in the mid-1980s. It was updated during the 1990s by URS and since 2000 the model has primarily been maintained and operated by Cleath-Harris Geologists (CHG). The model was peer reviewed in 2010 by Stetson Engineers. The Model utilizes USGS's SEAWAT program to simulate three-dimensional, variable-density groundwater flow. Additional information regarding the model and its development and calibration is available in Basin Plan Section 5.6.5.

Sustainable Yield$_x$ Assumptions

There are number of key assumptions that are utilized within the Model when performing the calculation of Sustainable Yield$_x$. These key assumptions that were included in the 2017 calculation of Sustainable Yield$_x$, are described below:

Precipitation – Precipitation in the model is assumed to be 17.5 inches per year. This average is based on US EPA Climate Resilience Evaluation and a base period of 1981-2010 for which the Morro Bay Fire Station rain gauge average rainfall was 17.48 inches per year.

Stream Inflow – Stream Inflow in the model is limited at 800 AFY and is constrained by stream bed seepage capacity to be approximately 20% of the estimated average watershed runoff.

Recycled Water – Recycled water delivery assumptions included in the model include 448 AFY to Broderson and 33 AFY to Bayridge Estates.

Non-Purveyor Pumping – Non-Purveyor pumping assumptions in the model are listed below:

Non-Purveyor Pumping Type	Assumed Pumping Rate (AFY)	Notes
Agriculture	750	
Private Domestic	220	
Sea Pines Golf Course	50	Assumed 30 AFY recycled water from Monarch WWTP
Memorial Park	50	
Community Park	0	Assumed 5 AFY recycled water

Purveyor Pumping – The amount of purveyor pumping included in the Sustainable Yield$_x$ calculation is iteratively determined by increasing purveyor well pumping until the 250 mg/L Chloride concentration limit at an active pumping well constraint is reached. Pumping rates for individual purveyor wells are optimized, based on available infrastructure, to shift purveyor pumping from the lower aquifer to eastern portions of the Basin and/or to the upper aquifer.

Sea Level – Sea level in the model is assumed to be 0 ft elevation in National Geodetic Vertical Datum of 1929 (NGVD 29) which is roughly equivalent to Mean Sea Level for the Port San Luis buoy of 2.72 ft in North America Vertical Datum of 1988 (NAVD 88).

Sustainable Yieldx Requirements

Several key requirements that the SJ specifies regarding the Sustainable Yield estimate are listed below:

- Prior to the start of each Year X following the commencement of the Stipulated Judgment, the Basin Management Committee shall establish the Sustainable Yield for that year based on the conservation implemented and Basin Plan infrastructure then developed in the Basin and the Model.
- With unanimous consent, the Basin Management Committee shall annually evaluate, confirm and set the Sustainable Yield$_X$. Any change to the Sustainable Yield$_X$ shall be based upon the best available then existing data and evidence.
- Unless conditions warrant an adjustment as the Basin Management Committee may determine, for the first five years after entry of the Stipulated Judgment (i.e. 2015), the Basin Management Committee shall set the Sustainable Yield$_X$ at 2,400 AFY.

Sustainable Yield$_x$ Estimate Update Timeline

The following is description of the timeline regarding the initial establishment and updates to the Sustainable Yield$_x$ for the Los Osos Basin by the BMC.

2015 – The Basin Plan and SJ established the initial Sustainable Yield$_x$ estimate at 2,400 AFY.

2016 - The 2015 Los Osos Basin Annual Report, prepared by CHG, included a Sustainable Yield$_x$ estimate of 2,450 AFY, based on infrastructure in place at the end of 2015 and was unanimously approved by the BMC at its June 30th, 2016 Meeting.

2017 - In 2017, CHG prepared the "Basin Yield Metric response to reduced long-term precipitation in the Los Osos Groundwater Basin" Technical Memorandum, which included an updated Sustainable Yield Estimate that accounted for completion of projects in 2016 included in Programs A and C of the Basin Plan. With the completion of these programs the updated estimate of Sustainable Yield$_x$ was calculated to be 2,760 AFY. The BMC received and filed the TM at its March 15, 2017 Meeting. The 2016 Annual Report prepared by CHG included the updated Sustainable Yield$_x$ estimate of 2,760 AFY and was unanimously approved by the BMC Directors at its June 21st, 2017 BMC Meeting.

2018 – The Sustainable Yield$_x$ estimate included in the 2017 Annual Report prepared by CHG remained at 2,760 AFY and the Annual Report was unanimously approved by the BMC at its June 20, 2018 Meeting.

2019 – The Sustainable Yield$_x$ estimate included in the 2018 Annual Report prepared by CHG remained at 2,760 AFY and the Annual Report was unanimously approved by the BMC at its June 19, 2019 Meeting.

2020 – The Sustainable Yield$_x$ estimate included in the 2019 Annual Report prepared by CHG remained at 2,760 AFY and the Annual Report was unanimously approved by the BMC at its June 17, 2020 Meeting.

2021 – During the BMC's June 16, 2021 consideration of the 2020 Annual Report, which included the Sustainable Yield$_x$ estimate of 2,760 AFY, the BMC approved submitting the 2020 Annual Report to the Court. However, in its motion approving the 2020 Annual Report the BMC clarified that approval of the report should not be construed as "evaluating, setting or establishing" the Sustainable Yield$_x$ under the terms of the SJ, directed staff to conduct a review of the Sustainable Yield$_x$ estimate and stated that major management decisions would be deferred until updated Sustainable Yield$_x$ is reviewed and approved by the BMC through a more formal process in accordance with the requirements of the SJ.

Proposed Sustainable Yield Update Process

To meet the requirements of the SJ to determine the Sustainable Yield$_x$ on an annual basis the following process is proposed.

1. Beginning in July of a given year, BMC Staff will evaluate the need to develop an updated Sustainable Yield$_x$ for the upcoming year based on changes in Basin Plan infrastructure, groundwater inflow or outflow parameters, the understanding of hydrogeologic or geologic features in the basin or other factors.
2. BMC Staff will then provide a recommendation to the BMC on whether or not to update the Sustainable Yield$_x$ and the reasoning for that recommendation.
    a. If the recommendation is to update the Sustainable Yield$_x$, then recommendations for which parameters to modify from the previous Sustainable Yield$_x$ will be provided.
        i. If the BMC approves the proposed update to the Sustainable Yield$_x$ and the recommended update parameters, BMC Staff will perform the updated Sustainable Yield$_x$ calculation and bring the results back to the BMC for consideration and approval.
        ii. If the updated Sustainable Yield$_x$ results are unanimously approved by the BMC then the updated Sustainable Yield$_x$ will be documented in the Annual Report for that Year.
    b. If the recommendation is to not update the Sustainable Yield$_x$ and the BMC agrees, then the Sustainable Yield$_x$ will remain the same as the previously approved Sustainable Yield$_x$ by the BMC.
    c. If the BMC cannot come to unanimous agreement of whether or not to update the Sustainable Yield$_x$, the update parameters or the updated Sustainable Yield$_x$ results then the Sustainable Yield$_x$ will remain the same as the previously approved Sustainable Yield$_x$ and the BMC will provide direction to Staff on how to proceed.

Financial Considerations

Cost associated with developing a Sustainable Yield$_x$ was included in the BMC CY 2021 Budget as part of Task 6 2020 Annual Report. However, if significant modifications to the methodology or more than one calculation is requested then additional budget may be required to complete the Sustainable Yield$_x$ calculation. There are currently contingency and Technical Support/Adaptive Management Services funds in the CY 2021 Budget that could be put toward additional effort associated with the Sustainable Yield$_x$ calculations, if desired.

TO: Los Osos Basin Management Committee

FROM: Dan Heimel, Executive Director

DATE: September 29, 2021

SUBJECT: Item 8b – Sustainable Yield$_x$ Methodology Review and Recommendations

Recommendations

Receive information from BMC Staff's review of the Sustainable Yield$_x$ methodology and provide direction on Staff's recommendations regarding; 1) revisions to the methodology; and 2) the procedure / timeline by which the Sustainable Yield will be calculated each year.

Discussion

Background

In the Stipulated Judgement (SJ) and the Basin Plan, the BMC Parties agreed on a framework and methodology for estimating and updating the Sustainable Yield for the Los Osos Basin (Basin), referred to as Sustainable Yield$_x$, where "X" represents the Sustainable Yield estimate for that year. The SJ and Basin Plan require the BMC to annually evaluate, confirm and set the Sustainable Yield$_x$ based on the best available data and evidence. At the July 21, 2021 BMC Meeting the BMC directed staff to review the Sustainable Yield estimate and to bring back recommendations for calculating the Sustainable Yield$_x$.

The Sustainable Yield$_x$ calculation is a critical component of the basin monitoring and management framework established for the Basin. As specified in the Basin Plan, the Sustainable Yield$_x$ is defined as the maximum amount of groundwater that may be extracted from the Basin, with the existing infrastructure, in Year "X" (1) without causing seawater to advance further inland or (2) while maintaining a stable seawater intrusion front and with no active well producing water with chloride concentrations above 250 mg/L. The amount of water that can be extracted under this criteria is determined using the numeric groundwater model (Model) created for the Basin. Additional information regarding the Model and its development and calibration is available in Basin Plan Section 5.6.5.

The Sustainable Yield$_x$ is used to guide the BMC in making decisions regarding the current sustainability and management of pumping by the purveyors within the Basin and is included in calculation of the following metrics and management mechanisms:

Basin Yield Metric

The Basin Yield Metric (BYM) is one of the metrics that the BMC utilizes to track progress in the fight against seawater intrusion. The BYM compares the actual amount of groundwater extractions in a given year with the Sustainable Yield$_x$ for that year. The equation for calculating the Basin Yield is shown below.

$$\text{Basin Yield Metric} = \frac{\text{Year}_{xx}\text{ Groundwater Production}}{\text{Sustainable Yield}_{x}} * 100$$

Figure 1. Basin Yield Metric Equation

The target BYM identified in the Basin Plan is 80 or lower. This target, which includes a 20% buffer or safety factor was incorporated into the BYM to target Basin conditions that would push the freshwater-seawater interface or seawater intrusion front seaward and to protect against uncertainty. The types of potential uncertainty identified in the Basin Plan include: physical and pumping assumptions in the Model; Model limitations (i.e. Steady State); changes in agricultural pumping; effectiveness in the Urban Water Use Efficiency Program; changes in population; climate variability (including climate change); and natural hazards. Figure 2, which is Figure 38 from the Basin Plan, illustrates the anticipated location of the seawater intrusion front under the Sustainable Yield (BYM 100) pumping scenario and the location under the BYM 80 (20% safety factor) pumping scenario. As shown, with the reduced pumping associated with a BYM of 80 the Model predicts that the seawater intrusion front will be pushed seaward.

The BMC evaluates the BYM on an annual basis and compares the BYM for that year against the target of 80 for estimating whether or not the pumping occurring in a given year is sustainable given the available infrastructure (i.e. wells). A BYM value below 80 is an indicator that Basin pumping is below the maximum sustainable level and a BYM value above 80 indicates that pumping need to be reduced or additional infrastructure is needed to achieve sustainable conditions.

Figure 2. Figure 38 from Basin Plan illustrating seawater intrusion front at BYM 100 and BYM 80

Basin Development Metric

The Basin Development Metric is a comparison of the Sustainable Yield$_x$ and the potential Sustainable Yield that could be achieved through completion of all the potential projects identified in the Basin Plan for implementation. This metric provides the BMC with an indication of how much progress has been made toward implementing the programs identified in the Basin Plan for increasing the Sustainable Yield.

Purveyor Pool

The Sustainable Yield$_x$ is also used for the purposes of determining the Purveyor Pool. The SJ establishes four Pools: the Purveyor Pool; Agricultural Pool; Community Pool; and Private Domestic Pool for the purposes of dividing the Sustainable Yield$_x$ amongst the different groundwater user types within the Basin. The allocation percentages for a Sustainable Yield$_x$ estimate of 2,400 AFY for each of the Pools is shown in Figure 3 below. The SJ currently only allows for adjustments to the Purveyor Pool based on changes to the Sustainable Yield$_x$ (because no private pumpers are parties). Additional information on the Purveyor Pool and its relationship to the Sustainable Yield$_x$ can be found in Section 4 of the SJ.

Table 3. Pool Allocation Based on Sustainable Yield$_X$ of 2,400

User	Pool Share (%)	Pool Allowance (AFY)
Purveyor Pool	59.58	1,430
Agricultural Pool	31.25	750.0
Community Pool	2.92	70.0
Private Domestic Pool	6.25	150.0
Subtotal	100.00	2,400

Figure 3. Pool Allocation Based on Sustainable Yield$_x$ of 2,400 AFY

Sustainable Yield$_x$ Methodology and Key Assumptions Review

As directed by the BMC, BMC Staff and BMC Party Staff, which includes staff representatives from each of the BMC Parties, reviewed the current methodology and key assumptions for the Sustainable Yield calculation. Based on the review, BMC Staff prepared the following recommendations for the BMC's consideration when approaching the Sustainable Yield$_x$ calculation.

Sustainable Yield Threshold

As described previously, the Sustainable Yield$_x$ is defined as the maximum amount of groundwater that may be extracted from the Basin in Year "X" (1) without causing seawater to advance further inland or (2) while maintaining a stable seawater intrusion front and with no active well producing water with chloride concentrations above 250 mg/L. Based on policy direction that was provided during the development of the Stipulated Judgement, the Basin Plan and the previously developed Sustainable Yield estimates, this was interpreted to allow for the development of Sustainable Yield pumping scenarios and calculation of the Sustainable Yield$_x$ that included seawater intruding further into the basin than has previously occurred to date (i.e. losing additional ground to seawater intrusion) before stabilizing and meeting the criteria described above.

BMC Staff propose evaluating an alternative approach, which would not allow seawater to intrude further than has been observed to-date (i.e. holding ground against further seawater intrusion). This approach would include establishing thresholds or limits for future seawater intrusion in the basin based on the current extent of seawater intrusion for Zones D and E. These new thresholds or limits would then be the limiting constraints for calculating the Sustainable Yield$_x$ or the amount of pumping that the Model predicts could be achieved without inducing further seawater intrusion into the Basin. Figure 4 illustrates the current estimated extents of seawater intrusion in Zones D and E of the Basin and the associated “intrusion front” threshold lines that could be used as the limiting constraint for the proposed alternative approach to calculating the Sustainable Yield.

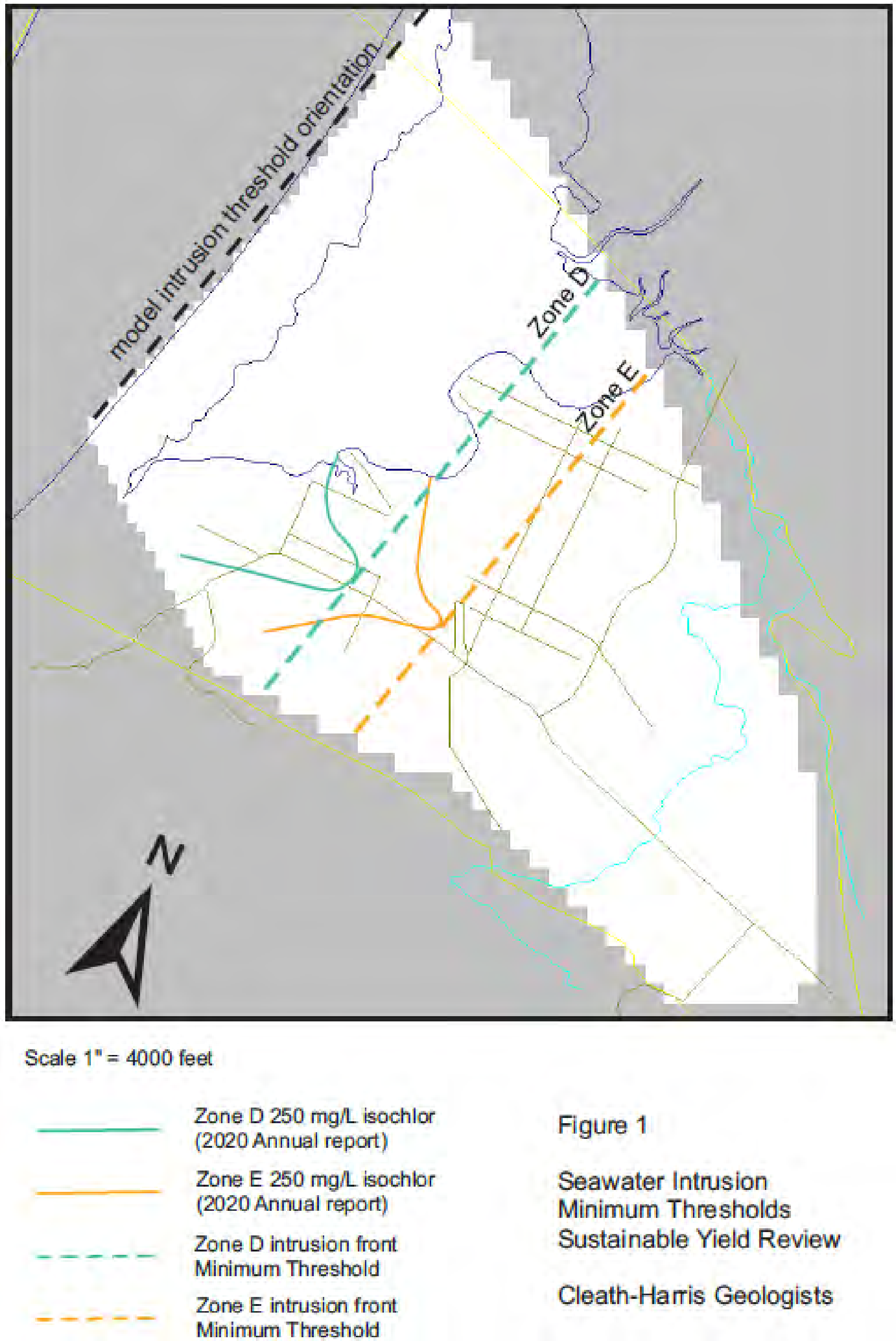
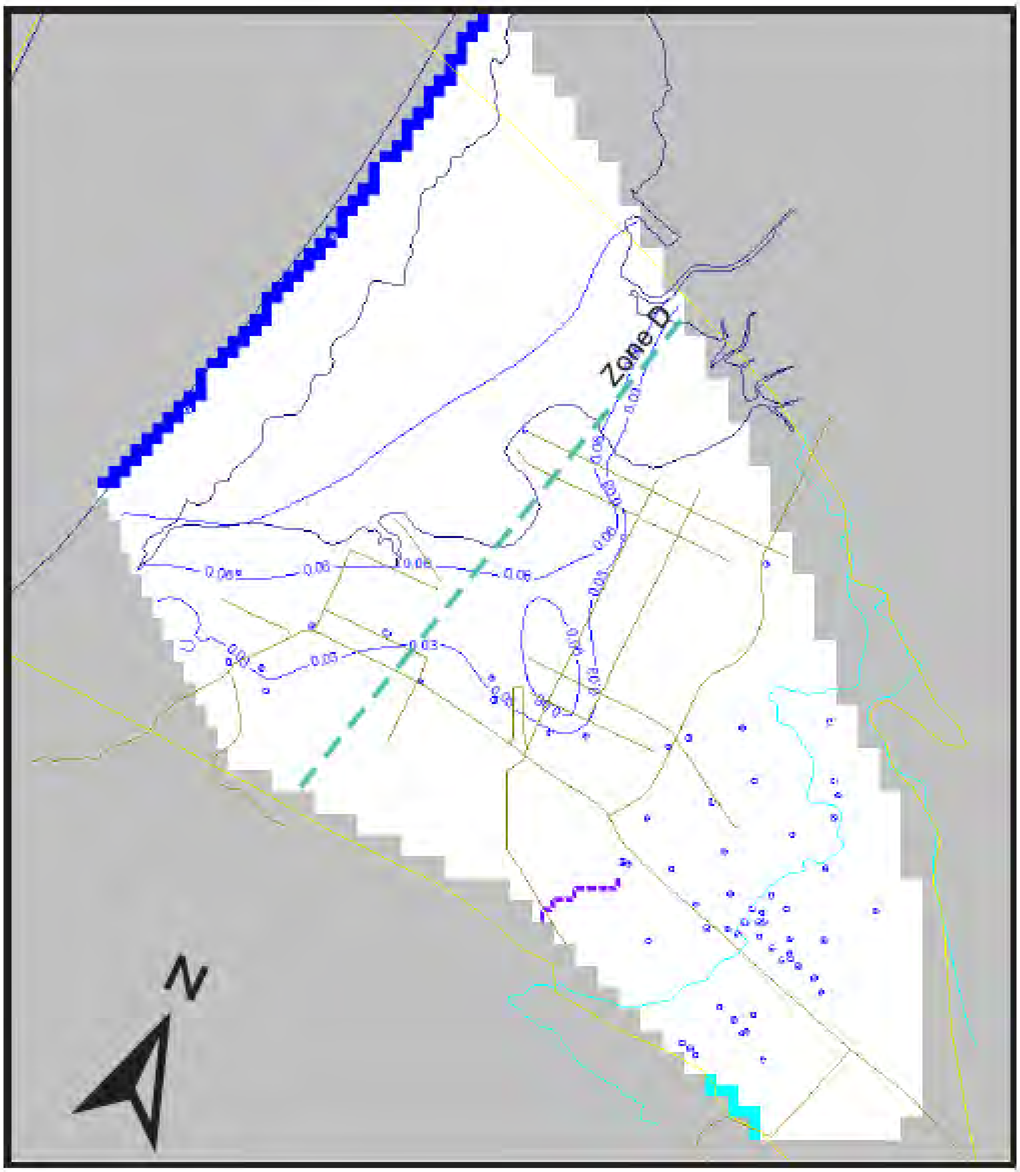


Figure 4. Current estimates of seawater intrusion extent within the basin

For comparison purposes, the estimated extent of seawater intrusion included in the "Basin Yield Metric response to reduced long-term precipitation in the Los Osos Groundwater Basin" 2017 Technical Memorandum Sustainable Yield calculation, is shown in Figure 5 and Figure 6. As shown in these figures, the model estimates that pumping occurring at the 2,760 AFY Sustainable Yield would allow seawater to intrude further inland than the current extent of seawater intrusion, illustrated by the proposed "intrusion front" threshold developed based on the current extent of seawater intrusion in the Basin.

Based on the desire to avoid further degradation of the Basin from seawater intrusion, BMC Staff recommends that the threshold for calculating Sustainable Yield be modified to represent the current extents of seawater intrusion. Under the proposed alternative approach, the Sustainable $Yield_x$ would be calculated as the amount of water that could be extracted from the basin, with existing infrastructure, without causing seawater to intrude further than the current extent and with no active well producing water with a chloride concentration above 250 mg/L.

Establishing this new threshold is consistent with how basins with similar seawater intrusion threats approach the development of Sustainable Management Criteria (SMC) under the Sustainable Groundwater Management Act (SGMA). SGMA calls for the development of SMC that includes Minimum Thresholds and Measurable Objectives. Minimum Thresholds are established as the minimum threshold or worst-case condition that cannot be exceeded without having undesirable results or detrimental impacts on the basin. Measurable Objectives are set as the desired objective that indicate maintenance or improvement of specific groundwater conditions that is desired to achieve. Under the proposed alternative approach, the "intrusion front" thresholds, established based on the current extent of seawater intrusion, could be the equivalent of the Minimum Threshold under SGMA and the BYM target of 80 could be the equivalent of the Measurable Objective.



Scale 1" = 4000 feet

TDS isoconcentrations in lb/ft3

0.03 lb/ft3 = 500 mg/l TDS ≈ 250 mg/l Chloride
0.06 lb/ft3 = 1,000 mg/l TDS≈ 500 mg/l Chloride
0.31 lb/ft3 = 5,000 mg/l TDS≈ 2,500 mg/l Chloride

Zone D intrusion front
Minimum Threshold

Figure 2

TDS Isoconcentrations
2016 BYM 100 - Zone D
Steady State at 2,760 AFY

Cleath-Harris Geologists

Figure 5. Estimated extent of Zone D seawater intrusion in 2,760 AFY Sustainable Yield estimate

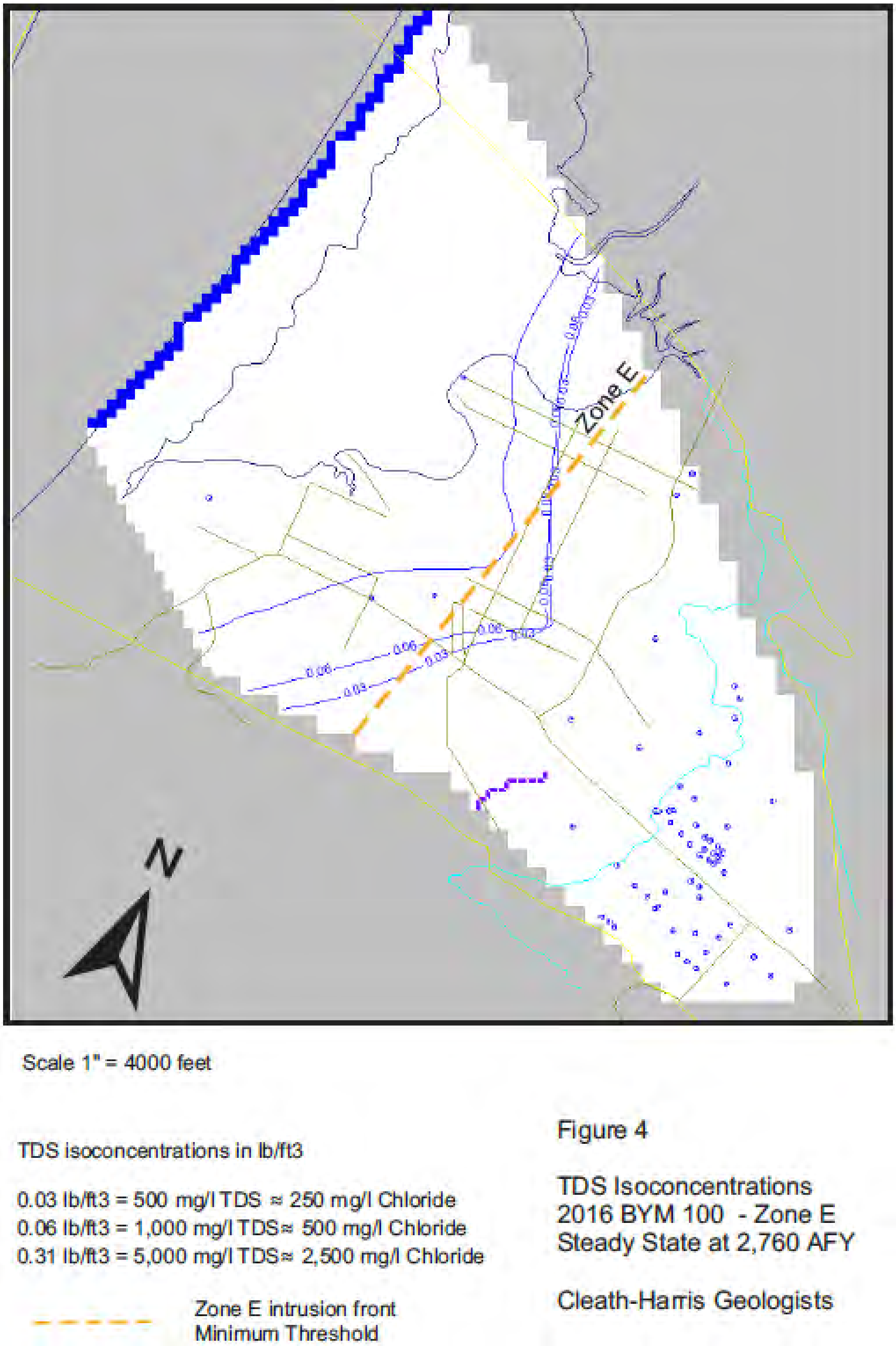


Figure 6. Estimated extent of Zone E seawater intrusion in 2,760 AFY Sustainable Yield estimate

Precipitation

Precipitation in the Model is currently assumed to be 17.5 inches per year. This average was based on correlating annual rainfall at Morro Bay Fire Department (which has the longest period of record) with rainfall at the South Bay Fire Department (Los Osos). The original correlation (Yates and Williams 2003) resulted in a multiplier of 1.05 (Morro Bay rainfall x 1.05 = Los Osos rainfall). Using the long-term average annual rainfall at Morro Bay of 16.72 inches (through 2003) the corresponding long-term average for Los Osos was 17.5 inches. BMC Staff reviewed the rainfall assumption and performed an evaluation that incorporated the most recent data available from the PRISM Climate Group and the Los Osos Landfill and Morro Bay Fire Department rain gauges. The results of the PRISM data set evaluation, which included data from 1981 - 2010 and is the latest available 30-year normal isohyetal data provided a weighted rainfall average estimate for Los Osos of 17.1 inches/year. The analysis and updated correlation of rainfall data from the Morro Bay Fire Station and the South Bay Fire Department/Los Osos Landfill incorporating data from 1960 – 2020 produced an average rainfall estimate for Los Osos of 17.5 inches/year. Based on the results of this evaluation, BMC Staff is recommending reducing the rainfall/precipitation assumption in the model from 17.5 inches/year to 17.3 inches/year, which represents an average of the results from the two updated evaluations. Additional information on the rainfall analysis is included in Appendix A.

Other Sustainable Yield$_x$ Assumptions

There are number of other assumptions that are utilized within the Model when performing the calculation of Sustainable Yield$_x$, which are described below. BMC Staff reviewed these assumptions and determined them to be suitably conservative for the Sustainable Yield$_x$ calculation and additional changes are not recommended.

Stream Inflow – Stream Inflow in the Model is limited at 800 AFY and is constrained by stream bed seepage capacity to be approximately 20% of the estimated average watershed runoff.

Recycled Water – Recycled water delivery assumptions included in the Model include 448 AFY to Broderson and 33 AFY to Bayridge Estates.

Non-Purveyor Pumping – Non-Purveyor pumping assumptions in the model are listed below:

Non-Purveyor Pumping Type	Assumed Pumping Rate (AFY)	Notes
Agriculture	750	
Private Domestic	220	
Sea Pines Golf Course*	50	Assumed 30 AFY recycled water from Monarch WWTP (prior to recycled water deliveries from LOWRF)
Memorial Park	50	
Community Park	0	Assumed 5 AFY recycled water

*Pumping rate for Sea Pines to be adjusted based on projected demand and LOWRF recycled water deliveries.

Purveyor Pumping – The amount of purveyor pumping included in the Sustainable Yield$_x$ calculation is iteratively determined by increasing purveyor well pumping until the identified threshold is reached. Pumping rates for individual purveyor wells are optimized, based on available infrastructure, to shift purveyor pumping from the lower aquifer to eastern portions of the Basin and/or to the upper aquifer.

Sea Level – Sea level in the Model is assumed to be 0 ft elevation in National Geodetic Vertical Datum of 1929 (NGVD 29) which is roughly equivalent to Mean Sea Level for the Port San Luis buoy of 2.72 ft in North America Vertical Datum of 1988 (NAVD 88).

Proposed Sustainable Yield Update Process

To meet the requirements of the SJ to determine the Sustainable Yield$_x$ on an annual basis the following process is proposed.

1. Beginning in July of a given year, BMC Staff will evaluate the Sustainable Yield$_x$ for the upcoming year based on changes in Basin Plan infrastructure, groundwater inflow or outflow parameters, the understanding of hydrogeologic or geologic features in the basin or other factors.
2. BMC Staff will then provide a recommendation to the BMC on Sustainable Yield$_x$ for the upcoming year and the reasoning for that recommendation.
    a. If the recommendation is to modify the Sustainable Yield$_x$, then recommendations for which parameters to modify from the previous Sustainable Yield$_x$ will be provided.
        i. If the BMC approves the recommended modifications to the Sustainable Yield$_x$, BMC Staff will perform the updated Sustainable Yield$_x$ calculations and bring the results back to the BMC for consideration and approval.
        ii. If the updated Sustainable Yield$_x$ results are unanimously approved by the BMC then the updated Sustainable Yield$_x$ will be documented in the Annual Report for that Year and used for calculation of the Basin Yield Metric, Basin Development Metric and Purveyor Pool for the upcoming year.
    b. If the recommendation is to not modify the Sustainable Yield$_x$ and the BMC agrees, then the Sustainable Yield$_x$ will remain the same as the previously approved Sustainable Yield$_x$ by the BMC.
    c. If the BMC cannot come to unanimous agreement of whether or not to modify the Sustainable Yield$_x$ then the Sustainable Yield$_x$ will remain the same as the previously approved Sustainable Yield$_x$ and the BMC will provide direction to Staff on how to proceed.

An example timeline for the envisioned process of updating the Sustainable Yield$_x$ and incorporating it into the BMC monitoring, management and Annual Monitoring Report processes is outlined below:

1. July 2021 BMC Staff begins evaluation of Sustainable Yield$_{2022}$
2. BMC Staff presents recommendations for Sustainable Yield$_{2022}$
3. Before January 2022 BMC approves Sustainable Yield$_{2022}$
4. Sustainable Yield$_{2022}$ used to establish Purveyor Pool for 2022

5. Sustainable Yield_{2022} incorporated into Basin Yield and Basin Development Metric calculations for 2022 Annual Monitoring Report (AMR)
6. Sustainable Yield_{2022} described in 2021 AMR

Financial Considerations

Minimal costs associated with developing a Sustainable Yield_x were included in the BMC CY 2021 Budget as part of Task 6 (2020 Annual Report). However, Cleath-Harrris Geologists (CHG) has been tasked to provide additional analysis and attend multiple meetings in support of the Sustainable Yield_x evaluation and calculation and it is recommended that the BMC authorize the Executive Director to utilize $12,000 of contingency funds, as needed, to compensate CHG for their additional effort and support in preparing the Sustainable Yield_{2022} calculations. There are currently contingency and Technical Support/Adaptive Management Services funds in the CY 2021 Budget that could be put toward this additional effort associated with the evaluating and updating the Sustainable Yield_x.

Appendix A

Los Osos Long-Term Annual Rainfall

Method 1: Isohyetal map (PRISM 1981-2010 data set)

The Basin area between each isohyetal contour was measured. These areas were multiplied by the intermediate isohyetal value, and added together to determine average annual rainfall, which was 17.1 inches. See attached Figure 1.

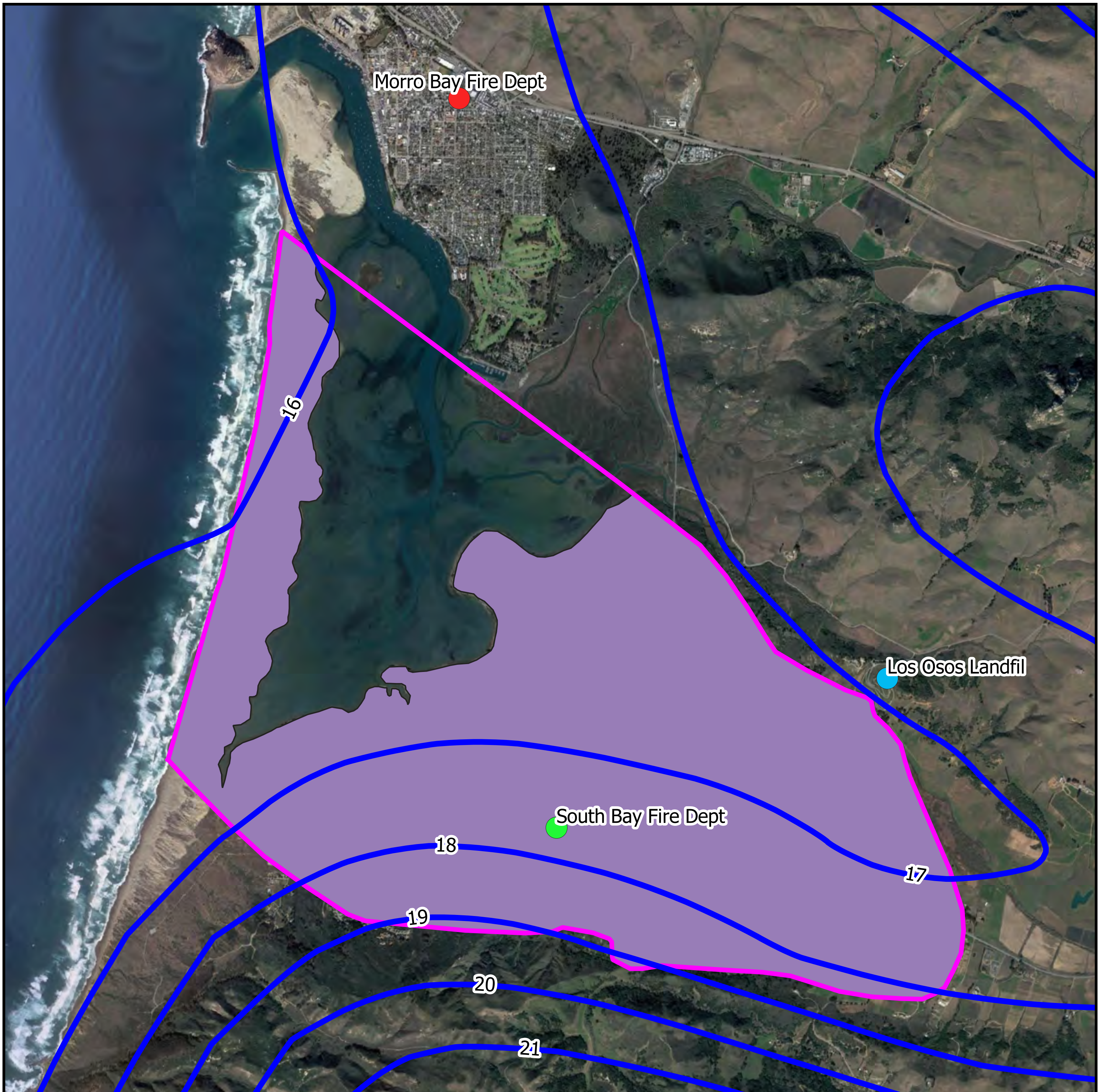
Rainfall (in)	Area (acres)	Ratio	weighted rainfall (in)
16	178	0.037	0.59
16.5	2496	0.518	8.55
17.5	1493	0.31	5.43
18.5	617	0.128	2.37
19	32	0.007	0.13
Total	4816	1	17.1

Method 2: Correlation with long-term rainfall data at the Morro Bay Fire Department.

Rainfall data at the South Bay Fire Department (1975-2001) and the Los Osos Landfill (2006-2020) were combined into a single dataset and correlated with rainfall at the Morro Bay Fire Department. The best fit linear trend line indicates Los Osos averaged 8.7 percent wetter than Morro Bay. The corresponding long-term annual rainfall for Los Osos is 17.5 inches, based on multiplying the long-term annual rainfall value of 16.1 in/year at Morro Bay Fire Department (1960-2020) by 1.0874. See attached Figure 2.

Long-Term Annual Rainfall

Results from the two methods (17.1 inches and 17.5 inches) were averaged to establish the updated long-term annual rainfall of **17.3 inches** for Los Osos.



Explanation

- Isohyetal Contours Inches/ Year
- Measured Area for Isohyetal Calculation
- Los Osos Groundwater Basin Boundary
- Morro Bay Fire Dept
- South Bay Fire Dept
- Los Osos Landfill

0 4,000 8,000 ft

[Coord. Sys: State Plane Zone 5, US ft] [Horiz. Datum: NAD83] [Vert. Datum: NAVD88]

Figure 1
Isohyetal Map of Los Osos, CA

Los Osos BMC

Cleath-Harris Geologists

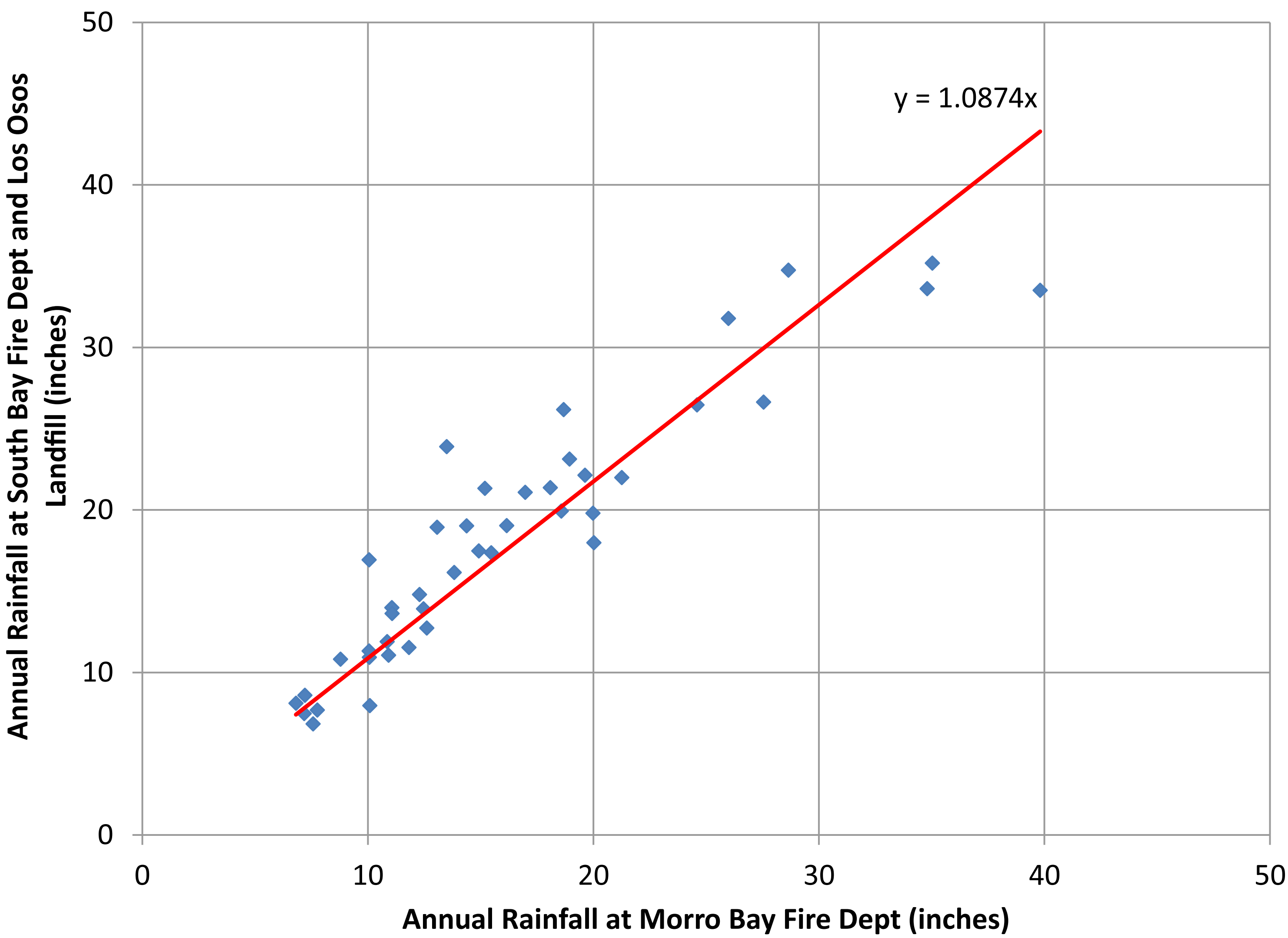


Figure 2

Los Osos - Morro Bay Rainfall Correlation
Los Osos BMC

Cleath-Harris Geologists

TO: **Los Osos Basin Management Committee**

FROM: **Dan Heimel, Executive Director**

DATE: **October 27, 2021**

SUBJECT: **Item 8a – Sustainable Yield$_x$ Methodology Review and Recommendations**

Recommendations

BMC Staff recommends that the BMC: 1) receive information on the updated Sustainable Yield$_x$ calculations and approve the proposed Sustainable Yield estimate of 2,380 AFY for Calendar Year 2022 based on the findings provided below; or 2) provide alternate direction to staff.

BMC Staff proposes establishing the Sustainable Yield estimate for Calendar Year 2022 (Sustainable Yield$_{2022}$) as 2,380 AFY, based on the following justification:

1. Seawater Intrusion Threshold - Utilizing the Adaptive Method for limiting the extent of seawater intrusion does not allow seawater to intrude farther inland during the calculation of the Sustainable Yield for the Basin. This approach establishes that further degradation of the Basin is an undesirable affect and basin pumping should be managed to, at a minimum, not further degrade the basin and with the goal (Basin Yield Metric 80 pumping target) of reversing seawater intrusion and pushing the seawater intrusion front back toward the Bay.
2. Broderson Mound - Sustainable Yield calculations for 2022 should be performed using the assumption that the Broderson Mound is only 50% developed. Based on the best available information that we have, it is estimated that the Broderson Mound is approximately 50% developed and incorporating this assumption into the Sustainable Yield calculation helps identify the amount of pumping that can be sustainably achieved under anticipated conditions in 2022.
3. Available Infrastructure – The calculation of Sustainable Yield$_{2022}$ accounts for currently available infrastructure and infrastructure that is anticipated to be available for the majority of 2022.
4. Precipitation – BMC Staff reviewed the rainfall assumptions in the Sustainable Yield calculation and recommends utilizing 17.3 inches per year as the long-term average rainfall for the basin. This recommendation is based on an evaluation of two different datasets using the latest available rainfall data for the basin. Additional information on the rainfall evaluation is provided in Item 8b of the 9/29/2021 BMC Agenda Packet.

Discussion

Background

In the Stipulated Judgement (SJ) and the Basin Plan, the BMC Parties agreed on a framework and methodology for estimating and updating the Sustainable Yield for the Los Osos Basin (Basin), referred to as Sustainable Yield$_x$, where "X" represents the Sustainable Yield estimate for that year. The SJ and Basin Plan require the BMC to annually evaluate, confirm and set the Sustainable Yield$_x$ based on the best available data and evidence. At the July 21, 2021 BMC Meeting, the BMC directed staff to review the Sustainable Yield estimate and to bring back recommendations for how to calculate the Sustainable Yield$_x$. At the September 29th BMC Meeting, the BMC directed staff to calculate Sustainable Yield$_{2022}$ estimates using the Historic Method threshold for seawater intrusion—which allows seawater to intrude farther inland before stabilizing—and proposed Adaptive Method threshold for seawater intrusion-which limits seawater intrusion in the Sustainable Yield calculations to current extents—and provide them to the BMC for consideration. Additional information on the seawater intrusion threshold criteria and other key assumptions in the Sustainable Yield calculations are provided in Item 8b of the 9/29/2021 BMC Agenda Packet.

Based on the direction provide by the BMC, BMC Staff developed updated Sustainable Yield calculations, which are described below. During the development of the updated Sustainable Yield calculations, BMC Staff identified a methodology that allows for a more accurate representation of the development of the Broderson Mound, a critical component of the Basin Plan strategy for stopping and pushing back seawater intrusion in the basin. To help illustrate the impact that the Broderson Mound has on the Sustainable Yield estimate, multiple scenarios were run that represent a Broderson Mound that is 50% (current estimated level of development), 75% and 100% developed. The table below provides a summary of the Sustainable Yield scenarios and the Sustainable Yield estimates and Basin Yield Metric values associated with each scenario.

Table 1. Sustainable Yield Scenario Summary

Scenario	Seawater Intrusion Front[1]	Rainfall[2]	Broderson Mound	Available Infrastructure[3]	Sustainable Yield (AFY)	Basin Yield Metric[4]
1	Historic Method	17.3 inches per year	100% Developed	2022 Infrastructure	2,650	0.76
2	Adaptive Method	17.3 inches per year	100% Developed	2022 Infrastructure	2,510	0.80
3	Adaptive Method	17.3 inches per year	75% Developed	2022 Infrastructure	2,450	0.82
4	Adaptive Method	17.3 inches per year	50% Developed	2022 Infrastructure	2,380	0.84

[1]Historic Method allows seawater to intrude farther inland before stabilizing. Adaptive Method restricts the intrusion of seawater in the basin to current extents for purposes of calculating the Sustainable Yield
[2]Rainfall assumption based an updated evaluation of rainfall for the Los Osos Basin, additional information is provided in Item 8b of the 9/29/2021 BMC Agenda Packet.
[3]Available infrastructure represents the infrastructure anticipated to be available in Calendar Year 2022 (e.g. the Los Osos Community Services District's 8th Street Upper Well is assumed to be available in 2022 as it is anticipated to be online in Q1 2022).
[4]Basin Yield Metric calculated using basin production estimate of 2,010 AFY (2020 Annual Monitoring Report)

Additionally provided are figures that illustrate the modeled location of the seawater intrusion front under the various scenarios. Figure 1 illustrates the estimated location of the seawater intrusion front, using the Historic Method threshold for seawater intrusion (i.e. allowing seawater to intrude farther inland than current extents) for Zones D and E, as well as the anticipate location of the seawater intrusion front if pumping within the Basin was limited to 80% of the Sustainable Yield estimate (i.e. BYM 80). It should be noted that when pumping is limited to 80% of the Sustainable Yield the model predicts the seawater intrusion front will be pushed back toward the Bay.

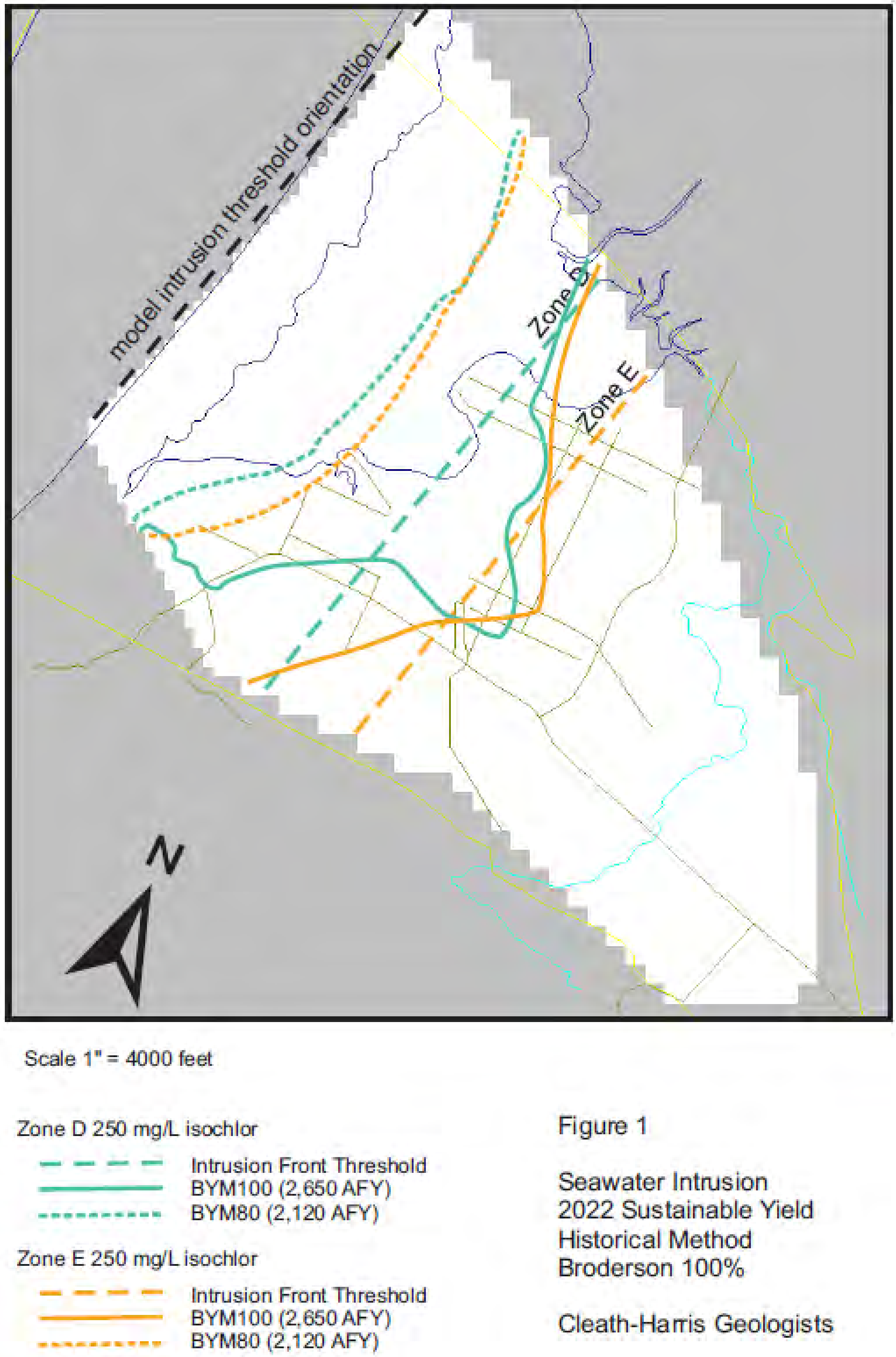


Figure 1. Historic Method Sustainable Yield Calculation (100% Broderson Mound development)

Figure 2 illustrates the estimated location of the seawater intrusion front, using the Adaptive Method threshold for seawater intrusion (i.e. limiting intrusion to current extents) for Zones D and E, as well as the anticipate location of the seawater intrusion front if pumping within the Basin was limited to 80% of the Sustainable Yield estimate (i.e. BYM 80).

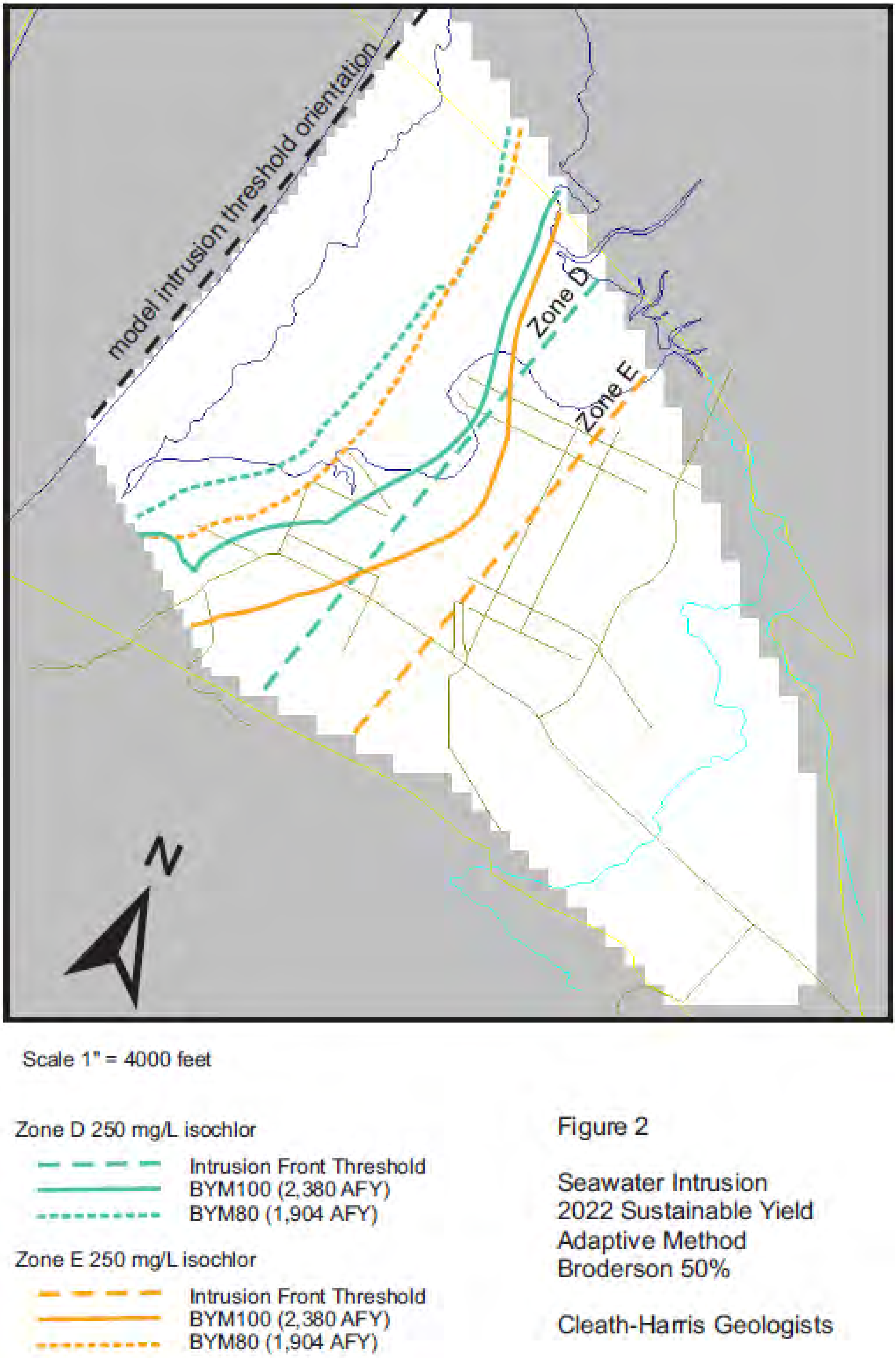


Figure 2. Adaptive Method Sustainable Yield Calculation (50% Broderson Mound development)

Based on review of these results and extensive discussion with BMC Party Staff, BMC Staff recommends that the BMC establish the Sustainable Yield for the year 2022 (Sustainable $Yield_{2022}$) as 2,380 AFY (Scenario 4), based on the following reasons:

1. Seawater Intrusion Threshold - Utilizing the Adaptive Method for limiting the extent of seawater intrusion does not allow seawater to intrude further inland during the calculation of the Sustainable Yield for the Basin. This approach establishes that further degradation of the Basin is an undesirable affect and basin pumping should be managed to at a minimum not further degrade the basin and with the goal (Basin Yield Metric 80 pumping target) of reversing seawater intrusion and pushing the seawater intrusion front back toward the Bay.
2. Broderson Mound - Sustainable Yield calculations for 2022 should be performed using the assumption that the Broderson Mound is only 50% developed. Based on the best available information that we have, it is estimated that the Broderson Mound is approximately 50% developed and incorporating this assumption into the Sustainable Yield calculation helps identify the amount of pumping that can be sustainably achieved under anticipated conditions in 2022.
3. Available Infrastructure – The calculation of Sustainable $Yield_{2022}$ accounts for currently available infrastructure and infrastructure that is anticipated to be available for the majority of 2022.
4. Precipitation – BMC Staff reviewed the rainfall assumptions in the Sustainable Yield calculation and recommends utilizing 17.3 inches per year as the long-term average rainfall for the basin. This recommendation is based on an evaluation of two different datasets using the latest available rainfall data for the basin. Additional information on the rainfall evaluation is provided in Item 8b of the 9/29/2021 BMC Agenda Packet.

Proposed Sustainable Yield Update Process

To meet the requirements of the SJ to determine the Sustainable $Yield_x$ on an annual basis the following process is proposed for updating the Sustainable Yield.

1. Beginning in July of a given year, BMC Staff will evaluate the Sustainable $Yield_x$ for the upcoming year based on changes in Basin Plan infrastructure, groundwater inflow or outflow parameters, the understanding of hydrogeologic or geologic features in the basin or other factors.
2. BMC Staff will then provide a recommendation to the BMC on Sustainable $Yield_x$ for the upcoming year and the reasoning for that recommendation.
    a. If the recommendation is to modify the Sustainable $Yield_x$, then recommendations for which parameters to modify from the previous Sustainable $Yield_x$ will be provided.
        i. If the BMC approves the recommended modifications to the Sustainable $Yield_x$, BMC Staff will perform the updated Sustainable $Yield_x$ calculations and bring the results back to the BMC for consideration and approval.
        ii. If the updated Sustainable $Yield_x$ results are unanimously approved by the BMC then the updated Sustainable $Yield_x$ will be documented in the Annual Report for that Year and used for calculation of the Basin Yield Metric, Basin Development Metric and Purveyor Pool for the upcoming year.

b. If the recommendation is to not modify the Sustainable $Yield_x$ and the BMC agrees, then the Sustainable $Yield_x$ will remain the same as the previously approved Sustainable $Yield_x$ by the BMC.
c. If the BMC cannot come to unanimous agreement of whether or not to modify the Sustainable $Yield_x$ then the Sustainable $Yield_x$ will remain the same as the previously approved Sustainable $Yield_x$ and the BMC will provide direction to Staff on how to proceed.

An example timeline for the envisioned process of updating the Sustainable $Yield_x$ and incorporating it into the BMC monitoring, management and Annual Monitoring Report processes is outlined below:

1. July 2021 BMC Staff begins evaluation of Sustainable $Yield_{2022}$
2. BMC Staff presents recommendations for Sustainable $Yield_{2022}$
3. Before January 2022 BMC approves Sustainable $Yield_{2022}$
4. Sustainable $Yield_{2022}$ used to establish Purveyor Pool for 2022
5. Sustainable $Yield_{2022}$ incorporated into Basin Yield and Basin Development Metric calculations for 2022 Annual Monitoring Report (AMR)
6. Sustainable $Yield_{2022}$ described in 2021 AMR

It is additionally recommended that, if the BMC agrees upon a Sustainable $Yield_{2022}$ estimate, that a Sustainable $Yield_{2021}$ estimate be calculated utilizing the same methodology and key assumptions for use in the 2021 AMR Basin Yield Metric and Basin Development Metric calculations.

Broderson Groundwater Mound Development – 2017-2021

The Broderson Site is a community leach field used for recycled water disposal (location shown in report Figure 2). Operation of the Broderson Site is part of the Urban Water Reinvestment Program (LOBP Program U), and is one of the infrastructure components that can increase Basin Sustainable Yield and help mitigate seawater intrusion, compared to no action.

Recycled water discharges began at the Broderson Site in August 2016. Discharges to the community leach field are interpreted to percolate downward through mostly unsaturated fine sand, before reaching the Upper Aquifer water table. A groundwater mound has subsequently been developing within the Upper Aquifer, the evidence for which was observed at monitoring well FW6 (report Figure 2) beginning July 2017.

Basin Model scenarios that incorporate Program U have been based on the Broderson Site operating at 100 percent of permitted capacity, which is 448 acre-feet per year (AFY). The Basin Model is a steady-state model, and the beneficial impacts to Sustainable Yield from recycled water discharges at the Broderson Site are simulated with full development of the groundwater mound. Under current conditions, however, the groundwater mound beneath the Broderson Site is still expanding and will likely take several years to reach a steady-state condition.

Appendix Figure M1 shows the water level hydrograph for monitoring well FW6, which represents the Broderson groundwater mound development over time. Steady-state projections of the mound (at FW6) using the Basin model are also shown.

Without recycled water discharges (Broderson at 0 percent capacity), there is no Broderson mound and baseline steady-state water levels at FW6 are projected by the model to be in the range of 2012-2016 values (30-35 feet above sea level). At 50 percent capacity, steady state water levels at FW6 are projected by the model to be approximately 20 feet higher than baseline, which matches 2021 water levels. Therefore, for the purposes of estimating sustainable yield for 2022, the current condition development of the Broderson mound has been represented in the steady-state Basin model by simulating Broderson site operations at 50 percent capacity (224 AFY recycled water discharges). Full mound development is anticipated to add another 10-15 feet of water pressure, as percolating water continues to fill up pore space in the unsaturated zone beneath the Broderson site.

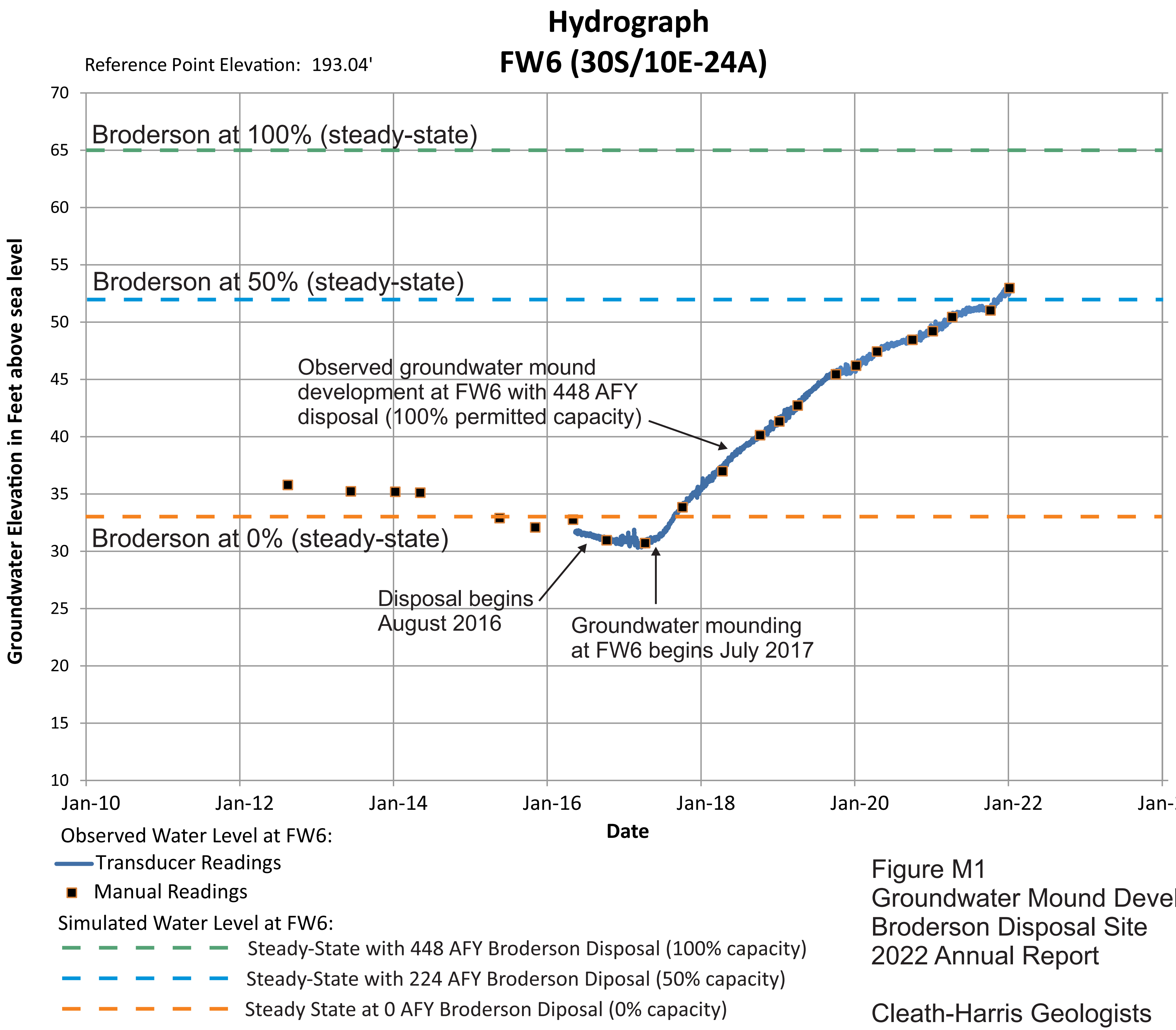


Figure M1
Groundwater Mound Development
Broderson Disposal Site
2022 Annual Report

Cleath-Harris Geologists

CHG response to LOSG comments on 2021 Annual Report Public Draft (no date; 10 pages).

LOSG Recommended Revisions for the 2021 Draft Annual Monitoring Report (AMR)

Page 1—The goals of the monitoring program should quote the “Immediate Goals” of the Basin Plan. The goals statement mentions only one “immediate goal” and it misstates it (e.g., the first immediate goal of the Basin Plan is not the “prevention of seawater intrusion”—it’s too late for that).

Misstatement corrected

Page 2—The “Seawater intrusion front” status (in brief) report is misleading and incomplete. Whenever the status is reported, it should include the caveat that it likely reflects localized conditions at LA10. Signs that seawater intrusion has retreated are also based on LA31, which is a mixed aquifer Zone C/D well, that is not likely accurate for Zone D. Further, the assertion that Zone E intrusion advanced toward LA12 is not supported by data. As this draft and the 2019 and 2020 AMRs acknowledge, not enough data points exist to know what is happening in Zone E (see further comments below regarding Page 57).

Caveat added. Advance toward LA12? Text says LA11. The data (Appendix K) shows increasing chlorides at LA11 over time – an indicator of seawater intrusion.

Page 2—The “Basin Yield Metric” status statement is incorrect and misleading based on changes in the sustainable yield definition and value last year. Although the BMC approved the changed sustainable yield value for 2022, the BMC did not find at the time that the old sustainable yield and estimated BYM of 2760 AFY were correct and still in effect. This status statement should report the new definition and value and state that the metric has not met LOBP goals since 2016. It would more accurately represent and the status of the Basin and actual sustainable yield and BYM to agencies and other stakeholders receiving the report.

The old SY value is correct per the original methodology and remains in effect until 2022. The upcoming change is mentioned.

Page 2—The “Water Level Metric” status statement and metric value require corrections and qualifying statements for at least three reasons, e.g., 1) the metric data, like other water level data, does not appear to be back-dated based on resurveyed reference points.

Metric graph and hydrographs are backdated.

Page 72 of the draft indicates that metric data has been
adjusted stating that the survey "resulted in a slight decline the Water Level Metric well elevations of 0.014." This would have to be explained since the survey resulted in water levels at LA16 increasing by almost 2', which would mean a .4' average increase in data from 2016 to 2020,

The former elevation for LA16 was 106.82 in NGVD 29, which is 109.62 in NAVD88. The new surveyed elevation is 108.74 in NAVD88, so there was a decline of 0.88 feet for that well. The resulting decline in average Water Lever Metric well elevations is 0.14 feet (47.473 average Metric elevation prior to correction, 47.329 with correction). The 0.014 in the report text is a typo, should be 0.14 (corrected).

and 2) the elevation reference point and data at
Well LA3, like LA3 data in the 2020 draft, are not consistent with data in Table 5. We explain (see "Page 57" comment below) why we think the metric overstates values and does not represent an improvement over 2020.

LA3 elevation needs to be corrected in table text, but the correct elevation was used for Water Level Metric Calculation (also see "Page 57 comment")

The status statement should
also report how much the metric has improved toward the target since 2015—since a purpose of the AMR is to report progress toward goals.

Progress in the metric over time is discussed and shown in main text of the AMR, will consider expanding summary for 2022.

Page 2—The "Chloride Metric" status statement, like the seawater intrusion front statement, should include the caveat that it likely reflects localized conditions at LA10. Clearly, the statement should not report "an improvement." The 3 mg/l per liter of chlorides change since 2020 is well within a margin of error, given the significant problems with LA10 data acknowledged in the Annual Reports. Again, improvements in the metric result since 2015 and progress toward target should be stated.

In lieu of caveats on the metrics, a footnote in Table ES-2 was inserted to note the upcoming revisions to the Water Level, Chloride, and Nitrate Metrics. The assignment of "improvement" or "deterioration" is a simple indicator to let the reader know the implications of the direction of metric movement. Progress in the metrics are discussed and shown in the main text.

Page 2—The summary of "recommendations for improving the quality and availability" should include mention of improvements to the Chloride and Water Level Metrics and the addition and modification of wells. These improvements are more relevant to the monitoring report than an update of the "Maximum Sustainable Yield" and Basin model mentioned.

Recommendations added. The update to the Maximum Sustainable Yield is an important task that would revise the estimated benefits to Basin yield for each of the LOBP programs (using the new methodology). This task would support decisions to make any changes in infrastructure planning (adding a third Program C well, for example).

Page 3—Table ES-2 should be modified per comments for Page 2 above, e.g., the Basin Yield Metric should be reported using the revised sustainable yield definition and BYM values.

The revision does not affect 2021 SY/BYM estimates. Comments of the upcoming change are provided

Pages 8 & 10—The purpose and basic elements of the monitoring program as stated are too narrow and limited. The purpose of the program is to provide and constantly improve an understanding of the Basin setting in order to better inform decision making. It should also provide information on the "three main" water supply aquifers (Zones C, D, and E) rather than considering Zones D and E one aquifer. In addition, it should provide information on surface water interconnections, e.g., with Los Osos Creek. The programs should also be used to set and verify measurable objectives to address undesirable conditions and the threat of undesirable conditions throughout the Basin.

Expanded language will be considered for the 2022 AMR.

Page 10--The two paragraphs above section "2.2.1 Water Level Monitoring" should explain that many more dedicated monitoring wells are needed to improve the system—e.g., adequately track water levels and water quality Basin wide. The paragraphs should explain that use of municipal wells and private wells have significant limitations, including limited access (private wells) and mixed aquifer screening and pumping interference (municipal wells). When use of private wells are mentioned, the limitations should be mentioned, including the number of private wells with restricted data or collection access.

Expanded language will be considered for the 2022 AMR.

Page 14—The last paragraph should state that Zones D and E are two separate aquifers, which may have some communication (since conditions are different in each aquifer). This paragraph should also recognize the fact that at least two major supply wells including LA 20, LA21, and the new expansion well being installed by the LOCSD, will be screened partly in Zone E. The immediate goals of the Basin Plan should be cited as the goal rather than a modified version ("to halt, slow, and/or reverse intrusion"). This sounds as though the goal may now be to only "slow" seawater intrusion when the BYM target of 80 is intended to reverse it in both lower aquifers to the estuary.

Expanded language will be considered for the 2022 AMR.

Page 17—Constituents of emerging concern should include the class of chemicals referred to as PFAS and any other CEC's that threaten to reduce beneficial uses of the Basin or cause harm to people or the environment.

Modification of CEC's to be considered with BMC Staff input for 2022 AMR.

Pages 19 & 20—The list of "Additional Basin Studies" should include the evaluation the BMC authorized to review sites and add additional wells.

Included (part of well modification study).

Page 21—The Field Methods section should explain that BMC management does not have a quality control program or procedures in place that ensure monitoring methods and protocols are followed and data is reviewed for accuracy. The section should also explain how the BMC's monitoring and data control protocols and related practices compare to SGMA requirements or another set of respected protocols and accepted practices. Looking over the data, we've come across several obvious errors in the past, in addition to anomalies and inconsistencies that raise questions of data accuracy, and indicate a need for better quality control.

BMC Staff has not requested a formal quality control program to date. Monitoring methods and protocols for the BMC program (Appendix E) are from authoritative sources (USGS and DWR) and comparable to County practices and methods submitted in local Groundwater Sustainability Plans. SGMA legislation does not require specific quality control procedures. CHG staff are experienced and perform quality assurance procedures during fieldwork and quality control during report preparations, including independent review of data entry. Not all "errors" pointed out by LOSG comments are, in fact, errors.

Page 21— The "Elevation Datum" section should explain that historic data was not updated and has been incorrect since 2015 by on average about 2' per well. Water level data should be backdated to provide a better understanding of water level trends, problem areas, and any problems with data (e.g., questionable reference point survey results—see Pages 45-52 comment).

The elevations have not been incorrect as described above. The wells were simply surveyed in two different datums historically, which were listed for each well in prior AMRs. From 2015 through 2020, adjustments to the NGVD 29 elevations were made before contouring and storage calculations. Water level hydrographs are backdated.

Pages 26 & 28—Tables 5 and 8 should have the elevation reference point for LA3 listed as 19.47' changes to 23.89.' If 19.47' is accurate, the Water Level Metric is not accurate and if 23.89' is accurate, then the elevation reference point for years 2016 through 2018 should be corrected or clarified, as well as the foot note on the 2016 data tables (also see comments Pages 57 & 58).

23.89' is correct beginning in 2019 (wellhead raised). This update is applied to the County database every year and was missed in the draft text this year – the metric calculation uses correct elevation.

Pages 33 & 34—Tables 10 and 11 show nitrate levels for LA10 to be 2.1 mg/l. According to the Appendix J of the 2018 AMR (Pages 3 and 4), 2.1 mg/l indicates well-bore leakage. To calculate the spring 2020 chloride metric value, a chloride value of 320 mg/l with nitrates of 2.1 was replaced with 250 mg/l of chlorides with 2.0 mg/l of nitrates (see 2020 AMR, Page 71). The substitution produced results inconsistent with expected results (less upper aquifer influence is assumed in Appendix J to result in higher chloride levels). However, our point is that 2.1 of nitrates resulted in a substitution. Our more basic point, which we further explain in the Page 57 comment below, is that Well LA10 data and the Chloride Metric are unreliable with or without consistent use of the methodology (e.g., since nitrate data is variable relative to chlorides).

The spring 2020 substitution was an effort to mitigate a localized spike in chloride due to increased pumping prior to the sampling event. The 250 mg/l value was considered more representative of spring 2020 conditions (with nitrates at 2.0 mg/L)

Page 35—Table 12 should include the class of chemicals referred to as PFAS.

Pending BMC consideration for 2022

Page 36—The last paragraph should also say whether the sucralose concentrations at FW6 prevent or reduce beneficial use of the water in the area including for ESHA.

Text added with respect to drinking water regulations.

Page 37—The Geophysics section should discuss all limitations and potential error of the logs. For instance, the logs are provided triennially and do not "correspond to the 250 mg/l chloride concentration isopleth." Therefore, they are apparently not effective for early detection of intrusion or for setting and confirming seawater intrusion objectives. We note that logs provided in an appendix include disclaimers that suggest the logs have substantial uncertainties and margins of error (see 2021 Draft AMR, pdf Page 253).

Expanded language will be considered for the 2022 AMR.

Page 38—The discussion of water use should point out that purveyor use shows no overall reduction since Basin operations began in 2015, despite conservation being a key program. Of course, this poor showing was because neither the County nor BMC followed through on the Basin Plan proposed Basin-wide program and related commitments and requirements (e.g., Special Condition 6 of the LOWWP). The discussion of water use should also point out that the only decline in overall use has been due to estimated declines in private well use—i.e., declines on paper rather than declines verified by data.

The text already notes that purveyor use declined through 2016, and has fluctuated since then. Text has been added indicating declines since 2015 are from estimated production values, not metered production.

Page 39—If unmetered water use is 50% of water use, then uncertainty is much greater than 5%. The estimated reduction in Ag use alone is 5% (see related LOSG comments for the 2020 draft AMR).

The LOBP compared the uncertainty in unmetered production (given as +/- 10 percent) to 5 percent of the sustainable yield in 2012. The reduction in ag use was due to a reduction in irrigated acreage. Nevertheless, we can update the LOBP statement for 2022 AMR (BMC staff review needed).

Page 30 and 40—The discussion of groundwater production should point out that pumping of the lower aquifers has gone down only slightly less than 100 AFY on average in the past five years (since 2017) and that lower aquifer pumping in the Western Area has gone up slightly since 2017.

Text added.

Pages 42 & 43—Los Osos Landfill annual rainfall data should be used for the model at a minimum. The 15+ year record at the official County station in the area cites an average annual rainfall of 15.97," more than an inch below the annual rainfall assumed in the Basin model. The statement that the Los Osos Landfill record can be used once it "becomes more representative of long-term climatic conditions" represents a mode of planning that become obsolete with climate change. Last year, despite worsening drought conditions, the BMC reduced the assumed rainfall for the model from 17.5 inches/year to 17.3 inches/year showing that it places a greater priority on maximizing extractions from the Basin than protecting the resource. A more precautionary approach is justified and essential for a Basin suffering from 40 years of severe overdraft.

The model does use the Los Osos landfill data – it correlates the data to the long-term record at Morro Bay. We have been through more cycles of drought in the last 15 years than normal. Global climate model outcomes do not show less average rainfall on the central coast at mid or late century.

Pages 45-52—The Water Level Contour mapping and water in storage discussions should point out that there are not nearly enough water level monitoring wells to reliably track lower aquifer water levels in the Western and Centrals Areas of the Basin, especially in the northern part of the Basin and the western part of the Central Area. For instance, on Figure 11, spring lower aquifer water levels for the entire northern Basin inland from the estuary appear to be based on one or two data points. Even along the estuary, where the Basin is most vulnerable to seawater intrusion, there are only three data points. There are also no data points to the south of Los Osos Valley Road along the historic intrusion pathway or through the entire commercial area, and just one data point between the commercial area and Los Osos Creek.

There is a need for more monitoring locations in Los Osos, and additional sites will be recommended.

Keep in mind, however, that the density of water level monitoring data points per square mile in the Los Osos Basin far exceeds that of other basins. The BMC monitoring program has close to 90 wells in a basin that covers about 10 square miles. By comparison, the Paso Robles Basin uses around 40 wells to contour water levels over an area of close to 680 square miles. The USGS recently proposed targeting a network of 30 wells to monitor water levels in the Adelaida Area of SLO County that covers about 230 square miles. The BMC network has two orders of magnitude more wells per square mile than the above examples.

Pages 45-52-- Some of the data points on contour maps Figures 11 & 14 appear to be incorrect. For instance, LA22 near South Bay Blvd. is shown in data Table 5 to be about -11.4' (NAVD 88), but in Figure 11 it is shown as "0." Similarly, Table 8 shows LA22 at -42' in the fall, but the water level is shown as 0' on Figure 14.

None of the data points noted are incorrect. LA22 is immediately adjacent to an active production well and water levels are significantly affected by localized pumping, so data from that well is not representative of basin static conditions and is not used in the water level contours.

LA15 is shown at -12.5' on Table 5 in the spring but appears as -5 in Figure 11.

There is actually another contour interval shown around LA15 on Figure 11 (the -10 contour) but it's too small to support a label.

LA12 also appears within a "0" contour line in Figure 11, but is -11.7' according to Table 5.

LA12 has a labeled -10-foot contour around it on Figure 11 (see LA12 location on Figure 4).

Further, LA6 appears to be incorrect, possibly due to problems with the elevation point survey, which raised levels by 6 feet. LA6 is shown as being an island of high water levels (about 10') surrounded by water levels about 5'. Historical data at LA6 shows it shut down between 2009 and 2014 due to seawater intrusion. Why it would be experiencing significant localized mounding--if it is—must be explained.

The old survey elevation was NGVD29, so the survey effectively raised the wellhead elevation by 3.8 feet. LA6 and LA16 actually have similar Spring 2021 water levels (LA6 was 1.4 feet higher) and are both downgradient of the Broderson site, which may provide some mounding influence (pressure transducers are now installed to help with this determination). There may also be some minor mounding effects from Upper Aquifer wellbore leakage.

Page 52—As we suggested last year, the source of the groundwater moving into the Basin from the south should be explained, including its effects on water level and chloride data reliability--and also on water quality, especially if the water is flowing in from Cabrillo Estates since Cabrillo is still on septic systems.

Sources of groundwater inflow along the southern Basin boundary include percolation from the Broderson Site wastewater disposal site (since late 2016), return flows from Cabrillo Estates, percolation of precipitation, potential range-front recharge, and Los Osos Creek, all of which can contribute to a rising hydraulic gradient approaching the Basin boundary. Contouring software also tends to follow established patterns (gradients) toward boundaries. The Broderson site is a location that will be recommended for a lower aquifer monitoring well, and will help define local conditions. Water quality with respect to return flows from Cabrillo Estates is a topic that S&T is currently investigating.

Page 52—Anther recommendation/request we submitted last year is that all water level metrics and other measures based on water data are expressed in the same datum and we suggested NGVD 29 since “0” is very near sea level. Currently, the Water Level Metric is expressed in NGVD29 and the contour maps are in NAVD 88. This is confusing to stakeholders and can be misleading. For instance, people looking at Figure 11, the spring lower aquifer water level contour map, might think no part of the lower aquifers in the Western and Central Area have water levels below mean sea level. In fact, the very large areas within “0” contour lines are about -2.8’ (2.8 feet below sea level) and all other contours are 2.8 feet lower that the number that appears relative to sea level.

We can possibly contour the 0 elevation for NGVD29 in red, or switch the metrics to NGVD 88 as part of the current review process. Will consult with BMC staff for the 2022 AMR.

Page 52—The discussion of water levels on Page 52 states (at the ends of the first three paragraphs) that average seasonal water level declines are “followed by full water level recovery in the spring.” This phrase should be removed or reworded since some wells have pumping depressions below sea level year round, resulting in chronically low levels near the wells and extending out from the wells. For instance, water levels at community supply wells LA12, LA15, LA20, LA22, and LA39 never get above from about -2’ to about -15’ depending on the well. Further, the lower aquifers continue to have no water in storage above sea level though water above sea level is an indicator of Basin health.

Reworded phrase.

Page 57—A discussion of seawater intrusion influence on all lower aquifer wells in the Western Area and even the Central Area should be included, including its effect on the reliability and accuracy of water level data. It is clear from transducer data that seawater influences Wells LA11, LA40, and LA41. Further, the Basin Plan indicates that wells LA11, LA14, and LA16 have been influenced by seawater intrusion in the past (see Pages 100 and 101). We note that these three Water Level Metric wells located in the Western Area. The other two, LA2 and LA3, are on the sand spit.

As explained in the AMR (page 57) the transducer data shows pressure loading and unloading from tidal action in the bay at LA11, LA40, and LA41. This is not “seawater influence” as normally associated with water quality impacts.

Page 57—Regarding Zone D seawater intrusion contour mapping, how the addition of LA41 resulted in "a more westerly (improved) position" for the Zone D contour map (Figure 18) as compared to the 2020 contour map, would have to be further explained and justified. The contour is based mainly on LA10 data, which is acknowledged to have significant variability and not be representative of "broad intrusion front movement." The "refinement" may also be based on data from LA31. Based on the cross section map, LA31, like LA10 is unreliable for Zone D, because it is a mixed aquifer well. (LA10 is a Zone D/E well and LA31 appears to be a Zone C/D well). Any estimated improvement in the contour is likely more than offset by the potential error in the data. Besides variability and mixed aquifer screening adversely affecting data, it is impossible to know if the fall chloride data for LA10 (from a sample with 2.1 of nitrates) is affected by well bore leakage. The multiple factors adversely affecting data—and the potential for the map to not accurately represent Zone D intrusion--should be further discussed and the metric reviewed. Also, the need for more wells to better delineate Zone D intrusion should be mentioned in the discussion.

The westerly movement of the intrusion front resulting from the addition of LA41 to the contour data set has nothing to do with LA10 or LA31. The recommendation for additional monitoring locations to better delineate seawater intrusion in Zones D and E was mentioned.

Pages 57 & 58—Regarding Zone E intrusion, BMC staff agreed with the LOSG in May of 2021 that Zone E intrusion "is a significant threat to basin sustainability and has been for decades" (see 5-19-21 BMC agenda packet, pdf Page 39, Item 1). This threat should be discussed, including the potential for wells in the commercial area to pull seawater further into the Basin and for the intrusion to upcone into Zone D wells (e.g., as indicated in the 2019 Adaptive Management TM and the LOCSD Program C Update TM, e.g., Pages 3 and 4). Due to the lack of sufficient wells to monitor Zone E, the discussion should point out that the direction and extent of Zone E is not known, but that the substantial increases in chloride levels at LA40 indicate substantial inflow that is degrading a substantial portion of the aquifer.

Text added with respect to LA40, along with statement regarding seawater intrusion threat to Zone E. Recommendations for additional wells are mentioned.

Suggesting that the intrusion is moving only toward Well LA12 (also see second Page 2 comment) based on rising chlorides at LA11 downplays the seriousness. The statement that the intrusion is "interpreted to be laterally pervasive in the Western Area…(and)…rising chlorides at LA40 and LA11 indicates worsening conditions over time" also tends to downplay the seriousness by suggesting the intrusion is not an urgent problem. Zone E intrusion could be moving in any direction or several directions. Without adequate monitoring, the movement of Zone E intrusion can't be assessed. The acknowledged threat to LA12 points out that it can threaten any or all Zone D wells. Based on increasing chlorides at LA40, it is more logical that the intrusion is moving in along the syncline than toward LA12, e.g., toward or along the historic pathway. The potential increased influence of Zone E on LA10 data could be a sign that intrusion in Zone E has intruded to the top of the aquifer adversely influencing use of the well. The statement that "There has been no evidence of further movement west of Palisades Avenue…based on the latest geophysics at LA14 and on… Zone E monitoring well LA32… " ignores the potential that seawater in Zone E is intruding to higher levels in the aquifer and could be moving under LA16 and/or to the south of LA16, LA15, and LA18 into the commercial area.

As mentioned above, text added with respect to LA40 and threat to Zone E. Intrusion is already interpreted to have reached the top of Zone E near LA10 (Figures 19 and 20). LA32 is along the Basin syncline and would be directly in the pathway of Zone E intrusion between Palisades and the commercial area.

It may even be moving into Well LA14, which is monitored with geophysics. Based on the discussion in the Geophysics section, the method is not sensitive to the 250 mg/l threshold for intrusion or intrusion precursors—100 to 250 mg/l. We're not sure why the BMC has not included LA5, LA6, LA13, LA14, and LA16 in the water-quality monitoring program since the wells are accessible and already part of the water level monitoring program. Though some of these wells have well-bore leakage and others have mixed aquifer screening, like LA10 they could provide information on seawater intrusion conditions in the Basin. These wells should be added to the water quality program in the short-term, and several new wells should be installed a.s.a.p.

LA14 is one of the targets for well modification to isolate Zone E for direct sampling. This well is being monitoring with geophysics, albeit not with the sensitivity to intrusion detection that direct sampling will allow. All the wells mentioned above are relatively large diameter and deep wells, some of which have ongoing borehole leakage. It was not considered feasible to pump to waste thousands of gallons of water in order to purge a well that has on-going borehole leakage.

Pages 62-65—The considerable uncertainties of groundwater in storage estimates should be discussed, and the need for more monitoring to measure actual water levels throughout the Basin, especially the lower aquifers in the Western and Central Areas, should be stressed. The lack of sufficient wells and the fact that water in storage estimates are based on contour lines, makes the estimates highly uncertain, and it appears to us arbitrary (e.g., where contour lines are drawn). Several other issues relative to groundwater in storage should also be stressed: 1) that there is no water in storage above sea level, which makes the Basin vulnerable to seawater intrusion and future droughts, climate change impacts, and even management actions such as moving wells, 2) that water in storage above sea level is an indicator of a Basin's health and sustainability, 3) that water in storage above sea level in the Upper Aquifer may be needed to stop seawater intrusion and is likely to take time to develop, 4) that setting a measurable objective to reverse seawater intrusion in the lower aquifers in necessary for Basin sustainability, and 5) that setting objectives to reverse seawater intrusion in the Western area would also build reserves (water in storage) that could be used during droughts, etc., while providing a freshwater barrier to preserve beneficial uses, e.g., all supply wells.

A groundwater storage sensitivity analysis was performed for the 2017 AMR (Appendix J). Even under pre-development conditions and pressures that mitigate seawater intrusion, there would be little groundwater storage above sea level in the Lower Aquifer. To be sustainable, water pumped from the Lower Aquifer in the Western and Central areas needs to be replenished by an equal amount of leakage through the Upper Aquifer, boundary inflows, or inflow from the Eastern area. Expanded discussion with graphics with respect to storage above sea level is planned for AMR 2022.

Page 66—The second paragraph under "Basin Metrics" discusses the changes in the Basin sustainable yield definition and value that the BMC approved in 2021. As stated, these changes, including the revised yield of 2,380 and BYM 80 target of 1904 AFY, should be applied in the 2021 report since they represent a sustainable yield value and definition, and a pumping target, more consistent with accepted practice. As we have pointed out, the revised sustainable yield would continue result in undesirable effects (continuing threats of Zone E to wells and the Basin), and the BYM 80 should be set as the "sustainable yield" as a starting point (until sufficient high-quality data is available to accurately assess seawater intrusion conditions and the effects of management actions). The discussion explains that the methodology sets "…a condition that no further inland advance (of intrusion) is allowed from threshold lines drawn parallel to the coast that represent the current (2021) position of the seawater intrusion front in the Lower Aquifer." As we have pointed out, there are not enough wells producing good quality data now to establish the locations of fronts in Zones D and E or to set and confirm measurable objectives that would verify the management actions are achieving the objectives. These issues should be discussed.

Changes in the sustainable yield methodology were adopted for 2022, and mention of this is made throughout the annual report, including the likelihood that the BYM would fall below 80. The need for additional monitoring wells has been stated.

Page 69—The second paragraph mentions that the peer review in 2010 indicates that the model "would benefit from updates as more data is collected" and the Stipulated Judgment requires a peer review every 10 years. However, the 2021 draft also continues to use modeling projections without the 2021 updates and the 2021 draft recommends that the peer review is not completed until after the model is upgraded to a transient model. The LOSG has pointed out that the transient model is not likely to significantly improve the model as a planning tool unless there are many new monitoring wells to better understand basin conditions (e.g., water levels, the movement of groundwater, and Basin structure) and the effects of management actions. We have also pointed out that the model is being relied on too heavily now for key decisions (e.g., deferring programs) that are not supported by sufficient data. We have suggested that BMC priorities should be on implementing Program C and a strong conservation program for the current population as proposed in the Basin Plan, in addition to improving the monitoring system, and implementing measurable objectives based on improved monitoring. The need for better data relative to modeling and measurable objectives should be discussed.

Comment noted. Transient modeling will benefit from data collected since implementation of the wastewater project, such as Broderson mound development and the continued rise on Lower Aquifer water levels.

Page 70-72—The Water Level Metric has several issues that make the metric unreliable and/or inaccurate (not representative of conditions in the intrusion impacted Western Area of the Basin). These include 1) too few wells, 2) inadequate well distribution and density, 3) wells producing poor quality data, and 4) problems with the data as presented. The metric includes one well in the northern Basin (LA11), two wells in the historic pathway (LA14 and LA16) and two wells on the sand spit (LA2 and LA3). This leaves significant gaps in coverage where water levels effects on water levels could differ substantially from the effects on metric wells. Furthermore, Wells LA14 and LA16 are mixed aquifer wells, so the data is not reliable for Zones D or E leaving a major gap in the pathway in both Zones D and E, and the only aquifer-specific metric well is LA11, a Zone E north of the pathway. LA11, and likely LA2 and LA3, are unreliable due to seawater intrusion influence. In fact, all of the wells in the Western and even some in the Central Area may be unreliable due to seawater influence since the Basin Plan cites LA11, LA14, and LA16 as being influenced by seawater intrusion historically (see Pages 100 and 101).

A revised Water Level Metric with more wells and better distribution is under review by BMC staff.

Further, the data presented for LA3 will need to be explained. Last year, we pointed out what we believed to be an error in the metric based on spring water level data in the draft report, and we received the following reply:

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. Subsequently, the elevation reference point for LA3 was changed in the final 2020 AMR from 19.47’ to 23.89’. This year, there is either the same error in Table 20 (i.e., a number inconsistent with water level data on Table 5.) or the data on Table 5 is the correct data and Table 20 overstates the elevation at LA3. The reason we think the data and reference point in Table 5 of the current draft are correct, is that the 2016, 2017, and 2018 AMR final drafts have the same elevation reference point and the footnote on the table in 2016 indicates that data accounts for the County's "adjustment for raising (the) wellhead." Further, the other well the footnote applies to, LA1, has no later changes in the elevation reference point. The LA3 reference point is changed in 2019 and 2020 to 23.89.' LA3 water levels in 2016-2918 are also based on the elevation reference point of 19.47. Therefore, if 19.47' is incorrect, LA3 values and related metric values would apparently have to be backdated, in addition to all line graphs and analyses. This inconsistencies with this data will have to be explained, and documentation of what has happened at the well should be provided.

The well head at LA3 was raised in February 2019 from 19.47' to 23.89'. This update is applied to the County database every year and was missed in the draft text this year – the metric calculation uses correct elevation.

Pages 72 & 73—The Chloride Metric also has several issues that make the results unreliable and/or inaccurate. One of these is the insufficient number of wells and larges gaps in the metric, especially for Zone E, due in part to poor quality data. We discussed some quality issues in comments on water contour mapping above, most of which AMRs also acknowledged (variability and related unreliability for monitoring general conditions, well-bore leakage, and mixed aquifer screening)—mainly stemming from problems with LA10. Further, it is not possible to eliminate the problems at LA10 with a data substitution method as implemented in 2017, 2018 and 2020, or with a pumping/collection protocol as implemented apparently in 2019 through 2021. These measures have their own limitations and unreliability/inaccuracy issues, including that nitrate data has considerable variability relative to chloride data, so substituting data based on nitrate levels is unreliable. The pumping/collection protocol results in unreliability due to variability in operator schedules and needs, as shown by the decision to substitute data in 2020 due to too much pumping prior to the spring sampling. The protocol also undermines the basic strategy for reversing seawater intrusion—the reduction of pumping in the Western Area. Thus, to state that a 3 mg/l improvement in the metric, indicates "an overall improvement during 2021" is not supportable and it is misleading (e.g., it does not reflect that seawater intrusion conditions in Zone E are worsening).

A revised Chloride Metric with more wells and better distribution is currently under review by BMC staff.

Page 74—The Nitrate Metric highlights a shortcoming of all the monitoring metrics. The Chloride, Water Level, and Nitrate Metrics all provide average values, which provide limited information about conditions and can be misleading. The Nitrate metric has improved, but this is almost entirely due to improvements at one well. SGMA requires water level and water quality objectives to be based on quantified minimum thresholds at each well in a series of wells. The SGMA metric requirement better represents conditions in management areas and Basin wide. This shortcoming of the metrics should be discussed for all the monitoring metrics. Also, it would be helpful for planning purposes if timelines for improvements in water quality in specific parts of the Upper Aquifer and Basin in general were estimated using the model to make management of the upper aquifer more effective and to determine the best use of recycled water. Currently, most if it is being discharged at Broderson leach fields. Offsetting potable water use or blending some upper aquifer water for injection and replacing the groundwater with recycled water via leach fields may be a more effective use of recycled water.

A revised Nitrate Metric with more wells and better distribution is currently under review by BMC staff.

Conclusion: We did not have time to complete a full review of the AMR draft and reviewed only to Page 74. The LOSG is providing this input to explain some ways the Annual Report can provide stakeholders more accurate, complete, and useful information regarding the status of the Basin to aid in a fuller understanding of conditions and options. We do not intend to imply that by making some or all of the changes we suggest that the BMC will correct all of the problems we see with the present Basin Plan, Stipulated Judgment, and BMC practices and policies. In general we believe that, for Basin management to stop and reverse seawater intrusion and make other necessary improvements for a sustainable Basin, the management approach would have to be much more data-driven and outcome-based consistent with SGMA and with the Coastal Commission's requirements (e.g., that County must show with "conclusive evidence" that additional development can be supported by the Basin before it is approved). The BMC process now primarily a model-driven approach, in which key decision-making is based on theoretical future outcomes (e.g., that certain programs, mainly infrastructure programs, will increase the sustainable yield). We support substantial upgrades to the monitoring program, the development of measurable objectives based on high-quality data that address all undesirable effects on beneficial uses of the Basin, and a focus on maximizing conservation, recycled water use, and the most cost-effective infrastructure programs Basin wide, with costs and participation in programs spread Basin wide. To obtain grant funding and achieve these goals and Basin sustainability, Basin management may have to be shifted to SGMA jurisdiction.

CHG Response to S&T Comments on 2021 Annual Report Public Draft dated May 15, 2022

Item	Section/ Doc page	Pdf page	Comment or exception
A	ExecSum/2	7	On recommendations made in the AR: We are concerned that a unanimous vote of the BMC Board could be interpreted as approval for changes in BMC policy presented in an Annual Report.

The following statement has been added to page 3 and page 67 of the Final Draft AMR: "Approval of the Annual Monitoring Report by the BMC does not constitute unanimous approval of actions listed under Section 5.11.4 of the Stipulated Judgment or setting the Sustainable Yield for a given year. These actions require a separate action and unanimous approval by the BMC."

Item	Section/ Doc page	Pdf page	Comment or exception
B	ExecSum/1	6	The 2021 AR should acknowledge that the figures used for sustainable yield(2021) were not arrived at by the methods mandated in the Stipulated Judgement agreement. The SY(2021) value used in this AR was not approved by the methods mandated in the Stipulated Judgement. This situation will be corrected for the 2022 AR, but the problem remains in this draft AR for 2021.

Clarifying text added to footnote on report Page 67.

Item	Section/ Doc page	Pdf page	Comment or exception
C1	ExecSum/1	6	There has been a large decline in estimated Ag well production over the past 10 years. We feel that a complete and rigorous presentation of the methods for estimating non-metered irrigation has not been sufficiently provided in Appendix H. We would like to have enough information so that we could independently reproduce the resulting estimates. We would also like to see how the variables may have changed over the years, resulting in changes to the estimates for non-metered production.

Additional information has been provided in Appendix H.

Item	Section/ Doc page	Pdf page	Comment or exception
D	App H,	298	This appendix should be renamed, "2021 Agricultural and Community Water Use Estimates"

Done, although more specifically as "2021 Agricultural and Community Turf Water Use Estimates".

Item	Section/ Doc page	Pdf page	Comment or exception
E	App H, G4	303	The calendar year rainfall used for estimating irrigation production in 2021 is 23.12 in, but the actual 2021 calendar year rainfall reported for the Los Osos Landfill site was 12.17 inches. Is this a mistake?

No, the rainfall for calendar year 2021 is 23.12 inches. You may be confusing the rainfall year (July 1 – June 30) with the calendar year (January 1 – December 31).

Item	Section/ Doc page	Pdf page	Comment or exception
F	App I	305	S&T indicated that there were some specific questions regarding the BMC use of 17.3 in/year of rainfall as an input to the Basin Model which is used, in part, to derive the Sustainable Yield estimates. I suggest that the annual rainfall estimate represents an important policy decision for the BMC and should only be adopted or changed by a unanimous vote of the BMC Board.

Comment noted.